

# Table of Contents

## Rack and Pinion, and Leadscrew Table

Introduction	1	Carriage Overview	29
This Manual	1	Sides	30
Background	1	Back Plate	31
Sequence Notes	2	Top Plate, Y Leadscrew	31
Tools	2	Top Plate, Y Rack and Pinion	33
Table Overview	2	Y Leadnut Block	35
X Axis	3	Z Stepper Plate	36
Y Gantry	3	Z Bottom Plate	37
Z Carriage	4	Attach Sides to Back	38
X Axis Construction	5	Studs in Back Plate	39
Table Frame	5	Stud Installation	40
Table Legs	6	Z Side Braces	41
Rack Legs	6	Install Top	42
Leadscrew Legs	7	Install Braces	42
Pipe Supports Boards	8	Install Carriage Bolts	43
Table Top	9	Install Bottom	44
Pipe Rails	9	Install Bearing Trucks	44
Rails Ties Installation	10	Z Leadscrew Bearing	45
Sequence Note	11	Z Leadscrew Bracket	45
Gantry Overview	12	Z Leadscrew Bearing Block	46
Sequence Note	12	Sequence Note	46
Gantry Beam	13	Rack and Pinion Top Plate	47
Rack for Y	14	Pinion Bearing Block	48
Rack Brackets	15	Pinion Axle	49
Install Rack Brackets	15	Assembly of Pinion	49
Y Pipe Rails	16	Z Rails Overview	50
Install Rails	16	Z Bearing Trucks	51
Tighten Rails	16	Determine Rail Length	51
Rack Installation	16	Leadnut Travel	51
Sequence Note	17	Rail and Bearing Spacing	51
Y Bearing Trucks	17	Cut and Drill Pipes	52
Measure Y Trucks	19	Cross Ties Overview	53
Gantry End Plates	19	Tie Length	54
Left End, X Pinion, Y Leadscrew	20	Remove Tie Corners	55
Right End, X Pinion, Y Leadscrew	21	Hole Placement	55
Ends, X and Y Rack and Pinion	22	Attach Ties to Rails	56
Left End, X and Y Leadscrew	23	Drill Holes in Ties	56
Right End, X and Y Leadscrew	24	Leadnut Cross Tie	57
Stepper Dimensions	25	Leadnut Support Bar	57
Gantry Components	25	Attach Leadnut Tie to Rails	59
Y Leadscrew Bearing Block	25	Spindle Mount Overview	60
Belt Tensioner	26	Spindle Cradles	61
X Rack Stepper Mount	26	Vertical Flat Bar	62
X Bearings	27	Flat Bar Cross Tie	62
Angle Bearing Support	28	Router Band Straps	63
120° Flat Bar	28	Router Mount Assembly	64

Tension Rods	65	X Leadscrew Sequence Note	91
Tension Rod Extensions	65	X Leadnut Brackets	91
Adjust Z Tension Rods	66	Cut X Leadscrew	93
Sequence Note	66	Install Leadscrews	93
Z Leadscrew, Overview	66	Install Leadnut Brackets	94
Z Leadscrew Installation	67	Install X Stepper and Belts	95
Sequence Review	69	Sequence Review	95
Gantry Installation	70	Assemble Rack X Axis	96
Attach Gantry to Rails	70	Racks	96
Attach End Plates	71	Rack Boards	97
Attach X Pinion Components	71	Rack Blocks	98
Attach X Stepper Mount	72	Install Rack Blocks	99
Install X Stepper	73	Install X Racks	99
Attach Carriage to Gantry	74	Steppers, Leadscrews and Racks	100
Position Carriage	74	Steppers	100
Rack and Pinion Y Axis	74	Micro-Stepping	100
Y Pinion Adjustment	75	Leadscrews TPI	101
Install 36 Tooth Pulley	75	Racks and Pinions	102
Tension Pinion	76	Determining Steps Per Inch, Screw	103
Install Y Stepper	76	Determining Steps Per Inch, Rack	104
Install Idler	77	Tuning Leadscrews	105
Design Notes for Pinion	77	Drive System Comparisons	107
Leadscrew Y Axis	77	Chart	108
Install Bearing Block	77	Material and Design	109
Install Y Leadscrew	78	Rails	110
Install Y Stepper	79	Bearings	110
Install Idler	80	Leadscrews	110
Install Z Stepper	81	Belts and Pulleys	111
Sequence Review	81	Racks and Pinions	111
Assemble Leadscrew X Axis	82	Table Sizing	111
Front Leadscrew Bearings	83	Lengthening X Rack	111
Back Leadscrew Bearings	83	X Leadscrews	112
Front Bearing Blocks	83	Length of Gantry	113
Anti-Whip Bearing Blocks	84	Widening X Axis	114
X End Plate	84	Determining Length, One Belt	115
One Stepper One Long Belt	85	Determining Length, Two Belts	115
Long Belt End Plate	85	Materials	116
Stepper Plate	85	Plywood	116
Idler for Long Belt	86	Plastic Bearing Blocks	117
Install Belt and Stepper	86	Stepper Mounts	117
One Stepper with Two Belts	87	Suppliers	118
Stepper Plate	87	Parts Lists	118
End Plate	88	X Axis	119
Install Belt and Stepper	88	Y Axis	120
Two Slaved Steppers	89	Z Axis	122
Stepper Plates	89	Parts By Machine	124
End Plate	90	Pulleys Belts, Bearings, Racks	126
Install Belts and Steppers	91	Aluminum Notes	127
Install All End Plates	91	Templates	129