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Butler Performance has long been the big chief of Pontiacs. They have steadily built a legacy of being the go-to shop for anyone looking to make big power with their Pontiac, and with the introduction of the LS in late-model GTOs, client demand has expanded their services.

When COMP Cams began updating its iconic convertible '69 Camaro for the company's 40th anniversary, Butler was ready and waiting. Not only is Lawrenceburg, Tennessee-based Butler fairly close to the COMP headquarters in Memphis, the shop's vast experience with the new RHS blocks made it an ideal fit.

With a full assortment of COMP Performance Group products stacked up on an engine-building cart, the project went from bare block to a 690 hp screamer in three days. Final numbers were 690 hp at 6,700 rpm and 619 lb-ft at 5,100 rpm. Follow along. [PPV](#)

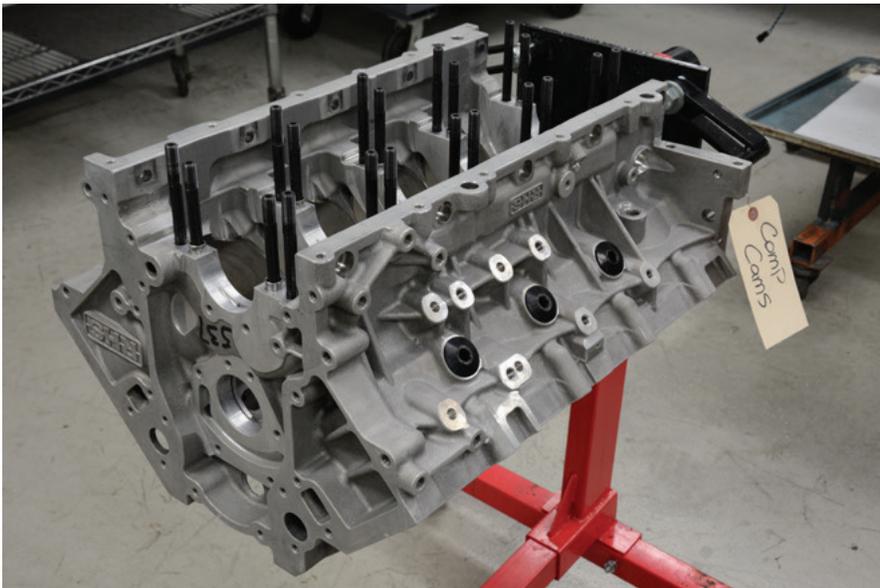
Source: Butler Performance, butlerperformance.com



(Above) COMP Cams built its 1969 Camaro in the late '90s. (Right) The finished Camaro was a fixture on Hot Rod Power Tours until 2010.



(Above) Butler Performance has been in its "new" building for two years. Previously it was split into two buildings for machining and assembly. This old furniture store has plenty of room.



After a thorough inspection and measuring, the RHS block was given a preliminary cleaning and mounted on the engine stand.



Each engine gets its own assembly cart to make sure everything stays in one mobile place. All paperwork and specs are within reach.



The pistons from Diamond were works of art. They were coated on the bottom and featured beautiful CNC work on the crown — no extra work needed.



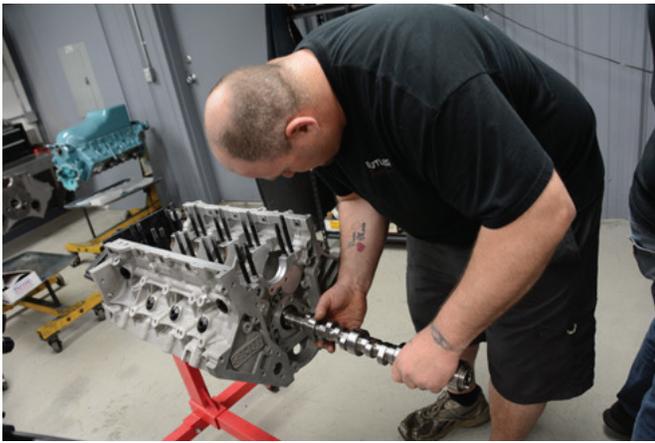
Lunati Rods were checked and balanced before hand.



The Lunati crankshaft was balanced in-house.



The titanium valves were installed in the RHS heads so the spring height could be double-checked. The trick tool steel retainers were loaded into the height checker, and all measurements were recorded.



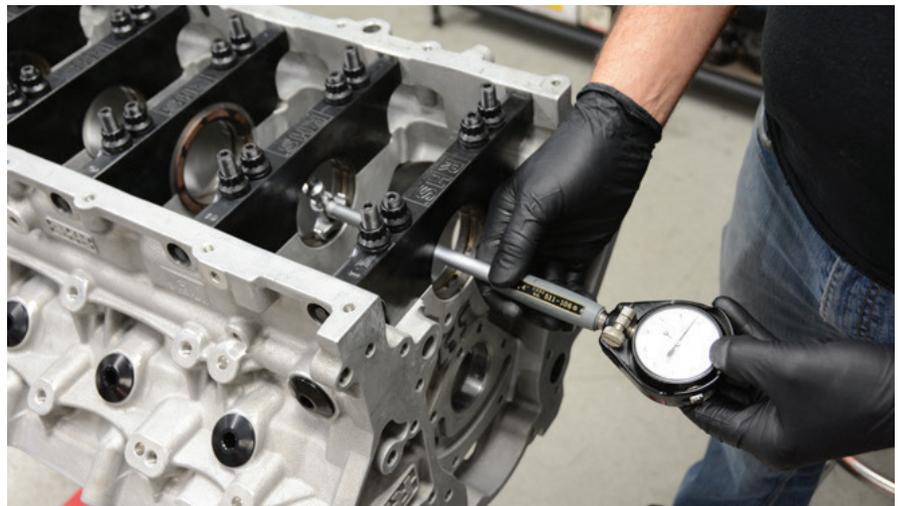
The camshaft was installed first to measure pushrod height. Since aluminum engines expand, allowing cam bearings to move around, spiral locks hold the bearing in place. Of course we all know it's getting a custom COMP camshaft. It's on a 117 lobe separation and ground straight up with a .675 valve lift and 298/316 advanced duration and 247/257 at .050.



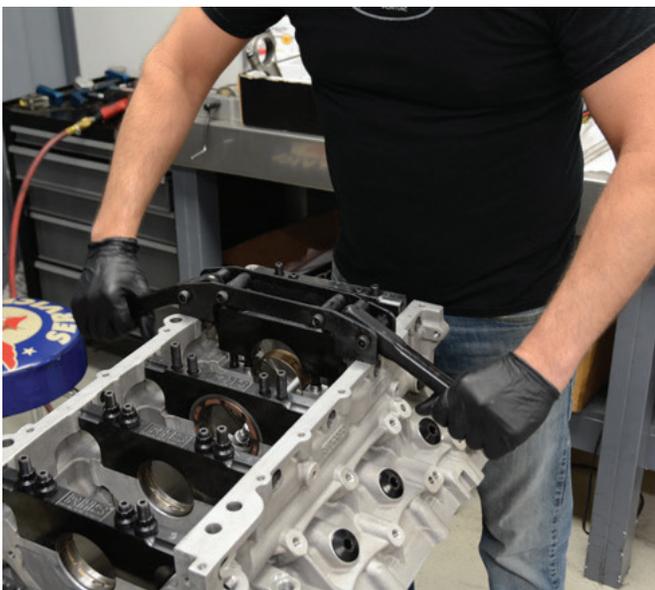
The Lunati rods were wrist-pinned into the Diamond pistons after a little oiling.



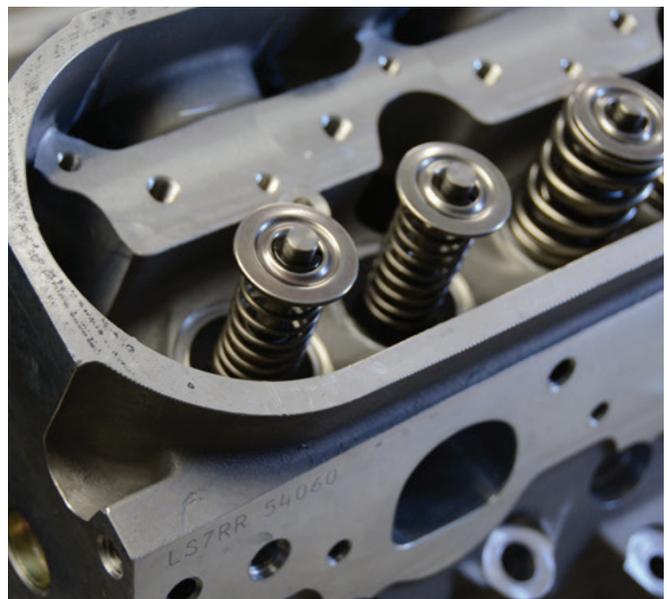
The rod bolts were torqued to spec in a bench clamp and checked for proper rod bolt stretch. All measurements were carefully recorded.



The main caps were torqued into place. Their measurements were taken, recorded and later compared to the crank to ensure proper bearing size.

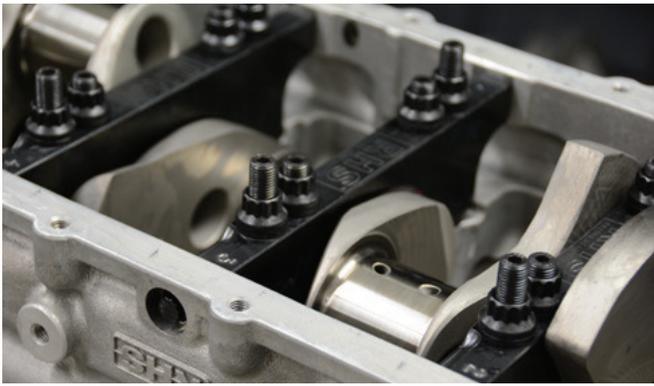


To remove the doweled main caps, RHS makes a very handy cap puller tool that does the job properly without damaging the caps or block.



COMP XD Short travel lifters were installed to begin checking the pushrod length. A set of lightweight "check springs" were also installed. By eliminating unwanted spring deflection that would occur from full spring pressure, check springs allow the valve train to be rotated without damaging the checking pushrod.

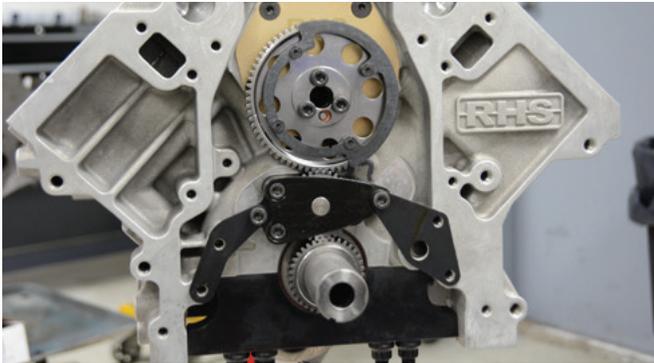
For more, search "Butler Engine Build" at PPNDigital.com.



We installed the crank and torqued the main caps. A dab of silicone sealer was added to the side bolts, and they were torqued to 40 pounds.



The RHS block uses a sturdy cam-retention plate, held in with six Allen bolts.



The camshaft was ground on a 117 lobe separation, but also ground straight up. Degreasing showed the need to add four degrees by using the correct concentric gear bushing to orientate the gear. A beefy gear drive was also added.



The Butler valley cover went on next. It offers two versions for engines using either a front or rear cam sensor. RHS spacers are needed when using the tall deck block. Raising the cam in the block moves the head surfaces up and out.



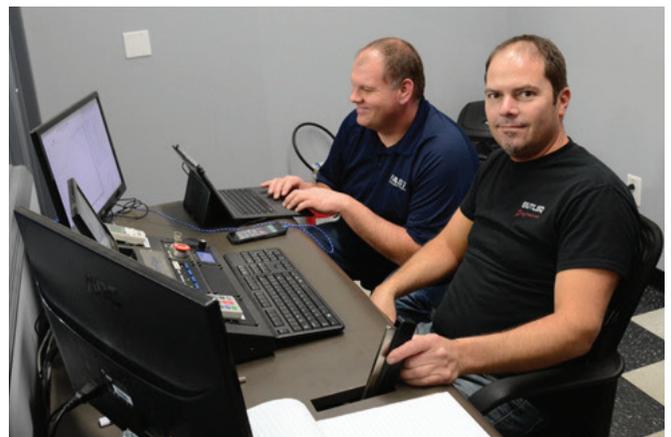
With the rocker arm stands installed and the rockers and pushrods adjusted to zero lash, the valve train was dialed in. With our FAST LSXR 102mm intake and throttle body plumbed with fuel rails, the engine was taking shape.



Wegner whittled out our trick valve covers on its CNC machines. The coils tuck neatly under the top half. An ATI Super Damper will handle the power.



The engine was mounted on the dyno and filled with Driven BR40 break-in oil. Ignition was controlled with the EZ-LS Ignition Control from FAST. This version is LS-specific. After break-in, the oil was replaced with Driven LS30 synthetic 5W-30 for the dyno pulls. David Page from FAST was brought in to assist with the EFI tuning. He and Rodney Butler broke the engine in and ran a series of tests to find the right fuel curves.



After finding what the engine liked and tuning accordingly, David and Rodney were able to tip the dyno charts at 690 hp at 6,700 rpm and 619 lb-ft of torque at 5,100.