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TWIN CAM 88: Camshaft Installation Instructions

Important Notes:

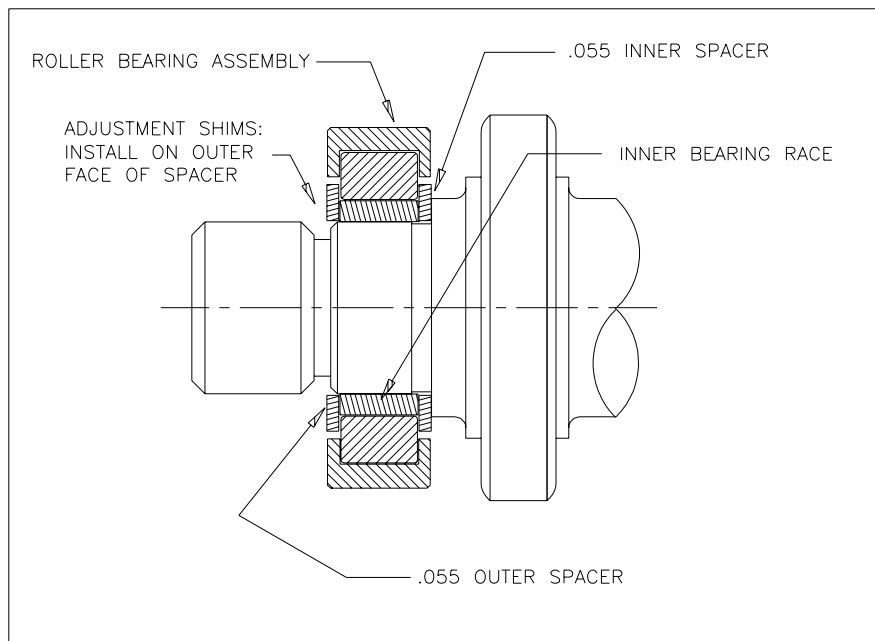
- A. This instruction sheet covers installation of roller bearings on Twin 88 rear camshafts. The roller bearing is an H/D production change as of December, 1999; (H/D service bulletin # M-1097 (Dec 21, 1999) covers this change in detail). The H/D part number for the roller bearing is 8983.
- B. The roller bearing will fit ALL TW88 rear camshafts but this installation guide must be followed exactly. The roller bearing installation is different from installation of ball bearings.
- C. Andrews Products makes heat treated, splined 34 tooth sprockets which are slightly longer than stock H/D sprockets. Andrews Products sprocket part number is 288015.
- D. We strongly recommend that you read the factory service manual and follow all proper procedures for camshaft removal and replacement. The procedure for retracting and releasing the two sprocket chain tensioners is especially important. There are many new procedures involved in changing camshafts on Twin 88 engines.

1. All Andrews Products Twin 88 cams, TW21, TW26A, TW37B, TW44, TW50, TW55 and TW60A are made with stock size lobe base circles so stock pushrods will be the correct length. If you are going to use the original pushrods, removing the fuel tank(s) and rocker boxes will be necessary. Mark the pushrods so they can be replaced into their original locations. (Not all stock pushrods are the same length).
2. **If you want to save time (and not remove fuel tanks and rocker arms), EZ-install pushrods are available from Andrews Products in either aluminum or chrome moly steel.** If you are going to use EZ-install pushrods, stock pushrods can be cut with bolt cutters and then removed (in two pieces). Part numbers for EZ-install pushrods are: 292188 for aluminum and 292088 for steel pushrods.
3. Remove the 10 bolts holding outer cam cover. When this cover is reinstalled later, note that there is a specific bolt tightening sequence and torque setting for these 10 bolts. Read the H/D manual!
4. Before proceeding further, put the transmission in 4th or 5th gear. With the spark plugs removed (so there will be no resistance due to compression pressure), position the engine (by turning the rear wheel) so that all camshaft timing marks are properly aligned. This step will simplify reassembly later.
5. Following the factory service manual, the outer chain tensioning shoe must now be retracted. This can be done with H/D tool set (part number H/D-42313, cam chain tensioner unloader with retention pins). Retracting the chain tensioner without this tool will be difficult.
6. Remove the retaining bolt holding the 17 tooth crankshaft sprocket and the retaining bolt holding the 34 tooth rear camshaft sprocket. This can be done with H/D tool set (part number H/D-42314, crankshaft/camshaft sprocket locking tool). It is well worth the cost.
7. Remove the cam support plate which holds both front and rear camshafts. The service manual thoroughly explains how to assemble and tighten these bolts at the time of reinstallation. All four oil pump retaining bolts must be loosened (to permit correct pump rotor alignment with pinion shaft) and then retightened after the cam support plate is in place.
8. With the cam support plate removed, the interior cam chain tensioner can be retracted and locked with the unloader tool. This retaining lock pin should not be removed until the cam support plate has been reinstalled back into the engine.
9. If you need to replace the front camshaft ball bearing, (6004 SKF or equivalent). It should be available from any bearing distributor or H/D dealer. The tool for pressing bearings new onto camshaft journals is part number H/D-43644.
10. If the rear camshaft has a ball bearing, we recommend that it be updated with to a roller bearing. (See step 11).
11. Installation of roller bearing on rear camshaft journal should be done according to the diagram on the next page:
  - a. Place **one** hardened spacer (.055 thick) against the camshaft journal thrust face.
  - b. Press the roller bearing inner race onto the bearing journal. (*This step may require a small arbor press*).
  - c. If you are using an H/D roller bearing kit (#8983) and an Andrews cam, **DO NOT** use the "O" ring.
  - d. Place the roller bearing assembly over the inner race.
  - e. Place the **second** hardened spacer (.055 thick) against the outer end of the roller bearing.
  - f. Both cams and the cam drive chain may now be installed in the support plate as per H/D manual.
  - g. Install sprocket, outer washer and retaining bolt for trial fit and spin test.
  - h. With finger pressure, turn the roller bearing to make sure it spins freely.

**IMPORTANT:** There **MUST** be some radial clearance and side clearance present in the outer roller bearing race! If there is no clearance and the bearing outer race feels tight, the bearing rollers have somehow become preloaded. Do not continue the installation until you can assemble the outer race with no evidence of preload!

12. **Fitting new 34T sprockets:** Two .055 thick hardened spacers and three shims are supplied in each 34 tooth sprocket kit. The three shims are; .005", .010" and .020". Andrews Products 34 tooth sprockets are machined to approximately .690 length. After a trial assembly, alignment of crankshaft sprocket and cam sprocket must be checked and adjusted with shims if necessary. See factory manual for proper procedure. **Make sure all timing marks are aligned before proceeding!**
13. When reinstalling and tightening the 2 sprocket retaining bolts, use loctite retaining compound to secure the bolt threads. The sprocket locking tool can be used here. Bolt torque should not exceed 25 ft-lbs for 5/16 x 18 bolts. Bolt torque for splined rear camshafts (3/8 x 24) should not exceed 35 ft-lbs. The factory H/D service manual describes all steps in replacement and reassembly of cams very thoroughly. Please note that whether your camshaft uses 5/16 bolts (key drive camshafts) or 3/8 bolts (spline drive camshafts), the bolts must be rated as grade 8. (All grade 8 bolts have a 6 pointed star symbol on the top of the heads).
14. Reinstall the outer cam cover with the 10 cover bolts. Remember that these bolts are to be tightened in sequence to a torque specification of 90-120 in-lbs. The service manual shows the correct tightening sequence.
15. EZ-install pushrods are made with 2 long (exhaust), and 2 short (intake) rods. To install, adjust pushrod to shortest length, then position in engine, rocker arm end first. Swing the lower end into the lifter pushrod seat. Lengthen pushrod adjuster until free play is gone. Adjust pushrod 3.5-4 full turns longer (21-24 flats) and tighten locknut. Wait until hydraulic unit bleeds down and repeat procedure on next pushrod. **When adjusting pushrods, make sure that cam lobe for that pushrod is on lowest lift point. Lifter housing covers can be temporarily removed to gain another 1/4 inch of installation clearance.**
16. For engines with stock pistons and stock heads, TW21, TW26A and TW37B cams will bolt in without head work. TW50 cams need piston to valve clearances and valve to valve clearances checked. TW55 and TW60A cams need .620 minimum valve travel and .060 minimum piston to valve clearance. With Andrews Products high lift titanium collars (part# 293110; includes 4 pcs), setting valve spring travel for either of these two cams will be easier.
17. Final tuning of carburetors with bigger cams sometimes requires re-jetting. For stock H/D Keihin CV carbs and TW26A or TW37B cams, #48 slow jets and #175 main jets will be a reasonable starting point. When tuning engines on a moving bike, alwa remember that your personal safety is the most important consideration!

**Figure 1: Roller bearing with inner race and spacers shown in position.**



## Andrews Products: TWIN Cam 88 Camshaft Timing Specifications

<u>Grind</u>	<u>Timing</u>	<u>Duration</u>	<u>Lift</u>	<u>Springs</u>	<u>Valve Lift (@TDC)</u>	<u>Spring Travel (MIN)</u>
Stock (A)	-02/38	216	.473	STOCK	.072	STOCK
99 (carb)	36/-04	220	.473	-	.110	STOCK
Stock (B)	02/34	216	.473	STOCK	.087	STOCK
99 (fuel inj)	36/04	220	.473	-	.110	STOCK
TW21	10/30	220	.498	STOCK	.134	STOCK
	40/08	228	.498	-	.121	STOCK
TW26A	11/35	226	.490	STOCK	.138	STOCK
	41/09	230	.490	-	.120	STOCK
TW37B	14/42	236	.510	STOCK	.151	STOCK
	48/12	240	.510	-	.140	STOCK
TW44	21/41	242	.495	STOCK	.182	STOCK
	49/17	246	.495	-	.158	STOCK
TW50	21/41	248	.510	STOCK	.184	STOCK
	49/17	252	.510	-	.168	STOCK
TW55	22/46	248	.550	STOCK	.197	.620
	52/20	252	.550	-	.181	.620
TW60A	24/56	260	.560	HI-LIFT	.205	.620
	58/22	260	.560	-	.192	.620

Timing and duration listed for .053 cam lift