

Pro-Series Shaft-Mount Rocker Arms

Part Number 118108-1, AFR 215RR (Raised Runner) & 220 SBC Racing Heads

For more information, see www.cranecams.com

Crane Pro-Series Shaft-Mount Rocker Arms are designed for Professional racers utilizing aftermarket racing cylinder heads. This system was designed to take advantage of the latest developments in advanced composite materials technology and metallurgy. These rockers were designed and engineered using the latest in Finite Element Analysis software, have undergone hundreds of hours of Spintron® laser traced valve-train analysis, and enhanced with the many decades of design, fabrication and testing experience of Crane Cams' Research & Development Department.

How Crane Shaft-mounted Rockers Increase Power and Endurance

During the opening and closing of the valves, the needles in traditional needle bearing roller rocker arms actually roll in one direction as the valve opens. They then stop rotation at maximum valve lift and then as the valve closes must reverse their direction. This stopping and starting of the bearings is called "bearing inertia."

Simply put, bearing inertia consumes horsepower. What's more, this effect increases significantly as engine rpm rises and valve spring loads increase. In addition, needle bearing rocker arms use what are termed "full complement" bearings, meaning the needles lay against each other. Since hundreds of needle bearings are used in a set of rockers, this friction accumulates to create significant rolling friction.

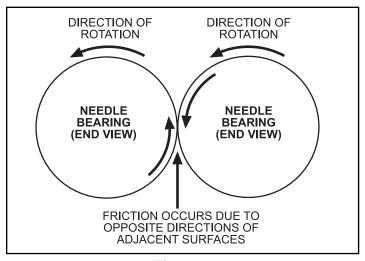


Figure 1.

One "solution" could be using "caged bearings", with separated needle bearings. However, the added weight of the bearing cages and the decrease in load bearing strength would make this option obviously undesirable. With a "full complement bearing" rocker, all the needles roll in the same direction, but the adjoining surfaces move in the opposite direction. This "back-and-forth" motion plus the need to move the weight and mass of the needle bearings with each up and down motion creates a significant amount power-robbing friction! (See Figure No. 1)

The knowledge of bearing inertia has been known and of concern for many years. The most common way to minimize bearing inertia has been to reduce the diameter of the fulcrum shaft. Unfortunately, this creates at least three other problems, all of which are made even worse when the valve spring load on the smaller shaft increases "unit loading" on the shaft and bearings. This results in: (1) Increased friction (2) Increased shaft wear (3) Increased shaft flex, resulting in nose wheel chatter and accelerated valve guide wear.

Crane Cams new Shaft-Mount Rockers have no needle bearings! Instead, they utilize an advanced polymer-matrix composite bearing riding on a specially finished shaft of substantially larger diameter. This delivers a rocker system with exceptional strength, zero bearing inertia, and unequalled structural rigidity. Crane Cams Shaft-Mount Rockers operate with less friction, deliver more horsepower, reduce valve guide wear, and have a longer operational life than any other rocker arm system!

In addition to reduced friction and elimination of needle bearing inertia, additional power gains are also realized through the unique geometry of the Crane Shaft-Mount rocker body design. Unlike other rocker arm systems, Crane Shaft-Mounts lift the valve off the seat at a rate higher than the advertised rocker ratio. For example: A 1.6 ratio Crane Shaft-Mount rocker opens the valve from the seat with a starting ratio of 1.72 to 1. As the valve is opening the ratio reduces due to the geometry so that the "stated" 1.6 ratio is achieved at about .300" valve lift and maintained throughout the remainder of the valve lift. This feature improves flow to the cylinder in this critical early period of crankshaft rotation and helps maximize cylinder pressure

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and peak power. This unique action is not unlike changing to a more aggressive cam lobe profile while maintaining the same operational duration!

Considerable strength and durability increases have also been realized by building these rockers from a new alloy of extruded aluminum billet material! This new alloy has far greater strength in the critical 250-300°F temperature range seen by today's high output engines. By comparison, other aluminum rockers are made from alloys designed for high altitude aircraft use, where temperatures are extremely low. These alloys typically lose as much as 50% of their strength when operated in the 250-300°F environment common to a street or race engine! New Crane Shaft-Mount rockers are alloy-engineered to be substantially stronger and far more durable than other stud-mount or shaft-mount rockers.

Crane Shaft-Mount rockers are manufactured using CNC (computer numerical control) machinery and quality control verified continuously during all manufacturing operations. We use only the finest materials in all phases of manufacturing and all required heat treat hardening is performed in our Daytona Beach facilities.

Notes About Crane Cams "Pro-Series" Shaft-Mount Rocker Arms

Due to the vast array of cylinder head manufacturers and cylinder head part #s within a given manufacturer, Crane Cams sells the cylinder head installation kits without the rocker arms. Installation kits include mounting stands, shafts, mounting hardware and appropriate shims and thrust washers. Rocker arms are sold separately due to the large number of ratios (and in some cases pushrod seat offsets). Rockers must be ordered by specifying the number of intakes and exhaust (with consideration of left offset or right offset of the pushrod seat) and the rocker arm ratio desired for intake and exhaust. Contact the Crane Cams Technical Service line at 1-386-258-6174 for any questions or assistance in placing your order for rocker arms.

Intake Rocker		Exhaust Rocker	
Arm Number	Ratio	Arm Number	Ratio
118121L/R-1	1.50	118201L/R-1	1.50
118122L/R-1	1.55	118202L/R-1	1.55
118123L/R-1	1.60	118203L/R-1	1.60
118124L/R-1	1.65	118204L/R-1	1.65
118125L/R-1	1.70	118205L/R-1	1.70
118126L/R-1	1.75	118206L/R-1	1.75
118127L/R-1	1.80	118207L/R-1	1.80
118128L/R-1	1.85	118208L/R-1	1.85
118129L/R-1	1.90	118209L/R-1	1.90

Note: It is suggested that lifters with offset pushrod seats be used with AFR 215RR cylinder heads!

- The shafts in your Crane Shaft-Mount system have been treated to a special metal finishing process.
 Do not scratch, dent, ding or damage these shafts. Treat them exactly as you would main or rod bearing inserts! Any damage to the shafts will negatively affect the performance and life of the system.
- 2. Do not run the pushrod seat of the adjuster more than 2 turns out from the seated position. If proper geometry cannot be achieved within 2 turns of the pushrod seat, **change pushrod length.** This is required to achieve proper operational geometry, assure adequate internal oiling to the composite bearings, and minimize wear of the pushrod seat and tip.
- Do not use oil restrictors in the lifter galleries or restrict oil to the rockers in any way! High valve spring pressures generate heat that builds in the rocker body. Full oil flow to the rockers must be provided to cool the rocker body and reduce friction.
- 4. Check the cylinder heads for pushrod clearance through the pushrod holes. Be sure that clearance exists through the **full range of valve motion**. Grind clearance in the pushrod holes as needed. Grind in the plane of operation; which is in line with the pushrod and valve stem. Be careful not to grind through the sides of the intake ports.
- Clean all rocker stud holes with a clean tap (7/16 x 14) to assure that no debris has collected in the bottom of the holes that might interfere with proper torquing of mounting bolts.
- Use liberal amounts of the supplied Crane Cams "red" Assembly Lube on the shafts, rocker arm bearings, and rocker nose wheel.
- Use oil or fastener torquing lube on all fasteners before tightening to proper torque spec.
- 8. Do not over torque or under torque fasteners.
- 9. VERY IMPORTANT, PLEASE READ: Do not install or remove shaft bolts with spring pressure working against the rockers. Installing or removing the shaft bolts with spring pressure on the rockers can result in a cracked rocker shaft!
- Check for adequate valve cover and breather clearance before starting engine. Do this by turning the engine through several revolutions with the spark plugs removed.

Parts List for Crane Pro-Series Shaft Mount Kit #118108-1				
Item No.	Part Number	Description	Quantity	
1	11810C7L/11810C7R	Rocker Arm Stand, left/right	4 left/4 right	
2	7833BL/7833BR	Rocker Arm Shaft, left/right	4 left/4 right	
3	11619MPBT	7/16-14x1" 12pt Stand Bolt	16	
4	7808B	Thrust Race 1.125 x .625 x .031	24	
5	7802B	Retaining Clip	8	
6	7848B	Thrust Race .910 x .640 x .015	16	
7	7877B	T-45 Shaft Bolt 5/16-18 x 1", a286 Stainless	8	
8	7878B	T-45 Shaft Bolt 5/16-18 x 1-1/4", a286 Stainles	s 16	
9	11810SP	.180" Rocker Body Spacer	8	
10	11810SHA	Rocker Stand Shim, .050" Thick	8	
11	11810SHB	Rocker Stand Shim, .100" Thick	8	
12	7876B	Geometry Checking Fixture (see Fig. 4)	1	
13	99726B (not shown)	Adjustable checking pushrod	1	
14	99008B (not shown)	4 oz. Assembly lube	1	

Special tools necessary for installation

T-45 Torx® (6-lobe) socket drive

5/8-12 pt socket

7/16-12 pt socket

Snap ring pliers

Crane Shaft-Mount Rocker Arms - Parts List

NOTE: Shaft stands are identified as left or right based on the position of the exhaust rocker on the stand when viewed from the exhaust side of the head. If the exhaust rocker is in the left hand location, then the stand is called a "left-hand stand". Rocker bodies are identified as left hand or right hand when viewing the position of the pushrod seat adjuster jam nut with respect to the longitudinal centerline of the rocker arm body as viewed from the nose wheel end. If the pushrod seat is to the left of the centerline, the body is identified as a left-hand intake or exhaust rocker. If it is to the right of the centerline, it is a right-hand intake or exhaust rocker. (See Figure 2)

Fastener Torque Specifications

(With SAE 30 Wt. Oil)

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Bolt Description	Torque (lbs/ft)
7/16-14; 12-point stand bolts (Iron heads)	65-70
7/16-14; 12-point stand bolts (Aluminum heads)	60-65
5/16-18; 6-lobe shaft bolts	26-28
7/16; 12-point pushrod seat Adjuster nut	22-24

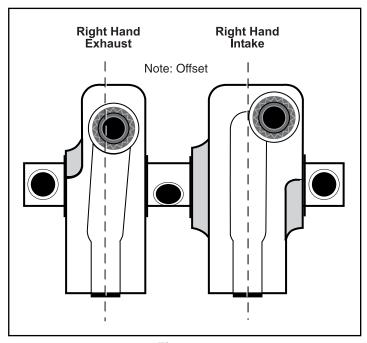


Figure 2.

Assembling Crane Shaft-Mount Rockers On Heads

Install rocker stands on the cylinder head. The
exhaust rockers operate in the narrower slots of the
stands, intakes operate in the wider slots of the
stands. Torque each stand bolt to appropriate spec
(See Torque Specs and Figure 5), using oil as a
lubricant. (Shake excess oil from threads so that no
oil accumulates in the bottom of the stud holes
causing the bolts to hydraulic before adequately
securing the stands to the heads).

(Continued on page 7)

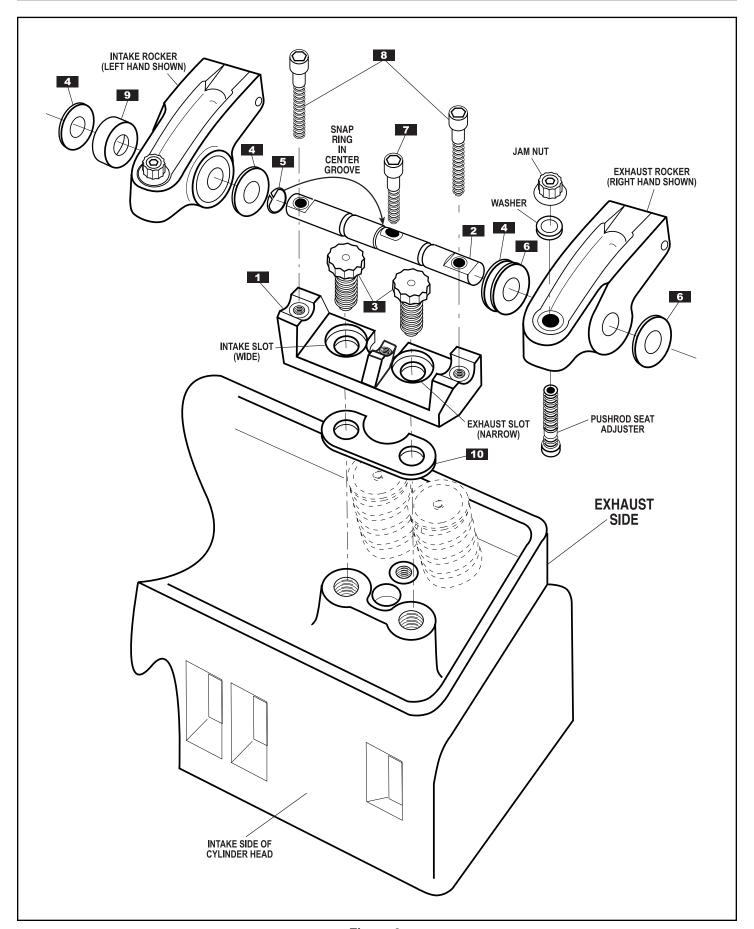


Figure 3.

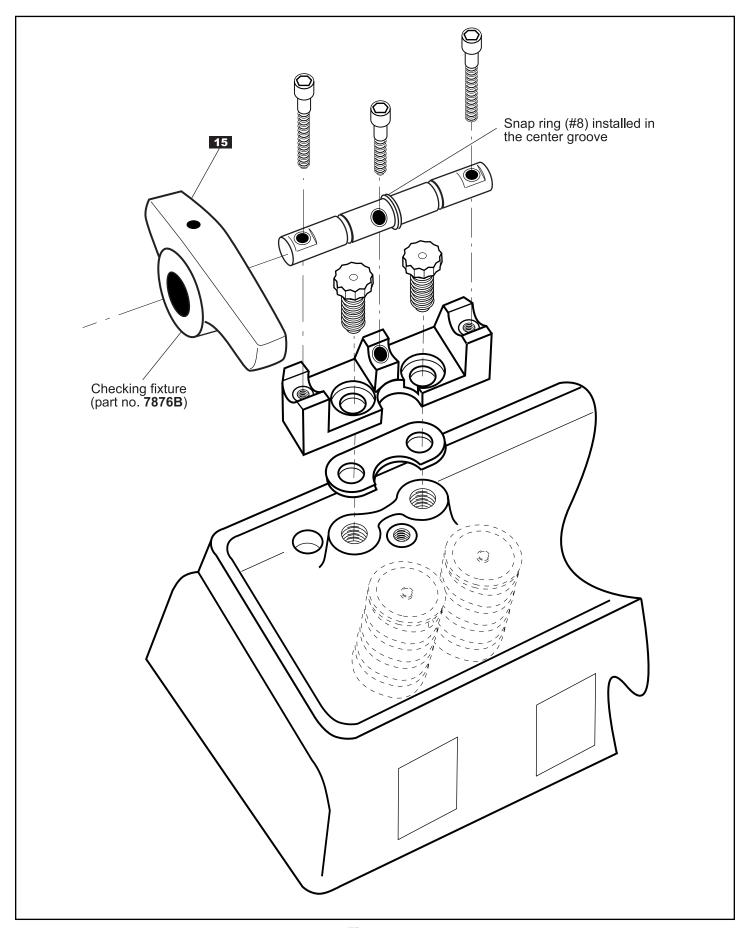


Figure 4.

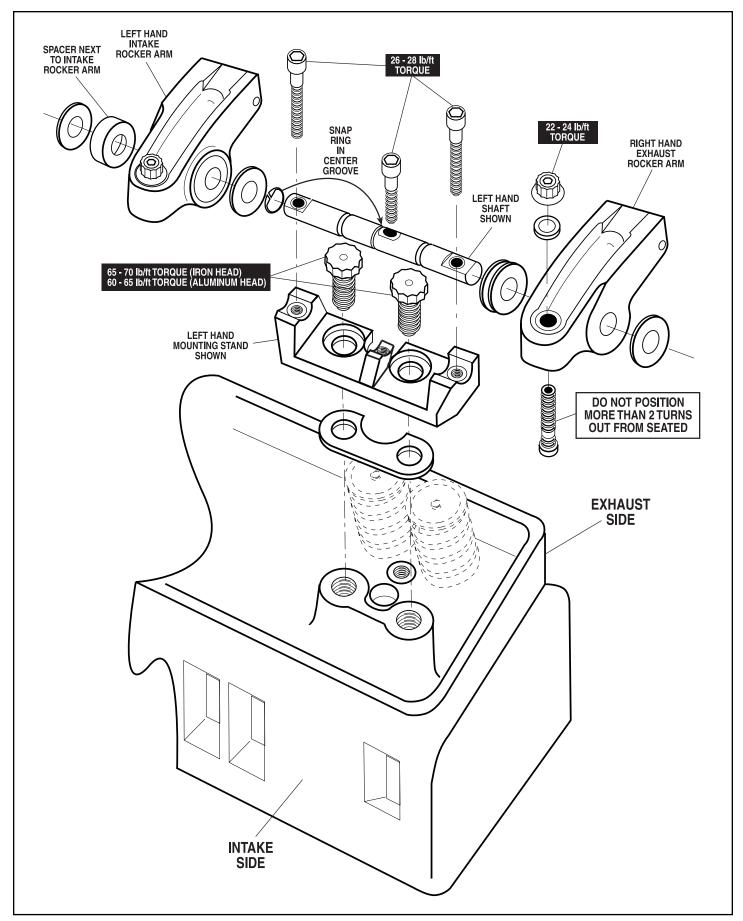


Figure 5.

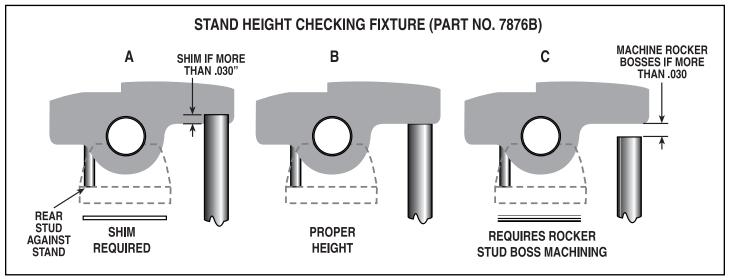


Figure 6.

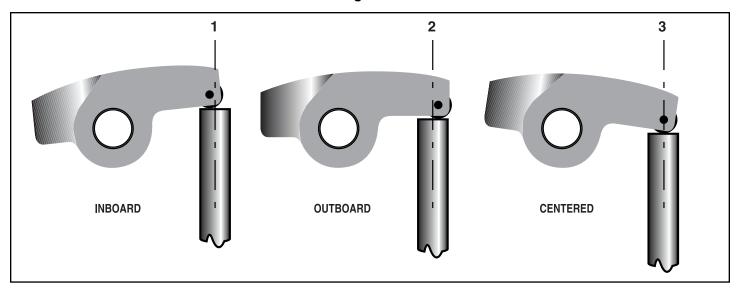


Figure 7.

- 2. Install the stand height-checking tool (Item No. 11 on Parts List, Part No. 7876B) onto a shaft and install the shaft on a stand. (See Figure 4) Lightly snug the shaft to the stand with 1 short and 2 long shaft mounting bolts. Gently slide the checking tool adjacent to the valve or over the valve. The stands are at the proper height if the tip of the valve is within (+ or -) .030" of the bottom of the checking tool as shown in Figure No. 6. NOTE: the rear stud of the checking tool must be resting on the shaft stand when comparing valve tip height.
- 3. If the tip of the valve is higher than .030" from the bottom edge of the checking tool, it will be necessary to use Crane Shaft Mount Stand Shims, Part No. 11810SHA (.050") or Part No. 11810SHB (.100") to shim the stands to a position that the tip of the valve is + or .030" from the bottom side of the checking tool. If the tip of the valve is more than .030" below the edge of the checking tool, the rock-
- er arm stud bosses must be milled that amount to allow the shaft stands to sit lower on the cylinder head and put the tip of the valve in the correct position to the checking tool (longer valves or valve lash caps could also be used). Shaft mount height and rocker geometry is considered correct when the rocker arm nose wheel is just inboard of the valve stem centerline when the valve is closed. See Figure No. 7 for proper nose wheel position as the rocker body moves through its entire range of movement. Notice that at mid-lift the nose wheel travels just outboard of the valve stem centerline and at maximum lift it comes back close to the valve stem centerline (See Figure No. 7). Total sweep of the nose wheel across the valve tip is minimized. keeping the loading on the valve tip centered to reduce valve guide wear.
- Lubricate the pushrod adjuster threads and install them in the rockers from the bottom side. Screw in

until the adjuster bottoms in the recess in the rocker body and then back out one full turn from seated.

- On the top of the rocker body, install the thin washer and adjuster jam nut on the top tip of the pushrod seat adjuster and lightly snug.
- 6. When viewing Small Block Chevy rocker arms from the exhaust side of the cylinder head, the rocker body arrangement is as follows: RH exhaust, LH intake; RH intake, LH exhaust; RH exhaust, LH intake; RH intake, LH exhaust. See Figure No. 3 for the arrangement of the rocker arm bodies, spacer positions, and thrust washer positions when installing the assemblies in the stands.
- 7. Install one snap ring in the middle (thin) groove of each shaft. (See Figure 3&5) NOTE: Do not scratch, ding or scrape the surface of the shaft! Treat the shaft surface exactly as you would a main or rod bearing insert!
- Lube the bearings and shaft and carefully assemble the bodies, spacers and thrust washers on the shafts.
- 9. Start installation with No.1 cylinder at TDC at the end of the compression stroke (both lifters will be on the cam base circle and both valves will be closed). NOTE: Whenever it is necessary to remove or install the shaft/rocker assemblies, always assure that both valves on that cylinder are closed and spring tension is removed from the rockers. Failure to do so can cause the rocker shaft to crack. This type of breakage is not covered by any warranty! Install the adjustable pushrod. Lubricate the pushrod tip where it engages the pushrod adjuster seat.
- 10. Install the shaft with rocker bodies, spacer, and shims onto the stands. Take care to assure shims and spacers are in their proper positions. Caution: Do not install or remove the rocker arm/shaft assembly under spring load. NOTE: Shims Pt. No. 7808B & 7848B can be rearanged to assure proper nose wheel alignment.
- Lube shaft bolts, install and torque each bolt to spec.
- Determine pushrod length by adjusting valve lash with the adjustable pushrod. Measure the pushrod length and record for both intake and exhaust.

Measure pushrod length on at least two cylinders on each bank. When checking pushrod length, keep in mind that custom pushrods are available in .050" length increments. Also, there is about .070" of useful adjustment in the pushrod seat adjuster in the rocker body. NOTE: The Adjustable Checking Pushrod (supplied, Item No. 12, Part No. 99726B) must be used to determine pushrod length with the valves closed. It is not strong enough to open the valves against the pressure of high-rate springs. Do not use this pushrod with any spring pressure over 75 lbs.!

- 13. With correct length pushrods installed, rotate the engine through several revolutions and recheck pushrod clearance through the pushrod holes in the heads. Start with cylinder No. 1, positioned so that the lifters are on the base circle of the camshaft, and adjust the valve lash (for mechanical camshafts) or set the lifter preload (on hydraulic camshafts pushrod length must be determined with the hydraulic lifters at proper preload). Proceed through the firing order rotating the crankshaft 90° between each cylinder adjustment.
- 14. With all rockers and shafts installed, recheck shaft bolt torque and recheck valve lash. Assure that all pushrod seat jam nuts are tightened to proper torque spec.
- Install valve cover, and rotate engine to make sure there is no interference with the valve train. Correct as necessary.
- Prime oil pump with a drill motor and priming tool before firing engine. Do not start engine until oil is seen coming out of rockers at the shafts or nose wheel area.
- 17. Fire engine, warm up to operating temperature. Shut off engine and verify valve adjustment.
- 18. Do not operate this rocker arm system with restrictors in the oiling passages to the lifters and rocker arms. Adequate oil supply is necessary to cool the polymer-matrix composite bearings under extreme valve spring pressures.