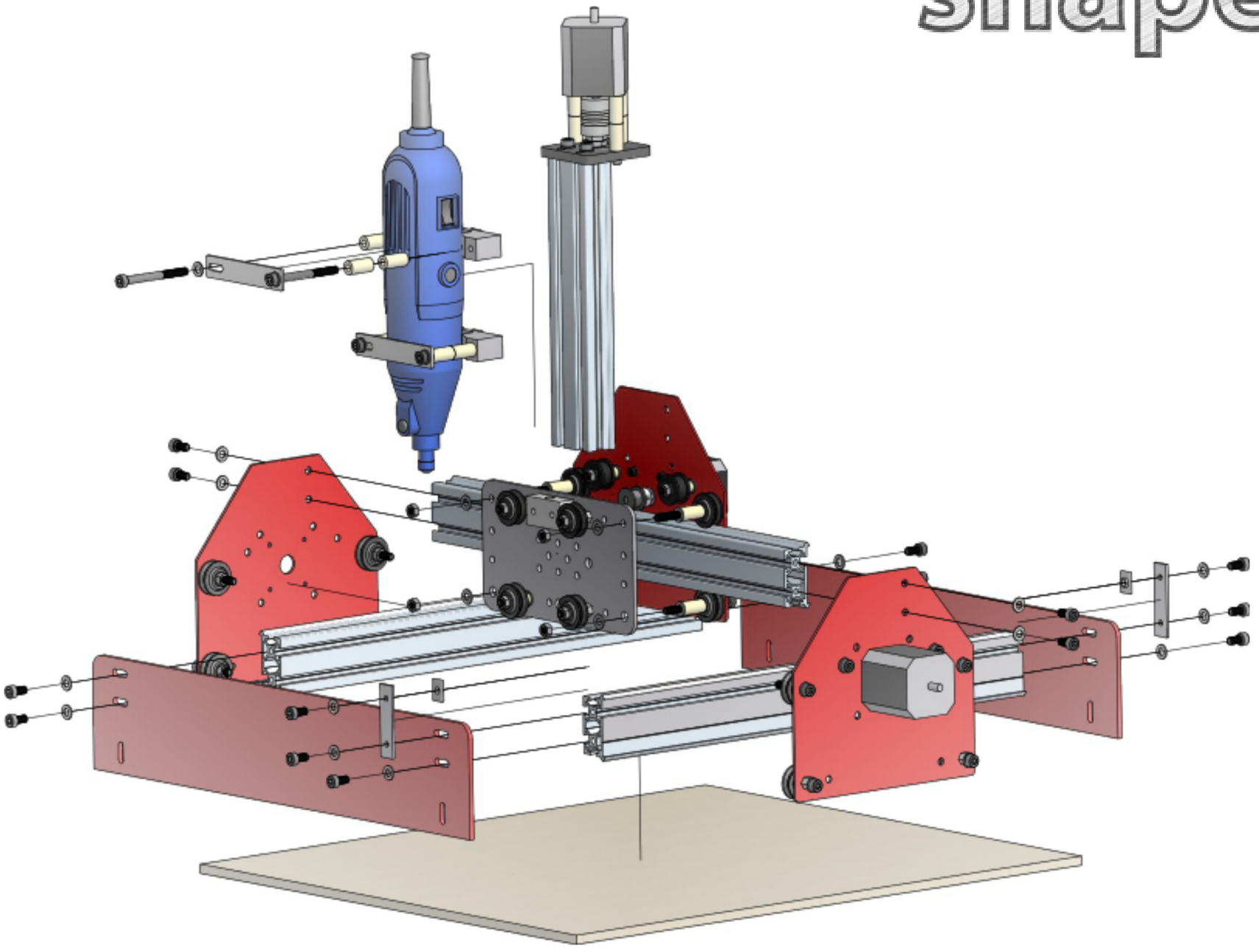
shapeoko



Shapeoko Build Instructions v1

Published June 7, 2012

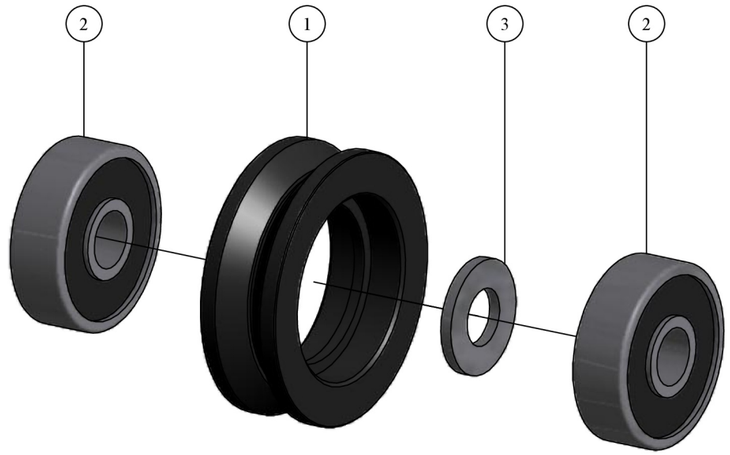
Shapeoko Build Instructions

STEP 1

V-Wheel Assembly:

- Insert a bearing into one side. These are force fit tolerances so you might have to push hard.
- Press the bearing until it's seated against the inside lip of the v-wheel.
- Slide an M5 bolt through the bearing (outside in) - you'll use this to align the precision washer and the other bearing.
- Slide the precision washer over the bolt and let it slide all the way down until it is touching the bearing you just inserted
- Slide the other bearing over the bolt and let it slide down until it hits the rim of the v-wheel.
- Press the second bearing into the v-wheel just as you did the first
- When the assembly is complete, you can remove the M5 bolt

Note: do not forget the precision washer!



ITEM	QTY	PART NUMBER	TITLE
1	1	MSK01-05	V Wheel
2	2	MSK01-07	5mm x 16mm x 5mm bearing
3	1	MSK01-08	Precision Washer (1mm thick)

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_1

shapeoko

TOLERANCES (EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: v-wheel assembly

SIZE B | DRAWING NUMBER: MSK01-05A

SCALE | SHEET 1 OF 1

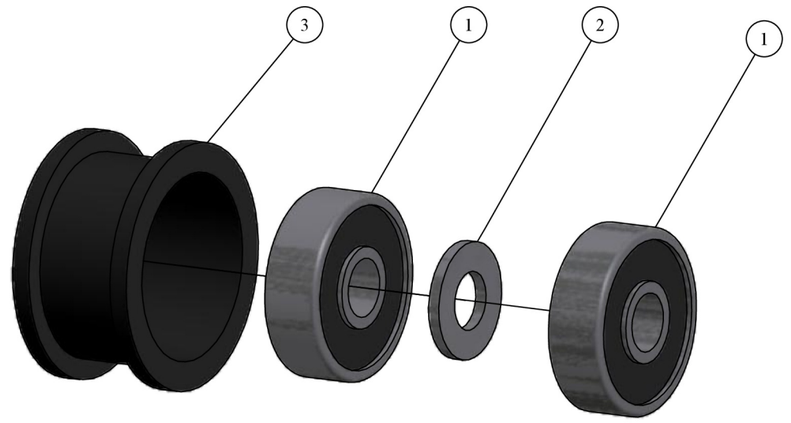
Shapeoko Build Instructions

STEP 2

Smooth Idler Assembly:

- Insert a bearing into the open side side. These are force fit tolerances so you might have to push hard.
- Press the bearing until it's seated against the inside lip of the idler drum.
- Slide an M5 bolt through the bearing (outside in) - you'll use this to align the precision washer and the other bearing.
- Slide the precision washer over the bolt and let it slide all the way down until it is touching the bearing you just inserted
- Slide the other bearing over the bolt and let it slide down until it hits the rim of the drum.
- Press the second bearing into the drum just as you did the first until it is tight against the precision washer
- When the assembly is complete, you can remove the M5 bolt

Note: do not forget the precision washer!



ITEM	QTY	PART NUMBER	TITLE
1	2	MSK01-07	5mm x 16mm x 5mm bearing
2	1	MSK01-08	Precision Washer (1mm thick)
3	1	MSK01-06	Smooth Idler Drum

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_2

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY: ERF | DETAILED BY: ERF | DATE: 6/5/2012

TITLE: Smooth Idler Assembly

SIZE B | DRAWING NUMBER MSK01-06A

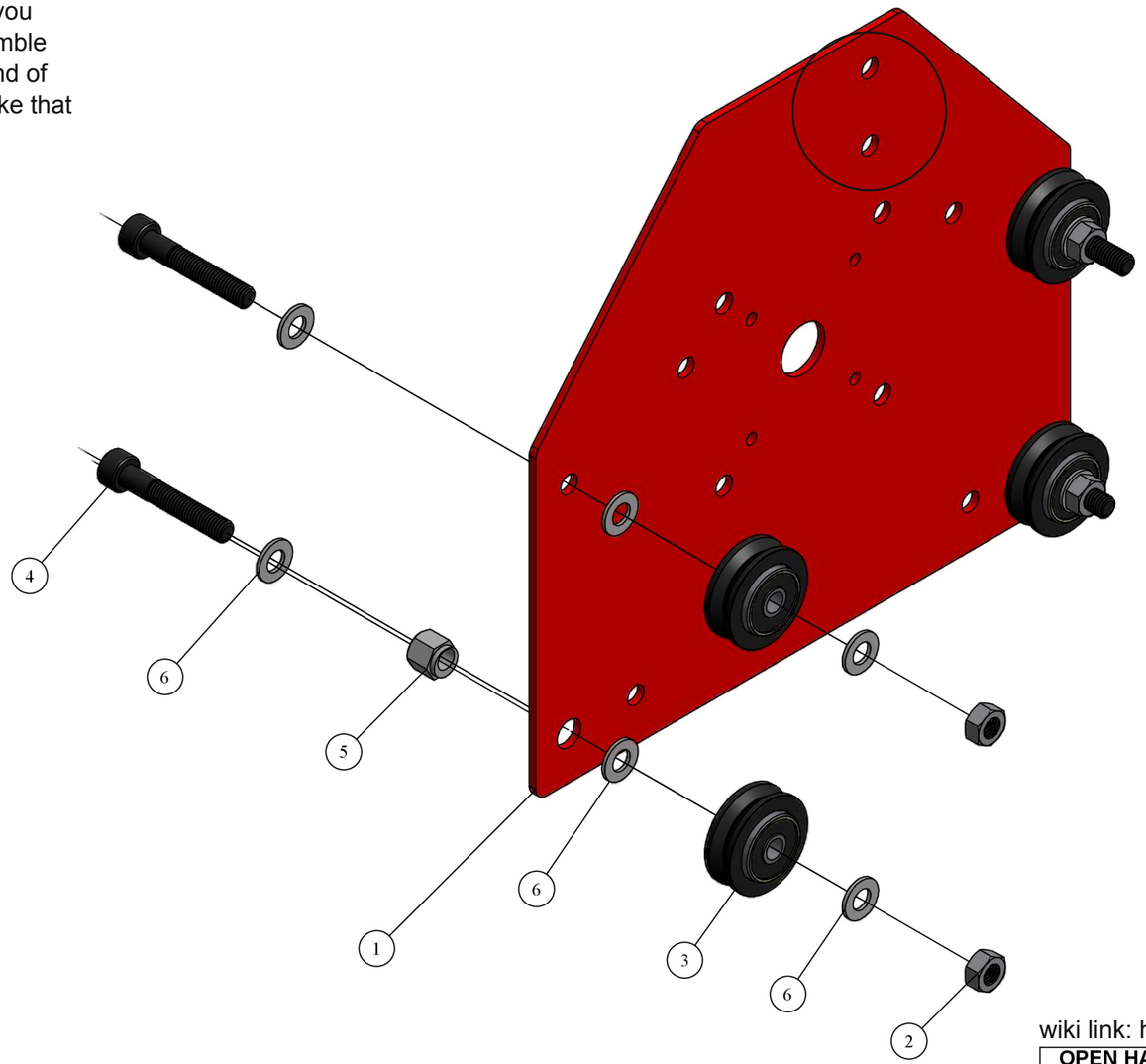
SCALE | SHEET 1 OF 1

Shapeoko Build Instructions

STEP 3

Y-Axis Idle Plate Assembly:

Take note of the top hole orientation. Looking from the inside of the plate (view shown) the cross mount holes (circled) need to be in the top right of the plate. If you assemble these backwards you'll have to disassemble the plate and flip the wheels around. It's not the end of hte world, but it's tedious and frustrating if you make that mistake.



ITEM	QTY	PART NUMBER	TITLE
1	1	SM-S01	Mounting Plate
2	4	SM-H04	M5 Hex Nut
3	4	MSK01-05A	V-Wheel Assembly
4	4	SM-H08	M5 x 30mm SHCS
5	2	MSK01-04	Eccentric Nut
6	12	SM-H03	M5 Flat Washer

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_3

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: Y Axis Idle Mount Assembly

SIZE B | DRAWING NUMBER SM_YA02

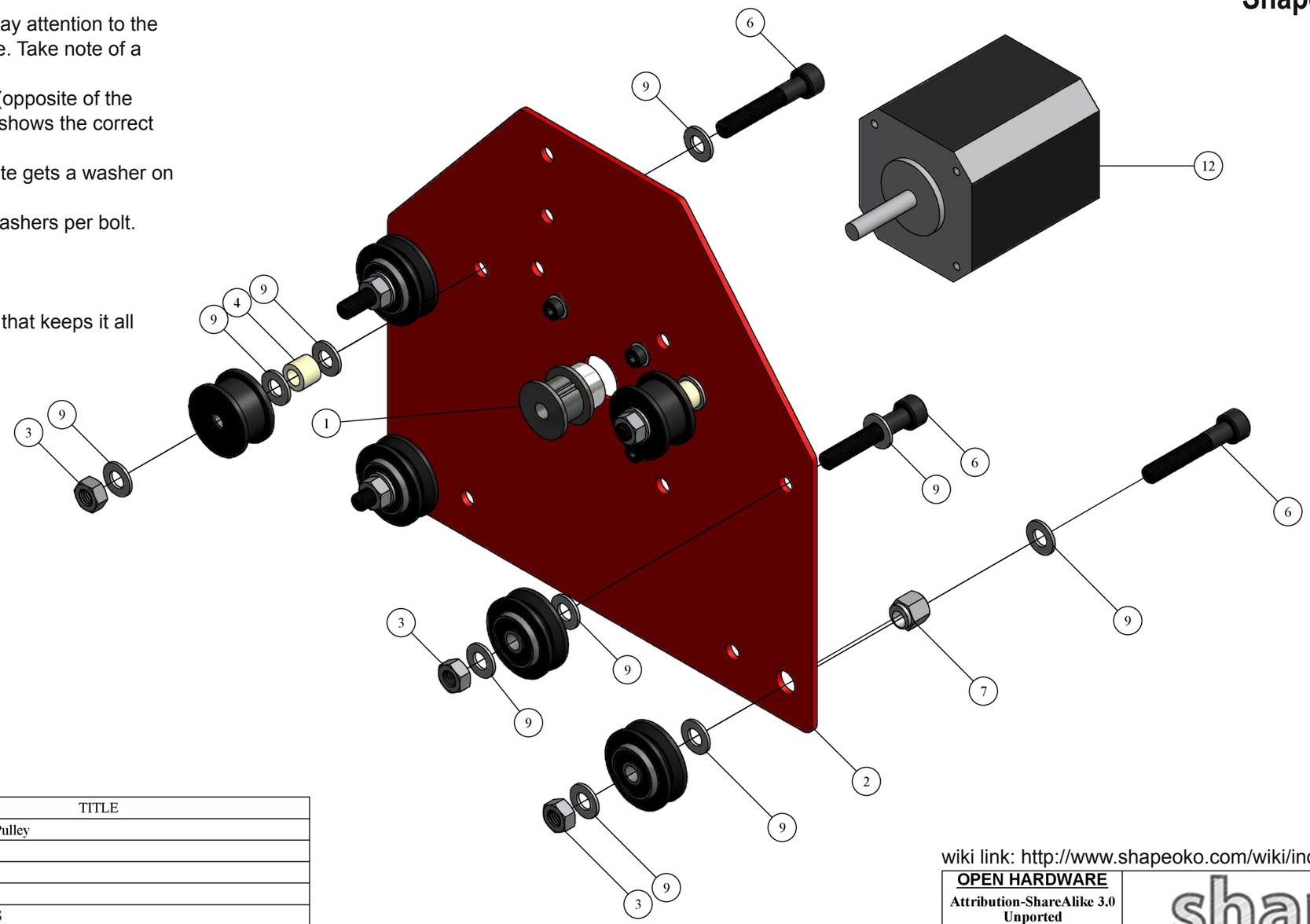
SCALE | SHEET 1 OF 1

Y-Axis Motor Mount Plate

Shapeoko Build Instructions

STEP 4

This is the other side of the gantry. Pay attention to the hole orientation at the top of the plate. Take note of a couple of things:
- These holes need to be on the left (opposite of the previous sub-assembly). The image shows the correct orientation.
- Each Bolt that goes through the plate gets a washer on BOTH sides.
- The smooth idlers get a total of 4 washers per bolt.
-- One on the backside of the plate
-- One on the front side of the plate
-- One on the end of the 1/4" spacer
-- One between the idler and the nut that keeps it all together.



ITEM	QTY	PART NUMBER	TITLE
1	1	MSK01-09	18 Tooth Timing Pulley
2	1	SM-S01	Mounting Plate
3	6	SM-H04	M5 Hex Nut
4	2	SM-H01	1/4" Nylon Spacer
6	6	SM-H08	M5 x 30mm SHCS
7	2	MSK01-04	Eccentric Nut
9	20	SM-H03	M5 Flat Washer
10	4	SM-H14	M3 x 8mm SHCS
11	4	SM-H15	M3 Flat Washer
12	1	SM-E01	Nema 17 Stepper Motor (60oz/in holding torque)
13	4	MSK01-05	V Wheel
14	12	MSK01-07	5mm x 16mm x 5mm bearing
15	6	MSK01-08	Precision Washer (1mm thick)
16	2	MSK01-06	Smooth Idler Drum

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_4

shapeoko

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

TITLE: Y Axis Motor Mount Assembly

SIZE B | DRAWING NUMBER SM_YA01

SCALE | SHEET 1 OF 1

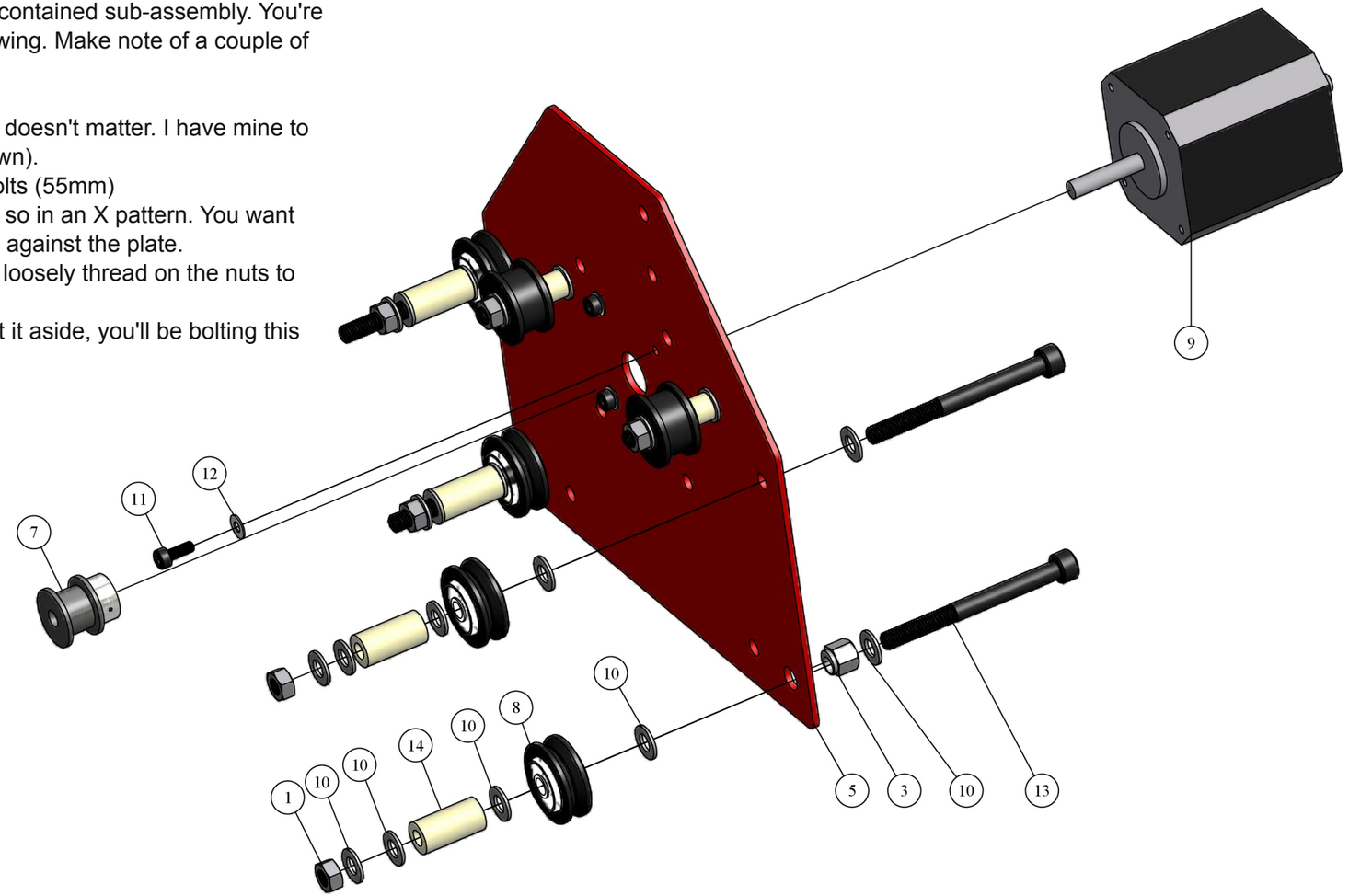
X-Axis Motor Mount Plate

Shapeoko Build Instructions

STEP 5

This is more of a pre-assembly than a fully contained sub-assembly. You're going to assemble this as shown in the drawing. Make note of a couple of things:

- The hole orientation at the top of the plate doesn't matter. I have mine to the left, but they can be to the right (as shown).
- The bottom set of bolts are the long M5 bolts (55mm)
- When you tighten the motor into place, do so in an X pattern. You want the face of the motor to be equally pressing against the plate.
- Don't tighten down the v-wheel bolts. Just loosely thread on the nuts to keep everything together.
- When you are done with the assembly, set it aside, you'll be bolting this to the next assembly build.



ITEM	QTY	PART NUMBER	TITLE
1	6	SM-H04	M5 Hex Nut
2	2	SM-H01	1/4" Nylon Spacer
3	2	MSK01-04	Eccentric Nut
4	2	SM-H08	M5 x 30mm SHCS
5	1	SM-S01	Mounting Plate
6	2	MSK01-06A	Smooth Idler Assembly
7	1	MSK01-09	18 Tooth Timing Pulley
8	4	MSK01-05A	V-Wheel Assembly
9	1	SM-E01	Nema 17 Stepper Motor (60oz/in holding torque)
10	28	SM-H03	M5 Flat Washer
11	4	SM-H14	M3 x 8mm SHCS
12	4	SM-H15	M3 Flat Washer
13	4	SM-H09	M5 x 55mm SHCS
14	4	SM-H02	3/4" Nylon Spacer

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_5

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TOLERANCES (EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: X Axis Motor Mount Plate Assembly

SIZE B | DRAWING NUMBER SM_XA01

SCALE | SHEET 1 OF 1

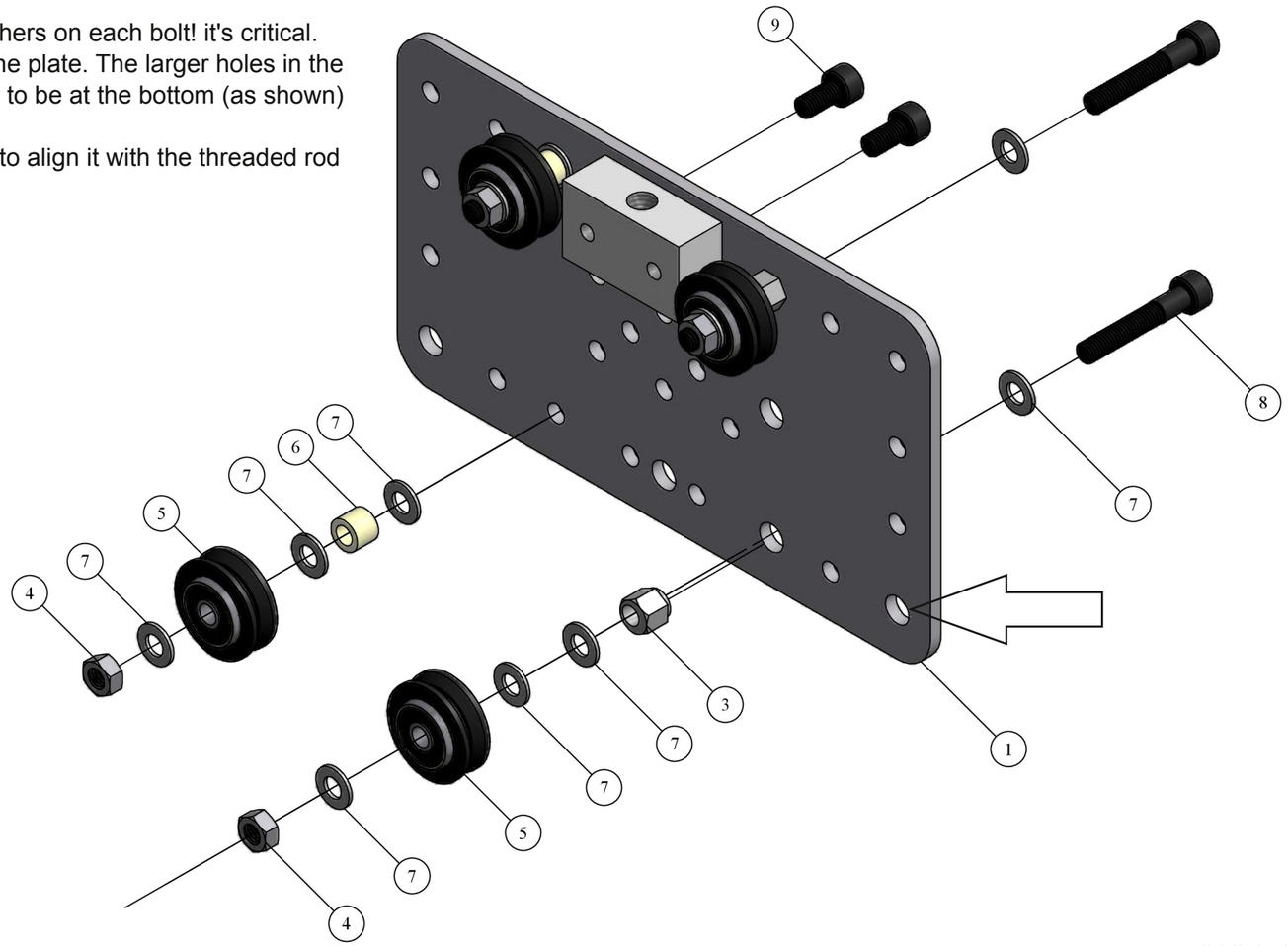
Z-Axis Mount Plate

Shapeoko Build Instructions

STEP 6

This is the second part of your pre-assembly.

Assemble this as shown in the drawing. Make note of a couple of things:
- Pay attention to the number of washers on each bolt! it's critical.
- Pay attention to the orientation of the plate. The larger holes in the corner (denoted with an arrow) need to be at the bottom (as shown)
- Tighten the non-eccentric vwheels
- Just snug the delrin nut, we'll want to align it with the threaded rod later, then tighten it down.



ITEM	QTY	PART NUMBER	TITLE
1	1	MSK01-01	Standard Carriage Plate
2	1	SM-M08	Delrin lead nut.
3	2	MSK01-04	Eccentric Nut
4	4	SM-H04	M5 Hex Nut
5	4	MSK01-05A	V-Wheel Assembly
6	2	SM-H01	1/4" Nylon Spacer
7	16	SM-H03	M5 Flat Washer
8	4	SM-H08	M5 x 30mm SHCS
9	2	SM-H07	M5 x 10mm SHCS

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_6

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TOLERANCES (EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: Z Axis Mount Plate Assembly

SIZE B | DRAWING NUMBER SM_ZA01

SCALE | SHEET 1 OF 1

Shapeoko Build Instructions

STEP 7

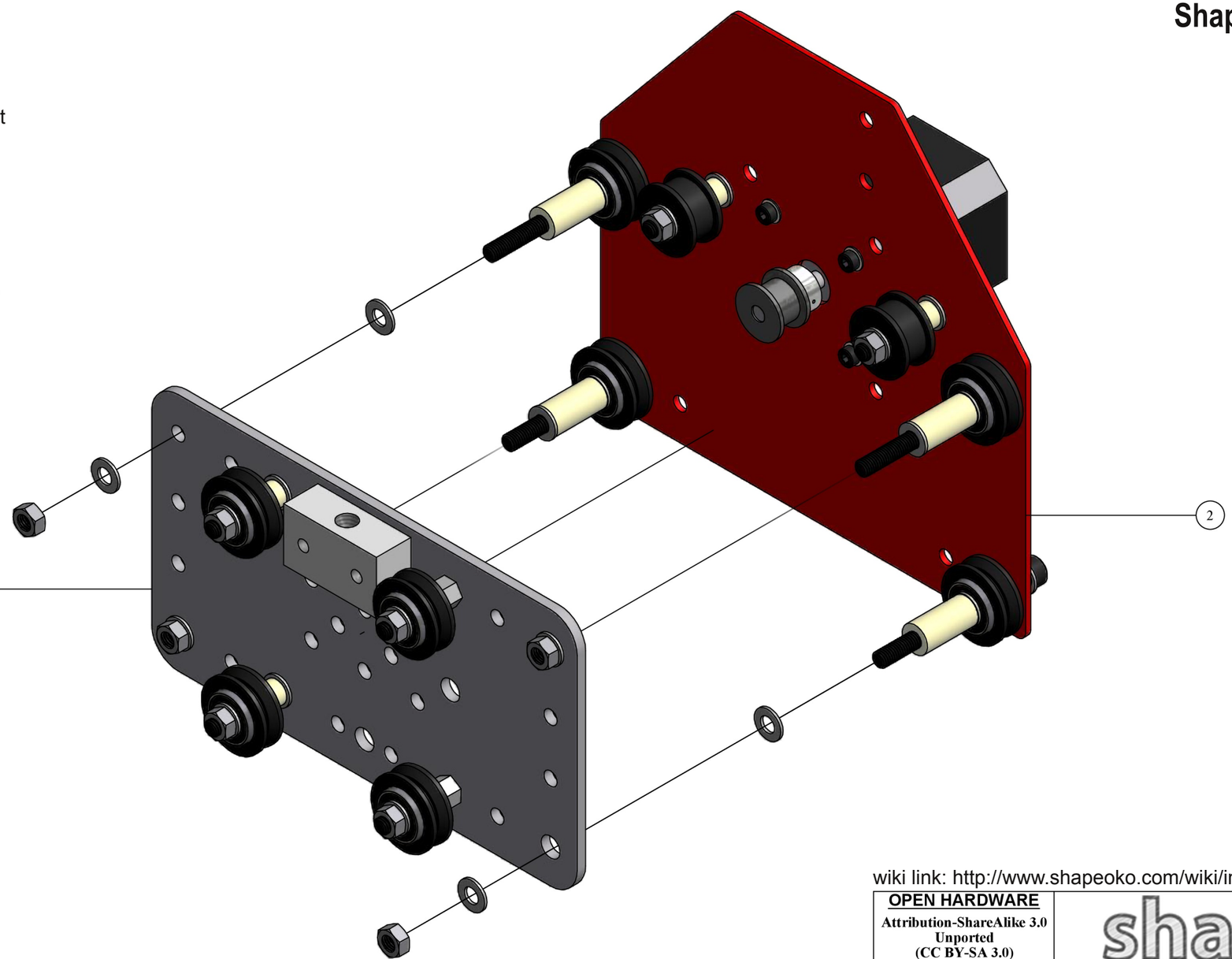
X / Z Plate Assembly

This is the assembly of the previous 2 pre-assemblies. Make note of a couple of things:

- This can get tricky if the bolts start to fall out of the X plate. If possible, use a small piece of tape across the bolt head to keep them in place
- Remove the nut and one (only 1!) washer from the ends of each M5 x 55mm bolt.
- Slide the Z-axis plate onto the M5 x 55mm bolts. Replace the washer and hex nuts onto each one.

Pro-tip. Do the top left bolt first. Then snug the nut back on so the bolt doesn't fall out. Now do the same thing to the bottom right bolt. Once you have those two in place, do the top right bolt, then finally the bottom left bolt.

Once all of the bolts are through, and their respective washers and nuts are replaced, tighten everything down.



ITEM	QTY	PART NUMBER	TITLE
1	1	SM_ZA01	Z Axis Mount Plate Assembly
2	1	SM_XA01	X Axis Motor Mount Plate Assembly

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_7

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: X/Z Carriage Assembly

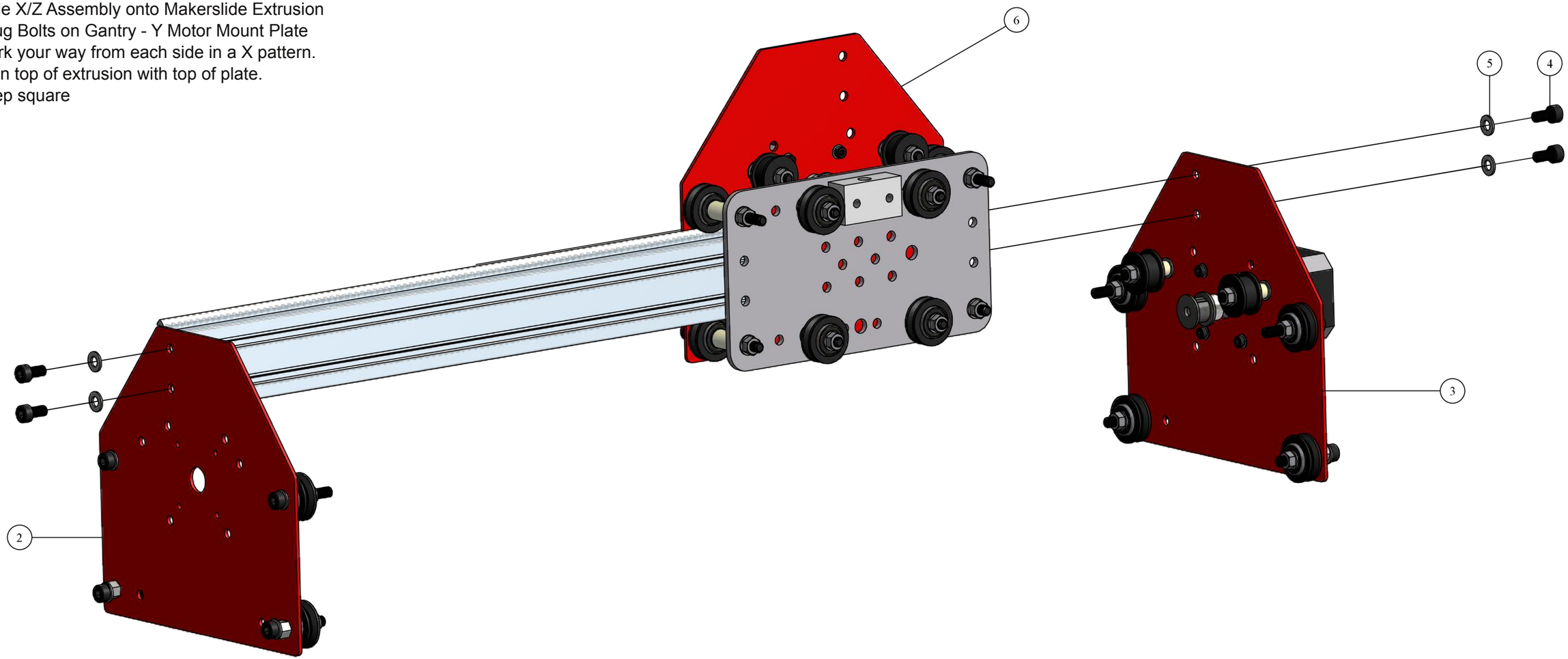
SIZE B | DRAWING NUMBER SM-XZA1

SCALE | SHEET 1 OF 1

Shapeoko Build Instructions

STEP 8

Full Gantry Assembly
- Clean ends of extrusion of any debris.
- Snug bolts on Gantry - Y Idle Mount Plate.
- PRO TIP! - Set eccentric wheels on SM-XZA1 to their widest position before attempting to slide onto makerslide.
- Slide X/Z Assembly onto Makerslide Extrusion
- Snug Bolts on Gantry - Y Motor Mount Plate
- Work your way from each side in a X pattern.
- Align top of extrusion with top of plate.
- Keep square



ITEM	QTY	PART NUMBER	TITLE
1	1	MKS01-02	Makerslide Extrusion - 375mm
2	1	SM_YA02	Y Axis Idle Mount Assembly
3	1	SM_YA01	Y Axis Motor Mount Assembly
4	4	SM-H07	M5 x 10mm SHCS
5	4	SM-H03	M5 Flat Washer
6	1	SM-XZA1	X/Z Carriage Assembly

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_8

shapeoko

TOLERANCES (EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE
Shapeoko Gantry Assembly
Shapeoko Gantry Assembly

SIZE	DRAWING NUMBER
B	SM-GA01

SCALE
SHEET 1 OF 1

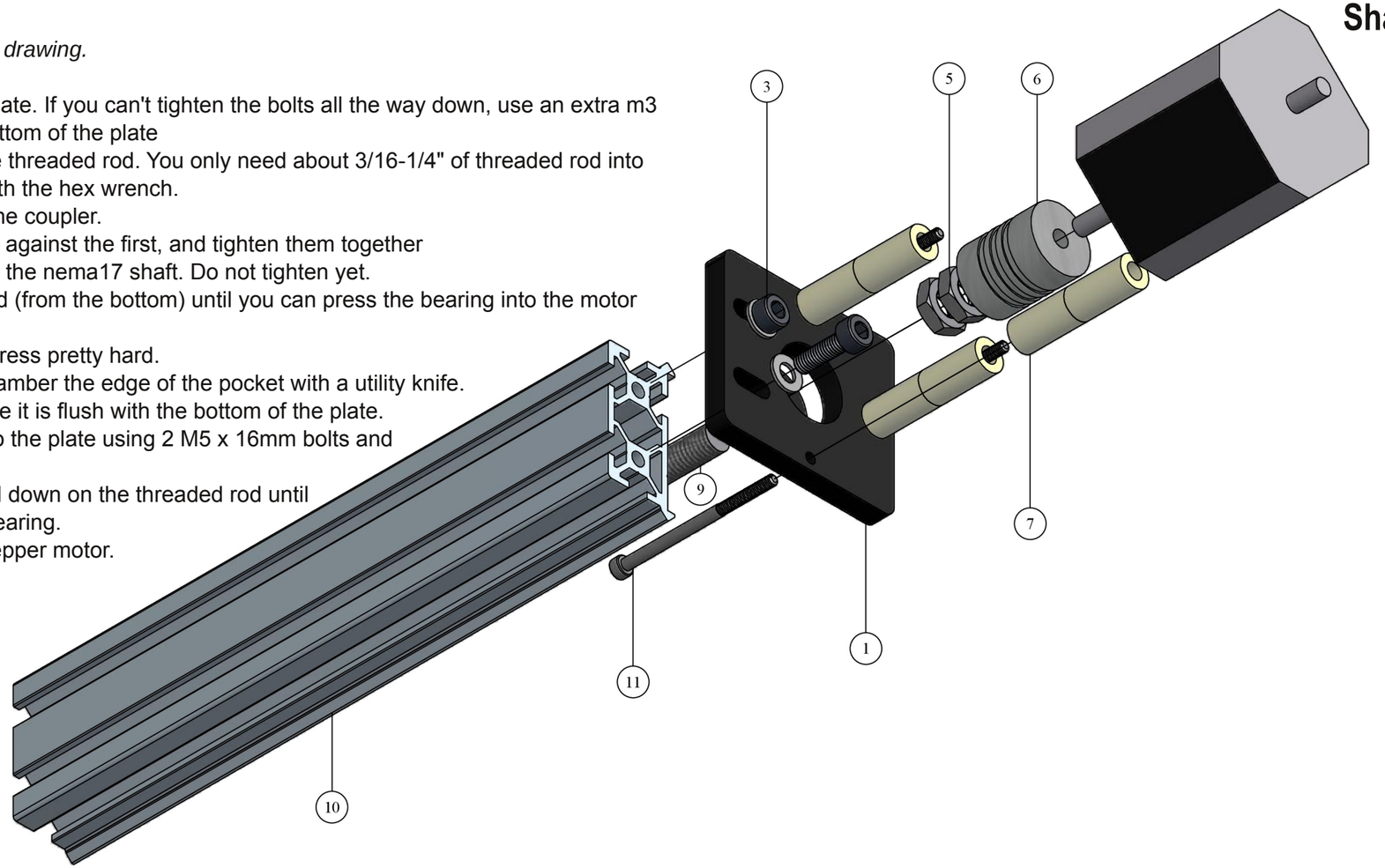
Z-Axis Slide

Shapeoko Build Instructions

STEP 9

Take your time, be patient and look at the drawing.

1.) Mount the Motor to the motor mount plate. If you can't tighten the bolts all the way down, use an extra m3 washer between the bolt head and the bottom of the plate
2.) Assemble the coupler to the end of the threaded rod. You only need about 3/16-1/4" of threaded rod into the coupler for it to grab. Tighten firmly with the hex wrench.
3.) Snug 1 M8 hex nut (jam nut) against the coupler.
4.) Tighten the other M8 hex nut (jam nut) against the first, and tighten them together
5.) Slide the other end of the coupler over the nema17 shaft. Do not tighten yet.
5.) Slide the bearing over the threaded rod (from the bottom) until you can press the bearing into the motor mount plate.
- This is a friction fit so you may have to press pretty hard.
- Some people have found it helpful to chamber the edge of the pocket with a utility knife.
6.) The bearing is in the correct place once it is flush with the bottom of the plate.
7.) Attach 200mm section of makerslide to the plate using 2 M5 x 16mm bolts and washers (as shown)
8.) Once your makerslide is attached. Pull down on the threaded rod until the M8 jam nuts are seated against the bearing.
9.) Tighten the coupler on the nema17 stepper motor.



ITEM	QTY	PART NUMBER	TITLE
1	1	SM-S06	Z-Axis Mount Plate
2	2	SM-H03	M5 Flat Washer
3	2	SM-H13	M5 x 16mm SHCS
4	1	SM-M07	Z-Axis Bearing
5	2	SM-H10	M8 Jam Nut
6	1	SM-H12	Coupler
7	6	SM-H02	3/4" Nylon Spacer
8	1	SM-E01	Nema 17 Stepper Motor (60oz/in holding torque)
9	1	SM-H05	Threaded Rod
10	1	MSK01-03	Makerslide Extrusion - 200mm
11	3	SM-H06	M3 x 50mm SHCS

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_9

shapeoko

TOLERANCES (EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: Z Axis Spindle Mount

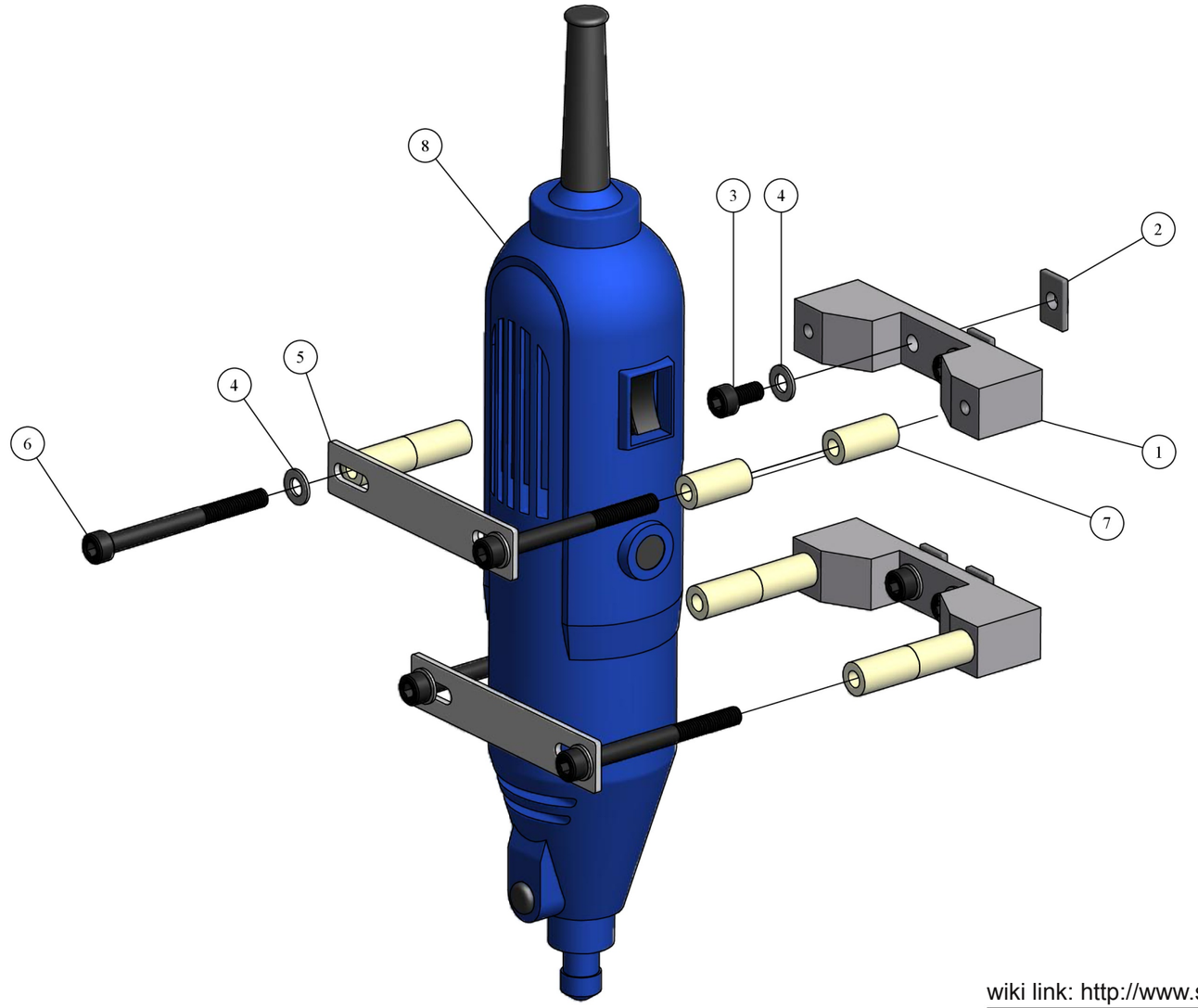
SIZE B | DRAWING NUMBER SM-ZA02

SCALE | SHEET 1 OF 1

Spindle Mount assembly

Shapeoko Build Instructions

STEP 10



ITEM	QTY	PART NUMBER	TITLE
1	2	SM-TM1	Spindle Mount
2	4	SM-H11	Insertion Nut
3	4	SM-H07	M5 x 10mm SHCS
4	8	SM-H03	M5 Flat Washer
5	2	SM-TM2	Spindle Strap
6	4	SM-H09	M5 x 55mm SHCS
7	8	SM-H02	3/4" Nylon Spacer
8	1	SM-TM3	Rotary Tool

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_10

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: Z Axis Spindle Assembly

SIZE	DRAWING NUMBER
B	SM-ZA03

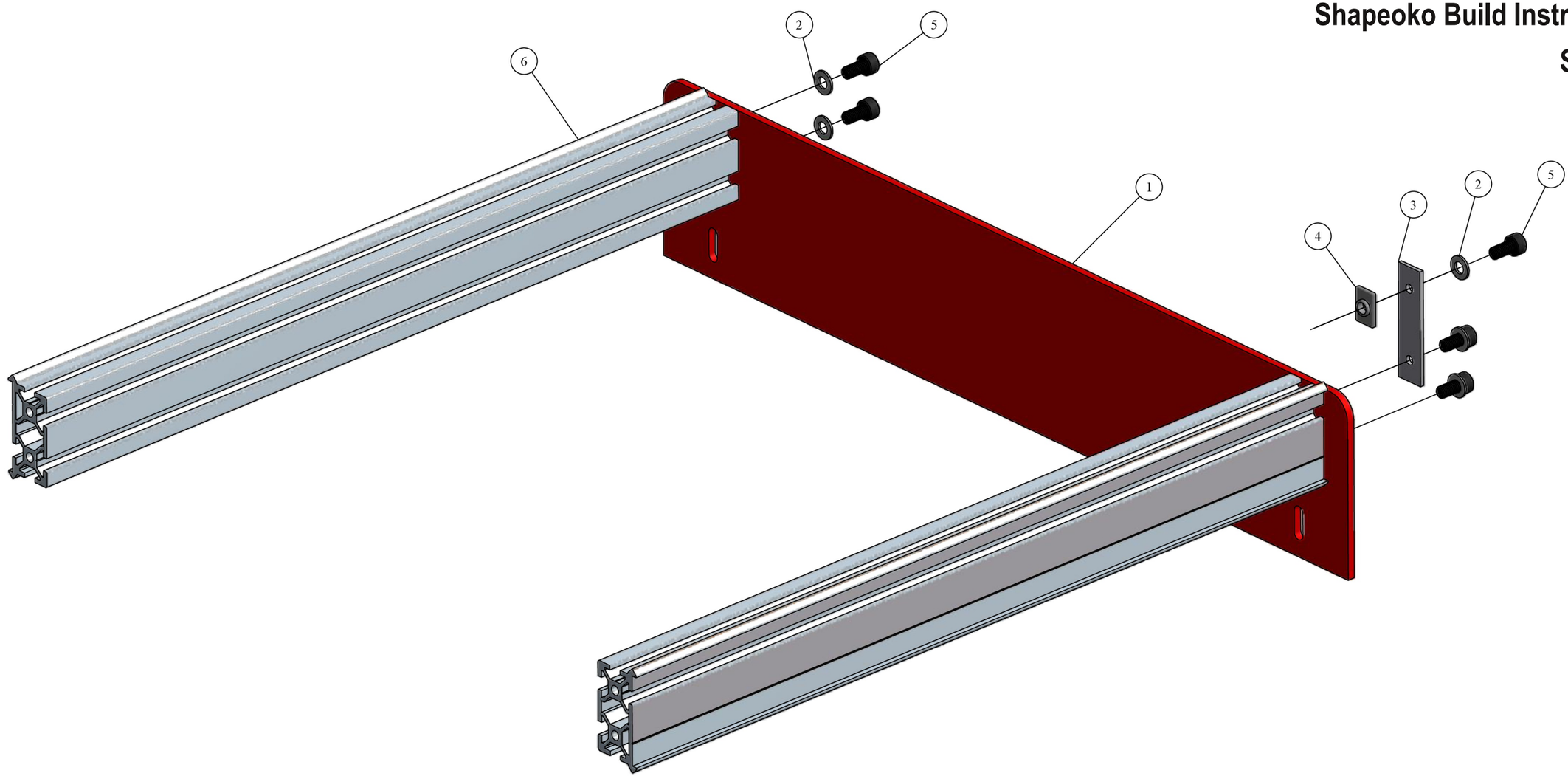
SCALE

SHEET 1 OF 1

Frame Assembly 1

Shapeoko Build Instructions

STEP 11



ITEM	QTY	PART NUMBER	TITLE
1	2	SM-S02	Front/Back Plate
2	10	SM-H03	M5 Flat Washer
3	2	SM-M05	Belt Anchor
4	2	SM-H11	Insertion Nut
5	10	SM-H07	M5 x 10mm SHCS
6	2	MKS01-02	Makerslide Extrusion - 375mm

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_11

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY: ERF | DETAILED BY: ERF | DATE: 6/5/2012

TITLE: Shapeoko - Frame Assembly

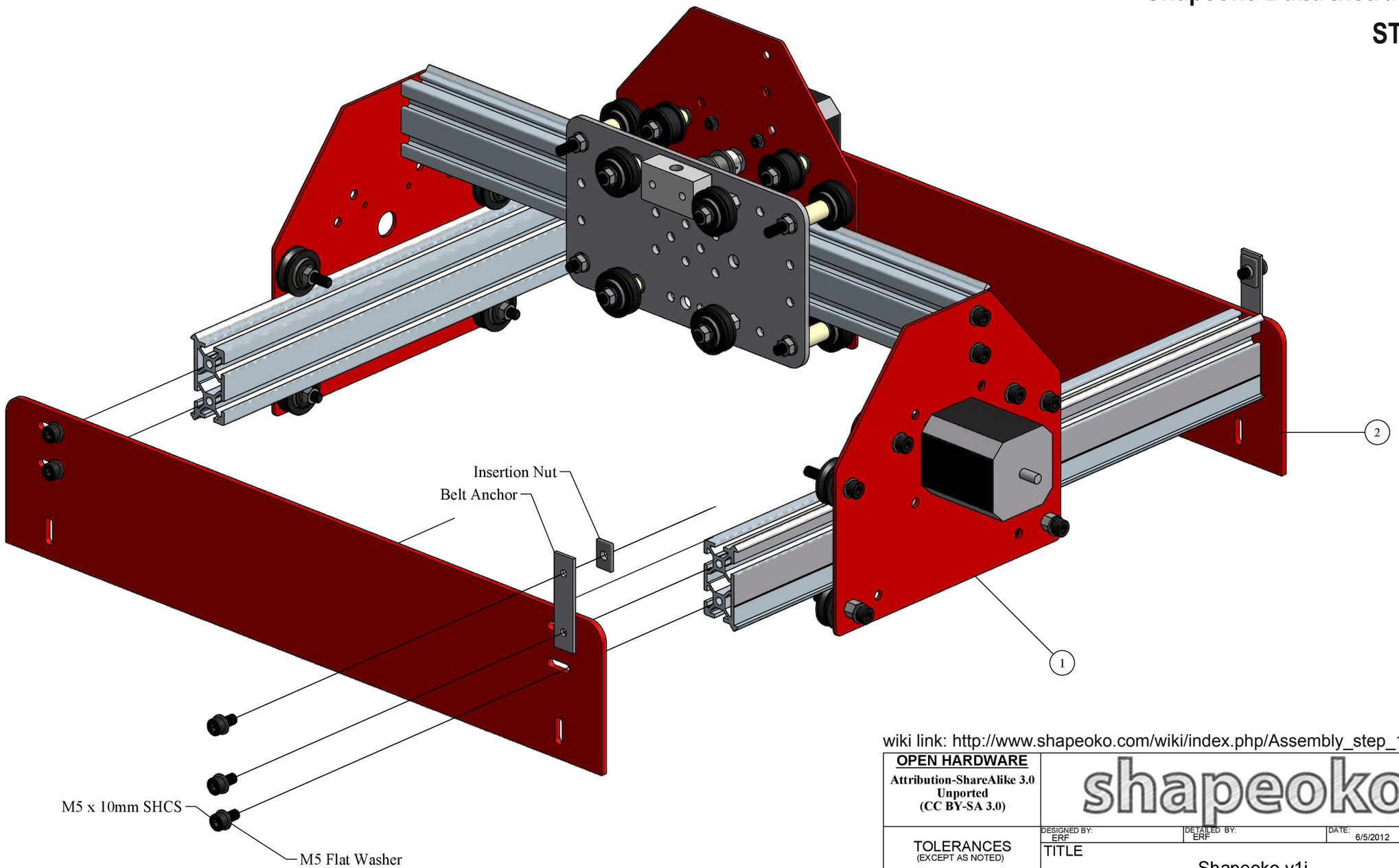
SIZE B | DRAWING NUMBER SM-FA01

SCALE | SHEET 1 OF 1

Frame Assembly 2

Shapeoko Build Instructions

STEP 12



ITEM	QTY	PART NUMBER	TITLE
1	1	SM-GA01	Shapeoko Gantry Assembly
2	1	SM-FA01	Shapeoko - Frame Assembly

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_12

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY:	DETAILED BY:	DATE:
ERF	ERF	6/5/2012

TITLE: Shapeoko v1i

SIZE: B | DRAWING NUMBER: Shapeoko_v1i

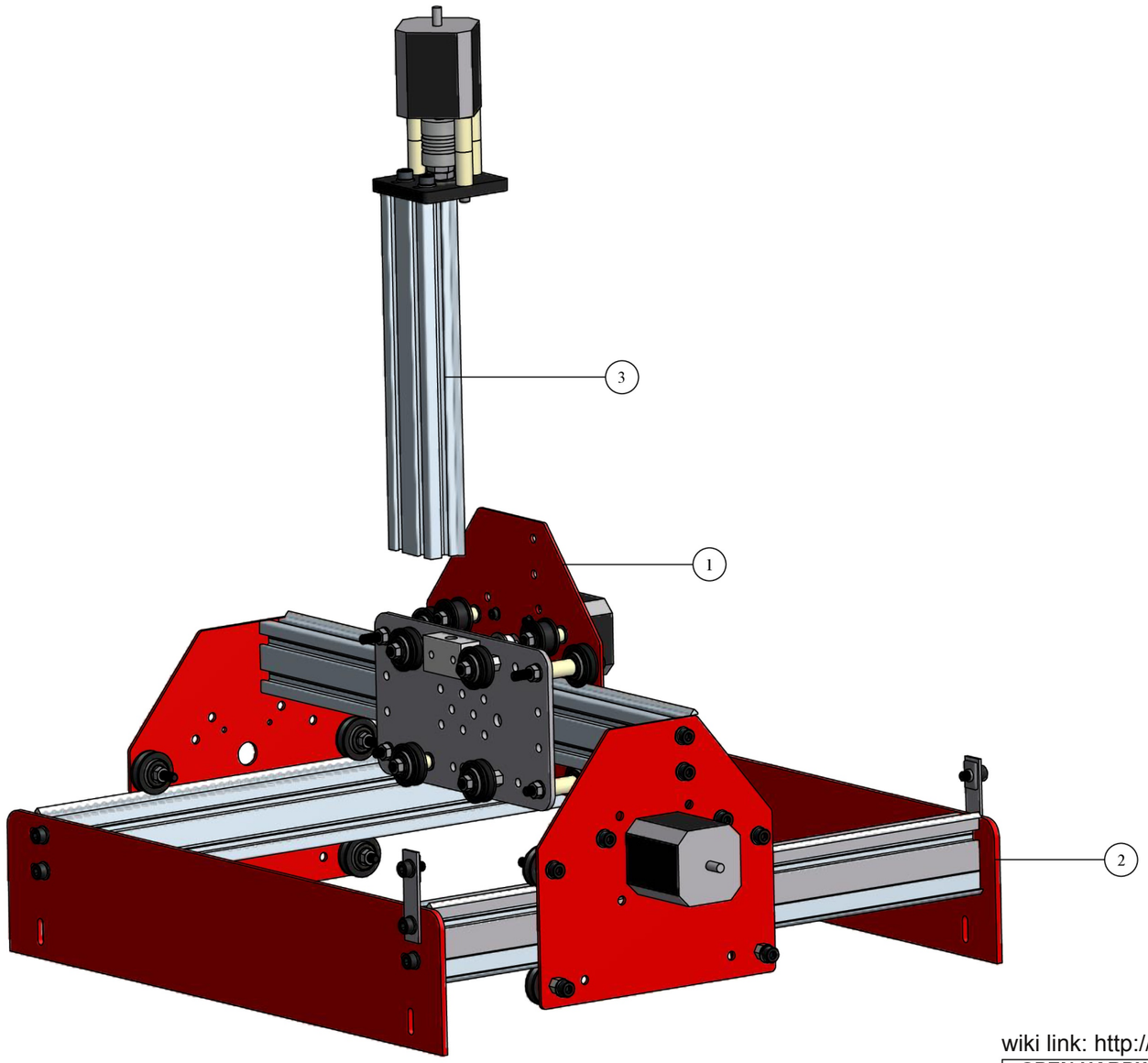
SCALE

SHEET 1 OF 1

Final Assembly

Shapeoko Build Instructions

STEP 13



ITEM	QTY	PART NUMBER	TITLE
1	1	SM-GA01	Shapeoko Gantry Assembly
2	1	SM-FA01	Shapeoko - Frame Assembly
3	1	SM-ZA02	Z Axis Spindle Mount

wiki link: http://www.shapeoko.com/wiki/index.php/Assembly_step_13

shapeoko

TOLERANCES
(EXCEPT AS NOTED)
BETWEEN FINSHED SURFACES
FRACTIONAL: ± 1/64"
DECIMAL: ± .010"
DETAIL DIMENSIONS: ± 1/16"

DESIGNED BY: ERF | DETAILED BY: ERF | DATE: 6/5/2012

TITLE: Shapeoko v1i

SIZE B | DRAWING NUMBER: Shapeoko_v1i

SCALE | SHEET 1 OF 1