BHJ Products, Inc.

LBF-1

Line Boring Fixture

Instruction Manual

Table of Contents

PLEASE READ THIS MANUAL IN ITS

ENTIRETY PRIOR TO OPERATING

THIS EQUIPMENT

CAREFUL STUDY OF THIS INSTRUCTION MANUAL IS RECOMMENDED PRIOR TO USING THIS FIXTURE. IT MUST BE ASSUMED THAT THE OPERATOR IS WELL VERSED IN VARIOUS MACHINE SET UP AND OPERATION TECHNIQUES.

IT IS ADVISED THAT ALL OPERATIONS BE TRIAL RUN ON A SCRAP BLOCK TO FAMILIARIZE THE OPERATOR WITH THE PROCEDURES.

SAFETY CONSIDERATIONS

WHILE THE LBF-1 LINE BORING FIXTURE DOES NOT IN AND OF ITSELF PRESENT ANY SPECIAL SAFETY HAZARDS, THE OPERATOR SHOULD BE FAMILIAR WITH NORMAL METAL MACHINING SAFETY REQUIREMENTS AND SHOULD BE SUITABLY PROTECTED FROM INJURIES.

PARTS IDENTIFICATION

FIGURE 1

1. Set-Up Indicator (1)
2. Main Line Support Blocks with Steel Guide Bushings (2)
3. Boring Tool Indicator
4. Cam Boring Guide Bushings (2)

⊗ Lift Jack Adjustment Socket

⊕ Main Line Boring Blocks (2)

7 Set-Up Indicator Points (2 ea.)

FIGURE 2

8. Adjustment Brackets (4)

◡ Lift Jacks with Shim Plates (2)

10. Guide Bushing Lock Pin (2)
11. Fore-Aft Clamp Screw (2)
12. Top Block Attachment Studs (4)
13. Front Clamp Plate
14. Main Line Support Block (2)
15. Cam Line Steel Guide Bushing Assembly (2)
16. Lift Jack Adjustment Hole (2)
17. Rear Bump Stops
18. End Plate (2)
19. Side Plate (2)

O Not Included in Cam Tunnel Kit

UNPACKING AND ASSEMBLY

The entire Line Boring Fixture is shipped in two wooden crates. Unpack all items and lay out for assembly.

Only minor assembly is required before use –

1. Install 4 “Top Block” attachment studs (1/2-13 X 3) into End Plates.
   See Figure 2, Item 12

- Install sliding wedges and top plates into “Vertical Adjustment Jacks”.
  See Figure 2, Item 9
  (Supplied with Main Boring Kit only)

SET-UP OF BRIDGEPORT MILLING MACHINE
FOR LINE BORING MAIN CAPS OR CAM TUNNEL

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1. Loosen the four clamp bolts and swing the overarm approximately 45° to the right. Re-tighten clamp bolts.

2. Crank the table all the way to the left.

3. Install the right-angle drive unit on the quill per the manufacturers instructions.

4. Using a straightedge, align the right angle drive with the table. Extreme accuracy is not necessary as the boring bars are driven through universal joints.

5. Lower the table. All vintage Bridgeports have sufficient daylight to line up with the cam tunnel. Some older Bridgeport Mills have sufficient daylight to perform the main boring operation, many do not. If not, a riser ring can be purchased directly from your local Bridgeport Dealer or from many other suppliers.

SET-UP INSTRUCTIONS FOR

LINE BORING MAIN CAPS

1. Install 2" Precision Support Bar and Adapter Rings. (This assembly is the same as is supplied with all other BHJ Fixtures.)

2. Slide on Bronze Adapter Sleeves. (one on each end)

3. Fit "Main Line Boring Blocks" (Fig. 1, Item 6) onto Bronze Adapter Sleeves. Pay careful attention to the orientation of the "X"s stamped on the "End Plates" and the Top Blocks.

4. Using a scale, carefully measure the distance from crankshaft centerline to the intake manifold surface of the block. Adjust the shim pack on fully lowered lifting jacks so that there will be less than 1/8 inch clearance when the block is lowered into the fixture.

5. Thoroughly clean the bottom surface of the top blocks and the mating surfaces of the end plates. Any foreign particles embedded in these surfaces will cause errors when boring the cam tunnel.

6. Carefully lower the block into the fixture. Take care that the alignment dowels slide directly into their sockets. Any damage to the contact surfaces will cause errors when boring the cam tunnel. Install the nuts and tighten.

7. Tighten the "Fore-Aft Clamp Screws" so that the block is resting against the "Rear Bump Stops".

8. Slide the four "Adjustment Brackets" onto the side plates. Engage the clamp screw into the slots machined in the plates. Move each bracket forward or backward to find an appropriate spot for each adjustment screw foot to contact.

9. Snug down the four adjustment screws. Take care not to swing the block severely to either side as this will complicate the final dial-in of the main line.

10. Lift the entire assembly onto the milling machine table. Have the front of the fixture and block facing the right angle drive unit. Center the fixture on the table. It is not necessary to clamp the fixture, as it will stay in place from its own weight.

11. Adjust the “Lift Jacks” (see Fig. 3) and the “Adjustment Bracket Screws” (see Fig. 4) until the 2” Support Bar and Bronze Sleeves can be removed.

12. Install and torque the steel main caps that are to be bored.

13. Remove the indicator tips from the “Set-Up Indicators”. Liberally coat the body of each “Set-Up Indicator” and the inside of each “Main Line Boring Block” steel bushing with motor oil. Slide one “Set-Up Indicator” into each bushing. Install the appropriate indicator tip that will contact the block half (saddle) of the main bearing bores.

14. Rotating the “Set-Up Indicators” back and forth, dial in the main bores. Adjustments can be made using the “Lift Jacks” (Fig. 3) and the “Adjustment Clamp Screws” (Fig. 4).

15. During the dial-in operation, keep all adjustment screws equally snug all the time. Make adjustments by tightening and loosening opposing screws. Do not overtighten the adjustment screws as this will spring the side plates. Firm finger tightness is adequate.

16. Since the block is to be finish line honed after boring the steel caps, a dial-in tolerance of less than .002” is adequate. The fixture is capable of 0/0 dial-in, allowing an experienced operator to line bore all caps to finished size.
NOTE: If it is your objective to line bore the cam tunnel with this fixture after finishing the main bores, then the normal concern for maintaining the cam/crank center distance is not critical as that dimension will be re-established during the subsequent operation.

17. Remove the indicator tips and remove the “Set-Up Indicators”.

18. Oil the “Main Line Boring Bar” lightly. (Handle the boring bar with the utmost care. Any knicks or dings will cause it to bind in the steel bushings and if it is dropped and bent, it will not bore consistently sized holes.) Slide it through the steel bushings.

19. Prepare the boring bar as follows:

A. Insert the boring unit into the bar and assemble the back retaining bolt. Using the appropriate wrench, rough adjust the tool by turning the dial to the approximate diameter with the retaining bolt tightened only sufficiently to tension the assembly.

Figure 5

B. Using an appropriate allen wrench, tighten the back retaining bolt and back off approximately one quarter turn.

C. Calculate the tool protrusion required by subtracting the boring bar diameter from the desired bore diameter and dividing the result by two.

D. Using the “V” Block Indicator, set the indicator at zero on the bar surface and set the tool protrusion as calculated. (see Fig. 6). If more than one quarter turn is required, the back retaining bolt must be re-adjusted. After reaching the final setting, re-tighten the back retaining bolt and re-check.

Figure 6

20. Fill both oil cups with 20 or 30 wt. Motor oil.

21. Install the appropriate collet in the spindle of the “Right Angle Drive”. Insert the “Universal Joint Drive Tip” into the collet and tighten.

22. Set the spindle speed at approximately 135 RPM. Set the table power feed at approximately 5/8 inch per minute.

23. Start the spindle and then the table feed.

24. The cutting tool must be moved to the second position in the bar in order to bore all five main caps.

25. Some steel main caps are exceptionally tough material and others are supplied substantially undersize. Factory tests on Summers Brand Caps allowed one cut to bring them out to size, ready for finish honing. Other brands may require more than one cut and may also require adjustments of speed and feed.

26. The oil cups should be checked and kept full at all times.

SET-UP INSTRUCTIONS FOR

LINE BORING CAM TUNNEL

NOTE: THIS OPERATION SHOULD ALWAYS BE PERFORMED AFTER THE CYLINDER BLOCK HAS BEEN LINE BORED AND/OR LINE HONED.

1. Install 2" Precision Support Bar and Adapter Rings. (This assembly is the same as is supplied with all other BHJ Fixtures.) Install and torque all main caps.

2. Fit "Main Line Support Blocks" (Fig. 1, Item 2) onto the 2" Bar. Pay careful attention to the orientation of the "X"s stamped on the "End Plates" and the Top Blocks. Position the 2" Bar so that only 3 or 4 inches of the bar protrude from the front of the block and fixture.

3. Thoroughly clean the bottom surface of the Top Blocks and the mating surfaces of the End Plates. Any foreign particles embedded in these surfaces will cause errors in the cam/crank center dimension.

4. Carefully lower the block into the fixture. Take care that the alignment dowels slide directly into their sockets. Any damage to the mating surfaces will cause error in the cam/crank center dimension.

5. Tighten the "Fore-Aft Clamp Screws" so that the block is against the "Rear Bump Stops".

6. Slide the four "Adjustment Brackets" onto the side plates. Engage the clamp screw into the slots machined in the plates. Move each bracket forward or backward to find an appropriate spot for each adjustment screw foot to contact.

7. Snug down the four adjustment screws.

8. Lift the entire assembly onto the milling machine table. Have the front of the fixture and block facing the right angle drive unit. Center the fixture on the table. It is not necessary to clamp the fixture as it will stay in place from its own weight.

9. Install an appropriate pair of tips in the "Set-Up Indicators" that will contact the existing cam bearing bores.

10. Liberally coat the body of each "Set-Up Indicator" and the inside of each steel cam guide bushing with clean motor oil. Slide one indicator into each bushing.

11. Rotate the indicators from side to side and by way of the "Adjustment Clamp Screws" (see Fig. 5) adjust the bores so that a reading is achieved that will permit full clean-up at the new finished size. Remember that the vertical distance is set by the fixture and cannot be adjusted. Do not force the adjustment screws in an attempt to dial in both ends 0/0. Any typical cylinder block will have a considerable side to side error.

Figure 7

12. During the dial-in operation, keep all adjustment screws equally snug all of the time. Make adjustments by loosening and tightening opposing screws.

13. Remove the "Set-Up Indicators".

14. Prepare the boring bar as follows:

A. Insert the unit into the boring bar. Do not install the bolts. Using the appropriate wrench, rough adjust the tool by turning the dial to the approximate diameter with the retaining bolt tightened only sufficiently to tension the assembly.

B. Using an appropriate allen wrench, tighten the back retaining bolt and back off approximately one half turn.

C. Calculate the tool protrusion required by subtracting the boring bar diameter from the desired bore diameter and dividing the result by two.

D. Using the “V” Block Indicator, set the indicator at zero on the bar surface and set the tool protrusion as calculated. (see Fig. 6). If more than one half turn is required, the back retaining bolt must be re-adjusted. Re-check and make final tool adjustment. If additional cuts are anticipated, it is advisable to leave the tool in a position that will allow further outward adjustment.

15. Slide the boring bar into the cam tunnel. Handle the bar with the utmost care. Any knicks or dings will cause it to bind in the steel bushings and if it is dropped or bent, it will not bore consistently sized holes.

16. Oil the bore of each “Cam Boring Guide Bushing” and slide one onto each end of the boring bar . Give careful attention to the bushing lock notch. They will lock in opposite directions. Place the appropriate bushing on each end of the boring bar so that they will lock with rotation of the boring bar.

17. Lift one end of the boring bar and slide the bushing in the End Plate approximately 1/8 inch. Lift the other end of the bar and slide the bushing in and lock it. Slide the first bushing in completely and lock it also.

    To remove the bar and bushings, carefully reverse this procedure. **AVOID ALLOWING THE BORING BAR TO HAVE ITS ENTIRE WEIGHT SUPPORTED BY ONE BUSHING ONLY.

18. Install the appropriate collet in the spindle of the “Right Angle Drive”. Insert the “Universal Joint Drive Tip” into the collet and tighten. (see Fig. 8)

Figure 8

19. Fill both oil cups with 20 or 30 wt. motor oil.

20. Set the spindle speed at approximately 210 RPM. Set the table power feed at approximately 5/8 inch per minute.

21. Start the spindle and then the table feed.

22. The cutting tool must be moved to the second position in the bar in order to bore all five bores.

23. Some adjustment of speed and feed may be necessary in order to achieve the desired finish, due to variations in the block material.

24. The oil cups should be checked and kept full at all times.