

BHJ Products, Inc.

Parts List & Instructions

Product Name: **O-Ring Groove Cutter**
BHJ Part#: **ORG-3**

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Kit Contents:

- | | |
|---|---|
| 1x Cutter Head Assembly with Handle
& Adjustable Tool Block | 1x 1/8" Hex Wrench |
| 1x Graduated Adjusting Screw | 1x Insert Torx Wrench |
| 1x Adjustable Tool Holder | 1x 5/32" Hex Wrench |
| 1x Carbide Insert (Size of Choice) | 1x Big-Bore Adapter Ring |
| 1x Insert Screw | 3x Allen-head Adapter Ring Screws |
| 1x 1/8" Registration Pin | 4x Cutter Head Hold-down Knobs |
| 1x O-Ring Groove Depth Gauge | 1x Register Plate with Dowel Pins
(Application Specific, Sold Separately) |

Description

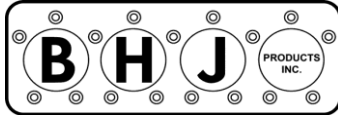
The O-Ring Groove Cutter system can be used to cut grooves for conventional stainless steel O-ring wire for copper head gaskets, copper O-ring wire for "M.L.S." gaskets, FEL-PRO LOC WIRE™ gaskets, as well as "Fire Ring" installation in diesel and Fuel drag racing applications.



The Cutter Head can be used on all BHJ big-bore Register Plates (most 8 & 6 cylinder engines), as well as all BHJ small-bore Register Plates (most 4 & smaller 6 cylinder engines). The Big-Bore Adapter Ring should either be installed or removed as necessary per application.

By using the BHJ O-Ring Groove Cutter system, absolute concentricity of the wire groove to the receiver groove is insured, when both a wire groove and receiver groove are necessary. When used correctly, this O-Ring Groove Cutter Kit will produce grooves that are well within the dimensional tolerances of any given head gasket and/or ring manufacturer. BHJ recommends referring to the head gasket manufacturer for O-ring groove dimension starting points.

Call BHJ for replacement cutting Inserts, Wire and other service parts for your application. BHJ also offers a wide variety of Register Plates for any application where an O-ring groove is necessary.



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Groove Diameter Adjustment Introduction

The ORG-3's Adjustable Tool Block incorporates a 1/8" Registration Pin with knurled knob, (see photo next page) to establish a known reference point for all groove diameter measurements. When the Registration Pin is inserted into the non-threaded hole in both the Tool Block and Tool Holder, a 4.00" groove diameter on-Centerline (C/L) reference point is established. All groove diameter adjustments are then made as a plus or minus from that known 4.00" reference dimension, by turning the Graduated Adjusting Screw.

There are two (2) slots for installing the Graduated Adjusting Screw in the underside of the Tool Block. The inboard slot location (closest to pivot-point of the Tool Block) is used for large-bore applications and the outboard slot location is used for small-bore applications. The diameter range with the Graduated Adjusting Screw installed in the large-bore (inboard) location is 4.000"-5.250" on C/L, while the range in the small-bore (outboard) location is 3.000"-4.245" on C/L.

NOTE: All dimensional and setting references in these instructions are for Diameter. Be sure to keep this in mind when making your calculations.



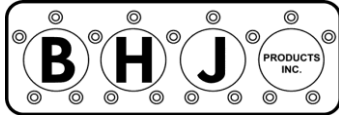
Cutter Head Diameter Set-Up

NOTE: For consistency, groove Centerline (C/L) is used as the primary measurement reference in these instructions. To determine the O.D. of the groove to be cut, simply add the full width of the Insert being used to the C/L measurement. Likewise, to determine the I.D. of the groove to be cut, subtract the full width of the Insert being used to the C/L measurement. (Example: 4.250" groove O.D. = 4.211" groove C/L + Insert width of .039")

1. Determine the O-ring groove application and groove diameter to be cut. If the groove C/L diameter falls into the large bore range of 4.000"-5.250" on C/L, install the Graduated Adjusting Screw into the inboard slot of the Tool Block (slot closest to the center shaft). If the groove diameter falls into the small bore range of 3.000"-4.245" on C/L, install the Graduated Adjusting Screw into the outboard slot (slot furthest from the center shaft).

NOTE: The threaded portion of the Adjusting Screw must be completely free of the Tool Holder before it can be moved from one slot to the other.

2. Using the supplied 1/8" Hex Wrench, turn the Graduated Adjusting Screw until the Registration Pin can pass into the non-threaded holes of both the Tool Block and Tool Holder. This will establish the 4.00" diameter reference point.



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3. Look at the adjustment-end of the tool block (opposite the tool holder) to view the graduated scale on the Adjusting Screw and the pointer (45 degree machined angle) on the Tool Block. Note the position of the scale to the pointer at the 4.00" starting point for your records, so it can be referenced while adjusting to the working groove diameter setting.
 - Increments on the Adjusting Screw dial are .001" diameter
 - One full turn of the Adjusting Screw equals .050" diameter

4. Remove the Registration Pin from the Tool Block, once the 4.00" reference point has been established and you are ready to adjust the cutter to the working diameter.

5. If the working diameter setting is greater than the 4.00" starting point, turn the Adjusting Screw clockwise. Likewise, if the working diameter setting is smaller than the 4.00" starting point, turn the Adjusting Screw counter-clockwise IN, until it is past the final setting point, then turn the Adjusting Screw clockwise, back OUT to the final setting.

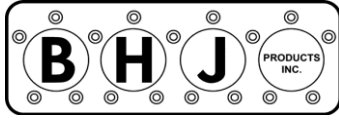


NOTE: As with any gear-drive or screw-drive device, there will be a small amount of "clearance" in the threaded interface between the Graduated Adjusting Screw and the Tool Holder. In consideration of this "clearance" factor, it is BHJ's recommendation that all diameter adjustments be made by turning the Graduated Adjusting Screw "OUTWARD" (clockwise) to the final dimension. If you overshoot your desired setting at any point, turn the Adjusting Screw in (counter-clockwise), past your desired position, then turn it back out to the final location.

6. Once the final diameter setting has been achieved, tighten both Allen head screws in the Tool Block to secure the Tool Holder in place, using the included 5/32" hex wrench.

NOTE: Do not attempt to turn the Adjusting Screw while the Allen head tightening screws are snug, as this will lead to excessive wear of the Adjusting Screw, Tool Block and Tool Holder.





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O-Ring Groove Cutting Procedure

*** It Is Strongly Recommended That You Practice On A Junk Cylinder Head Or Block, To Familiarize Yourself With The Technique Involved.**

- A. Install the supplied Dowel Pins into the locating holes on the underside of the Register Plate.
- B. Install the Register Plate onto the cylinder head or block. Install and tighten the Plate Clamping Bolts. Be sure that the cylinder head, or block deck surface, is absolutely clean and free of high spots.

NOTE: Do Not Torque the fasteners when installing the Register Plate, as this will typically cause the plate to warp and potentially cause uneven groove depths. It is also strongly recommended that the cylinder head and block deck be checked for straightness and surfaced if necessary, before installing the O-Ring Groove Register Plate.

- C. Set the cutting depth by gently allowing the Insert cutting tip to contact the cylinder head or block deck. Adjust the lower Depth-Adjustment Ring below the Handle, until the Cutter can be rotated and just barely contacts the deck surface when turning the Handle with a gentle downward pressure.

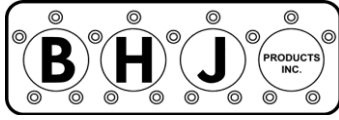
- D. Rotate the lower Depth-Adjustment Ring counter-clockwise to set the desired starting depth – Each mark on the Depth-Adjustment Ring equals .001", thus one full turn equals .020" (see photo).



NOTE: Preferred depth-of-cut settings vary from customer to customer. Practice and trial-and-error will help you determine the best settings

for your technique. Some customers report satisfactory results by setting as little as .001" of depth per cut, until reaching the final groove depth when working on difficult materials. Using this approach may result in longer Insert life when working with very hard materials, like Cummins diesel cylinder heads and blocks, but adds significantly more time to the job. Your results may vary.

- E. Tighten the top Depth-Locking Knob to lock the setting at the desired cut depth.
NOTE: It is highly recommended that the desired final depth NOT be dialed-in at the start, to avoid accidentally over-cutting the groove depth for the application.



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- F. Rotate the Handle rapidly and smoothly, CLOCKWISE, using steady, downward palm pressure to cut the groove. Small amounts of a light lubricant, such as WD40 will typically aid the cutting process and vacuuming-out the work area as often as possible will help as well. When pressing downward as described above and the cutting resistance fades, the groove is finished.

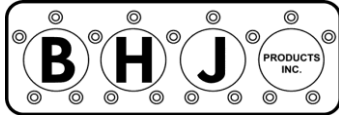
NOTE: Cutter Inserts May Break & Groove Damage Can Occur If Excessive Downward Force Is Applied To The Cutter Handle, Or If The Tool Is Rotated Counter-Clockwise (Backward) During The Operation. Finesse Is The Key To Success!

- G. When using the optional O-Ring Groove Depth Gauge (see photo next page), verify the new groove depth and evenness as follows:
- I. Leaving the Register Plate attached, remove the Cutter Head from the Register Plate after making the initial cut.
 - II. Position the O-Ring Groove Depth Gauge on the Register Plate top-surface, with the Indicator Stem passing through one of the four slots in the O.D. of the cylinder bore.
 - III. Zero the Indicator Tip on the deck surface at least 1/8" from the edge of the groove.
 - IV. Reposition the Indicator to allow the Tip to settle into the newly cut groove and check the groove-depth measurement. Record the groove depth and verify, based on the initial depth dialed-into the Depth-Adjustment Ring.
 - V. Repeat the depth check at the remaining three slots to verify the groove depth is even all the way around the bore.

NOTE: Uneven groove depth may be an indication that the deck surface is not even, or was not properly cleaned before installing the Register Plate. An uneven groove depth may also result if the Cutter Head is not installed securely on the Register Plate.



- H. Replace the Cutter Head onto the Register Plate and make any groove-depth adjustments necessary, using the Depth-Adjustment Ring, to achieve the final groove depth.
- NOTE: It Is Advisable To Double-Check The Diameter And Depth Settings Of The Cutter And Ensure The Depth-Locking Knob Is Securely Tightened Before Proceeding With Further Cuts.**
- I. Once the final groove depth is achieved, repeat the groove-cutting process for the remaining cylinders.



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When cutting is complete, it may be necessary to gently flat-file the head/deck surfaces to remove any burrs or raised edges.

Call BHJ at (510) 797-6780 with any questions regarding the part, setup, or operation.