

## **RS60 Eccentric-Chuck Instruction Manual**

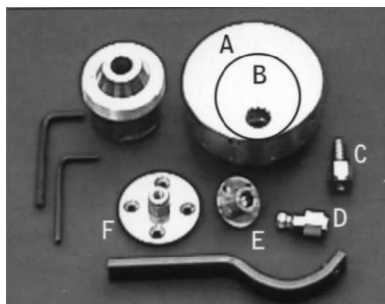
### **Introduction to the RS60 eccentric chuck**

The Robert Sorby Eccentric Chuck is the most sophisticated chuck for multi-centre turning. Ease and accuracy of adjustment (without removing the workpiece from the chuck) is provided by the unique offset boss which accommodates the three different driving components on which to mount your workpieces, viz:-

- I. Screwchuck Adaptor
- II. Ball drive & Socket
- III. Faceplate

In its basic form, illustrated below, the RS60 provides the means of driving from the Headstock with or without tailstock support. However, the unique hexagonal balldrive/socket component allows multiple-turning between centres and at any angle between 0° and 20° of the lathe's axis.

### **Main Components**



- A - Main body
- B - Eccentric boss (containing the Bi-hexagonal socket)
- C - Screwchuck - 7/16" (11mm) parallel sided
- D - Hexagonal ball drive
- E - Hexagonal socket for pairing with item D
- F - Faceplate

### **RS60BK Mounting Kit** - included with the RS60 Eccentric Chuck

The RS60BK back body (and spanner) to mount the RS60 to your lathe is included in the price of the RS60 but is supplied separately at the point of purchase. You must specify the RS60BK with the appropriate thread specification for your lathe e.g. 1" x 8, 25mm x 2mm, 3/4" x 16 etc.



## **Assembly of the RS60 Eccentric Chuck**

### **Mounting the Main Body (A) to the lathe**

Screw the RS60BK into the back of the main body. Use the open-ended spanner and the C-spanner to assemble both components. Should you wish to mount the RS60 on a different spindle size/thread, then a replacement RS60BK back body is relatively inexpensive.

### **Offset Boss (B)**

The Ø60mm offset boss accommodates the three driving components, providing multiple centres from 0 – 35mm offset. These driving components all have a common hexagonal shank which locates in the 16mm A/F Bi-hexagonal socket, allowing each driving component to be mounted in any of 12 rotational positions.

The amount of offset (graduated in 5mm steps) can be viewed through the 'window' in the main body. Adjustment and security of the offset boss is via the two Ø8mm grub screws in the main body. When attempting to remove the offset boss, always ensure that the grub screws are withdrawn sufficiently to clear the tapered recess around the edge of the boss.



An ejector hole is also provided in the bottom of the main body to assist removal, should the boss become fast for any reason. To gain access to the ejector hole, the RS60BK body must be removed from the main body.

### **Mounting the Driving Components**

Each of the driving components - Screwchuck (C), Hexagonal Ball Drive (D), and Faceplate (F) - has a 16mm A/F shank, locating socket in the offset boss. Each of the shanks is secured with the M8 countersunk machine screw and countersunk washer.

## **Using the Eccentric-Chuck**

**Safety** - In the interests of safety and overall good practice, please take the following precautions:-

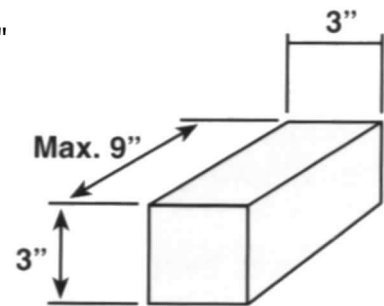
- **ROTATE THE WORKPIECE BY HAND BEFORE SWITCHING ON THE LATHE!**  
**With offset turning, it is even more important than usual that you observe this.**
- **ALWAYS WEAR SUITABLE EYE PROTECTION!**  
 Use the lowest speed possible to begin. Experience and increased familiarity with offset/speed/timber density combinations will soon allow you to reach the optimum operating speed.

## **I. USE OF SCREWCHUCK**

Before using the screwchuck, your timber should undergo some initial preparation, thus:-

- The timber section should be square-ended and flat - if the end grain is slightly convex, the workpiece will not sit firmly, giving poor results.
- If you are turning without tailstock support, the timber should not exceed the accepted maximum ratio of 3:1, length to side. With ratios in excess of 3:1, tailstock support is strongly recommended.

e.g. A 3" x 3" square must be no more than 9" long - including 1" of screw/thread which you may finally wish to part off!!



- A pilot hole of  $\text{Ø}8.25\text{mm}$  ( $21/64''$ ) x 25mm ( $5/16''$  x 1") is required in the headstock end of the workpiece to accept the thread. When initially mounting the screwchuck, it can be helpful to bring the tailstock right up to the workpiece and slowly wind the quill out to exert pressure on the thread as you rotate the workpiece with your free hand.
- The timber should normally be roughed down with zero setting before you begin eccentric turning.

### General Points of Technique

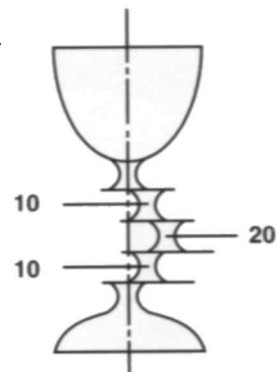
- We recommend that you draw a plan view of the item that you wish to produce, using compasses. This will show you the size of timber you require, which is often bigger than you think. Alternatively draw the cross section of your blank and contrive a design within the constraints of the timber size.
- Always work towards the headstock! You need the strength of the unturned timber to progress down the stem - in this project and most others.
- Always sand and polish each section of the workpiece before moving the workpiece to its new centre.

### **Example 1**

#### **Turning an eccentric/concentric Goblet - a typical project using the screwchuck.**

Recommended timbers:- close-grained hardwood.

1. Start by hollowing out the bowl section and forming its outer profile, with the offset on a zero setting, at approximately 1500 r.p.m.
2. Now turn, sand and polish the first of the 'coves' - the first being concentric -with the offset remaining at zero.
3. Proceed to turn the first offset cove bt resetting the offset to 10mm. Secure the offset boss again, tightening the two grub screws with the Allen key provided. Keep the lathe speed down - approximately 1000 r.p.m. depending on the nature of the timber and the rigidity of the lathe.
4. Your second offset cove (20mm offset) should be turned at approximately 750 r.p.m.
5. Turn the remaining two coves, reversing the offset sequence back to zero once again, where you will turn the base section.
6. 'Part off' carefully, finally supporting the workpiece at any concentric position as you do so.

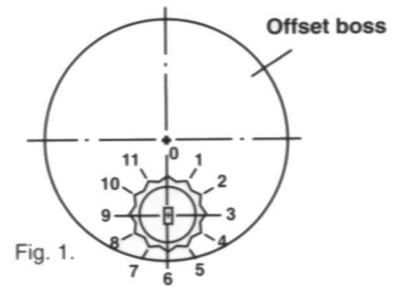


**N.B. DONT FORGET TO SAND AND POLISH AT EACH STAGE**

## **Example 2**

### **Creating polygonal sections using the Screwchuck and Bi-hexagonal socket: a curve-sided dodecahedron (12 equal sides)**

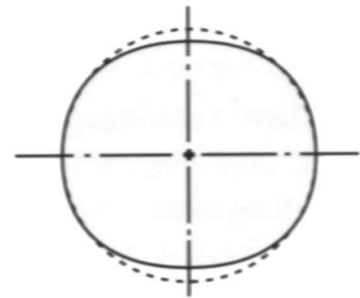
1. Mount the workpiece to the screwchuck adaptor as in Example 1, being careful to observe the 3 :1 ratio, length to side. Locate the screwchuck in the socket with the marked corner of the hexagonal shank in alignment with position '0' in Fig. 1, and, having set the amount of offset to the desired amount, turn the first side on your workpiece.



2. Stop the lathe and undo the grub screws which retain the offset boss, sufficient to allow the boss to withdraw freely from the main body.

3. Undo the M8 countersunk machine screw which holds the screwchuck captive in the Bi-hexagonal socket, and remove the screwchuck. Advance the screwchuck by six positions and reinstall it in the offset boss, with the same corner of the hexagonal shank in alignment with position '6' in Fig 1. This ensures that Opposite pairs of sides are turned consecutively, which helps to balance the revolving workpiece and keep vibration to a minimum. Secure the screwchuck once again with the M8 machine screw, with the Allen key provided.

At this point, with one pair of opposite sides turned, your workpiece will resemble that in Fig. 2, right, in 'section' at a point along its axis.



4. Replace the offset boss (with workpiece and screwchuck attached) in the main body and adjust to your original amount of offset, noting the reading through the 'window' in the Main body.

5. To obtain the remaining sides of the polyhedron, repeat steps 1. to 4. remembering to 'pair' opposite sides, until you have your complete 12-sided profile.

Fig. 2.

#### **N.B.**

Should you wish to create a polyhedron with fewer sides than 12, then you should omit some of the screwchuck positions, e.g. Curve-sided square requires pair positions (0,6), (3,9) in sequence. Curve-sided hexagon requires pair positions (0,6), (2,8), (4,10) in sequence. The same procedure is adopted when using the faceplate, the rim of which is marked with a zero to assist positioning.

## **II USE OF THE HEXAGONAL BALL DRIVE & SOCKET**

### **Basic Principle**

This pair of components can only be used together and in conjunction with the tailstock.

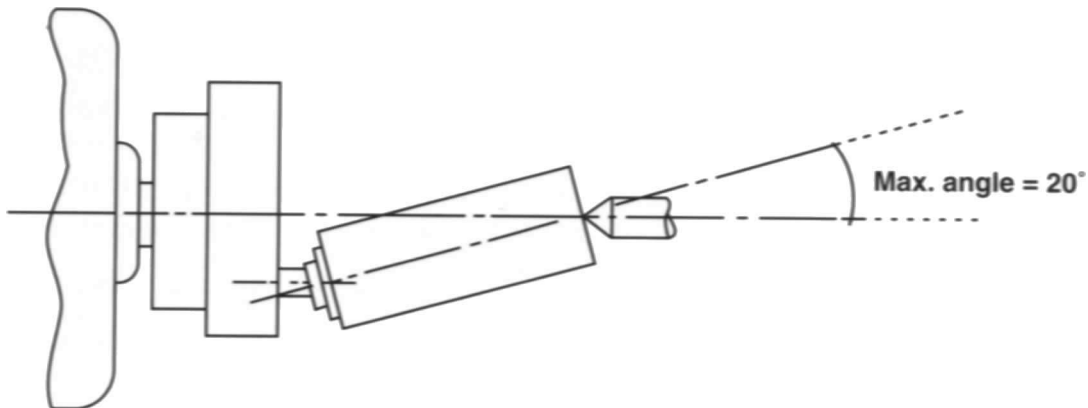
They give the capability to create polygonal geometric sections (e.g. curved-sided and hexagons etc) with either equal or unequal numbers of sides. These sides will be slightly curved due to the offset turning geometry.

The hexagonal ball drive & socket lends itself most readily to the creation of shapes which are polygonal at the headstock end blending to round at the tailstock. By simply removing the ball drive from the socket and relocating it in an adjacent position, (or any of its five other positions) you obtain another distinct side on the workpiece.

### **Preparation of the Workpiece**

The headstock end of the workpiece requires boring with a  $\text{Ø}8\text{mm}$  hole to accept the socket (see page 7) and smaller  $\text{Ø}3\text{mm}$  mutually perpendicular holes ( $90^\circ$ ). A second pair of  $90^\circ$  holes will be required to facilitate the creation of polygons with certain numbers of sides eg. squares and octagons.

Some polygons, which do not have sides at mutually  $60^\circ$ , (eg. squares and octagons), require further pairs of holes drilling in the end grain of the workpiece. The ball drive & socket allows the workpiece to be angled between headstock and tailstock at up to  $20^\circ$  to the axis of the lathe.



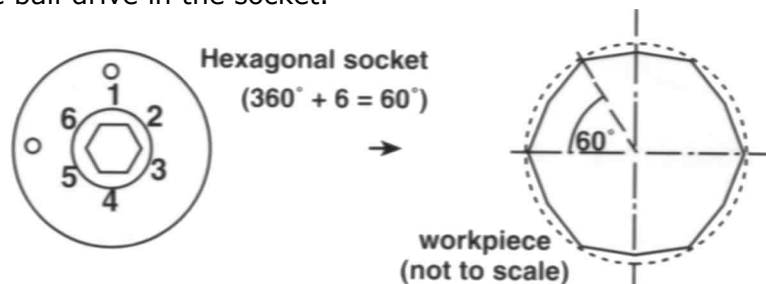
**Example 1****To produce a six-sided polyhedron/ tapering towards the tailstock.**

This is relatively simple, using the speed and convenience of the pre-indexing capability of the ball drive (D) and socket (E).

It is necessary only to repeatedly reposition the ball drive in its socket.

1. Turn the first of your six sides, with the ball drive aligned with side '1' (see below)
2. Stop the lathe and withdraw the tailstock down the bed a little to enable the hexagonal ball drive to come free of its socket. Replace the ball drive in the socket, such that the same side now aligns with side '4' of the socket. This sequence ensures that opposite sides of the workpiece are turned together, thus minimising imbalance and vibration (as per 'Using the Screwchuck', page 4)
3. Turn your second side.
4. Complete the remaining sides, 'pairing' opposite sides.

N.B. Each time you relocate the ball drive in the socket, a new side is formed. The angle between each side on the workpiece (viewed sectionally) is the same as the angle through which you turn the ball drive in the socket.



## **Example 2**

### **To produce a square and subsequently an octagon, both tapering towards the tail stock**

In this example, the sides of the polygon section are not at  $60^\circ$  to each other (i.e. triangles, hexagons etc), so it is necessary to use a combination to use a combination of relocating the ball drive in the hexagonal socket with rotation of the hexagonal socket on the workpiece.

#### **a) Square**

1. Before turning, it is necessary to drill one more mounting hole on the workpiece, at  $90^\circ$  to one of the existing ones, and then mount the socket to the workpiece with the holes configured as in Fig. 4, below.

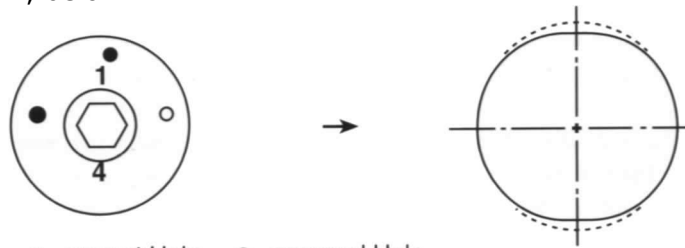


Fig. 4. ○ - vacant Hole ● - screwed Hole

2. Set the offset to the desired amount and turn the first side.
3. Before turning the opposite side of the pair, rotate the ball drive in the socket by  $180^\circ$ , such that you relocate from side '1' to side '4', fig. 4.
4. Stop the lathe and unscrew the hexagonal socket from the workpiece. Rotate it through  $90^\circ$ , to align with the 'new' pair of holes, return the ball drive to side '1', then secure once again with your woodscrews. (Fig. 5.) Turn the third side.

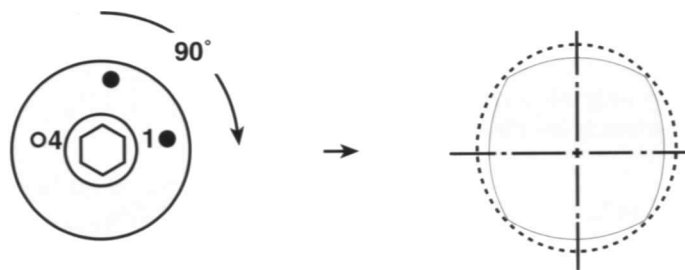


Fig. 5. ○ - vacant Hole ● - screwed Hole

5. Repeat step 2. before turning the opposite side of the last pair.

## b) Octagon

- this is a continuation of the square, so the same workpiece can be used.

1. To complete an octagon, two further pairs of mounting holes in the end of the workpiece are required. (Fig. 6 & Fig. 7)
2. Re-mount the hexagonal socket in the workpiece at  $45^\circ$  advanced on the previous pair of holes.
3. Locate the ball drive in the socket on side '1', Fig.4. Turn the fifth side.
4. Re-locate the ball drive in the socket, corresponding to side '4', before completing the pair

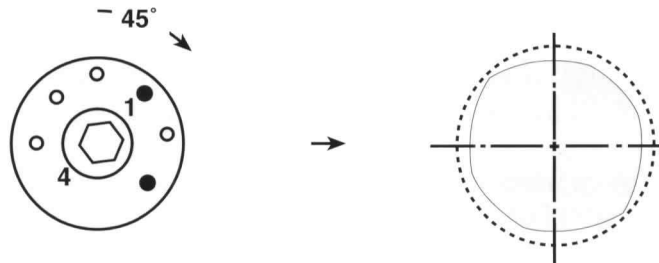


Fig. 6. ○ - vacant Hole ● - screwed Hole

5. To turn the final pair of sides, re-locate the hexagonal socket on the end of the workpiece, rotated  $90^\circ$  anti-clockwise, to occupy the pair of holes in Fig. 7.

Repeat steps 3. and 4. to complete the octagon.

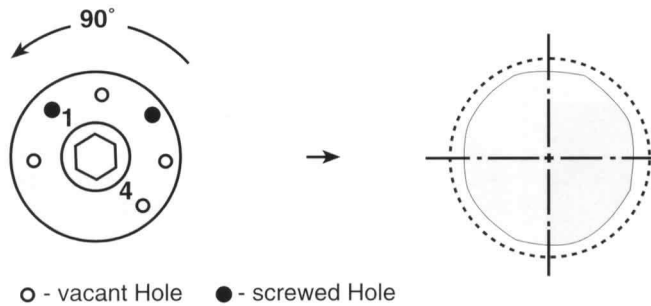
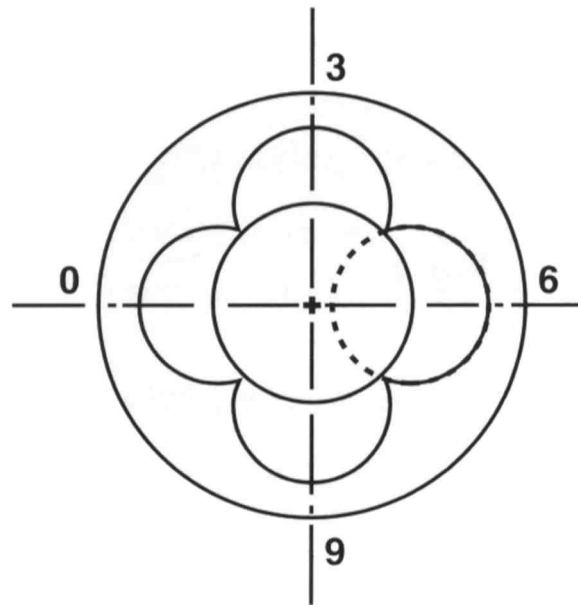


Fig. 7. ○ - vacant Hole ● - screwed Hole

**Example - Overlapping Circles**

This is a typical application of the RS60 and can easily be done by relocating the hexagonal shank in the Bi-Hexagonal socket four times at 90K intervals. This method is basically the same principle as the screwchuck project on page 5.

1. Rough the workpiece down to an '0' setting and set your offset value, before turning the first of the overlapping circles.
2. Undo the grub screws which retain the offset boss, and then undo the M8 machine screw retaining the adaptor. Advance the hexagonal shank three positions (90°) in the bi-hexagonal socket. Replace the whole assembly in the Main body, reset your offset value and retighten the two grub screws. You may now turn the second circle. Repeat the above procedure for remaining circles.