

# Arc Euro Trade



## C3 Mini-Lathe Preparation Guide

**A picture story book to help get your factory  
assembled Sieg C3 Mini-Lathe ready for action**

**Unbeatable Value Engineering Products by Mail Order**

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# PLEASE READ THIS FIRST

The Sieg C3 Mini Lathe is currently one of the most popular small lathes available to model engineers today.

The C3 has a swing of 180mm (90mm centre height) and is 350mm between centres. The spindle has a through bore of 20mm and an MT3 taper whilst the camlock tailstock taper is MT2. The standard 80mm 3 jaw self centring chuck is mounted directly to the spindle flange which will also accommodate an 80mm 4 jaw independent chuck, an ER25 collet chuck or an ER32 collet chuck directly on its Ø55mm register. A larger 100mm chuck may be fitted using one of our C3 (adaptor) backplates, but we do not recommend the use of a chuck larger than 100mm.

Power is provided by a 350w brushed DC motor which is electronically controlled to give a speed range of 100-3000 rpm with the aid of a 2 speed gearbox. The Sieg C3 is also fitted with a spindle speed display and is available in both metric and imperial options with a choice of standard indexable dials or factory fitted digital readouts to the cross slide and top slide.

At our current prices, this represents excellent value for money.

However, to get the best from the C3 Mini Lathe, we strongly recommend some preparation work is carried out before you start using

the machine. This will not only improve the accuracy of the lathe but also help to protect your investment from premature wear or possible failure.

This picture story guide is designed to help you through this preparation process exactly how we do it in our own workshop when a customer chooses the Arc Preparation Service. Anyone planning to prepare their C3 mini lathe should read through the entire guide and assess that they have the required equipment and skills to complete the task. For instance, some operations require the use of a lathe and you can't use your C3 if its all in bits!

Although not expressly stated at each stage in this guide, every part is thoroughly cleaned in a paraffin type solvent before reassembly.

For lubrication, we recommend Molyslip HSB grease (ARC code: 170-100-10300), and a good quality lubricating oil without additives e.g. slideway oil, compressor oil or hydraulic oil (we don't recommend using engine oil or 3-in-1).

Please note that Sieg also manufacture the C2 and C2A mini lathes which are smaller variations of the C3 and will have some construction differences. There are also other factories in China making mini lathes similar to the C3 so these will be different again.



1. The lathe out of the box and we are ready to start work.



2. Remove the chuck guard and rear splash guard.



3. Remove the tailstock.



4. Remove the chuck.



5. Remove the tool post and remove the indexing plunger and spring and keep in a safe place.





6. Remove the screw securing the compound slide handle. Remove handle and spacer.



7. Tap compound slide along with a soft mallet to remove micrometer dial and friction clip.



8. Remove the leadscrew end plate.



9. Slacken the gib adjusting screws.



10. Remove compound slide and gib strip.



11. Unscrew the leadscrew from the compound slide base.



12. Remove the compound slide base.



13. Wind the cross slide off the lead screw.



14. Slacken the gib adjusting screws.



15. Pull off the cross slide assembly.





16. Remove the screw securing the cross slide handle. Remove handle and spacer.



17. Remove the leadscrew end plate and leadscrew.



18. Remove the gear cover.



21. Undo the fixing screws on either side...



19. Undo and remove the final drive gear.



...and remove the transfer gear carrier.



20. Undo and remove the gear quadrant.



22. Undo and remove the tumbler reverse arm.



23. Remove the drive belt cover/backplate.



24. Remove the spacer and key from the main leadscrew.



25. Remove the leadscrew carrier bracket.



26. At the tailstock end, removed the leadscrew carrier bracket.



27. Draw out the leadscrew.



28. Undo the screws securing the apron and remove.



29. Slacken the saddle adjusting screws and slide the saddle off the end of the bed.



30. Remove the rack from the front of the bed.

#### Dismantling the spindle

Steps 31 to 81 cover a bearing change which is not part of our standard preparation service. Switching from standard ball raced bearings to taper roller bearings will improve the machining accuracies and finish.

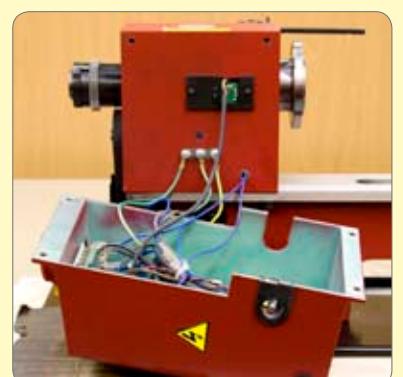
Since in many cases, taper roller bearings are not an essential upgrade, and because you will need access to a hydraulic press and bearing separator you may wish to keep the standard ball races and skip forward to step 82.



31. Remove the gear cover support bracket.



32. Remove 4 screws securing the control panel and lay to one side.

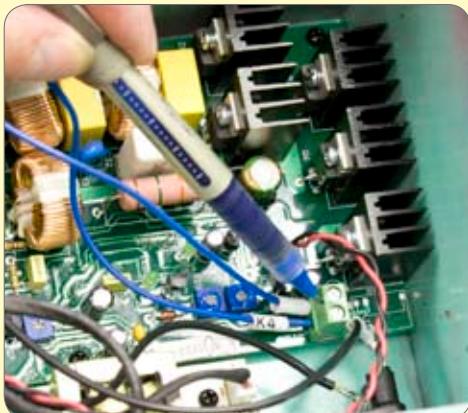




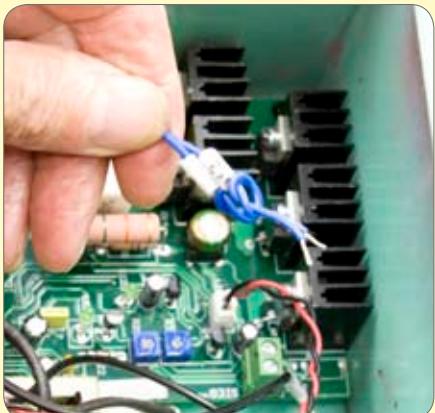
33. Undo two screws and remove the speed display pickup.



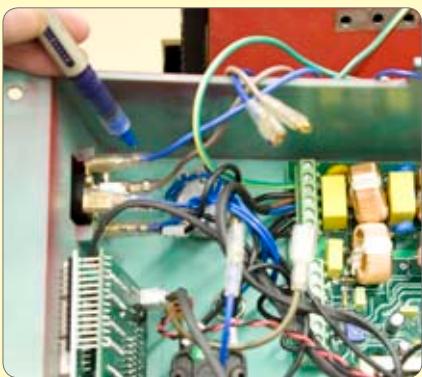
34. Disconnect the three earth wires.



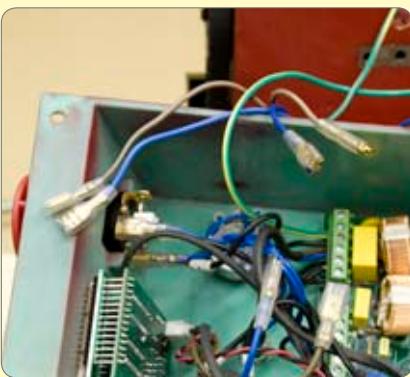
35. Disconnect K3 and K4 safety cut-out wires from the control board.



36. Disconnect the motor wires.



37. Disconnect the mains supply leads from the em-stop switch.



38. Put the control box to one side.



39. Remove the motor cover.



40. Slacken the two drive belt adjusting screws.



41. Slacken the motor mount pivot screws and remove the drive belt.



42. Undo the motor mount pivot screws enough to remove the motor.



43. Remove the chuck guard carrier spindle etc.



44. Remove circlip & pull off drive pulley.



45. Using two C spanners, unlock & remove spindle nuts.



46. Remove Spindle Gear.



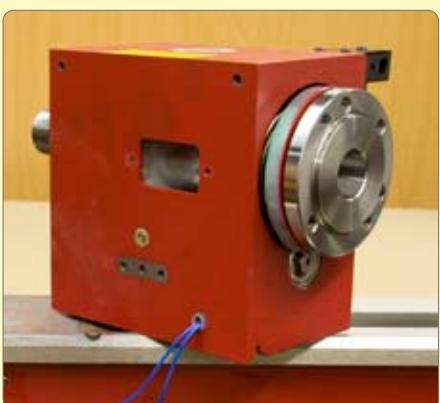
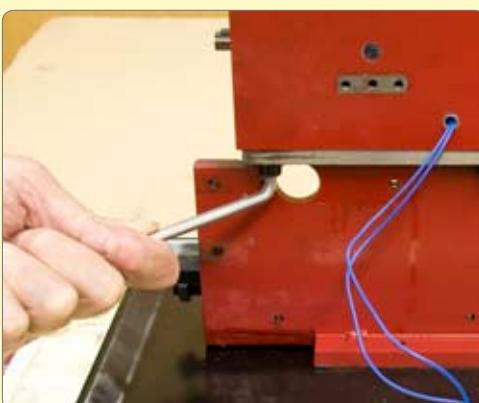
47. Remove key and spacer.



48. Remove the spindle rear bearing cover.



49. Using a hole in the spindle flange for access to the 3 fixing screws, remove the front bearing cover.



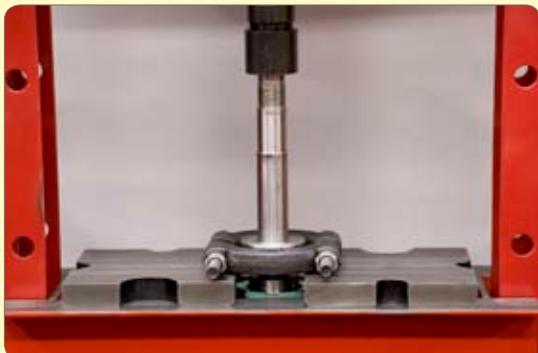
50. Undo and remove the three screws fixing the head casting to the bed and remove the head.



51. Press spindle out of head.



52. Remove spacer and key.



53. Press or pull off bearing and remove bearing cover from spindle.  
If the bearing is tight to remove, polish the spindle to make the bearing a Push Fit otherwise you will not be able to preload the taper roller bearings accurately.

54. Polish the spindle and test the fit by using one of the old bearings (if not damaged).



55. Press or drift-out rear bearing and remove the large white plastic spacer.

56. Remove the small white plastic spacer through the speed display pickup hole. Reduce the thickness of this spacer to 0.110" (2.8mm) before refitting later.

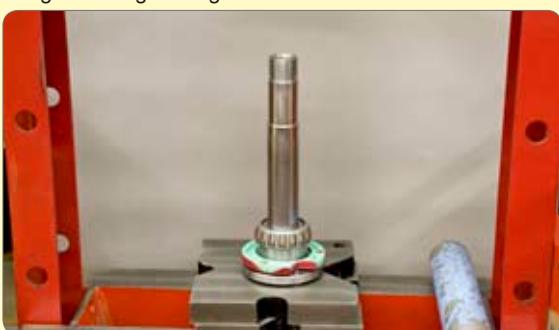
57. Press or drift-in new 30206 taper roller outer races to both front and rear of headstock.



58. Apply light coating of grease to gears and gear change linkage.

59. Refit headstock to bed making sure mating faces are clean and tighten down.

60. Refit front bearing cover to spindle and press on new 30206 taper roller bearing inner



61. The new bearing in place.

62. This picture shows the complete sequence of parts loosely assembled on the spindle. Gaps are left to clearly show the parts. There will be no gaps when assembled in the head. \* Note the outer spacers require a shoulder turning to clear the bearing cage.



63. Make and fit a new 0.190" (4.8mm) spacer between the gear and speed encoder disk inside headstock.

64. Refit the key, the original spacer + the small 0.110" (2.8mm) thick spacer (the original small spacer reduced in thickness) to the spindle and grease the bearing.



65. Assemble spindle aligning keyways in spacer, speed encoder and gears.



67. Grease and fit new 30206 bearing.



71. Fit rear plastic bearing cover.

72. Fit plastic drive pulley, secure with circlip.

73. Secure front bearing cover.



74. Refit the motor onto it's pivot screws.

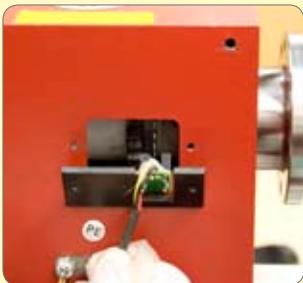
75. Refit the drive belt and adjust tension. If you cannot twist the belt through 90° quite easily, the tension is probably too tight.

76. Thread mains cable through but do not fit motor cover yet.



77. Refit the cable protector.

78. Reconnect all the wires to the control box.



79. Check the speed encoder disk aligns with the pick-up and fit.



80. Refit the chuck guard assembly.



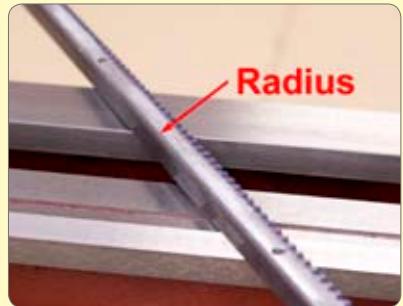
81. Adjust the bearings for "slight drag" and pinch up the C nuts for the moment. Following the Start Up Procedure on page 18, run the spindle to warm it up and settle the grease. Check and adjust the preload again. Lock the C nuts when the preload appears to be OK. Take care not to overdo the preload as this could overheat and damage the bearings.
82. Check the drive belt is running on the centre of the pulley. If not, then adjust the motor's lateral position with the motor pivot screws.
83. Check the drive belt tension again.



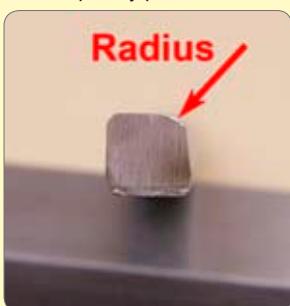
84. Scrape any paint off the bed shears.



85. Trial fit rack to check if it seats or rocks.



86. If necessary, radius top rear edge of the rack and trial fit again.



87. Drill and tap the fixing holes deeper if necessary.



88. Final fit rack making sure it seats properly in the corner.



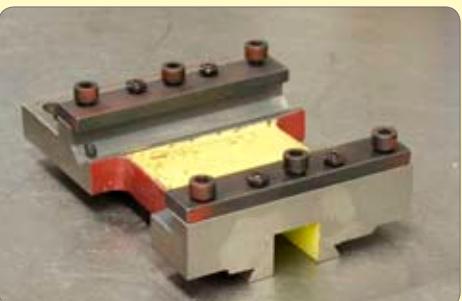
89. Place the saddle on the bed and check to see how it sits.

90. If it rocks, blue the bed and slide the saddle up and down to find the high spots.

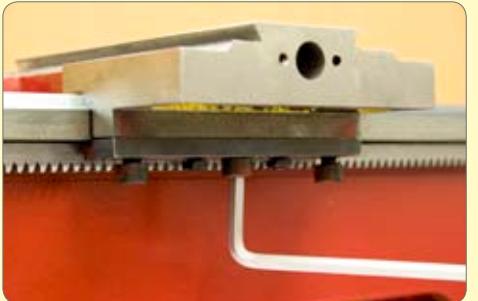
91. Scrape, file or stone down the high spots until the saddle sits flat on the bed.



92. Loosen shear plate adjusting screws below the level of the plate and loosely fit to saddle.



93. Oil bed and saddle and slide saddle onto bed.



Carry out all the following adjustments to both the front and rear shear plates step by step.

94. Lightly pinch middle cap screw.

95. Screw in adjusting screws until **just touching**.

96. Slacken the middle cap screw.

97. Screw in both adjusting screws 1/2 turn.

98. Pinch up middle cap screw.

99. Test slide saddle up and down the bed. There should be slight drag with no free play. Lightly pinch up remaining cap screws checking after each one and adjusting as required.



100. Check 1/2 nuts are correctly adjusted on apron by operating lever.



101. Check there is no rock on the 1/2 nuts.



102. Adjust the gib screws if necessary.



103. Grease or oil pinion gear and shaft assembly



104. Oil 1/2 nut cam slots and dovetails.



105. Temporarily fit apron to saddle.



106. The leadscrew brackets as they come on the machine. Notice there is no means of lubricating the bearing surfaces other than at each end of the bracket.



107. Drill oil holes through to the bore using a centre drill.



108. Finish off by cutting oil grooves in the bore using a Dremel and a 3mm ball end burr similar to the one shown in the inset.

(ARC code: 060-030-00310 - Carbide Burr 3mm Ball)



109. Loosely fit leadscrew bracket & grease bore.



110. Grease end of leadscrew and feed through 1/2 nut and into bracket at headstock end.



111. Grease end of leadscrew and bracket bore and temporarily fix in place.



112. Slightly loosen apron fixing screws.



113. Lock 1/2 nuts onto leadscrew and tighten apron fixing screws.



114. Unlock 1/2 nuts and rack saddle up and down bed to check pinion has no tight spots on rack.



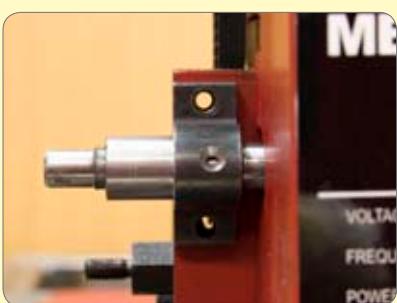
115. Return saddle close to leadscrew bracket and lock 1/2 nuts. Remove bracket screws.



116. Check the bracket holes align with the holes in bed. If holes are misaligned, slot the bracket holes to correct and refix screws.



117. Move saddle to headstock end and lock 1/2 nuts.



118. Check the bracket holes align with holes in bed. If the holes are misaligned, slot the bracket holes to correct and refix the screws.



119. Return saddle to tailstock end and lock 1/2 nuts. Rock handwheel back and forth with finger over end of leadscrew to check for end float. Tap brackets in to remove end float.



120. Check bite of 1/2 nuts on leadscrew is not too tight. Slacken 1/2 nut adjusting screw. Lock 1/2 nuts. Screw in adjusting screw until it touches and then a further 1/8th turn. Lock off.



121. Refit the belt cover.

122. Strip, clean, oil / grease and reassemble the tumbler reverse detent assembly.



123. Oil the tumbler reverse gear shafts.

124. Oil gear shaft.

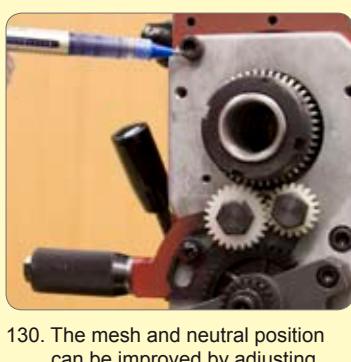
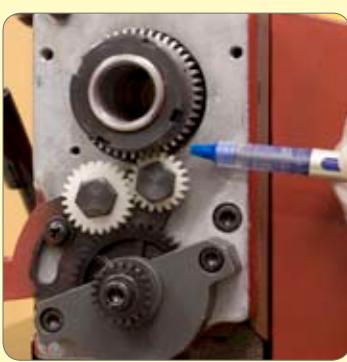
125. Oil the lower quadrant gear shaft.



126. Fit tumbler reverse mechanism.

127. Grease the gear shaft and fix the gear carrier to the cover.

128. Check forward and reverse...

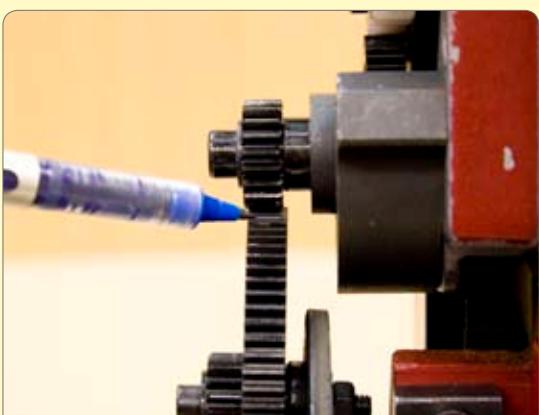


... gears for backlash.

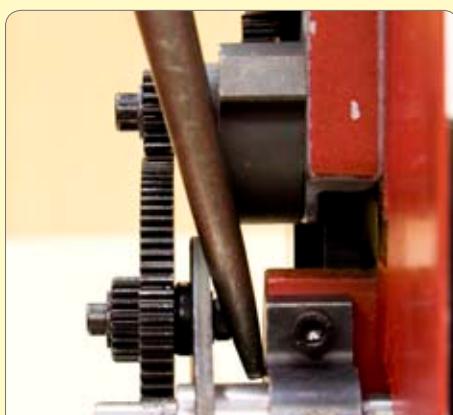
129. Check neutral gear position.

130. The mesh and neutral position can be improved by adjusting the position of the belt cover.

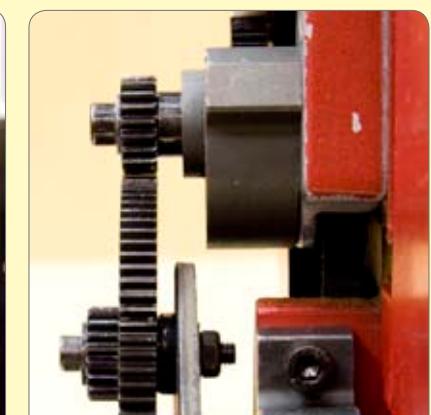
131. Refit lower gear quadrant.

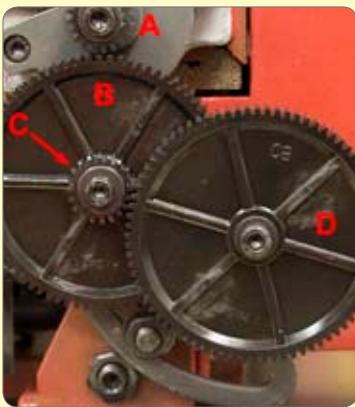


132. Check for correct gear alignment.

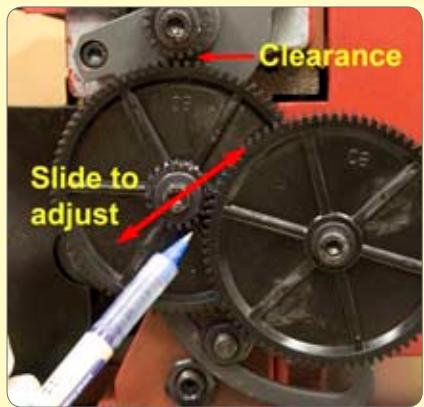


133. "Tweak" the lower quadrant bracket until the gears are in proper alignment.





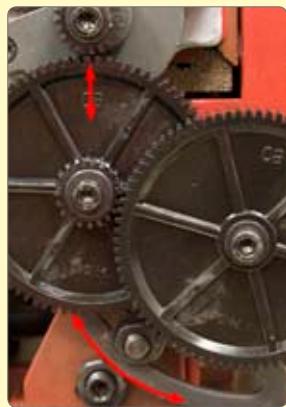
134. Fit leadscrew gear D.



135. Adjust backlash between gears C and D.



136. Engage quadrant and adjust backlash between gears A and B.



138. Run spindle to check for noisy gear meshing and readjust backlash if necessary.



137. Very lightly grease gears.



138. Run spindle to check for noisy gear meshing and readjust backlash if necessary.



139. Refit cover support bracket.



140. Refit gear cover.

141. Oil / grease leadscrew. Engage 1/2 nuts and power the saddle back and forth along the bed.



142. Temporarily fit the cross slide feed screw and bracket and check for backlash.



143. To reduce backlash, machine the rear face of the bracket.



144. To increase backlash, machine a little from the recess. Remove the feed screw and bracket and put to one side.



145. Place cross slide on saddle and check for clearance in corners of dovetail.



146. Modify gib screws or replace with cone point screws.



147. Assemble cross slide and gib strip.



148. Fit adjusting screws lightly.



149. View gib strip to check if it's sitting correctly. If OK, disassemble.



150. Fit top slide base retaining plate.



151. Drop in gib strip and lubricate all ways.



152. Assemble onto saddle.



153. Fit adjusting screws and adjust so slide can be moved back and forth easily by hand.



154. Grease / oil the feed screw and bracket.



155. Assemble onto the saddle.



156. Fit the handle.



157. Slacken the bracket screws, wind the slide right back and tighten the screws.



158. Wind the cross slide in and out. If there is any tightness, the feed screw nut will need adjusting.



159. The centre screw is for adjusting the position of the nut in an up/down direction and the two outside screws are for locking. Slacken all three screws for now.



160. Put finger pressure on handle and screw-in the adjusting screw until you can feel it just touching the nut and then  $+1/4$  to  $1/2$  turn extra.

161. Pinch up the cap screws equally while winding the slide in and out until handwheel turns freely and with minimum drag.  
Continue adjusting all three screws until the slide moves freely along its full travel.



162. If required, slacken and reposition bracket and return to adjusting the nut.



163. Make final adjustments to the gib screws for free movement of the handle with little drag.



164. Remove the handle again in order to fit the micrometer dial and friction spring.



165. Refit the handle assembly.



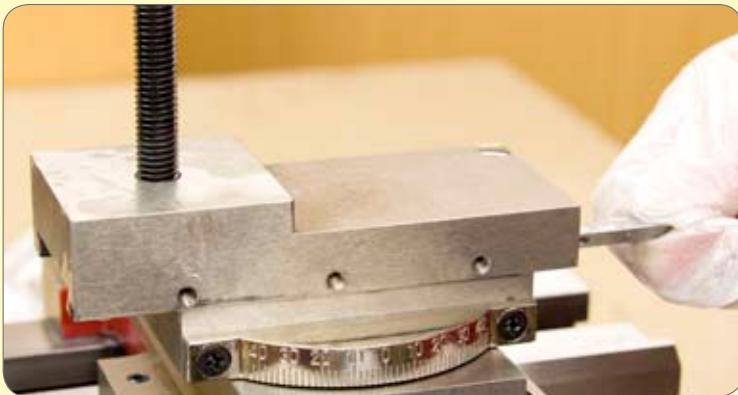
166. Fit compound base to cross slide.



167. Temporarily fit top slide to compound base and check for clearance in corners of dovetail.



168. Oil top slide assembly and fit.



169. Fit gib strip and adjusting screws making sure they engage in the gib strip dimples.



170. Adjust the screws so the slide will move back and forth easily by hand.



171. Oil / grease feed screw and fit. Oil / grease end of feed screw and bracket and fit.



171. Oil / grease feed screw and fit. Oil / grease end of feed screw and bracket and fit.



172. Turn the feed screw to check it turns freely.



173. Assemble and fit the micrometer dial and friction clip to feed screw.



173. Assemble and fit the micrometer dial and friction clip to feed screw.



174. Fit the spacer and handle and wind the slide back and forth.



175. Measure backlash with a feeler gauge.



176. Backlash can often be reduced by turning a recess in the spacer to clear the shoulder on the end of the feed screw. The recess depth should be slightly less than the measurement taken with the feeler gauge to allow some clearance. Adjust for free movement with minimal backlash.

177. Final adjust the top slide gib to your preference and lock-off the screws.



178. Grease and fit the tool post spring and plunger and fit the tool post.

179. Oil the lead screw.



180. Fit the chuck.

181. Fit the tailstock.

182. Fit the rear guard.

## The Completed Machine



## **Always follow the correct Start-Up Procedure**

1. Check everything is switched off -
  - Mains power off
  - Press Emergency stop switch (C) to turn off
  - Forward/reverse (B) to the centre position (off)
  - Speed control knob (A) turned fully anti-clockwise.
2. Switch on at the mains
3. Close the chuck guard
4. Slide back the emergency stop switch to release
5. Select forward or reverse
6. Slowly increase the speed by turning knob A

If the Fault LED (D) lights up and the machine will not run, check that the correct starting sequence has been followed.



## **Running the spindle for the first time:**

1. Follow the Start-Up procedure with low gear selected and the motor running forwards.
2. Run the machine at a low RPM. The machine should run smoothly with minimal noise and vibration. If not turn off the machine and investigate the cause of the problem.
3. Slowly increase the speed and run for 10 minutes at a high RPM.
4. Stop the machine and repeat steps 1-3 above in high gear.
5. Stop the machine and repeat steps 1-4 above in reverse.

This procedure will help to bed the motor brushes in and minimise arcing on the motor commutator. It will also help bed in the taper roller bearings if you fitted them.