

Four-in-One Grooving Bits

 For better safety, use this bit only in a router table with a fence – **not free hand**.

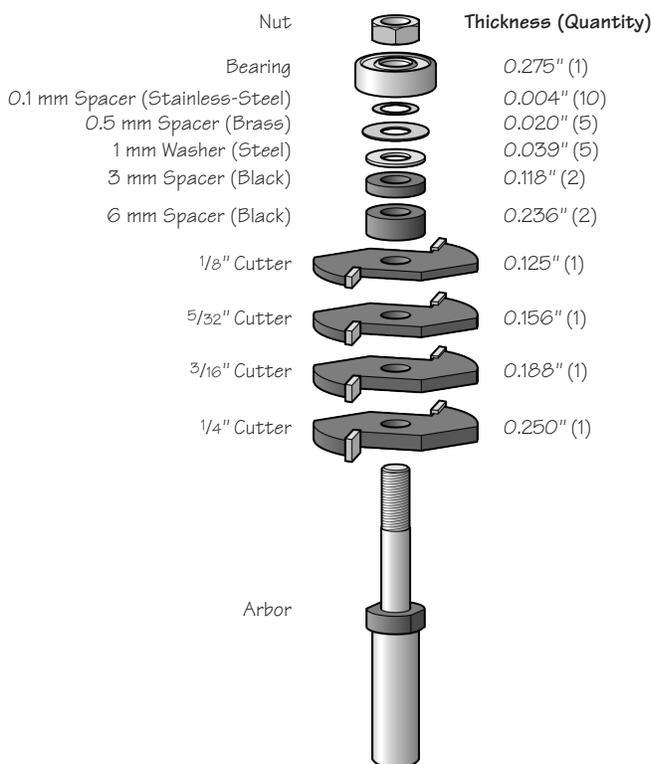


Figure 1: Bit components.

This bit comes with four sizes of slotting cutters for routing slots (grooves), dados, rabbets, or tongue and groove joints. When using the pilot bearing, the bit cuts to a depth of 1/2", or to a depth of 5/8" when the bearing is not used. The cutting depth can also be controlled with the use of a router table fence.

Cutting Slots

This bit can be used to cut slots in four nominal widths: 1/4", 3/16", 5/32", and 1/8". By stacking several cutters, spaced with the supplied spacers, slots from 1/4" to 23/32" wide can also be cut.

Table 1 lists the range of slot widths that can be cut using each of the 15 different cutter/spacer combinations. The "Minimum Width" column lists the slot width when the cutters are stacked on top of each other with no spacers in between. As spacers are added between the cutters, the slot width increases. Beyond a certain point, thin pieces of wood will remain in the routed slots from the gaps between the cutters. This point is listed as the "Maximum Width" in the table. The type and quantity of the spacers used at this point are listed in the "Maximum Spacers" column.

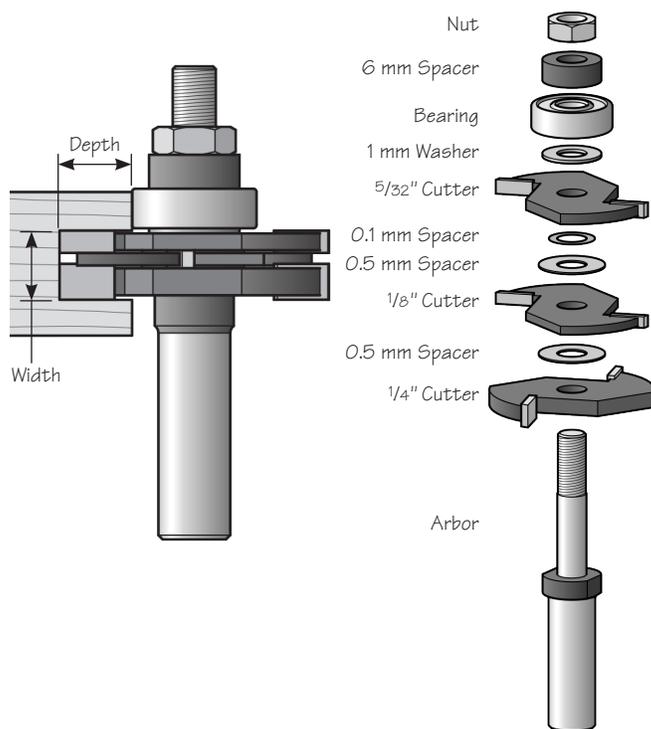


Figure 2: Slot dimensions.

Table 1: Slot widths

Combination	Cutters Used	Min. Width	Max. Width	Max. Spacer
A	1/8"	0.125"		None
B	5/32"	0.156"		None
C	3/16"	0.188"		None
D	1/4"	0.250"		None
E	1/8" + 5/32"	0.246"	0.283"	1 Brass + 4 Stainless-Steel
F	1/8" + 3/16"	0.274"	0.314"	2 Brass
G	5/32" + 3/16"	0.301"	0.345"	2 Brass + 1 Stainless-Steel
H	1/8" + 1/4"	0.320"	0.380"	3 Brass
J	5/32" + 1/4"	0.348"	0.408"	3 Brass
K	3/16" + 1/4"	0.376"	0.440"	3 Brass + 1 Stainless-Steel
L	5/32" + 1/8" + 3/16"	0.394"	0.468"	3 Brass + 3 Stainless-Steel
M	5/32" + 1/8" + 1/4"	0.441"	0.539"	4 Brass + 4 Stainless-Steel
N	3/16" + 1/8" + 1/4"	0.469"	0.569"	5 Brass
O	3/16" + 5/32" + 1/4"	0.492"	0.597"	5 Brass + 1 Stainless-Steel
P	3/16" + 5/32" + 1/8" + 1/4"	0.586"	0.730"	5 Brass + 10 Stainless-Steel

Chart 1 is a graphical representation of the ranges listed in **Table 1**. The chart can be used to quickly determine which combination of cutters will work for the desired slot width. For example, a 1/2" slot could be cut using combination M, N or O.

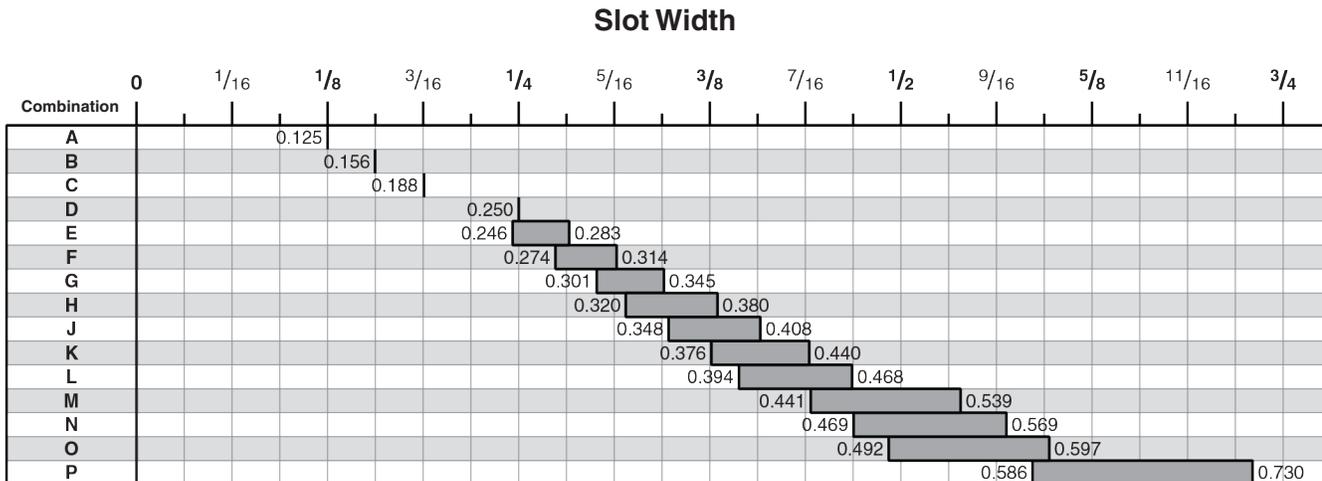


Chart 1: Possible slot widths.

When spacing multiple cutters for slotting, only the 0.020" thick brass and 0.004" thick stainless-steel spacers are required. If you have a shortage of brass spacers, five stainless-steel spacers have the same combined thickness.

For combinations of three or four cutters, the thickest cutters should be on the outside and the thinner ones in between (see **Figure 2**). This provides the largest range of slot widths. The spacers should also be uniformly distributed between the cutters.

To cut a slot of a specific size, determine which cutter combination will be used from **Table 1** or **Chart 1**. Using the "Minimum Width" value, determine how many 0.020" thick brass and 0.004" thick stainless-steel spacers will be required and place these between the cutters. A few test cuts should be made to verify width and fit.

Example:

The intent is to cut a $\frac{5}{16}$ " wide slot. Since $\frac{5}{16}$ " is equal to 0.313", combination F or G can be used. However, 0.313" is very close to the maximum thickness of combination F, so G will be used instead. This option allows for more adjustability should it be required.

The minimum value of combination G is 0.301". Adding a 0.020" brass spacer will be too much (0.321"), so stainless-steel spacers will be used instead. Adding three 0.004" stainless-steel spacers (0.012") to the minimum width (0.301"), results in the desired thickness 0.313". Three stainless-steel spacers would then be placed between the $\frac{5}{32}$ " and $\frac{3}{16}$ " cutters.

If, upon testing, the slot is determined to be either too large or too small, it can be adjusted in 0.004" increments by adding or removing stainless-steel spacers. In the example, the slot could be reduced to 0.301" or increased to 0.345" – the usable range for combination G.

Cutting Tenons

This bit can be used to cut short tenons from $\frac{3}{32}$ " to $\frac{15}{16}$ " thick in $\frac{1}{4}$ " to $\frac{13}{16}$ " thick stock. The thickness of the tenon is determined by the height of the spacers between the upper and lower cutter stack. **Figure 3** illustrates the standard bit configuration required to cut a $\frac{1}{2}$ " thick tenon.

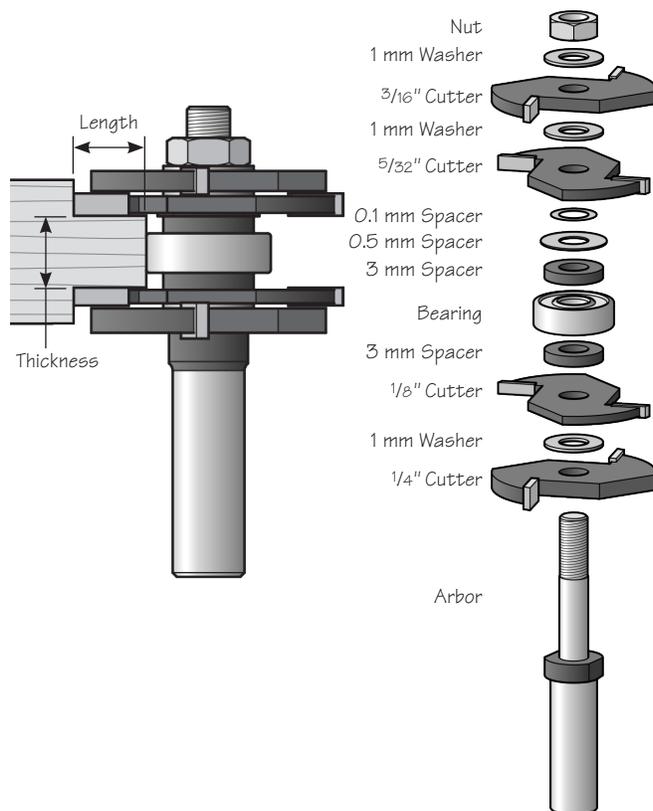


Figure 3: Standard bit configuration for a $\frac{1}{2}$ " thick tenon.

In the standard configuration, two cutters are used in both the upper and lower cutter stack. To achieve the best range of tenon sizes, one cutter stack consists of the $\frac{1}{8}$ " and $\frac{1}{4}$ " cutters and the other stack uses the $\frac{5}{32}$ " and $\frac{3}{16}$ " cutters. The cutters are separated using one of the zinc-plated steel washers. This frees up the precise thickness brass and stainless-steel spacers **required** for sizing the tenon.

For thick stock or thick tenons, the arbor may be too short to hold all the required spacers and cutters. In these cases, either one or both of the cutter stacks will be replaced with a single cutter, as shown in **Figure 4**. This is known as the minimized bit configuration.

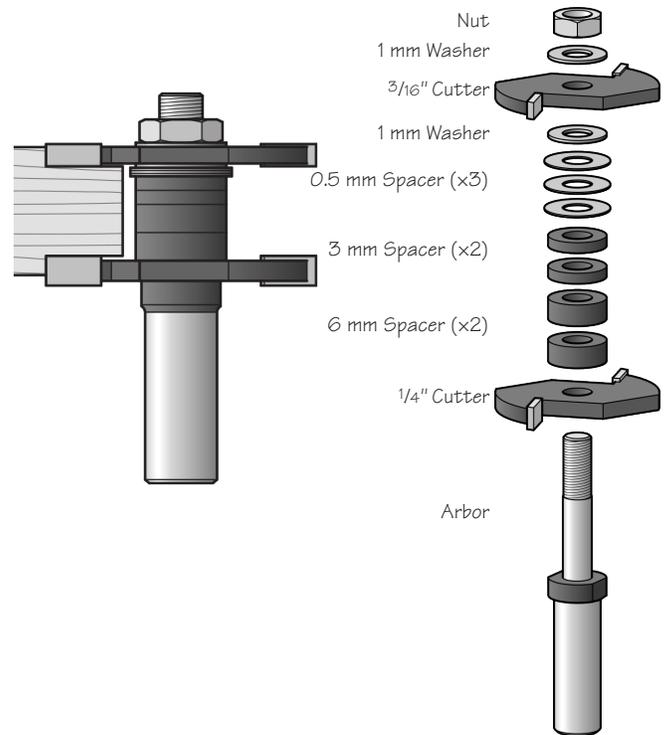


Figure 4: Minimized bit configuration for a $\frac{3}{4}$ " thick tenon.

For any particular stock thickness, there is a limited range of tenon thicknesses that can be cut. This range is governed by the amount of material the cutters can remove as well as the height of the arbor itself. In **Chart 2**, the shaded areas represent the range of tenon thicknesses for each stock thickness that can be used with this bit. In certain cases, the tenon may be too small to allow the use of the bearing, or the stock may be too thick, requiring the bit to be assembled in the minimized bit configuration. These variations are denoted by the five different styles of shading.

Tenon Thickness

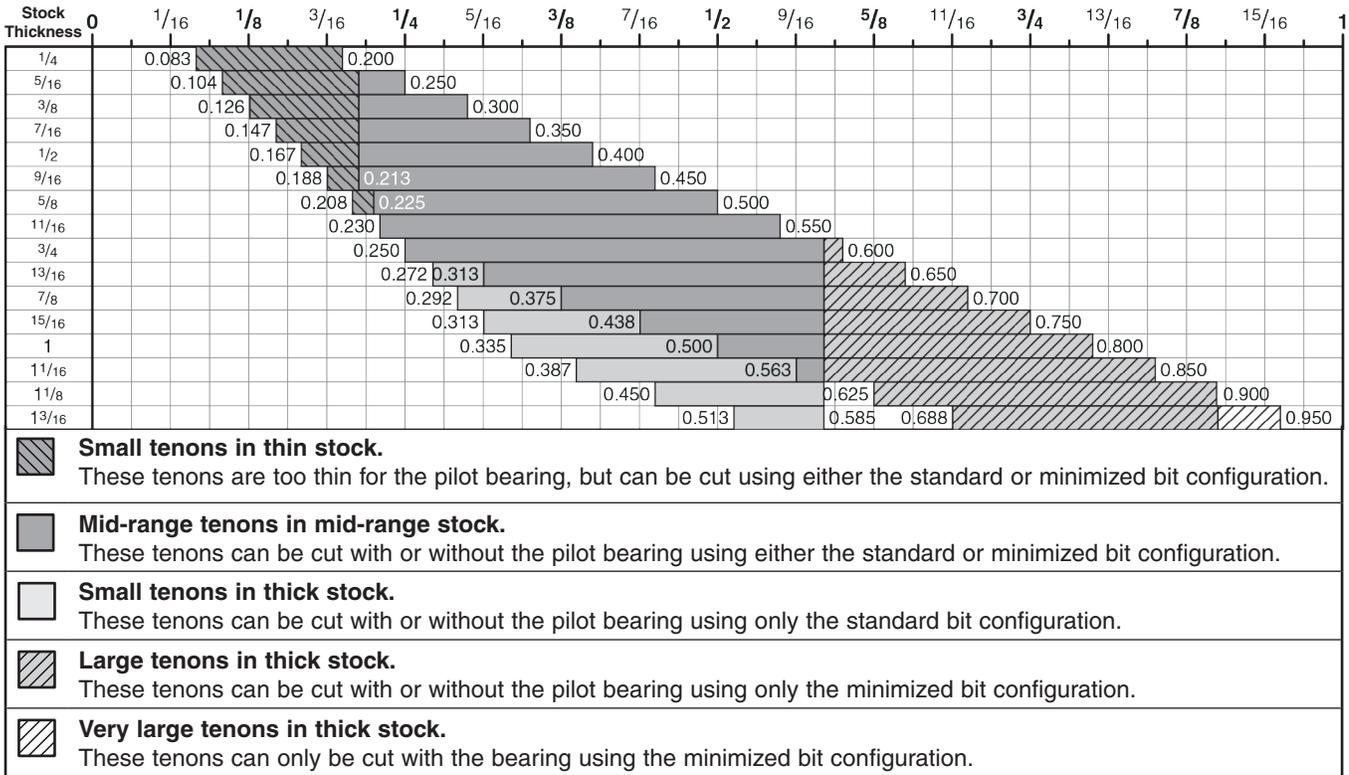


Chart 2: Possible tenon thicknesses.

Note: The ranges shown in Chart 2 are based on the width of the tenons being no less than 1/3 (33%) and no greater than 80% of the stock thickness. The ranges are also based on the tenon being centered on the stock thickness.

Spacing the Cutters

When assembling the bit for cutting tenons, the height of the spacer stack between the cutters needs to be the thickness of the desired tenon, plus enough to compensate for the inset of the two cutters (the height of the carbide is greater than the thickness of the web that connects them). The compensation amount depends on which cutters are adjacent to the spacer stack.

Table 2: Cutter inset compensation values

Cutters	Compensation
1/8" + 5/32"	0.035" – this value is used for the standard bit configuration
1/8" + 3/16"	0.039"
1/8" + 1/4"	0.055"
5/32" + 3/16"	0.043"
5/32" + 1/4"	0.058"
3/16" + 1/4"	0.062"

Example:

You are planning to use $\frac{7}{8}$ " thick stock for a project. **Chart 2** illustrates that the usable tenon range is 0.292" to 0.700". This range spans three different zones. For tenons from 0.292" to 0.375", only the standard bit configuration can be used. From 0.375" to 0.585", any bit configuration can be used. And for tenons from 0.585" to 0.700" only the minimized bit configuration can be used. All three zones permit the bit to be configured with or without the pilot bearing.

You decide to cut tenons that are $\frac{5}{8}$ " (0.625") thick. As this falls into the 0.585" to 0.700" range, the minimized bit configuration will be used. This set-up will use the $\frac{1}{4}$ " and $\frac{3}{16}$ " cutters, as the tenon shoulders are only $\frac{1}{8}$ " thick. **Table 2** lists the inset compensation value for this combination as 0.062". Accordingly, the spacer stack will need to be 0.687" tall ($0.625" + 0.062"$). **Figure 5** shows the final bit assembly.

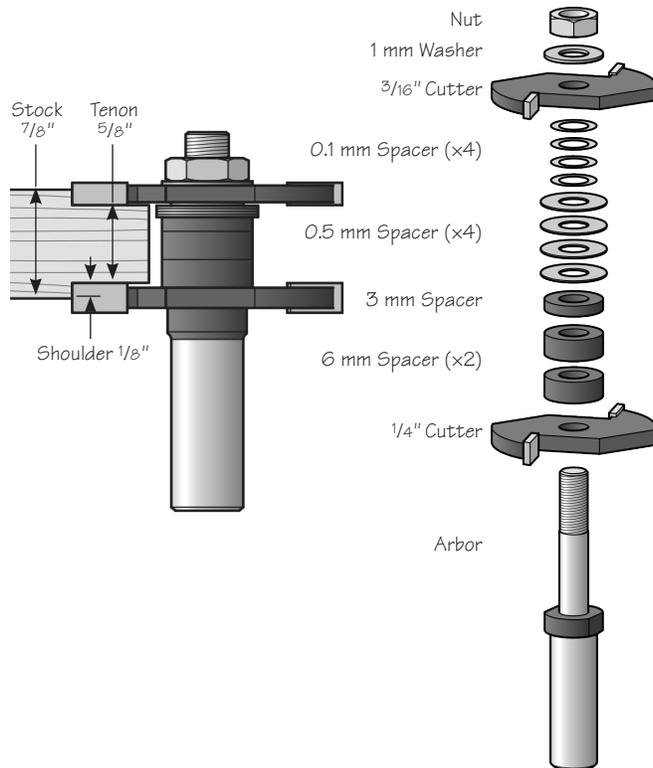


Figure 5: Bit assembled for a $\frac{5}{8}$ " tenon in $\frac{7}{8}$ " stock.

Rabbeting

By mounting all four cutters on one side of the bearing, the bit becomes suitable for rabbeting (see **Figure 6**).

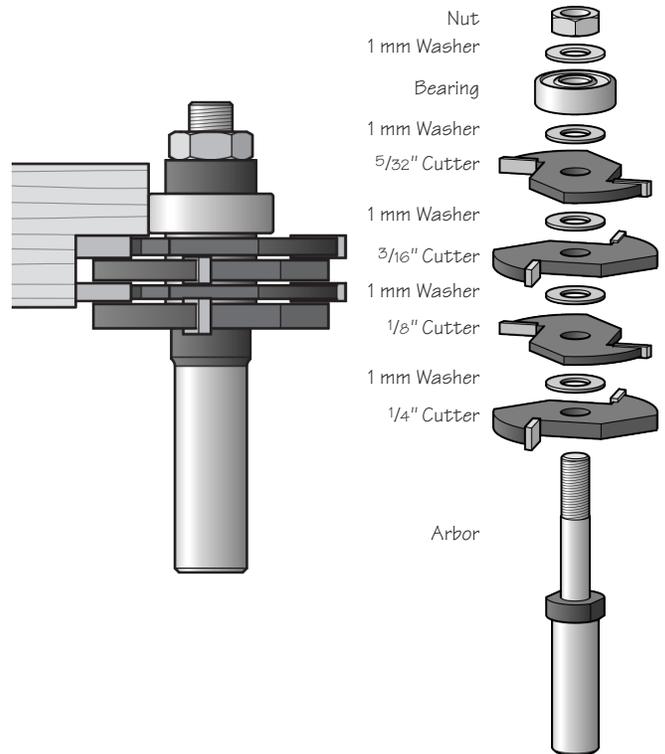


Figure 6: Bit configured for rabbeting.

In this configuration, the bit can be used to cut rabbets as tall as $\frac{11}{16}$ " and as deep as $\frac{5}{8}$ ".

Cutting a Tongue and Groove Joint

In the tongue and groove configuration, the bit is suitable for wood between $\frac{1}{4}$ " and $\frac{13}{16}$ " thick. The creation of a tongue and groove joint is simply a matter of cutting a slot in one piece and cutting a tenon in the other. As the range of slot sizes is more limited than that of the tenons, the slot should be cut first and the tenon sized to fit.

Assembling the Bit

Be sure to follow the guidelines below when assembling the bit for any type of cut.

1. When stacking several cutters on the arbor, always orient adjacent cutters at 90° to one another (see **Figure 7**). This prevents the carbide from coming into contact with the cutter web or other carbide. It also results in a more balanced cutting operation.

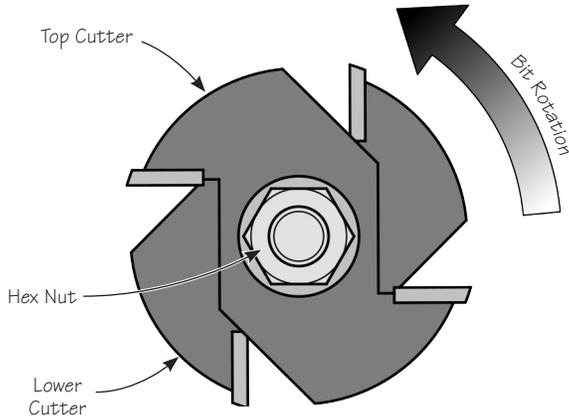


Figure 7: Orientation of two adjacent cutters.

2. When using the pilot bearing, always use a spacer between the bearing and cutter to ensure the bearing spins freely.
3. Be sure to install the cutters in the proper direction. When viewed from above, the bit spins counterclockwise, as shown in **Figure 7**.

4. When installing the nut, always place a steel washer or black spacer underneath, as shown in **Figure 8**. Never tighten the nut directly against a cutter, the bearing or a stainless-steel spacer.

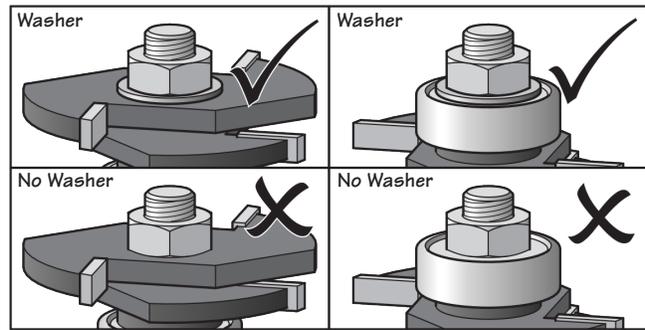


Figure 8: Installing the nut.

5. Be certain the assembly is tight before powering up the router. A 9/16" or 14 mm wrench is used on the arbor and a 1/2" or 13 mm wrench on the nut.

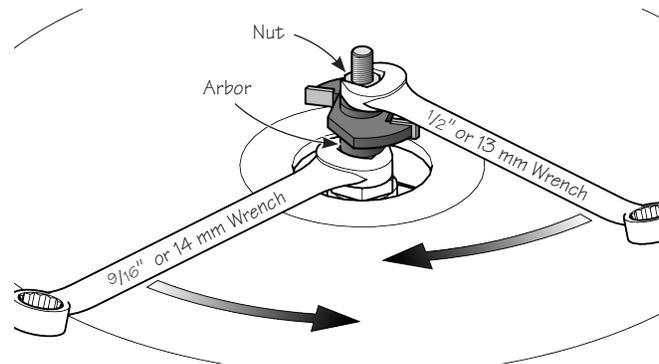


Figure 9: Tightening the assembly.