

FE Revival

BUILDING A 450HP "BOAT ANCHOR"

BY DAVID FREIBURGER

Photography: David Freiburger

The popular opinion of the collective gearhead is that a Ford FE engine is best utilized at the end of a chain at the bottom of a lake. FEs are just fun to ridicule—they're the automotive Rodney Dangerfield. Of course, that's a hobby practiced by guys who have never laid tracks with a 428SCJ or watched a few rounds of FE-powered Super Stockers hang the hoops. The 390 version of the FE uses a bore and stroke of 4.050x3.78, not unlike the specs for a Chevy 383 (4.030x3.75), but it has much longer rods (6.488 for the 390 compared to 5.7 to 6.125 for the Chevy). With a monster 10.170 deck height, the FE is certainly bigger, heavier, and funkier, but no less capable of making power. Torque, especially.



Baskerville always pounded into us that every car buildup needs to have an unwavering theme, and we see engine buildups no differently. This one's simple: truck motor. We want to stab this in our '66 F-150 shortbed, run it on 87 octane, and spin mad tire while haulin' parts to and fro. We hit our goals to the tune of 450 hp and 461 lb-ft, making this a great street engine for a Mustang, Galaxie, or whatever. Watch.

The Core

The Ford FE came in sizes from the tiny 332 through the average 352 and 360 through the renowned 427 and 428. But the FE with the best balance of availability and potential is the 390, introduced in 1961 and used in passenger cars through '70 and trucks to '75. The guys at Memory Lane Collector Auto Dismantlers, where we got our core, say the 390 is the single



most common Ford engine in their yard.

If you have a 360 Ford truck engine, the significant difference between it and a 390 is the stroke (3.500 versus 3.780), so all it takes is a 390 crank and pistons to make a 390 out of your 360. Similarly, a 410 Mercury is like a 390 block with a 428 crank (3.980 stroke). The 360, 390, and 410 all have a 4.05 bore, and all can accommodate a 3.780 or 3.980 crank.

Almost all the FE engines have "352" cast into the left front, so don't let that fool you when picking a core. Also, be aware that early high-performance 390s do not have oil holes drilled for the lifter galleries so hydraulic cams cannot be used. Another change is that '64-and-earlier blocks have two engine-mount holes per side, and '65-and-later have three. Our block is from a '64 T-bird, so we'll have fun trying to swap the mismatched mounts into our '66 truck.

Bottom End

While Scat will soon release 4,000-, and 4.125-inch-stroke cranks for Ford FE applications, we kept this buildup simple by reusing the stock crank and rods. Dougan's

Engine did all the machine, balancing, and assembly work, while Castillo's Crankshafts cut our stocker 0.010/0.010. Dougan's also rebuilt the stock connecting rods with new Sealed Power bush-

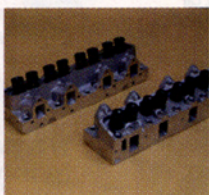
ings and ARP's premium Wave-Loc Pro Series 220,000-psi rod bolts. A good thing, since the rods have 758 grams each and the slugs are 817 grams. The pistons are Speed-Pro L2291F-030 forgings with 10 cc's of four-eyebrow valve reliefs. The bearings, rings, oil system parts (except for an



loaded with Fel-Pro gaskets. We left the oil pan and harmonic balancer stock, but sealed it all up with ARP fasteners.

Heads

To rebuild our 390's original heads to stock specs would have cost us somewhere in the 900-bucks range by the time we bought all the necessary parts. So it seemed obvious that the Edelbrock Performer RPM



FE heads were a much better deal at around \$1,250. Not only does the pair weigh 40 pounds less than the iron stockers, but the heads feature 2.09/1.66 valves

like a 428. Edelbrock says they flow 270/200 cfm at 0.600 lift and 28 inches of water. You can port iron heads to the same level, but why spend that fortune? Our only hangup was that Dougan's Tim Martindale found the stock bronze valveguides a bit too tight for his taste and honed them to 0.0014-0.0016-inch clearance. He also took 0.030 inch off of every intake-valve tip; "With a fixed rocker fulcrum, the pushrod does not determine the rocker geometry, and the valve length becomes more critical." Dougan's gets all the details perfect.

The Edelbrock FE heads are available with either 76cc chambers (PN 6007 for an assembled pair) intended for 427 low- or medium-riser applications, or with 72cc chambers (PN 6006). We chose the latter, and with 10 cc's of dish in the pistons, a piston deck height of 0.005 in the hole, and Fel-Pro PN 1020 head gaskets (0.041-inch thickness, 4.400 bore), the compression ratio landed at 9.68:1. With aluminum heads, we anticipate full compatibility with 87 octane. The spark plugs we needed were Autolite 3924s, and in a fit of overkill, we affixed the Edelbrock heads with ARP studs.

Cam & Valvetrain

Crane Cams offers hydraulic-roller-lifter cams for virtually any American V-8, and has two PowerMax juice-roller grinds for the FE. The Crane tech line advised the smaller of the two for our application. It's got 222/228 degrees of duration at 0.050-inch tappet lift, valve lift of 0.584/0.607, and 110 degrees of lobe separation. The



ARP pump drive-shaft), water pump, and freeze plugs are also Sealed Power or Speed-Pro parts, and we used a Sealed Power complete gasket set

lift seems like a lot for a cam of such little duration, and that's because of the FE's stock rocker ratio of 1.76:1. We used the cam in conjunction with an ARP cam-bolt kit and all of Crane's recommended components, including adjustable ductile-iron rocker arms installed on our original rocker shafts, but were able to use the stock valvesprings that came on the Edelbrock heads. The only drawback was that the distributor required a bronze-aluminum distributor gear due to the camshaft's steel construction without a ductile iron cam gear.

Because of the altered camshaft base circle, decked block, and height of the hydraulic roller lifters, custom pushrods were required. Whereas a stock FE has 5/16-inch-diameter, 9.585-inch rods with a 3/8-inch cup on one end and a 3/8-inch ball at the lifter end, Dougan's assembler Jeff Jacobs specified 8.710-inch pushrods. The custom pushrods were 3/8-inch diameter, and needed smaller 5/16-inch balls at the lifter end to accurately fit the Crane lifters.

Induction

Edelbrock offers three manifolds for the FE: the low-rise dual-plane Performer 390 (PN 2105), the high-rise dual-plane Performer RPM FE (PN 7105), and the all-



new Victor FE single-plane for either 4150-type carbs (PN 2936) or Dominator-type carbs (PN 2937). Of these, we felt the RPM was best matched to our

combo. We topped it with an Edelbrock 800-cfm carb with a manual choke, though Edelbrock now offers an electric-choke version (PN 1413) that we could have used for better street service.

Fel-Pro offers several intake gaskets, and we found the PN 1247, for a 427 medium-riser or 390 GT with a 1.4x2.1-inch intake port mouth, to be the best fit.

Ignition

For spark, we chose the Billetproof self-contained distributor from ACCEL as well as a Super Stock chrome coil and a set of black Extreme 9000 8mm plug wires with straight boots. AC-



CEL offers a conversion cap to swap the distributor to HEI-type terminals (PN 8345), but we kept the socket-type set-up to look more retro. And it does look pretty vintage with a set of gennie Cal Custom finned aluminum valve covers we picked up at a swap meet. We picked Hedman Hedders for the outlet, using the PN 89100 set for '65-'76 trucks; they have 1 3/4-inch-diameter primary tubes and 3-inch collectors. The headers

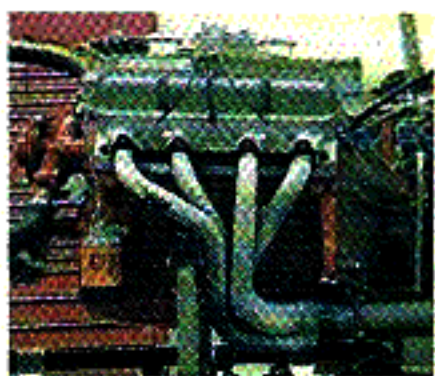
FORD 390 PARTS LIST

DESCRIPTION	PART NUMBER	SOURCE	PRICE
Short-Block & Heads			
390 engine core	NA	Memory Lane	\$350.00
Speed-Pro pistons	L2291F-030	Summit Racing	\$267.12
Sealed Power rings	E180K-20	Jobber*	\$64.37
Speed-Pro main bearings	125M-010	Jobber*	\$58.17
Speed-Pro rod bearings	8-7170CH	Jobber*	\$63.97
Sealed Power cam brings	1445M	Jobber*	\$22.18
ARP main bolts	155-5201	Summit Racing	\$45.95
ARP head studs	155-4201	Summit Racing	\$106.95
ARP rod bolts	255-6402	Summit Racing	\$79.69
ARP damper bolt	150-2501	Summit Racing	\$18.95
Edelbrock heads	6006	Summit Racing	\$1,229.00
Sealed Power rod bushings	2304V	Jobber*	\$19.92
Pioneer deck dowels	PF485	Dougan's Engine	\$1.00
Gaskets, Hardware & Chemicals			
Sealed Power gasket set	260-3026	Jobber*	\$238.97
Sealed Power plug set	381-8017	Jobber*	\$5.85
ARP cam bolts	155-1002	Summit Racing	\$2.95
ARP accessory bolt kit	555-9802	Summit Racing	\$75.95
Ford red, two cans	NA	Pep Boys	\$7.98
Valvetrain			
Crane roller cam	349521	Summit Racing	\$302.69
Crane roller lifters	35532-16	Summit Racing	\$399.95
Crane rocker arms	34772-16	Summit Racing	\$189.95
Custom pushrods	NA	Dougan's Engine	\$185.00
Induction			
Edelbrock Performer RPM	7105	Summit Racing	\$287.95
Edelbrock 800 carb	1412	Summit Racing	\$279.95
Oiling			
Speed-Pro oil pump	224-110R	Jobber*	\$48.89
Sealed Power pickup	224-14159	Jobber*	\$14.86
ARP oil-pump shaft	154-7902	Summit Racing	\$16.95
Fram oil filter	PH8A	Pep Boys	\$4.49
20W50 oil	NA	Pep Boys	\$6.45
Ignition			
ACCEL distributor	71200E	Summit Racing	\$224.95
Crane bronze gear	34990-1	Summit Racing	\$62.39
ACCEL plug wires	9000	Summit Racing	\$71.95
ACCEL chrome coil	8145C	Summit Racing	\$39.95
Spark plugs		Pep Boys	\$10.32
Accessories			
Hedman headers	89100	Summit Racing	\$129.95
Used bellhousing	NA	DSC Motorsports	\$45.00
Starter	NA	NAPA	\$71.60
Used valve covers	NA	Swap meet	\$45.00
Machine Work			
Hot tank and crack check		Dougan's Engine	\$45.00
Bore & hone with torque plate		Dougan's Engine	\$179.00
Surface engine block		Dougan's Engine	\$100.00
Align-hone		Dougan's Engine	\$100.00
Install cam bearings		Dougan's Engine	\$30.00
Recondition rods		Dougan's Engine	\$104.00
Rebush rods		Dougan's Engine	\$64.00
Balance assembly		Dougan's Engine	\$125.00
Check heads		Dougan's Engine	\$60.00
Hone guides		Dougan's Engine	\$80.00
Tip eight valves		Dougan's Engine	\$60.00

TOTAL

\$6,044.21

*These are Jobber prices as of press time for Federal-Mogul products. It's likely you can get these parts at lower prices from local parts suppliers nationwide.



are available coated, but we didn't choose that option. Our 390 was wrapped up with a stock iron water pump (Edelbrock also has aluminum ones, PN 8805 unpolished) and stock pulleys.

Dyno Time

So we could hang the 390 on the Westech dyno, Dennis Carrico of DSC Motorsport (an FE specialist) drove a couple of hours to deliver a used FE truck bellhousing and a floater plate (the steel shim between the block and the flexplate), then he hung out for the test and tune.



The first thing we learned is that the module inside the distributor had died; we bypassed it and ran the magnetic trigger through an external MSD Digital 7 ignition box. ACCEL has since replaced the distributor under

warranty, since we didn't want to run an external box on the truck. The best ignition timing setting proved to be 34 degrees total on 76 Performance Products 91-octane fuel. (We didn't have 87 octane at the dyno.) The 800-cfm Edelbrock is delivered with 0.113-inch main jets and 0.071x0.047-inch metering rods. We reduced the jet size to 0.107 to lean it out under WOT conditions, but that created a lean condition under part-throttle, high-vacuum motoring. We then changed the metering rods to ones with a thinner top half, 0.063x0.047, to let more fuel flow in cruise mode. Done.

The end result was 450 hp at 5,600 rpm and 461 lb-ft at 3,900 with over 400 lb-ft throughout the entire curve. It's not a full-race mill, just a good streeter. Under a simulated load on the dyno, it idled at 800 rpm with 11 inches of vacuum. It had a little lode to it, but you'd be a real namby-pamby if you couldn't live with it. We'll hook it up to a C-6 with about an 1,800-rpm-stall converter and some 3.00 rear gears and probably have ourselves a low-14s/high-13s parts-chaser. Neat. **HR**

BOAT-ANCHOR POWER

RPM	LB-FT	HP
3,000	434.5	248.1
3,100	432.0	254.9
3,200	434.4	264.6
3,300	441.1	277.2
3,400	447.8	289.8
3,500	454.0	302.5
3,600	457.6	313.6
3,700	459.4	323.6
3,800	459.0	332.1
3,900	460.8	342.1
4,000	459.4	349.9
4,100	457.4	357.0
4,200	455.4	364.2
4,300	455.0	372.5
4,400	454.7	380.9
4,500	454.9	389.7
4,600	455.1	398.6
4,700	453.6	405.9
4,800	451.7	412.8
4,900	447.5	417.5
5,000	445.0	423.6
5,100	442.0	429.2
5,200	440.5	436.1
5,300	436.3	440.2
5,400	432.6	444.7
5,500	427.3	447.5
5,600	422.1	450.0
5,700	412.5	447.6
5,800	404.0	446.1

Sources

76 Performance Products

Yorba Linda, CA; 800/345-0076

ARP

Oxnard, CA; 800/826-3045; www.arp-bolts.com

Dougan's Engine

Riverside, CA; 909/681-1961

DSC Motorsport

Anza, CA; 909/763-9765; www.dscmotorsport.com

Edelbrock

Torrance, CA; 310/781-2222; www.edelbrock.com

Federal-Mogul

(Speed-Pro, Sealed Power, Fel-Pro)

Southfield, MI; 800/325-8886

Hedman Hedders

Cerritos, CA; 562/921-0404; www.hedman.com

Memory Lane Collector Auto Dismantlers

Sun Valley, CA; 818/504-3341

See More at hotrod.com

While assembling our 390 for this story, the guys at Dougan's Engine imparted some invaluable tips and tricks for anyone wrenching on an FE Ford. See them now at

<http://www.hotrod.com/webonly/january>.