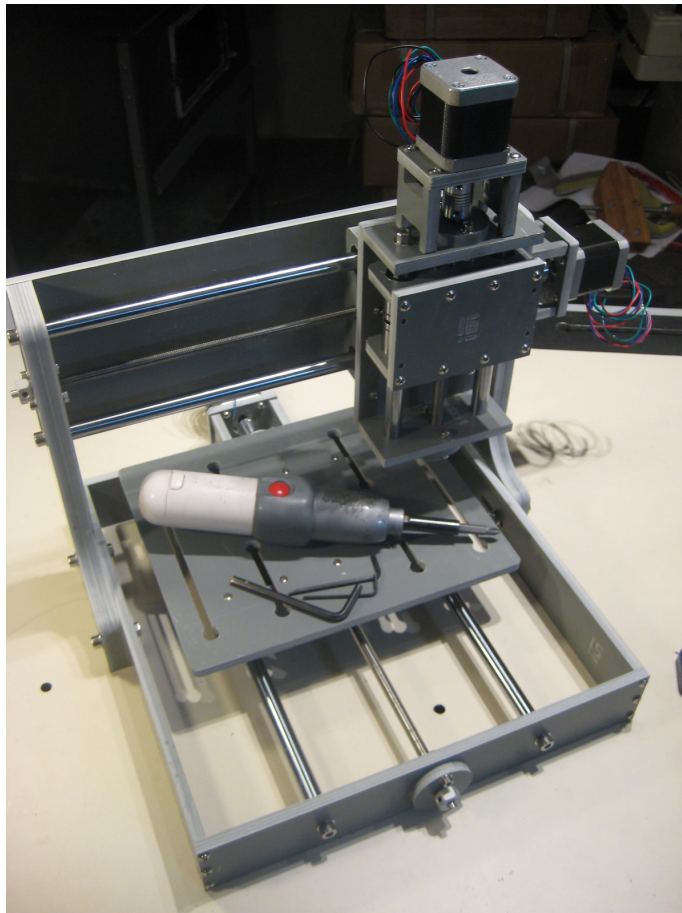


Zen Toolworks CNC Carving Machine DIY Kit User Installation Manual



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P-01, Nema 17 Stepper Motor, 3



P-02, Motor Shaft Flex Coupling, 3



P-03, End Support Ball Bearing, 6



P-04, Anti Backlash Big Falan, 3



P-05, Anti Backlash Small Falan, 3



P-06, Anti Backlash Spring, 3



P-07, Lead screw End Holding Nut, 3



P-08, X, Y Axis Guide Rod, 4



P-09, X, Y Axis Lead Screw, 2













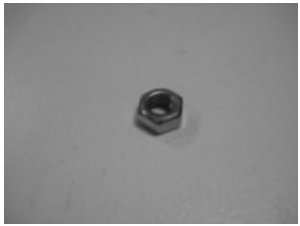

P-10, Z Axis Guide Rod, 2

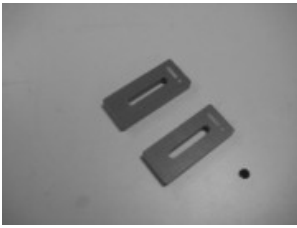


P-11, Z Axis Lead Screw, 1

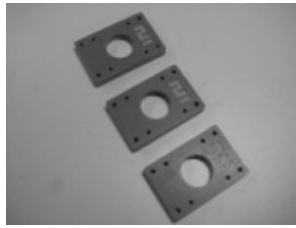


P-12, M3 x 20 Screw

 <p>P-13, M3 Washer</p>	 <p>P-14, M3 Machine Screw, 12</p>	 <p>P-15, M4 Machine Screw, 18</p>
 <p>P-16, M4 Washer</p>	 <p>P-17, M4 Lock Washer</p>	 <p>P-18, M4 Nut</p>
 <p>P-19, M6 x 15 Machine Screw, 8</p>	 <p>P-20, M6 Washer</p>	 <p>P-21, M6 x 20 Machine Screw, 4</p>
 <p>P-22, M6 x 25 Machine Screw, 4</p>	 <p>P-23, M6 Nut, 4</p>	 <p>P-24, Linear Ball Bearing, 12</p>



#01 - Clamping Blocks



#02 - Stepper Motor Base



#03 - End Bearing Block



#04 - Z Axis Upper support



#05 - Z Axis Lower Support



#06 - Gantry Right Support



#07 - Gantry Left Support



#08 - Z Bottom Frame



#09 - Z Top Frame



#10 - Y Axis Higher Support



#11 - Y Axis Lower Support



#12 - Motor Support Block



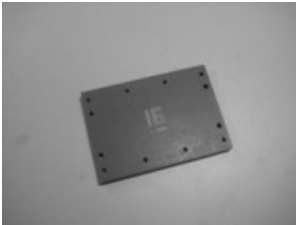
#13 - Y Axis Lower Frame



#14 - Y Axis Top Frame



#15 - Y Axis Side Frame



#16 - Tool Base



#17 - Gantry Left Outer Frame



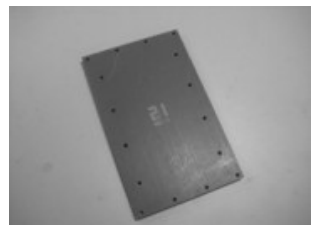
#18 - Gantry Left Inner Frame



#19 - Gantry Right Outer Frame



#20 - Gantry Right Inner Frame



#21 - Z Axis Base Frame



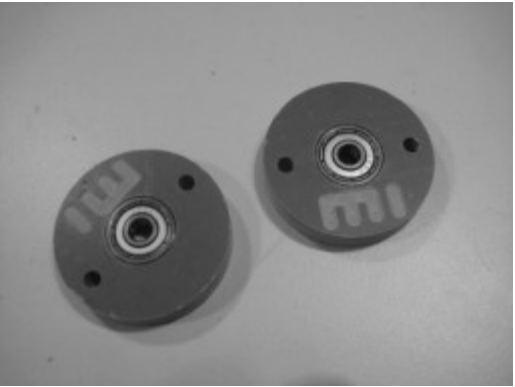
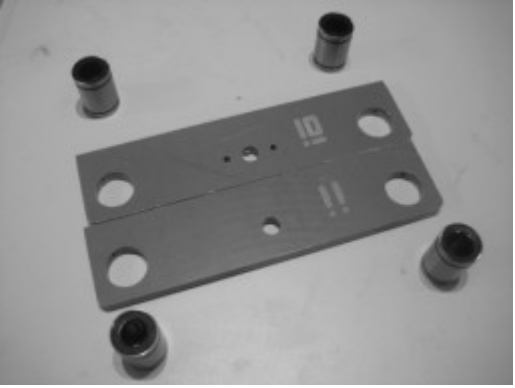
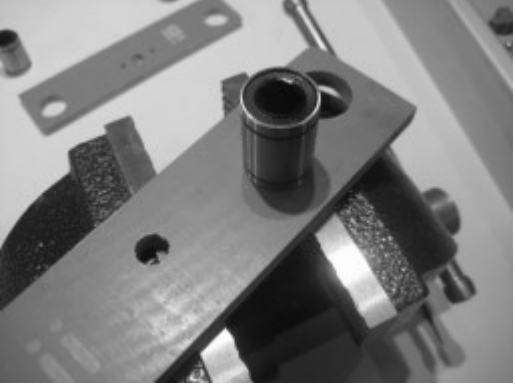
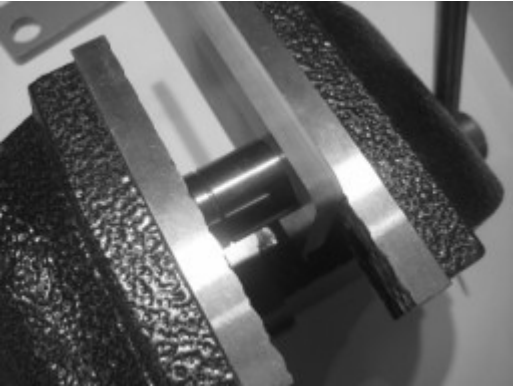
#22 - Gantry Back Enforce Frame


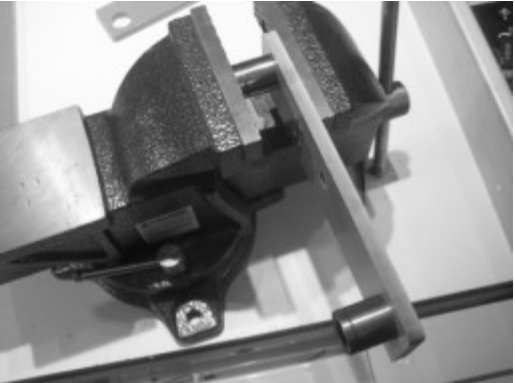




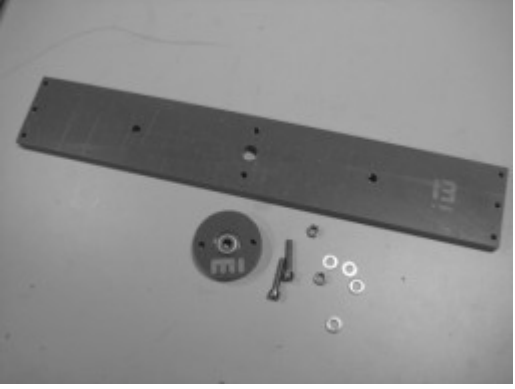



#23 - Working Table Frame



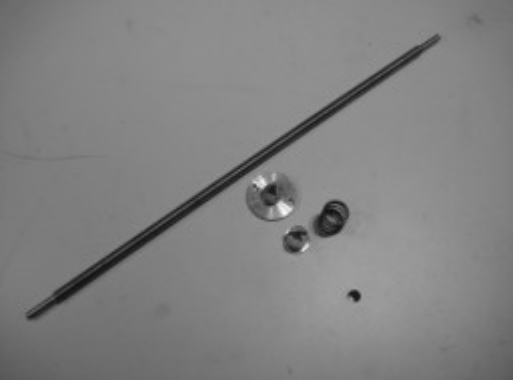

Assemble Instruction:

	<p><u>STEP Y-01</u></p> <p>Here is the layout of the main components for assembling Y Axis.</p>
	<p><u>STEP Y-02</u></p> <p>First, we need to put the bearing into #3. If you have a bench vise, it will make this job much easier. If not, you can find any equivalent tool that you have the access. Just make sure that when you apply the pressure, it should be even and slow. The bearing should be pushed straight into the block. When it is done, the bearing edge should be flush with the bearing block.</p> <p>Parts: P-03 Frame #3</p>
	<p><u>STEP Y-03</u></p> <p>Before push the bearings, make sure the hole is clean from manufacture debris. If not, use a needle file and small tool to clean it.</p>
	<p><u>STEP Y-04</u></p> <p>Push the bearing slowly into the bearing block hole.</p>



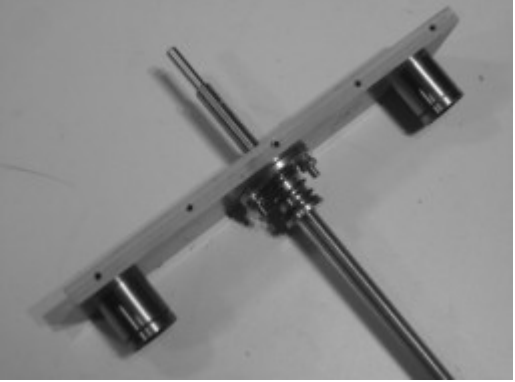
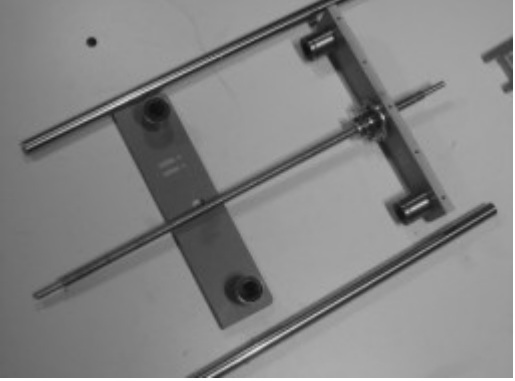
	<p><u>STEP Y-05</u></p> <p>Here is how it looks like when it is done.</p>
	<p><u>STEP Y-06</u></p> <p>We need to push the linear ball bearings into the support frames. Be aware of the orientation during the install.</p> <p>Parts: Frame #10, #11 P-24(4)</p>
	<p><u>STEP Y-07</u></p> <p>Again, we are using bench vise for the job.</p>
	<p><u>STEP Y-08</u></p> <p>Push it slowly and make sure it is straight.</p>



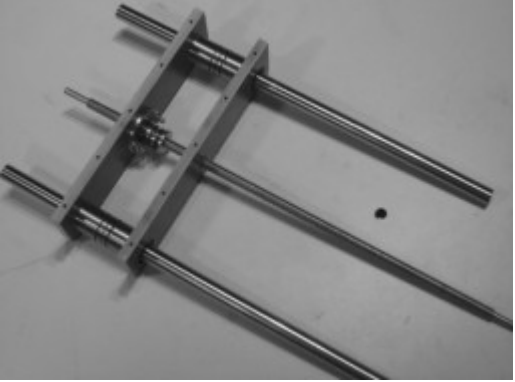
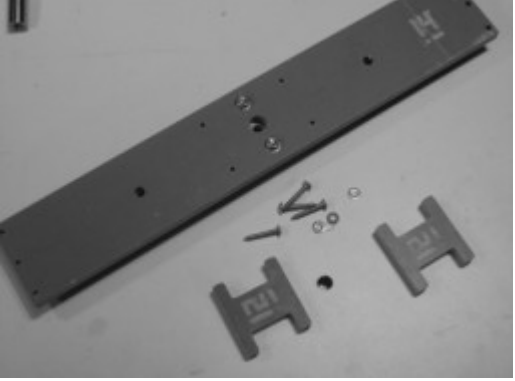
	<p><u>STEP Y-09</u></p> <p>Push it till the end.</p>
	<p><u>STEP Y-10</u></p> <p>Then do the other side. Please take a look at the orientation of two bearings in the picture.</p>
	<p><u>STEP Y-11</u></p> <p>Here is how they will look like when it is done.</p>
	<p><u>STEP Y-12</u></p> <p>Other side. The bearing's ends flush with the board surface.</p>

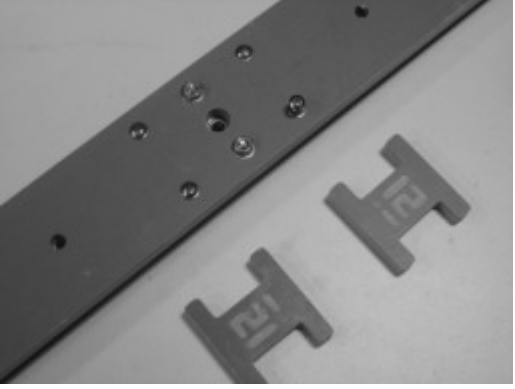
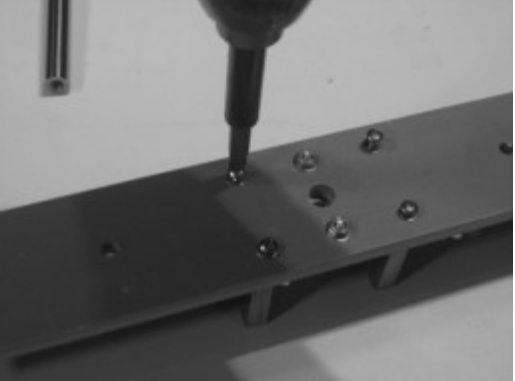
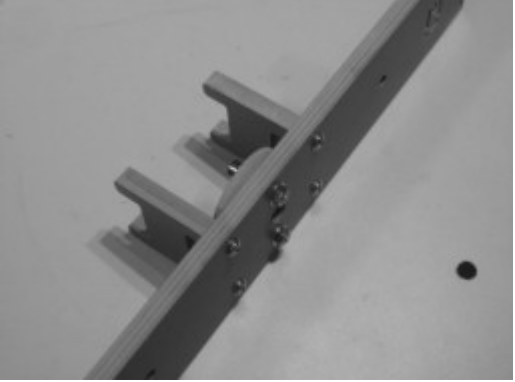
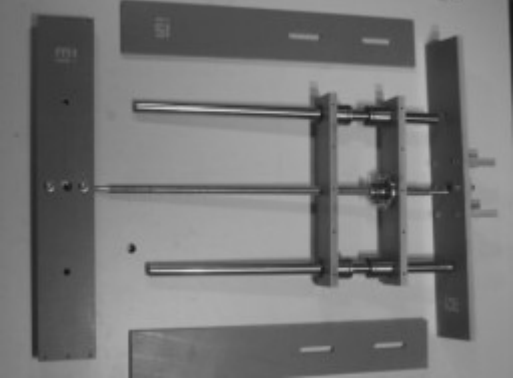
	<p><u>STEP Y-13</u></p> <p>Now we need to attach the bearing block (with bearing already installed) onto part #13.</p> <p>Parts: Frame #13, #3 P-15(2) P-16(4) P-18(2)</p>
	<p><u>STEP Y-14</u></p> <p>Using M4 machine screw, and put flat washers on both sides.</p>
	<p><u>STEP Y-15</u></p> <p>Now it is done.</p>
	<p><u>STEP Y-16</u></p> <p>On the other side, we need to put another bearing block onto part #14. The stepper motor will be attached to this frame.</p> <p>Parts: Frame#14, #3 P-15(2) P-16(4) P-18(2)</p>

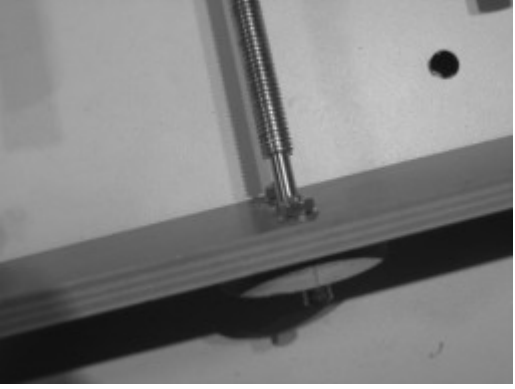

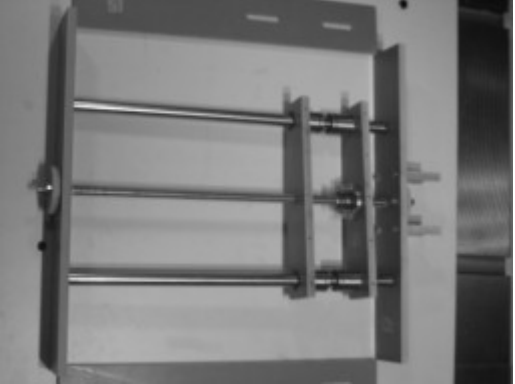

	<p><u>STEP Y-17</u></p> <p>Using M4, washers and nuts.</p>
	<p><u>STEP Y-18</u></p> <p>It is done now.</p>
	<p><u>STEP Y-19</u></p> <p>Here is the Y Axis lead screw, and anti backlash nuts assembly. We will need to put them on following the steps as illustrated in the next few picture.</p> <p>Parts: P-09(1) P-04(1) P-05(1) P-06(1)</p>
	<p><u>STEP Y-20</u></p> <p>First, put the small falan on. Just make a few turns onto the lead screw.</p>



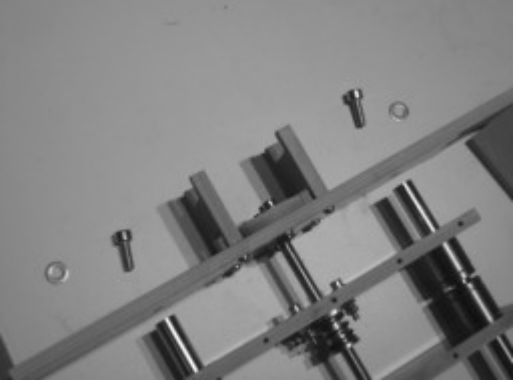

	<p><u>STEP Y-21</u></p> <p>Now put the spring onto it.</p>
	<p><u>STEP Y-22</u></p> <p>Finally, put the falan on. Apply some pressure to squeeze both falans together, and then turn the screw into the big falan. You may need to give it a couple of tries. Make sure the anti backlash nuts and lead screw are aligned properly.</p>
	<p><u>STEP Y-23</u></p> <p>Turn the anti backlash into the lead screw.</p>
	<p><u>STEP Y-24</u></p> <p>Here is the anti backlash nuts installed on the lead screw.</p>



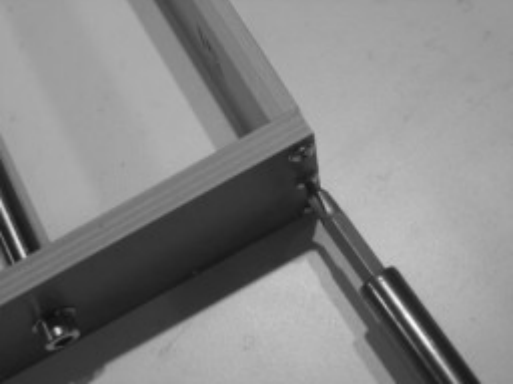
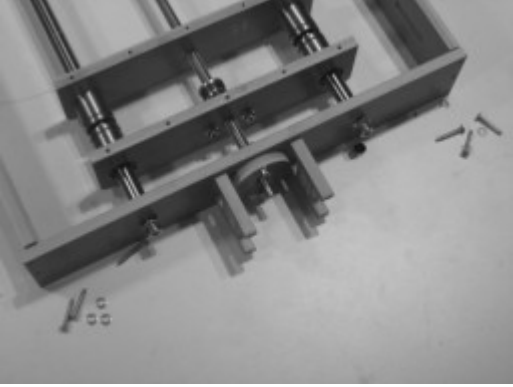
	<p><u>STEP Y-25</u></p> <p>The #10 will be attached to the anti backlash nuts using M4 machine screw, with flat washer, lock washer and nuts.</p> <p>Parts: Frame#10 P-15(2) P-16(4) P-17(2) P-18(2)</p>
	<p><u>STEP Y-26</u></p> <p>Put the screws on.</p>
	<p><u>STEP Y-27</u></p> <p>And then tight them up.</p>
	<p><u>STEP Y-28</u></p> <p>Now, we need to put another support frame and guide rods on.</p> <p>Parts: Frame #11 P-08(2)</p>


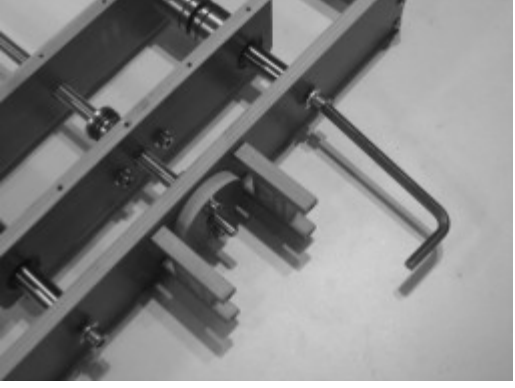


	<p><u>STEP Y-29</u></p> <p>Before we put the guide rod on, please use WD-40 clean the rod thoroughly.</p>
	<p><u>STEP Y-30</u></p> <p>Using a paper towel is fine.</p>
	<p><u>STEP Y-31</u></p> <p>The rods and #11 are installed.</p>
	<p><u>STEP Y-32</u></p> <p>On the other side, we need to first install the motor support blocks on before moving forward. This will make it much easier to access the screws.</p> <p>Parts: Frame#14, #12(2) P-12(4) P-13(4)</p>




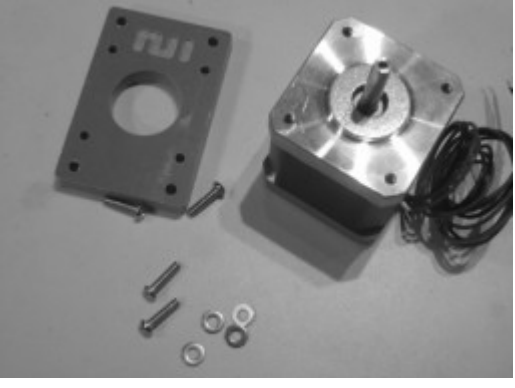
	<p><u>STEP Y-33</u></p> <p>Using M3 screws to attach the motor support blocks.</p>
	<p><u>STEP Y-34</u></p> <p>Using an electrical screwdriver is a good idea.</p>
	<p><u>STEP Y-35</u></p> <p>Now the motor support blocks are installed onto the frame #14</p>
	<p><u>STEP Y-36</u></p> <p>We are ready to put the rest of the frames of Y Axis together.</p> <p>Parts: Frame#14, #13, #15(2)</p>

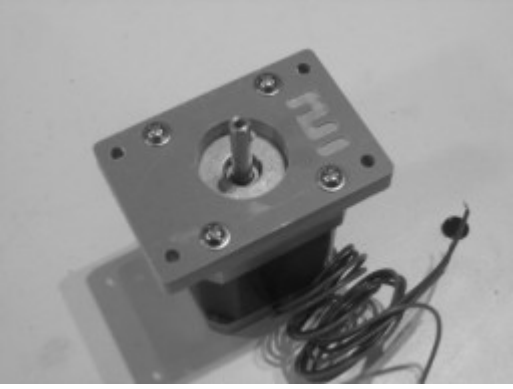
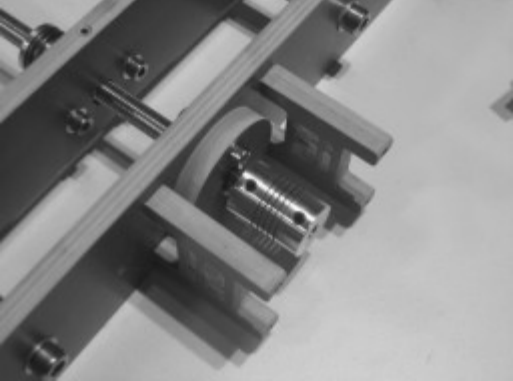
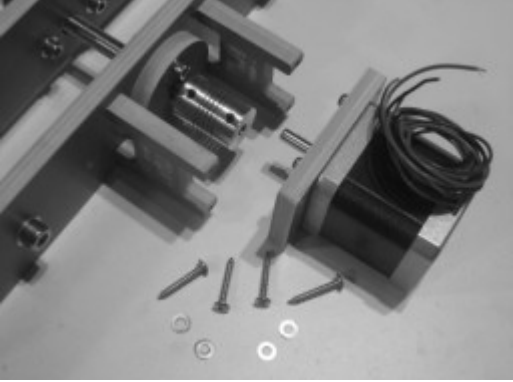
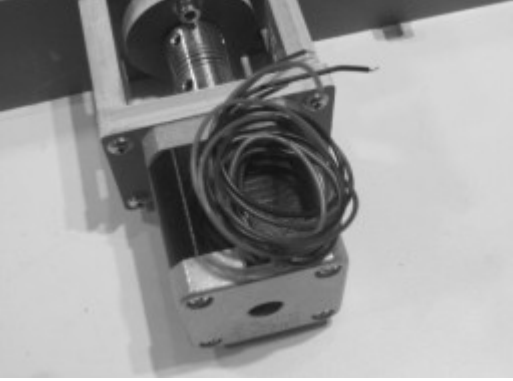
	<p><u>STEP Y-37</u></p> <p>Push the lead screw shaft through the end ball bearings.</p>
	<p><u>STEP Y-38</u></p> <p>The other side, same.</p>
	<p><u>STEP Y-39</u></p> <p>It should look like this</p>
	<p><u>STEP Y-40</u></p> <p>Using M6x15 for attaching the guide rods to end frames.</p> <p>Parts: P-19(2) P-20(2)</p>



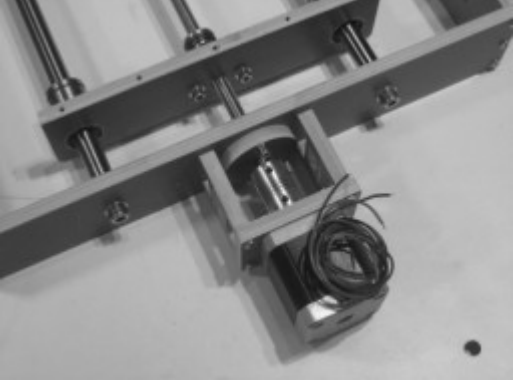

	<p><u>STEP Y-41</u></p> <p>Using a hex key to fasten the screws.</p>
	<p><u>STEP Y-42</u></p> <p>It is done on one side.</p>
	<p><u>STEP Y-43</u></p> <p>Same to the other side of the Y Axis.</p> <p>Parts:</p> <p>P-19 (2) P-20 (2)</p>
	<p><u>STEP Y-44</u></p> <p>It is done.</p>

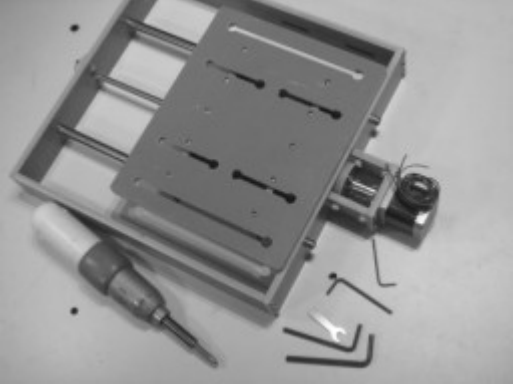

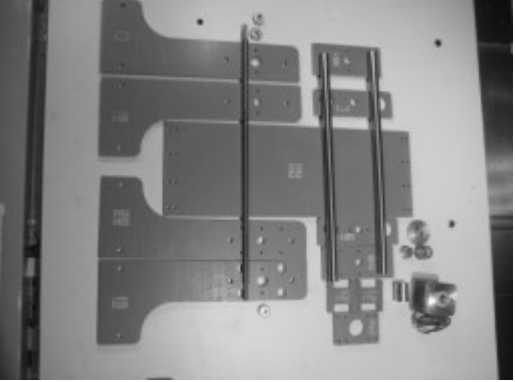

	<p><u>STEP Y-45</u></p> <p>Now we are ready to put the side frame on.</p>
	<p><u>STEP Y-46</u></p> <p>Using M3 screws provided, M3 flat washers should also be used.</p> <p>Parts: P-12 (6) P-13 (6)</p>
	<p><u>STEP Y-47</u></p> <p>Screw them on. Check the squareness often.</p>
	<p><u>STEP Y-48</u></p> <p>On the other side, same.</p> <p>Parts: P-12 (6) P-13 (6)</p>

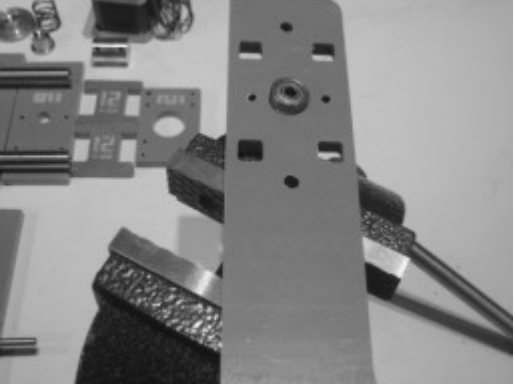
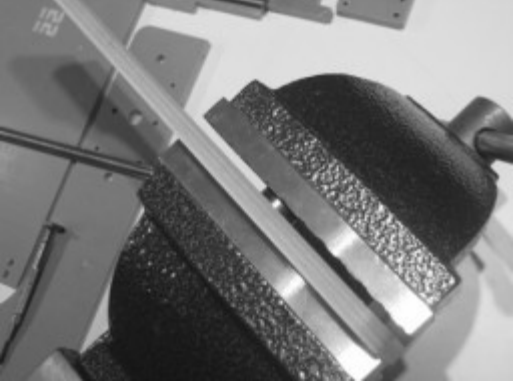
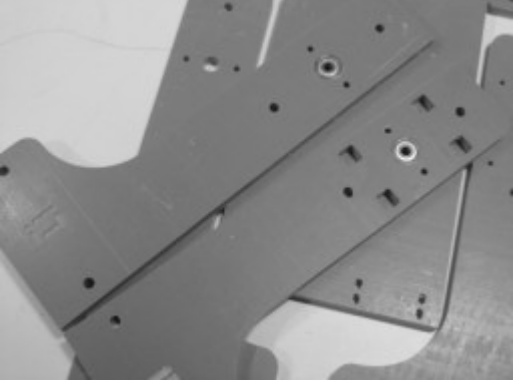

	<p><u>STEP Y-49</u></p> <p>Now we finished the M3 screws for the side frames.</p>
	<p><u>STEP Y-50</u></p> <p>Finally, we need to fasten the M6 screws on guide rods.</p>
	<p><u>STEP Y-51</u></p> <p>It is done.</p>
	<p><u>STEP Y-52</u></p> <p>Check whether you can turn the lead screw easily. It should, other wise, you should check where can be the problem. It is always a good idea to identify the issue earlier in the install. Otherwise, you will have to back out many steps to get it fixed.</p>

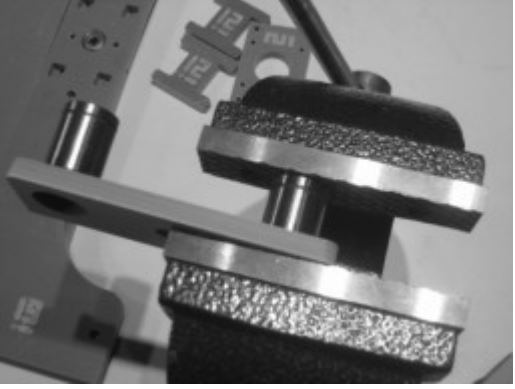

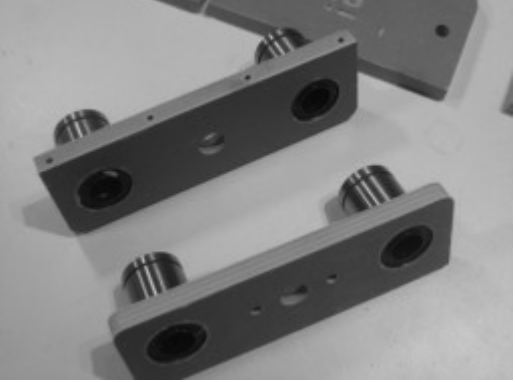

	<p><u>STEP Y-53</u></p> <p>We use a lead screw end holding nut to hold the lead screw to the ball bearing and frame.</p> <p>Parts: P-07(1)</p>
	<p><u>STEP Y-54</u></p> <p>To install the nut, you should hold the lead screw and the nut as shown in the picture. Make sure the nut, lead screw and ball bearing; there is no gap in between. Then fasten the setscrews on the nut.</p>
	<p><u>STEP Y-55</u></p> <p>Using a hex key to fasten the setscrews on the lead screw end holding nut. After this, check that there should no play between lead screw, bearing and frame.</p>
	<p><u>STEP Y-56</u></p> <p>Now we are ready to put the motor on.</p> <p>Parts: P-01(1) Frame #2(1) P-14(4) P-13(4)</p>


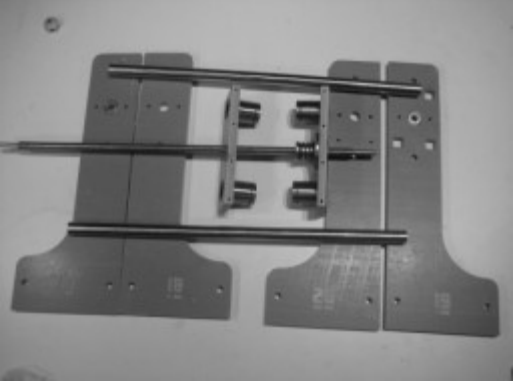

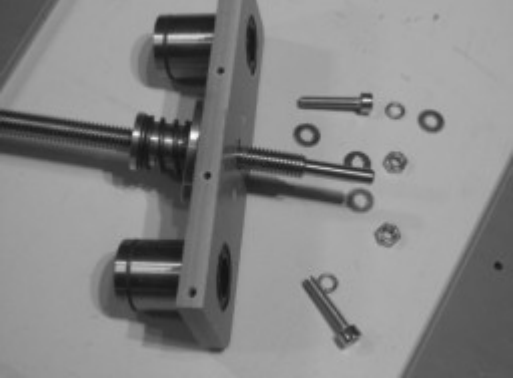
	<p><u>STEP Y-57</u></p> <p>Use M3 Machine screws provided to attach the stepper motor to the part #2.</p>
	<p><u>STEP Y-58</u></p> <p>Now, put the flex coupling onto the lead screw shaft.</p> <p>Parts: P-02 (1)</p>
	<p><u>STEP Y-59</u></p> <p>Then put the motor onto the motor support blocks.</p> <p>Parts: P-12 (4) P-13 (4)</p>
	<p><u>STEP Y-60</u></p> <p>Here you go.</p>

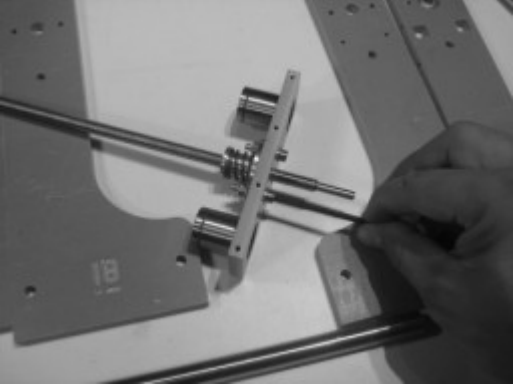

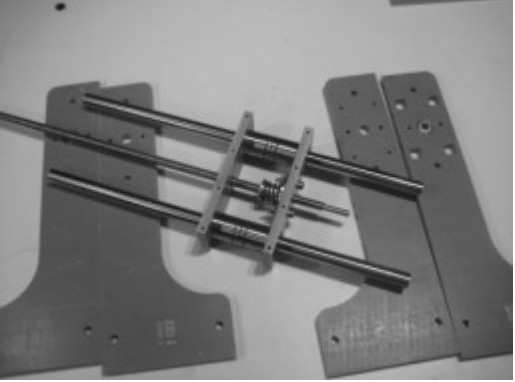

	<p><u>STEP Y-61</u></p> <p>Move the coupling to the middle position.</p>
	<p><u>STEP Y-62</u></p> <p>Fasten the setscrews on the flex coupling. Now the motor and lead screw is connected.</p>
	<p><u>STEP Y-63</u></p> <p>Be aware of the motor lead orientation; make sure it is easy for your wiring later. For Y Axis, you can either let the wire outlet face up or on the side.</p>
	<p><u>STEP Y-64</u></p> <p>Now we are putting the working table onto the support frames for Y Axis.</p> <p>Parts:</p> <p>Frame #23 P-12 (10)</p>

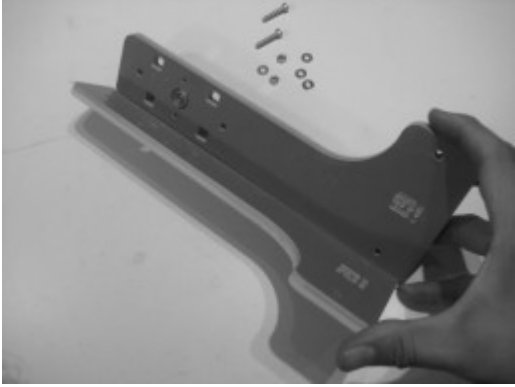

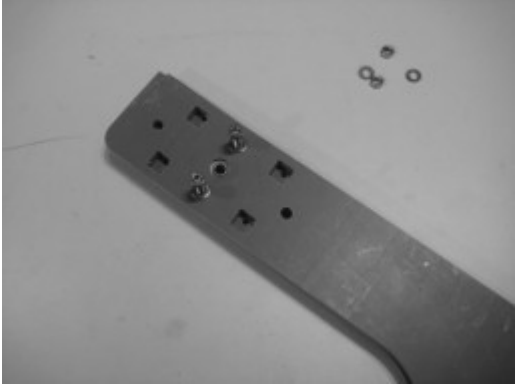

	<p><u>STEP Y-65</u></p> <p>Now, the Y Axis assembly is done. The picture shows tools we have used, except the bench vise.</p>
	<p><u>STEP Y-66</u></p> <p>Tools we have used so far.</p>
	<p><u>STEP X-01</u></p> <p>Now let's start Gantry install.</p>
	<p><u>STEP X-02</u></p> <p>First thing, we need to prepare the ball bearings and linear bearings. Clean the holes if necessary.</p> <p>Parts:</p> <p>Frame#19,#17</p>


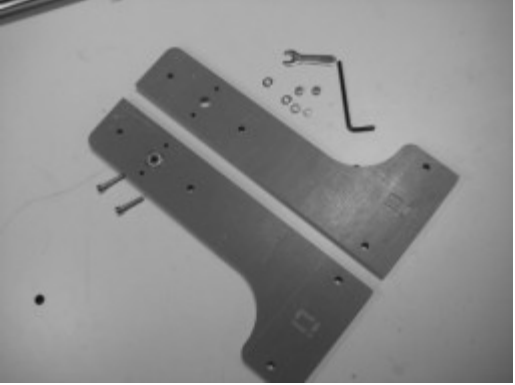
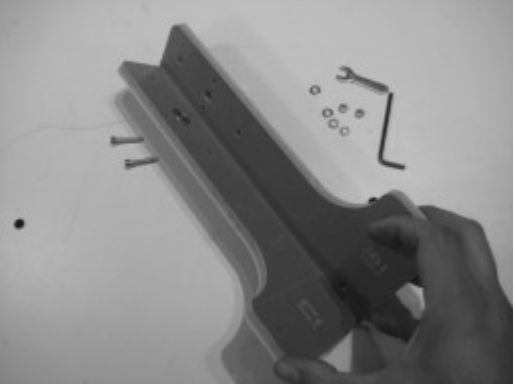

	<p><u>STEP X-03</u></p> <p>Again, we are going to use bench vise.</p> <p>Parts:</p> <p>Frame #19,#17 P-03(2)</p>
	<p><u>STEP X-04</u></p> <p>Push it slowly and make sure it is straight. If it is not aligned properly and force the bearing in, it can break the board, so be very careful here.</p>
	<p><u>STEP X-05</u></p> <p>Now ball bearings have been pushed into the side frames.</p>
	<p><u>STEP X-06</u></p> <p>Now let's install linear bearings to the support frames.</p> <p>Parts:</p> <p>P-24 (4) Frame #7 Frame #8</p>

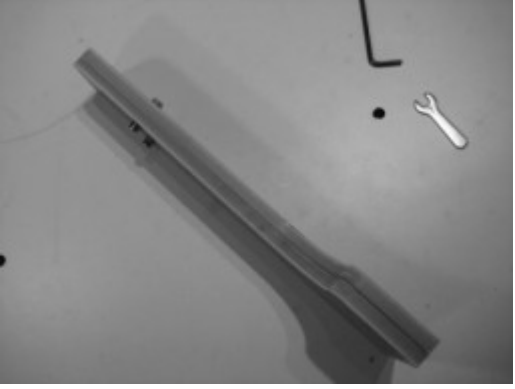
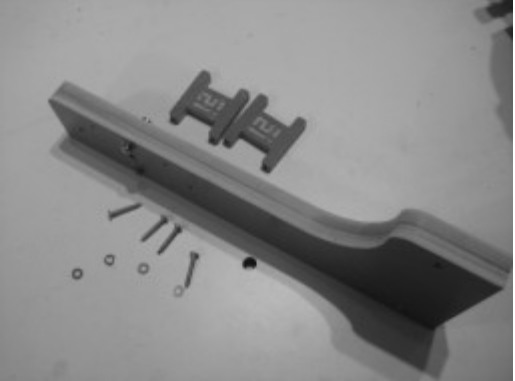
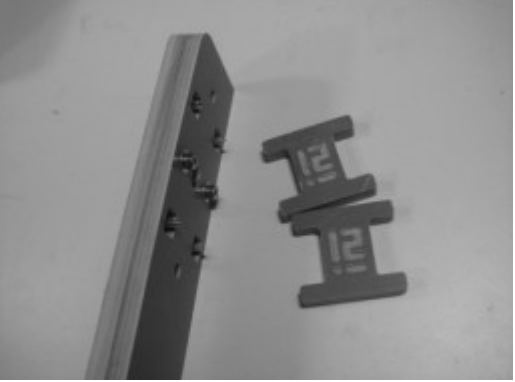
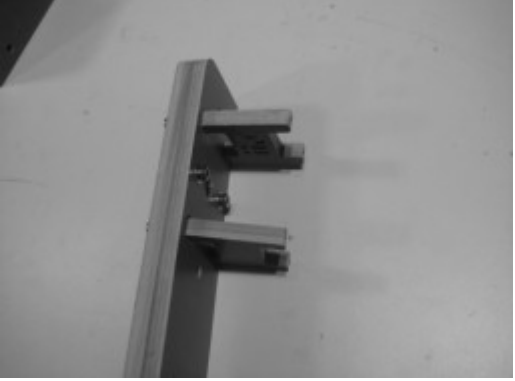
	<p><u>STEP X-07</u></p> <p>Make sure it is straight, it is important.</p>
	<p><u>STEP X-08</u></p> <p>Linear bearings have been installed to Gantry support frames.</p>
	<p><u>STEP X-09</u></p> <p>The end of the bearings is flush with the frame surface.</p>
	<p><u>STEP X-10</u></p> <p>Again, install the anti backlash nuts to the Gantry lead screw; refer to the install procedure for Y Axis.</p> <p>Parts:</p> <ul style="list-style-type: none">P-09P-04P-05P-06

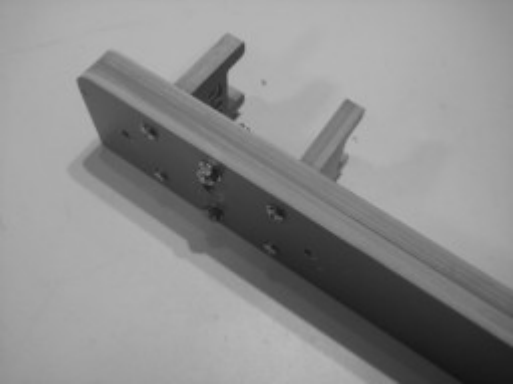

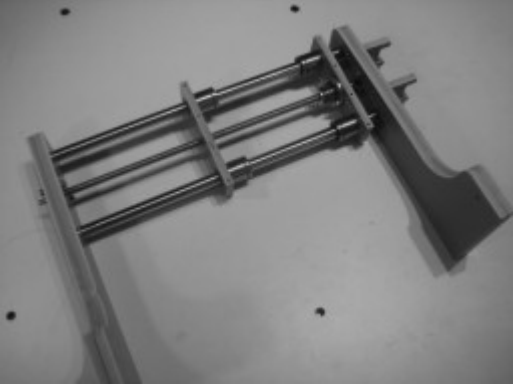
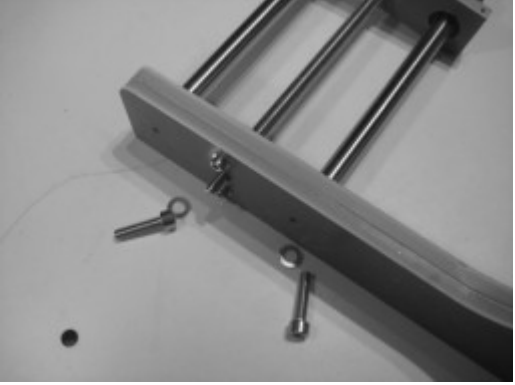
	<p><u>STEP X-11</u></p> <p>The anti backlash nuts are on the lead screw.</p>
	<p><u>STEP X-12</u></p> <p>Here is the layout of the main parts for Gantry.</p> <p>Parts:</p> <p>P-08 (2)</p>
	<p><u>STEP X-13</u></p> <p>Again, clean the rod using WD-40.</p>
	<p><u>STEP X-14</u></p> <p>Attach the anti backlash to the support frame using M4, with lock washers.</p> <p>Parts:</p> <p>P-15(2)</p> <p>P-16(4)</p> <p>P-17(2)</p> <p>P-18(2)</p>

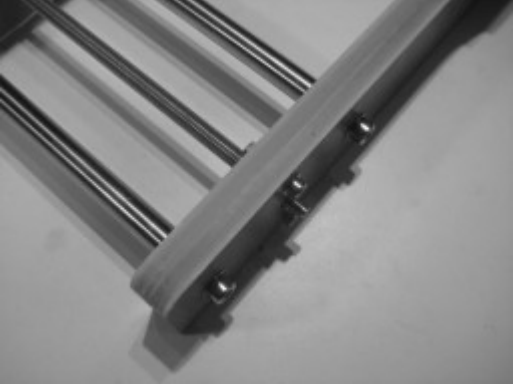

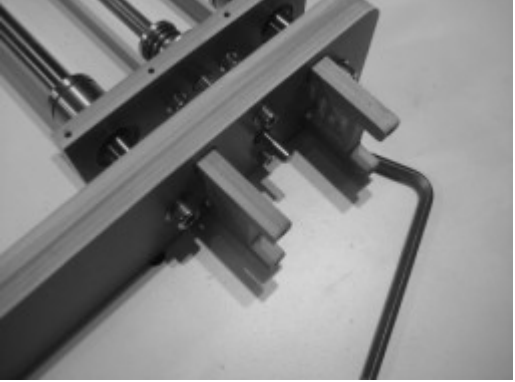

	<p><u>STEP X-15</u></p> <p>Fasten them using a hex key.</p>
	<p><u>STEP X-16</u></p> <p>Ready for guide rods.</p>
	<p><u>STEP X-17</u></p> <p>Slide the rods on.</p>
	<p><u>STEP X-18</u></p> <p>Now, let's prepare the side frames. This two are on the motor side (right).</p> <p>Parts: Frame #19, #20 P-15(2) P-16(4) P-18(2)</p>

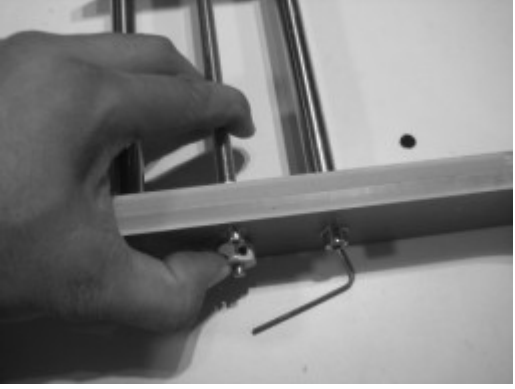
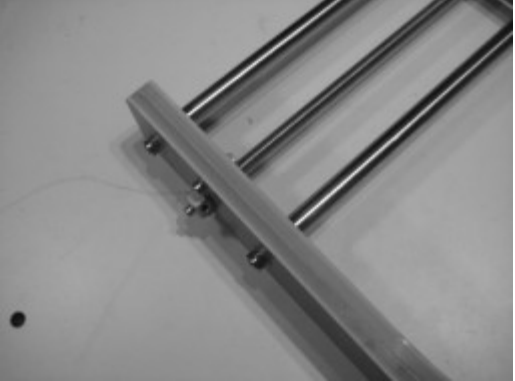
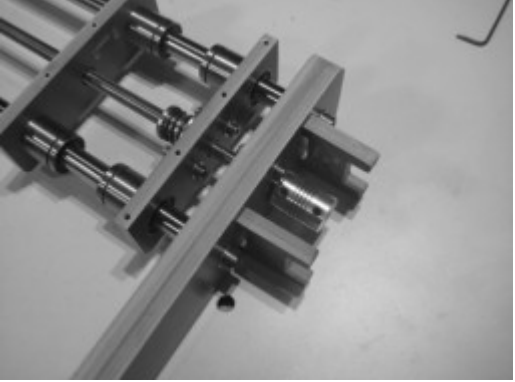
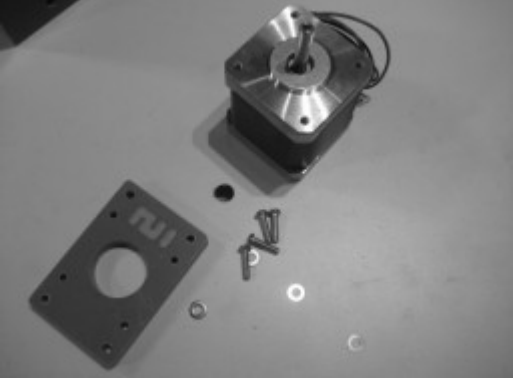
	<p><u>STEP X-19</u></p> <p>Close them up as shown.</p>
	<p><u>STEP X-20</u></p> <p>Using 2 M4 machine screws.</p>
	<p><u>STEP X-21</u></p> <p>Ready to fasten the screws.</p>
	<p><u>STEP X-22</u></p> <p>Put the washers and nuts on.</p>




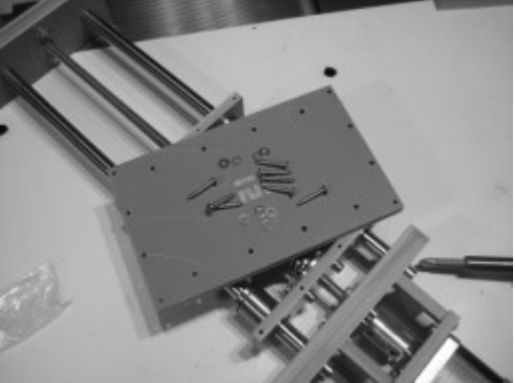
	<p><u>STEP X-23</u></p> <p>It is done on one side.</p>
	<p><u>STEP X-24</u></p> <p>Ready for the other side.</p> <p>Parts: Frame #17, #18 P-15(2) P-16(4) P-18(2)</p>
	<p><u>STEP X-25</u></p> <p>Be aware of the orientation.</p>
	<p><u>STEP X-26</u></p> <p>Close them up.</p>

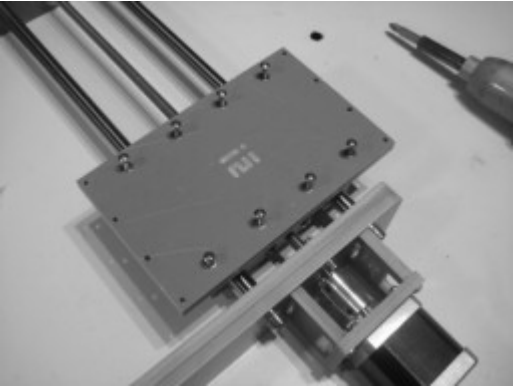
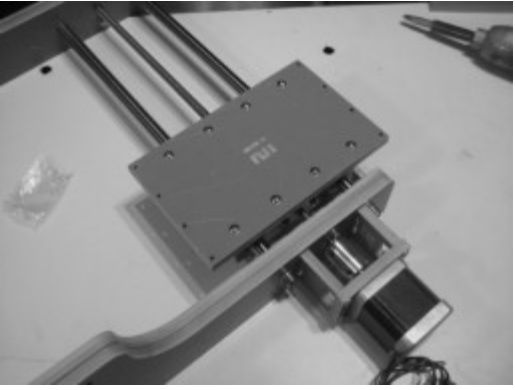
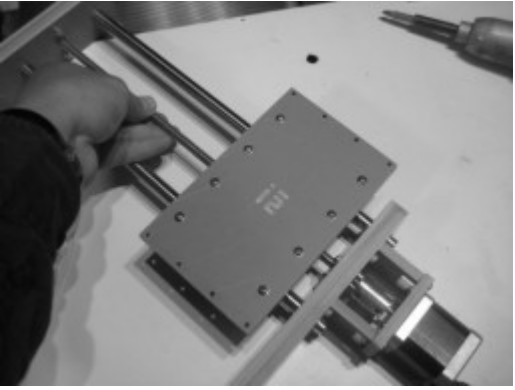
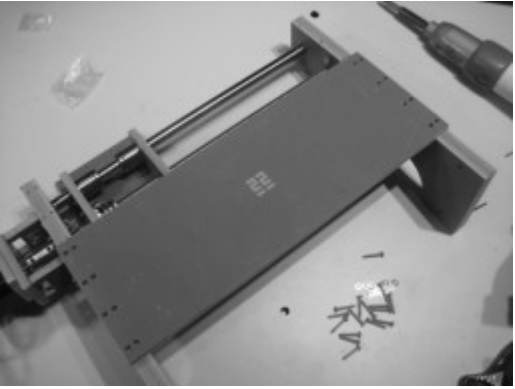
	<p><u>STEP X-27</u></p> <p>Fasten using M4 screws with washers and nuts.</p>
	<p><u>STEP X-28</u></p> <p>Now, we need to put the motor support blocks on. The M3 screws are much easier to access then after put everything together.</p> <p>Parts: Frame #19,#20 P-12(4) P-13(4)</p>
	<p><u>STEP X-29</u></p> <p>2 Motor support blocks for Gantry will be inserted into those square holes.</p>
	<p><u>STEP X-30</u></p> <p>As shown.</p>

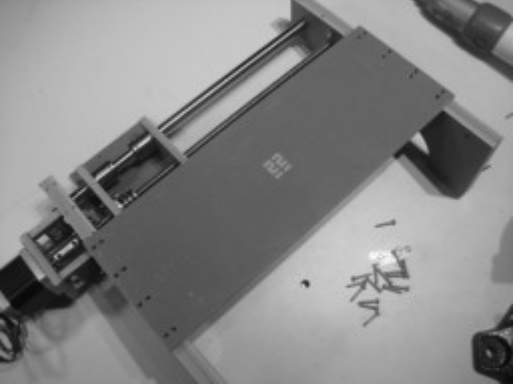
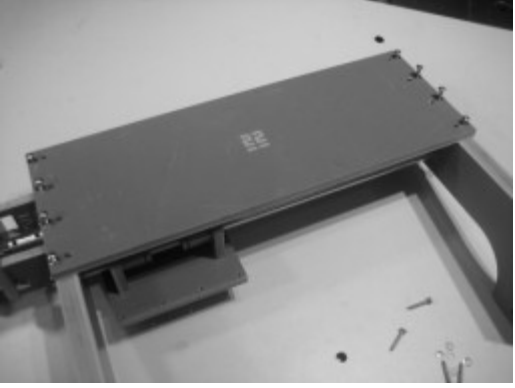

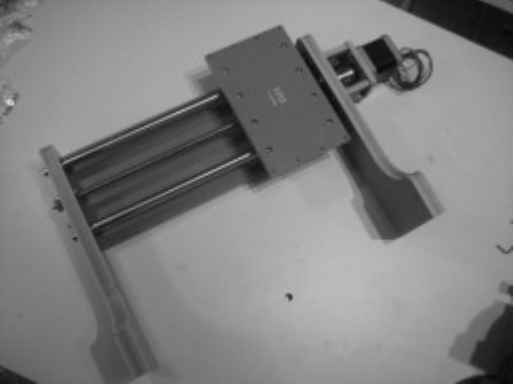
	<p><u>STEP X-31</u></p> <p>Use M3 screws and washers.</p>
	<p><u>STEP X-32</u></p> <p>It is done.</p>
	<p><u>STEP X-33</u></p> <p>Now we put all Gantry parts together.</p>
	<p><u>STEP X-34</u></p> <p>Using M6x20 to connect the gantry side frames and guide rods.</p> <p>Parts:</p> <p>P-21(2) P-20(2)</p>

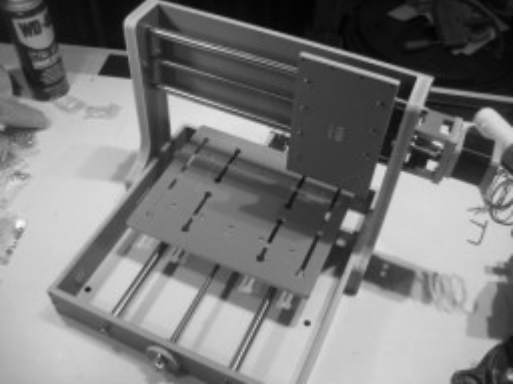



	<p><u>STEP X-35</u></p> <p>Done on one side.</p>
	<p><u>STEP X-56</u></p> <p>Similar to the other side.</p> <p>Parts: P-19(2) P-20(2)</p>
	<p><u>STEP X-37</u></p> <p>Using a hex key to fasten the screws.</p>
	<p><u>STEP X-38</u></p> <p>Same, install lead screw holding nut.</p> <p>Parts: P-07</p>

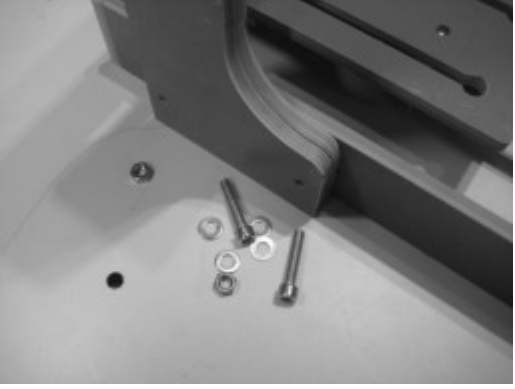


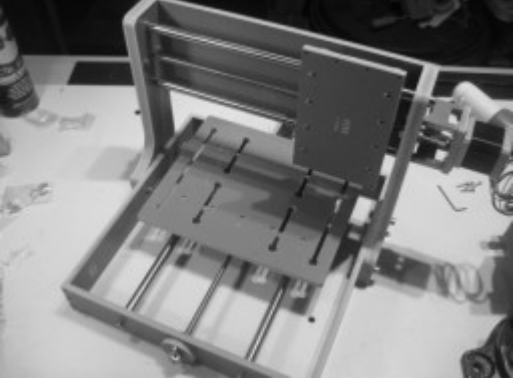
	<p><u>STEP X-39</u></p> <p>Squeeze them together; make sure there is no gap between lead screw and ball bearing and holding nut.</p>
	<p><u>STEP X-40</u></p> <p>Then fasten the setscrews on the holding nut.</p>
	<p><u>STEP X-41</u></p> <p>Put the flex coupling on before the stepper motor.</p> <p>Parts:</p> <p>P-02(1)</p>
	<p><u>STEP X-42</u></p> <p>Put the motor onto motor base #2.</p> <p>Parts:</p> <p>P-01 P-14(4) P-13(4) Frame #2</p>

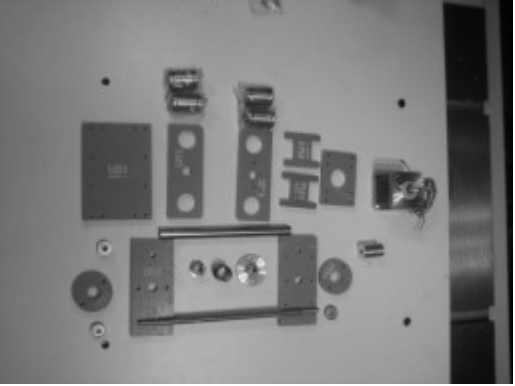
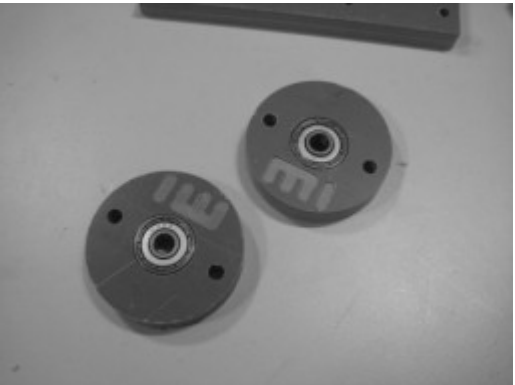
	<p><u>STEP X-43</u></p> <p>Using M3 machine screws provided.</p>
	<p><u>STEP X-44</u></p> <p>For gantry motor, you probably want to face the motor leads backward.</p>
	<p><u>STEP X-45</u></p> <p>Use screwdriver to fasten the screws.</p>
	<p><u>STEP X-46</u></p> <p>Now we need to put the Z Axis base onto the gantry support frames.</p> <p>Parts: Frame #21 P-12(8) P-13(8)</p>





	<p><u>STEP X-47</u></p> <p>Using M3 screws and washers.</p>
	<p><u>STEP X-48</u></p> <p>It is done.</p>
	<p><u>STEP X-49</u></p> <p>Make sure you can turn the lead screw by hand easily. Check it often and it will save you later.</p>
	<p><u>STEP X-50</u></p> <p>Now let's put the gantry back support on.</p> <p>Parts: Frame #22 P-12(16) P-13(16)</p>

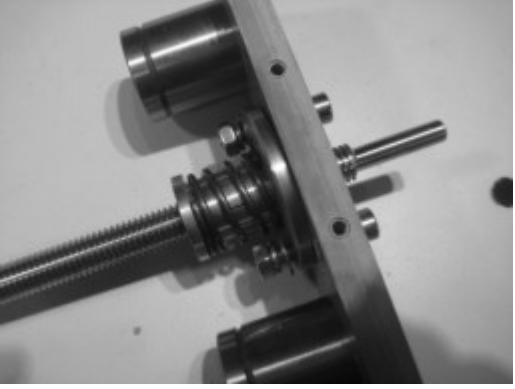

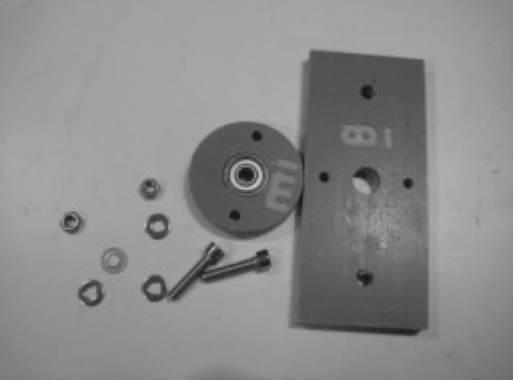

	<p><u>STEP X-51</u></p> <p>Use M3 screws with washers.</p>
	<p><u>STEP X-52</u></p> <p>No hurry, do it slowly. There are a lot of screws.</p>
	<p><u>STEP X-53</u></p> <p>Yes, it is done.</p>
	<p><u>STEP X-54</u></p> <p>Here is the finished gantry assembly.</p>



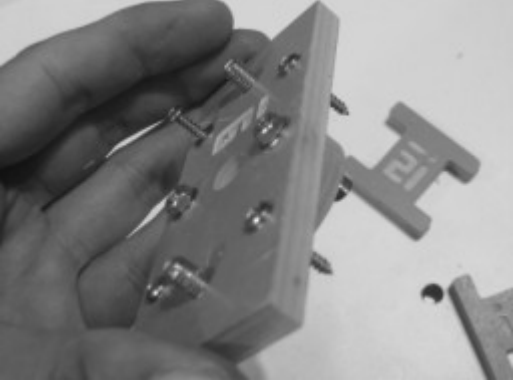
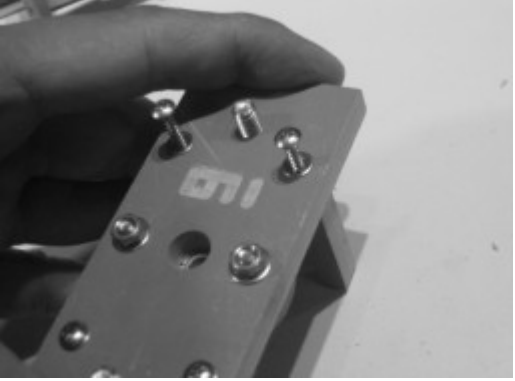
	<p><u>STEP X-55</u></p> <p>Now, let's try to put the gantry and Y Axis base together.</p>
	<p><u>STEP X-56</u></p> <p>Using M6 x 25 machine screws.</p> <p>Parts: P-22 (2) P-20(4) P-23(2)</p>
	<p><u>STEP X-57</u></p> <p>Finished one side.</p>
	<p><u>STEP X-58</u></p> <p>Tight them up.</p>



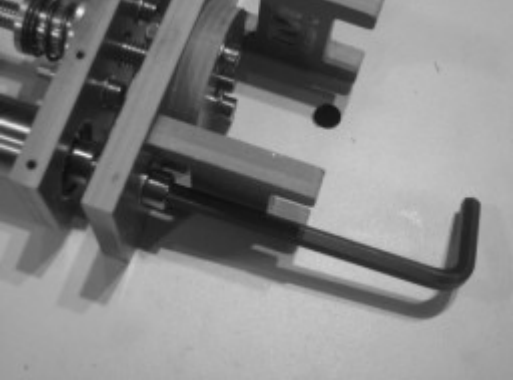
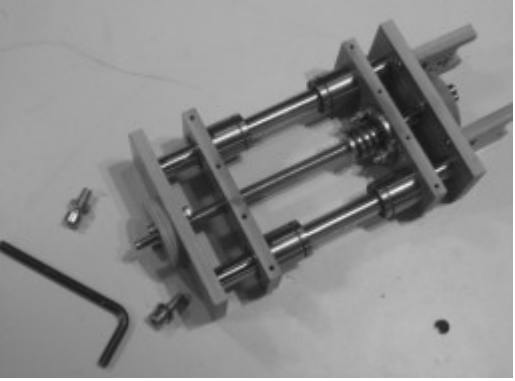
	<p><u>STEP X-59</u></p> <p>Here is the other side.</p> <p>Parts: P-22 (2) P-20 (4) P-23 (2)</p>
	<p><u>STEP X-60</u></p> <p>Before you tighten the screws on the other side, use a ruler, check that it is even on both side. You can fine-tune it later, but now, let's just make sure that there is no big error just because ignorance.</p>
	<p><u>STEP X-61</u></p> <p>Tight them up.</p>
	<p><u>STEP X-62</u></p> <p>Now we have gantry and Y-axis installed. We are ready for putting Z Axis together.</p>


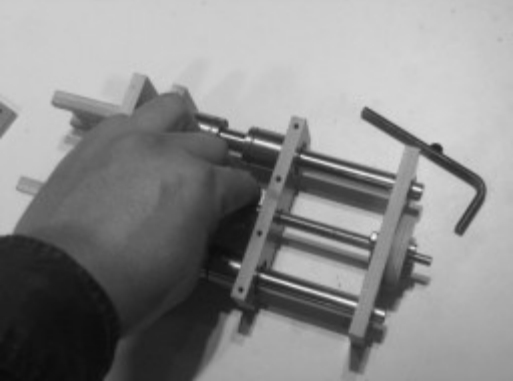
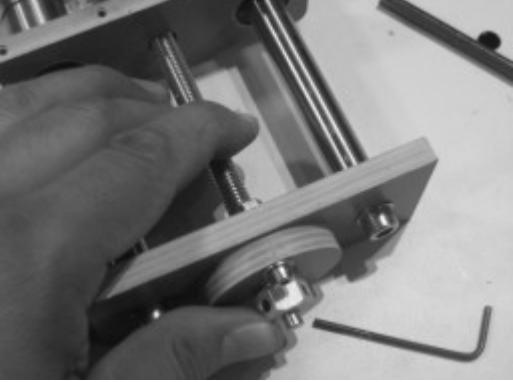
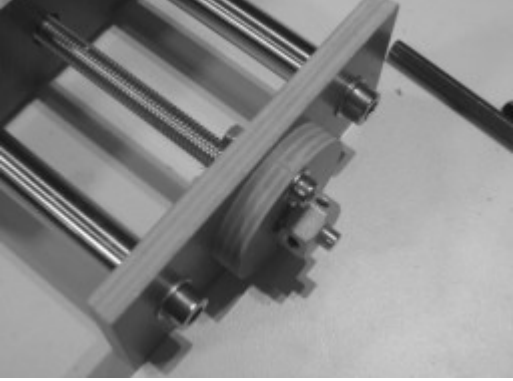
	<p><u>STEP Z-01</u></p> <p>Here is a layout of main components of assembling the Z Axis.</p>
	<p><u>STEP Z-02</u></p> <p>For Z Axis, we also need to push the ball bearings into bearing blocks. # 3.</p> <p>Parts: P-03 (2) Frame #3 (2)</p>

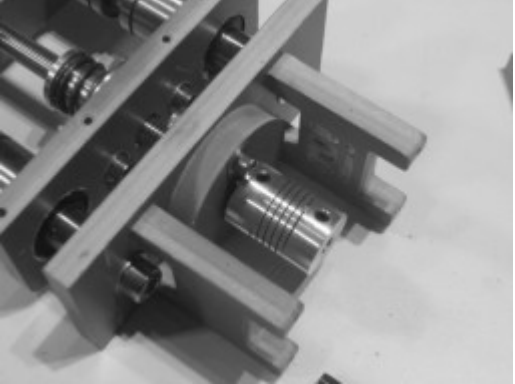

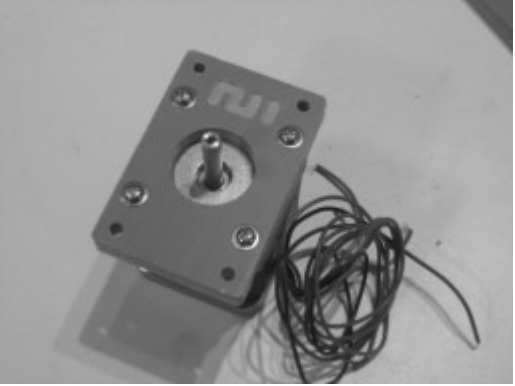
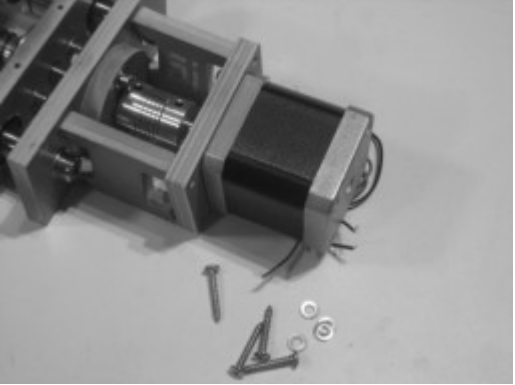
	<p><u>STEP Z-03</u></p> <p>Also, linear bearings will be pushed into support frames.</p> <p>Parts: Frame #3 (2) Frame #4 (2) P-24 (4)</p>
	<p><u>STEP Z-04</u></p> <p>Linear bearings have been installed onto Z Axis support frames.</p>
	<p><u>STEP Z-05</u></p> <p>Screw the Anti back lash nuts onto the Z Axis lead screw, as demonstrated earlier.</p> <p>Parts: P-11(1) P-4(1) P-5(1) P-6(1)</p>
	<p><u>STEP Z-06</u></p> <p>Screw the Anti back lash nuts onto the Z Axis lead screw, as demonstrated earlier. Connect the support frame and anti backlash nuts using M4 machine screw with lock washer, flat washer and nut.</p> <p>Parts: P-15(2) P-16(4) P-17(2) P-18(2)</p>



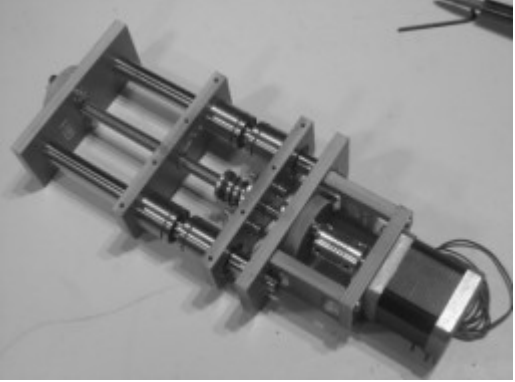
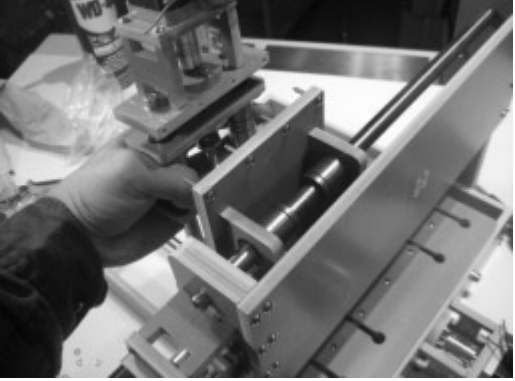
	<p><u>STEP Z-07</u></p> <p>Close up detail.</p>
	<p><u>STEP Z-08</u></p> <p>Use a hex key to and a small wrench to fasten M4 screws and nuts.</p>
	<p><u>STEP Z-09</u></p> <p>Put the bearing support onto #8 using M4 screws and washers.</p> <p>Parts: Frame#3,#8 P-15(2) P-16(4) P-18(2)</p>
	<p><u>STEP Z-10</u></p> <p>On the motor side, we need to put bearing block onto #9 using M4 screws and washers.</p> <p>Parts: Frame#3,#9 P-15(2) P-16(4) P-18(2)</p>

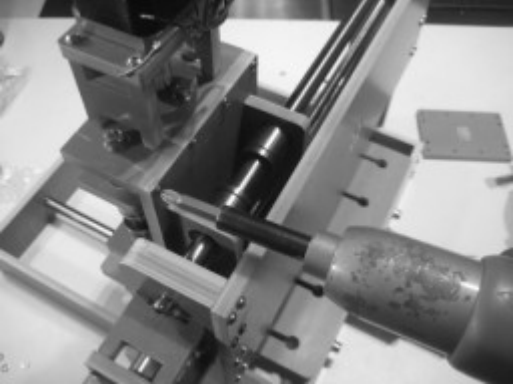

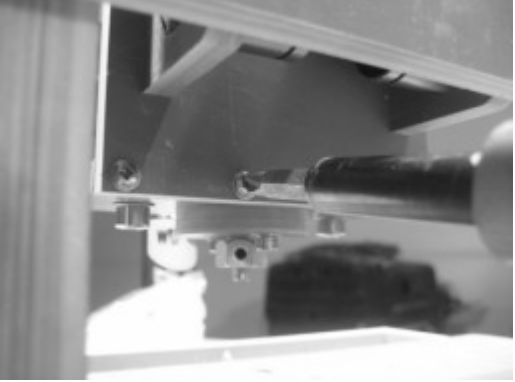
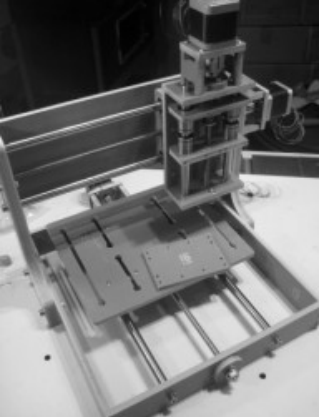
	<p><u>STEP Z-11</u></p> <p>Before we put the motor support blocks on, we need to pre insert the M6 x 15 machine screws onto #9. Otherwise, you will not be able to put those screws in.</p> <p>Parts:</p> <p>Frame #9 Frame #12(2) P-19(2) P-20(2)</p>
	<p><u>STEP Z-12</u></p> <p>Push M6 screws into the #9 frame ...</p>
	<p><u>STEP Z-13</u></p> <p>The M6 screws are pre inserted ...</p>
	<p><u>STEP Z-14</u></p> <p>Then put the motor support blocks on.</p> <p>Parts:</p> <p>P-13(4) P-12(4)</p>

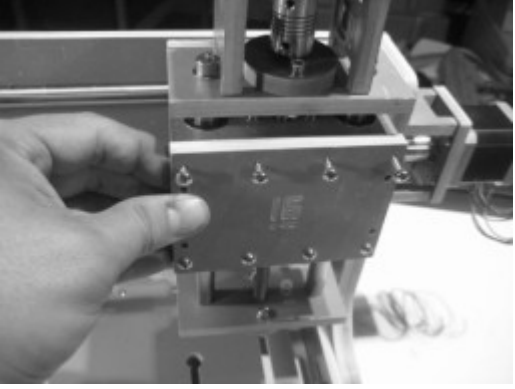

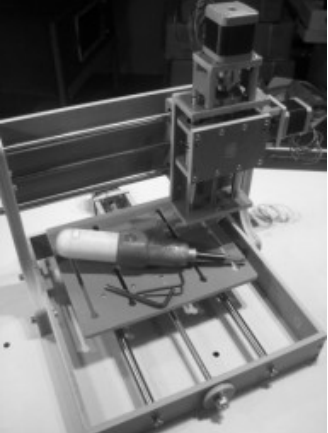
	<p><u>STEP Z-15</u></p> <p>Using M3 screw between #9 and motor support blocks.</p>
	<p><u>STEP Z-16</u></p> <p>Now we can put the motor side frame onto the guide rods.</p>
	<p><u>STEP Z-17</u></p> <p>Here you can use a hex key to fasten the M6 machine screw.</p>
	<p><u>STEP Z-18</u></p> <p>Install another side with M6 x 15 machine screw.</p> <p>Parts:</p> <ul style="list-style-type: none">P-19(2)P-20(2)

	<p><u>STEP Z-19</u></p> <p>Looks good?</p>
	<p><u>STEP Z-20</u></p> <p>Check whether you can easily turn the lead screw by hand. If not, there is an alignment problem, and it is better fix it right now.</p>
	<p><u>STEP Z-21</u></p> <p>Put the lead screw holding nut on, squeeze lead screw and holding nut towards the ball bearing.</p> <p>Parts:</p> <p>P-07(1)</p>
	<p><u>STEP Z-22</u></p> <p>The lead screw holding nut is installed.</p>

	<p><u>STEP Z-23</u></p> <p>Put the flex coupling on before install the motor.</p> <p>Parts:</p> <p>P-02(1)</p>
	<p><u>STEP Z-24</u></p> <p>The motor and motor base(#2)</p> <p>Parts:</p> <p>Frame#2</p> <p>P-01(1)</p> <p>P-14(4)</p> <p>P-13(4)</p>
	<p><u>STEP Z-25</u></p> <p>Using M3 machine screws with washers to connect motor and motor base (#2)</p>
	<p><u>STEP Z-26</u></p> <p>Put the motor onto the motor support blocks.</p> <p>Parts:</p> <p>P-12(4)</p> <p>P-13(4)</p>

	<p><u>STEP Z-27</u></p> <p>Motor is installed for the Z Axis.</p>
	<p><u>STEP Z-28</u></p> <p>Fasten the setscrews on the flex coupling.</p>
	<p><u>STEP Z-29</u></p> <p>Z Axis assembly is ready to be put on the machine.</p>
	<p><u>STEP Z-30</u></p> <p>Use M3 screws and washers to connect the Z Axis to the Z Axis baseboard on the gantry.</p> <p>Parts: P-12(8) P-13(8)</p>

	<p><u>STEP Z-31</u></p> <p>Fasten them up with a screwdriver.</p>
	<p><u>STEP Z-32</u></p> <p>Don't forget the screws at the bottom.</p>
	<p><u>STEP Z-33</u></p> <p>Use a screwdriver to fasten all screws.</p>
	<p><u>STEP Z-34</u></p> <p>The Z Axis assembly is installed on the machine now.</p>

	<p><u>STEP Z-35</u></p> <p>Now, let's put the tool base #16 to the Z Axis support frames. You can do this step later, if you haven't decided what kind of tool will be used. It is easier to install tool when the base is off.</p> <p>Parts:</p> <p>P-12(8) P-13(8)</p>
	<p><u>STEP Z-36</u></p> <p>The tool base has been installed on Z Axis. There are 4 pre-drilled holes on the tool base, which is for your tool holders. Zen Toolworks carries optional spindle motors with tool holders, which can be easily screwed onto this tool base.</p>
	<p><u>STEP Z-37</u></p> <p>We have completed the machine assembly. Hope it didn't take you too long and you have enjoyed the process so far. Now it is time to learn stepper motor controller software and design software for the project want to do.</p>