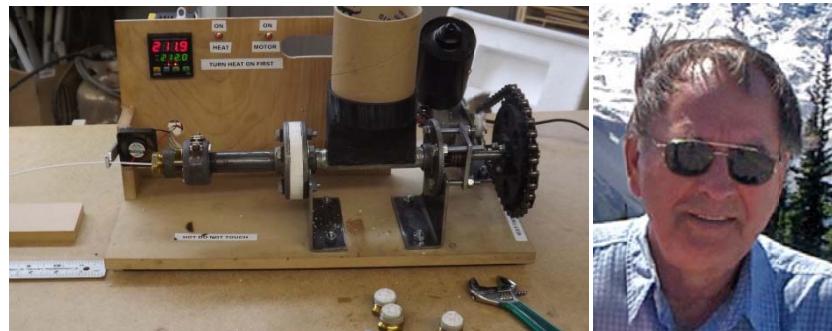


# LYMAN FILAMENT EXTRUDER II

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REVISED FOR DFC RESUBMITTAL – 11/01/12

## FABRICATION and OPERATIONAL MANUAL

### References:

Plastic Filament Extrusion System for Use with a 3D Printer: Project 1158, University of British Columbia

<http://www.youtube.com/watch?v=UG8jZpW81IE>

<http://www.youtube.com/watch?feature=fvwp&NR=1&v=angKC0i0a7Y>

<http://filabot.com/>

<http://www.youtube.com/watch?v=UG8jZpW81IE>

### Lyman Filament Extruder II Video:

<http://www.youtube.com/watch?v=hIz678sMvZo>

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There may be errors or omissions in this manual.

Feel free to change or modify as desired.

Advise Lyman of any errors or omissions at:

hlyman@comcast.net

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Part #	Part Dwg #	DESCRIPTION	SIZE	UNIT	QTY	FOB UNIT PRICE	SUB TOTAL	SUPPLIER PART # or Quote	SUPPLIER
39	P09	AUGER DRILL BIT	5/8" DIA	EA	1	\$8.00	\$8.00	tools4saleasis	EBAY
41	E03	PID TEMP CONTROLLER	TA4	EA	1	\$24.99	\$24.99	mambate9@gmail.com	EBAY
42	E03	POWER SUPPLY 12V 5 AMP	120V IN	EA	1	\$9.09	\$9.09	adAPTERMONSTERS	EBAY
43	E03	SOLID STATE RELAY 25 AMP	12V - 120V	EA	1	\$4.96	\$4.96	tywseller	EBAY
44	E02	THERMOCOUPLE	TYPE K	EA	1	\$1.00	\$1.00	tinxi-english	EBAY
45	E03	VOLTAGE REGULATOR 2 AMP	24V IN	EA	1	\$9.99	\$9.99	1984yht888	EBAY
47	E02	KAPTON TAPE	1/4"	FT	1	\$0.03	\$0.03	ouyou2010	EBAY
53	E03	FAN	40mm	EA	1	\$3.36	\$3.36	hmlytong@gmail.com	EBAY
1	P01	WOOD FRAME BASE	18x10	EA	1	\$7.77	\$7.77	see quote 400 ea	emachineshop.com
2	P02	WOOD ELECTRIONIC PANEL	10x12	EA	1	\$7.40	\$7.40	see quote 400 ea	emachineshop.com
5	P05	MOTOR MT BRACKET STEEL	4X1/8"	EA	1	\$4.96	\$4.96	see quote 400 ea	emachineshop.com
6	P05	HOPPER BASE STL MT BRKT	4x1/8	EA	2	\$1.69	\$3.38	see quote 800 ea	emachineshop.com
7	P07	LARGE SPROCKET	30 TOOTH	EA	1	\$14.37	\$14.37	see quote 400 ea	emachineshop.com
8	P07	SMALL SPROCKET	10 TOOTH	EA	1	\$1.98	\$1.98	see quote 400 ea	emachineshop.com
10	P06	NOZZLE BRASS	1/2" NPT	EA	1	\$5.09	\$5.09	see quote 400 ea	emachineshop.com
15	P08	FILAMENT GUIDE ALUM	1/2" x 1/8 X 3.5"	EA	1	\$1.11	\$1.11	see quote 400 ea	emachineshop.com
16	P05	HEAT BEARER INSULATOR	3" dia	EA	1	\$3.80	\$3.80	see quote 400 ea	emachineshop.com
19	P06	STEEL BEARING PLATE	2x2"	EA	1	\$2.57	\$2.57	see quote 400 ea	emachineshop.com
20	P03	HOPPER BASE ALUM	5"	EA	1	\$5.73	\$5.73	see quote 400 ea	emachineshop.com
28	P07	LARGE SPROCKET ADAPTER	1.5 x 1.5	EA	1	\$3.67	\$3.67	see quote 400 ea	emachineshop.com
30	P07	SMALL SPROCKET ADAPTER	see dwg	EA	1	\$1.77	\$1.77	see quote 400 ea	emachineshop.com
38	P08	BRASS BUSHING	10mm	EA	1	\$3.06	\$3.06	see quote 400 ea	emachineshop.com
51	P05	PHENOLIC WASHERS	1/8"	EA	4	\$1.41	\$5.64	see quote 1600 ea	emachineshop.com
13	E02	BOLT 1/4"	1-1/2"	EA	4	\$0.21	\$0.84	11010	FASTENAL
17	E02	WASHERS	1/4"	EA	20	\$0.04	\$0.70	33077	FASTENAL
18	E02	NUTS NYLOCK	1/4"	EA	2	\$0.11	\$0.22	37118	FASTENAL
22	E02	NUTS	1/4"	EA	14	\$0.06	\$0.84	36301	FASTENAL
23	E02	NUTS NYLOCK	M4	EA	3	\$0.11	\$0.33	1140147	FASTENAL
24	E02	WASHERS	M4	EA	3	\$0.08	\$0.24	11103679	FASTENAL
27	E02	SET SCREW SHCS	M5 x 15	EA	1	\$0.28	\$0.28	0154262	FASTENAL
29	E02	CAP SCREW SHCS	M4-35	EA	3	\$0.25	\$0.75	11103316	FASTENAL
31	E02	CAP SCREW SHCS	3mm	EA	3	\$0.15	\$0.45	39518	FASTENAL
32	E02	WASHERS	3mm	EA	3	\$0.02	\$0.06	40217	FASTENAL
34	E02	BOLT 1/4"	1"	EA	6	\$0.15	\$0.90	11007	FASTENAL
35	E02	COLALR	10mm	EA	1	\$2.34	\$2.34	0403084	FASTENAL
40	E02	BOLT 1/4"	2"	EA	4	\$0.20	\$0.80	11011	FASTENAL
49	E03	SCREWS #4	3/8"	EA	2	\$0.02	\$0.04	0139005	FASTENAL
50	E01	SCREWS #8	1/2"	EA	3	\$0.05	\$0.15	1131290	FASTENAL
52	E02	WASHERS	5/16"	EA	6	\$0.06	\$0.36	1133006	FASTENAL
11	P06	BLACK IRON COUPLING 1/2"	2" LONG	EA	1	\$1.19	\$1.19	6421812	HARDWAREANDTOOLS.COM
14	P03	PIPE FLOOR FLANGE 1/2"	3" DIA	EA	3	\$2.19	\$6.57	27-1/2B	HARDWAREANDTOOLS.COM
21	P04	PIPE NIPPLE 1/2"	3.5"	EA	1	\$0.90	\$0.90	1/2X31/2	HARDWAREANDTOOLS.COM
3	P02	WOOD FAN MOUNT MDF	1/2 x2x3.5"	SI	7.25	\$0.05	\$0.36	201504	HOME DEPOT
26	P08	HOPPER ABS OR PLA	see dwg	EA	1	\$20.00	\$20.00	see quote 400 ea	LYMAN ASSOCIATES INC
NA	*ND	CUT & DRESS AUGER BIT #39		EA	1	\$3.00	\$3.00	estimate	MACHINE SHOP
36	E02	THRUST BEARING	16-Jul	EA	1	\$2.72	\$2.72	6655K16	McMASTER-CARR
48	E03	SWITCHES	SPST	EA	2	\$0.75	\$1.50	5002 SW	MJPA
33	E02	WIPER MOTOR w/ nut,bolts,washer	12V	EA	1	\$16.99	\$16.99	12VWM	MONSTERGUTS.COM
37	P07	ALUMINUM FLAT BAR	1/8x1/2x1"	IN	6.6	\$0.08	\$0.53	6063-T52	ONLINE METALS
NA	*ND	HOOKUP WIRE	VARIABLES	FT +/-	6	\$0.12	\$0.72	estimate	RADIO SHACK
9	E01	BUMPER FEET	7/8"	EA	4	\$0.24	\$0.96	53824	TRUE VALUE HARDWARE
NA	*ND	ZIP TIES	SMALL	EA	2	\$0.10	\$0.20	estimate	TRUE VALUE HARDWARE
NA	*ND	GLUE, HOT MELT, CN, EPOXY	VARIABLES	LOT	1	\$1.00	\$1.00	estimate	TRUE VALUE HARDWARE
NA	*ND	INLINE WIRE CONNECTORS	SMALL	EA	2	\$0.15	\$0.30	estimate	TRUE VALUE HARDWARE
25	E02	BICYCLE CHAIN	1/2"	EA	0.5	\$8.80	\$4.40	VENTURA	WALMART
12	E02	BAND HEATER	1-1/2"	EA	1	\$21.46	\$21.46	G3026423	ZORO TOOLS
SUB TOTAL COST							\$225.83	frt. included on some items most on eBay verify item numbers	there maybe better suppliers
ESTIMATED FRT IN							\$22.58		
TOTAL COST							\$248.41		

\* ND - NO PART DRAWING INCLUDED

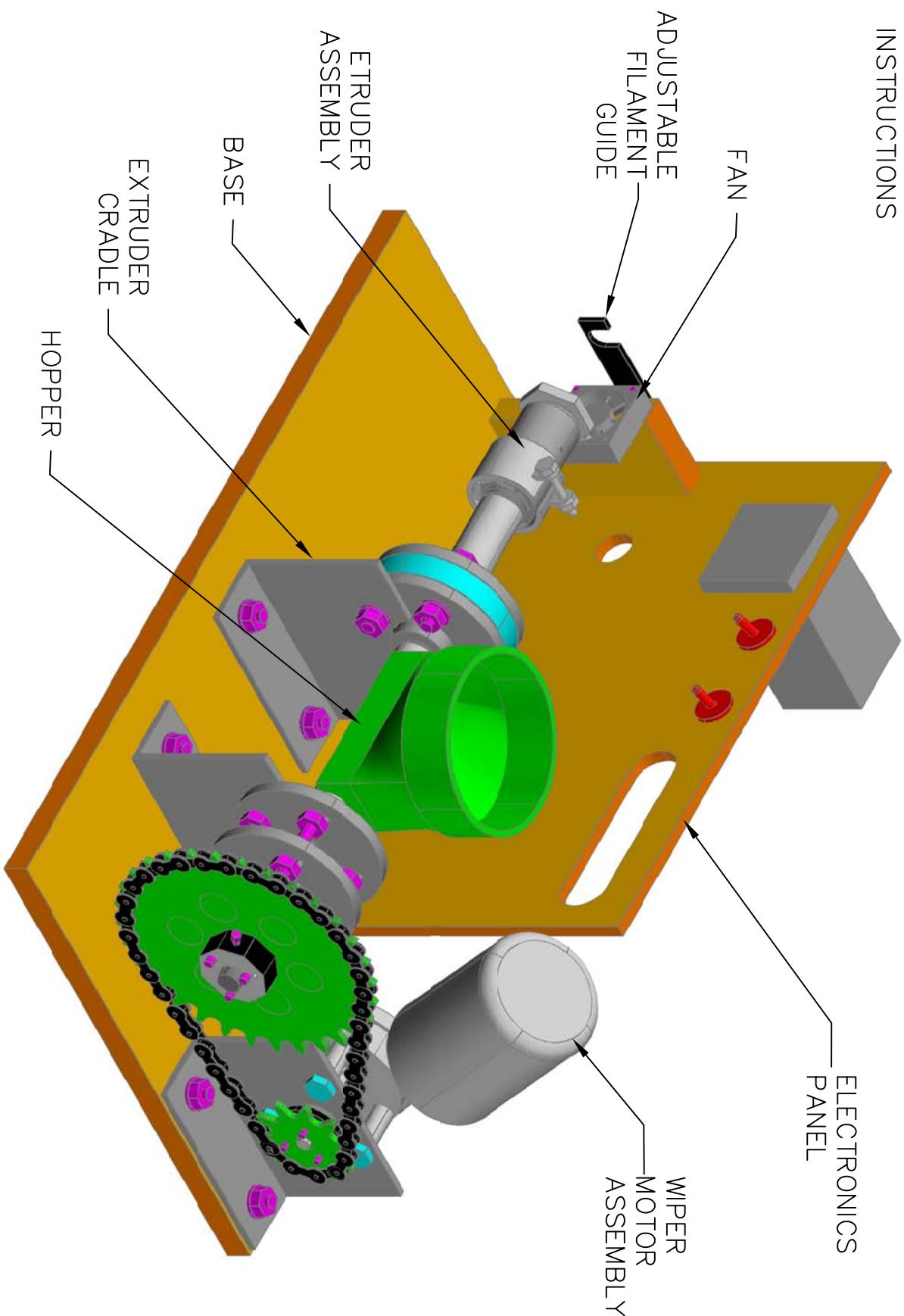
BOM - LYMAN FILAMENT EXTRUDER II (sorted by PART #)									
Part #	Part Dwg #	DESCRIPTION	SIZE	UNIT	QTY	FOB UNIT PRICE	SUB TOTAL	SUPPLIER PART # or Quote	SUPPLIER
1	P01	WOOD FRAME BASE	18x10	EA	1	\$7.77	\$7.77	see quote 400 ea	emachineshop.com
2	P02	WOOD ELECTRIONIC PANEL	10x12	EA	1	\$7.40	\$7.40	see quote 400 ea	emachineshop.com
3	P02	WOOD FAN MOUNT MDF	1/2 x2x3.5"	SI	7.25	\$0.05	\$0.36	201504	HOME DEPOT
5	P05	MOTOR MT BRACKET STEEL	4X1/8"	EA	1	\$4.96	\$4.96	see quote 400 ea	emachineshop.com
6	P05	HOPPER BASE STL MT BRKT	4x1/8	EA	2	\$1.69	\$3.38	see quote 800 ea	emachineshop.com
7	P07	LARGE SPROCKET	30 TOOTH	EA	1	\$14.37	\$14.37	see quote 400 ea	emachineshop.com
8	P07	SMALL SPROCKET	10 TOOTH	EA	1	\$1.98	\$1.98	see quote 400 ea	emachineshop.com
9	E01	BUMPER FEET	7/8"	EA	4	\$0.24	\$0.96	53824	TRUE VALUE HARDWARE
10	P06	NOZZLE BRASS	1/2" NPT	EA	1	\$5.09	\$5.09	see quote 400 ea	emachineshop.com
11	P06	BLACK IRON COUPLING 1/2"	2" LONG	EA	1	\$1.19	\$1.19	6421812	HARDWAREANDTOOLS.COM
12	E02	BAND HEATER	1-1/2"	EA	1	\$21.46	\$21.46	G3026423	ZORO TOOLS
13	E02	BOLT 1/4"	1-1/2"	EA	4	\$0.21	\$0.84	11010	FASTENAL
14	P03	PIPE FLOOR FLANGE 1/2"	3" DIA	EA	3	\$2.19	\$6.57	27-1/2B	HARDWAREANDTOOLS.COM
15	P08	FILAMENT GUIDE ALUM	1/2" x 1/8 X 3.5"	EA	1	\$1.11	\$1.11	see quote 400 ea	emachineshop.com
16	P05	HEAT BEARER INSULATOR	3" dia	EA	1	\$3.80	\$3.80	see quote 400 ea	emachineshop.com
17	E02	WASHERS	1/4"	EA	20	\$0.04	\$0.70	33077	FASTENAL
18	E02	NUTS NYLOCK	1/4"	EA	2	\$0.11	\$0.22	37118	FASTENAL
19	P06	STEEL BEARING PLATE	2x2"	EA	1	\$2.57	\$2.57	see quote 400 ea	emachineshop.com
20	P03	HOPPER BASE ALUM	5"	EA	1	\$5.73	\$5.73	see quote 400 ea	emachineshop.com
21	P04	PIPE NIPPLE 1/2"	3.5"	EA	1	\$0.90	\$0.90	1/2X31/2	HARDWAREANDTOOLS.COM
22	E02	NUTS	1/4"	EA	14	\$0.06	\$0.84	36301	FASTENAL
23	E02	NUTS NYLOCK	M4	EA	3	\$0.11	\$0.33	1140147	FASTENAL
24	E02	WASHERS	M4	EA	3	\$0.08	\$0.24	11103679	FASTENAL
25	E02	BICYCLE CHAIN	1/2"	EA	0.5	\$8.80	\$4.40	VENTURA	WALMART
26	P08	HOPPER ABS or PLA	see dwg	EA	1	\$20.00	\$20.00	see quote 400 ea	LYMAN ASSOCIATES INC
27	E02	SET SCREW SHCS	M5 x 15	EA	1	\$0.28	\$0.28	0154262	FASTENAL
28	P07	LARGE SPROCKET ADAPTER	1.5 x 1.5	EA	1	\$3.67	\$3.67	see quote 400 ea	emachineshop.com
29	E02	CAP SCREW SHCS	M4-35	EA	3	\$0.25	\$0.75	11103316	FASTENAL
30	P07	SMALL SPROCKET ADAPTER	see dwg	EA	1	\$1.77	\$1.77	see quote 400 ea	emachineshop.com
31	E02	CAP SCREW SHCS	3mm	EA	3	\$0.15	\$0.45	39518	FASTENAL
32	E02	WASHERS	3mm	EA	3	\$0.02	\$0.06	40217	FASTENAL
33	E02	WIPER MOTOR w/ nut,bolts,washer	12V	EA	1	\$16.99	\$16.99	12VWM	MONSTERGUTS.COM
34	E02	BOLT 1/4"	1"	EA	6	\$0.15	\$0.90	11007	FASTENAL
35	E02	COLALR	10mm	EA	1	\$2.34	\$2.34	0403084	FASTENAL
36	E02	THRUST BEARING	16-Jul	EA	1	\$2.72	\$2.72	6655K16	McMASTER-CARR
37	P07	ALUMINUM FLAT BAR	1/8x1/2x1"	IN	6.6	\$0.08	\$0.53	6063-T52	ONLINE METALS
38	P08	BRASS BUSHING	10mm	EA	1	\$3.06	\$3.06	see quote 400 ea	emachineshop.com
39	P09	AUGER DRILL BIT	5/8" DIA	EA	1	\$8.00	\$8.00	tools4saleasis	EBAY
40	E02	BOLT 1/4"	2"	EA	4	\$0.20	\$0.80	11011	FASTENAL
41	E03	PID TEMP CONTROLLER	TA4	EA	1	\$24.99	\$24.99	mambate9@gmail.com	EBAY
42	E03	POWER SUPPLY 12V 5 AMP	120V IN	EA	1	\$9.09	\$9.09	adaptermonsters	EBAY
43	E03	SOLID STATE RELAY 25 AMP	12V - 120V	EA	1	\$4.96	\$4.96	twseller	EBAY
44	E02	THERMOCOUPLER	TYPE K	EA	1	\$1.00	\$1.00	tinxi-english	EBAY
45	E03	VOLTAGE REGULATOR 2 AMP	24V IN	EA	1	\$9.99	\$9.99	1984yht888	EBAY
47	E02	KAPTON TAPE	1/4"	FT	1	\$0.03	\$0.03	ouyou2010	EBAY
48	E03	SWITCHES	SPST	EA	2	\$0.75	\$1.50	5002 SW	MJPA
49	E03	SCREWS #4	3/8"	EA	2	\$0.02	\$0.04	0139005	FASTENAL
50	E01	SCREWS #8	1/2"	EA	3	\$0.05	\$0.15	1131290	FASTENAL
52	E02	WASHERS	5/16"	EA	6	\$0.06	\$0.36	1133006	FASTENAL
51	P05	PHENOLIC WASHERS	1/8"	EA	4	\$1.41	\$5.64	see quote 1600 ea	emachineshop.com
53	E03	FAN	40mm	EA	1	\$3.36	\$3.36	hmlytong@gmail.com	EBAY
NA	*ND	CUT & DRESS AUGER BIT #39		EA	1	\$3.00	\$3.00	estimate	MACHINE SHOP
NA	*ND	ZIP TIES	SMALL	EA	2	\$0.10	\$0.20	estimate	TRUE VALUE HARDWARE
NA	*ND	GLUE, HOT MELT, CN, EPOXY	VARIERS	LOT	1	\$1.00	\$1.00	estimate	TRUE VALUE HARDWARE
NA	*ND	HOOKUP WIRE	VARIERS	FT +/-	6	\$0.12	\$0.72	estimate	RADIO SHACK
NA	*ND	INLINE WIRE CONNECTORS	SMALL	EA	2	\$0.15	\$0.30	estimate	TRUE VALUE HARDWARE
SUB TOTAL COST						\$225.83	\$rt. included on some items most on eBay verify item numbers	there maybe better suppliers	
ESTIMATED FRT IN						\$22.58			
TOTAL COST						\$248.41			

\* ND - NO PART DRAWING INCLUDED

BOM - LYMAN FILAMENT EXTRUDER II (sorted by DESCRIPTION)									
Part #	Part Dwg #	DESCRIPTION	SIZE	UNIT	QTY	FOB UNIT PRICE	SUB TOTAL	SUPPLIER PART # or Quote	SUPPLIER
37	P07	ALUMINUM FLAT BAR	1/8x1/2x1"	IN	6.6	\$0.08	\$0.53	6063-T52	ONLINE METALS
39	P09	AUGER DRILL BIT	5/8" DIA	EA	1	\$8.00	\$8.00	tools4saleasis	EBAY
12	E02	BAND HEATER	1-1/2"	EA	1	\$21.46	\$21.46	G3026423	ZORO TOOLS
25	E02	BICYCLE CHAIN	1/2"	EA	0.5	\$8.80	\$4.40	VENTURA	WALMART
11	P06	BLACK IRON COUPLING 1/2"	2" LONG	EA	1	\$1.19	\$1.19	6421812	HARDWAREANDTOOLS.COM
40	E02	BOLT 1/4"	2"	EA	4	\$0.20	\$0.80	11011	FASTENAL
34	E02	BOLT 1/4"	1"	EA	6	\$0.15	\$0.90	11007	FASTENAL
13	E02	BOLT 1/4"	1-1/2"	EA	4	\$0.21	\$0.84	11010	FASTENAL
38	P08	BRASS BUSHING	10mm	EA	1	\$3.06	\$3.06	see quote 400 ea	emachineshop.com
9	E01	BUMPER FEET	7/8"	EA	4	\$0.24	\$0.96	53824	TRUE VALUE HARDWARE
31	E02	CAP SCREW SHCS	3mm	EA	3	\$0.15	\$0.45	39518	FASTENAL
29	E02	CAP SCREW SHCS	M4-35	EA	3	\$0.25	\$0.75	11103316	FASTENAL
35	E02	COLALR	10mm	EA	1	\$2.34	\$2.34	0403084	FASTENAL
NA	*ND	CUT & DRESS AUGER BIT #39		EA	1	\$3.00	\$3.00	estimate	MACHINE SHOP
53	E03	FAN	40mm	EA	1	\$3.36	\$3.36	hmlytong@gmail.com	EBAY
15	P08	FILAMENT GUIDE ALUM	1/2" x 1/8 X 3.5"	EA	1	\$1.11	\$1.11	see quote 400 ea	emachineshop.com
NA	*ND	GLUE, HOT MELT, CN, EPOXY	VARIABLES	LOT	1	\$1.00	\$1.00	estimate	TRUE VALUE HARDWARE
16	P05	HEAT BEARER INSULATOR	3" dia	EA	1	\$3.80	\$3.80	see quote 400 ea	emachineshop.com
NA	*ND	HOOKUP WIRE	VARIABLES	FT +/-	6	\$0.12	\$0.72	estimate	RADIO SHACK
26	P08	HOPPER ABS or PLA	see dwg	EA	1	\$20.00	\$20.00	see quote 400 ea	LYMAN ASSOCIATES INC
20	P03	HOPPER BASE ALUM	5"	EA	1	\$5.73	\$5.73	see quote 400 ea	emachineshop.com
6	P05	HOPPER BASE STL MT BRKT	4x1/8"	EA	2	\$1.69	\$3.38	see quote 800 ea	emachineshop.com
NA	*ND	INLINE WIRE CONNECTORS	SMALL	EA	2	\$0.15	\$0.30	estimate	TRUE VALUE HARDWARE
47	E02	KAPTON TAPE	1/4"	FT	1	\$0.03	\$0.03	ouyou2010	EBAY
7	P07	LARGE SPROCKET	30 TOOTH	EA	1	\$14.37	\$14.37	see quote 400 ea	emachineshop.com
28	P07	LARGE SPROCKET ADAPTER	1.5 x 1.5	EA	1	\$3.67	\$3.67	see quote 400 ea	emachineshop.com
5	P05	MOTOR MT BRACKET STEEL	4X1/8"	EA	1	\$4.96	\$4.96	see quote 400 ea	emachineshop.com
10	P06	NOZZLE BRASS	1/2" NPT	EA	1	\$5.09	\$5.09	see quote 400 ea	emachineshop.com
22	E02	NUTS	1/4"	EA	14	\$0.06	\$0.84	36301	FASTENAL
23	E02	NUTS NYLOCK	M4	EA	3	\$0.11	\$0.33	1140147	FASTENAL
18	E02	NUTS NYLOCK	1/4"	EA	2	\$0.11	\$0.22	37118	FASTENAL
51	P05	PHENOLIC WASHERS	1/8"	EA	4	\$1.41	\$5.64	see quote 1600 ea	emachineshop.com
41	E03	PID TEMP CONTROLLER	TA4	EA	1	\$24.99	\$24.99	mambate9@gmail.com	EBAY
14	P03	PIPE FLOOR FLANGE 1/2"	3" DIA	EA	3	\$2.19	\$6.57	27-1/2B	HARDWAREANDTOOLS.COM
21	P04	PIPE NIPPLE 1/2"	3.5"	EA	1	\$0.90	\$0.90	1/2X31/2	HARDWAREANDTOOLS.COM
42	E03	POWER SUPPLY 12V 5 AMP	120V IN	EA	1	\$9.09	\$9.09	adaptermonsters	EBAY
49	E03	SCREWS #4	3/8"	EA	2	\$0.02	\$0.04	0139005	FASTENAL
50	E01	SCREWS #8	1/2"	EA	3	\$0.05	\$0.15	1131290	FASTENAL
27	E02	SET SCREW SHCS	M5 x 15	EA	1	\$0.28	\$0.28	0154262	FASTENAL
8	P07	SMALL SPROCKET	10 TOOTH	EA	1	\$1.98	\$1.98	see quote 400 ea	emachineshop.com
30	P07	SMALL SPROCKET ADAPTER	see dwg	EA	1	\$1.77	\$1.77	see quote 400 ea	emachineshop.com
43	E03	SOLID STATE RELAY 25 AMP	12V - 120V	EA	1	\$4.96	\$4.96	tywseller	EBAY
19	P06	STEEL BEARING PLATE	2x2"	EA	1	\$2.57	\$2.57	see quote 400 ea	emachineshop.com
48	E03	SWITCHES	SPST	EA	2	\$0.75	\$1.50	5002 SW	MJPA
44	E02	THERMOCOUPLE	TYPE K	EA	1	\$1.00	\$1.00	tinxi-english	EBAY
36	E02	THRUST BEARING	16-Jul	EA	1	\$2.72	\$2.72	6655K16	McMASTER-CARR
45	E03	VOLTAGE REGULATOR 2 AMP	24V IN	EA	1	\$9.99	\$9.99	1984yht888	EBAY
52	E02	WASHERS	5/16"	EA	6	\$0.06	\$0.36	1133006	FASTENAL
32	E02	WASHERS	3mm	EA	3	\$0.02	\$0.06	40217	FASTENAL
24	E02	WASHERS	M4	EA	3	\$0.08	\$0.24	11103679	FASTENAL
17	E02	WASHERS	1/4"	EA	20	\$0.04	\$0.70	33077	FASTENAL
33	E02	WIPER MOTOR w/ nut,bolts,washer	12V	EA	1	\$16.99	\$16.99	12VWM	MONSTERGUTS.COM
3	P02	WOOD FAN MOUNT MDF	1/2 x2x3.5"	SI	7.25	\$0.05	\$0.36	201504	HOME DEPOT
2	P02	WOOD ELECTRONIC PANEL	10x12	EA	1	\$7.40	\$7.40	see quote 400 ea	emachineshop.com
1	P01	WOOD FRAME BASE	18x10	EA	1	\$7.77	\$7.77	see quote 400 ea	emachineshop.com
NA	*ND	ZIP TIES	SMALL	EA	2	\$0.10	\$0.20	estimate	TRUE VALUE HARDWARE
SUB TOTAL COST						\$225.83	frt. included on some items most on eBay verify item numbers	there maybe better suppliers	
ESTIMATED FRT IN						\$22.58			
TOTAL COST						\$248.41			

\* ND - NO PART DRAWING INCLUDED

SEE EXPLODED DRAWINGS  
E01-E03 & PART DRAWINGS  
P01-P14 FOR FABRICATION  
INSTRUCTIONS



ISOMETRIC VIEW of SOLID MODEL  
LYMAN FILAMENT EXTRUDER II

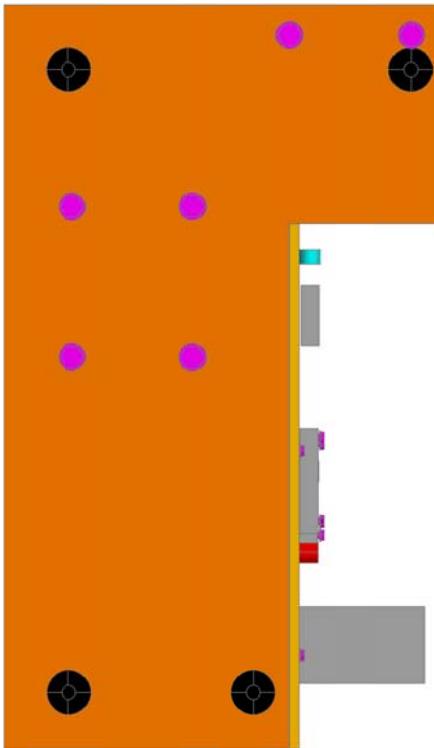
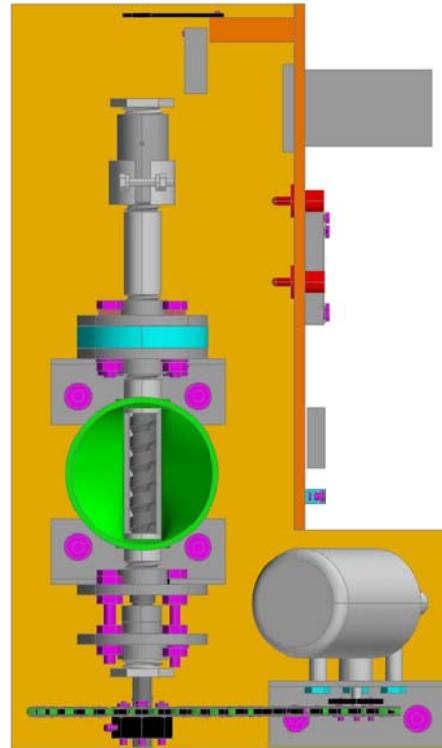
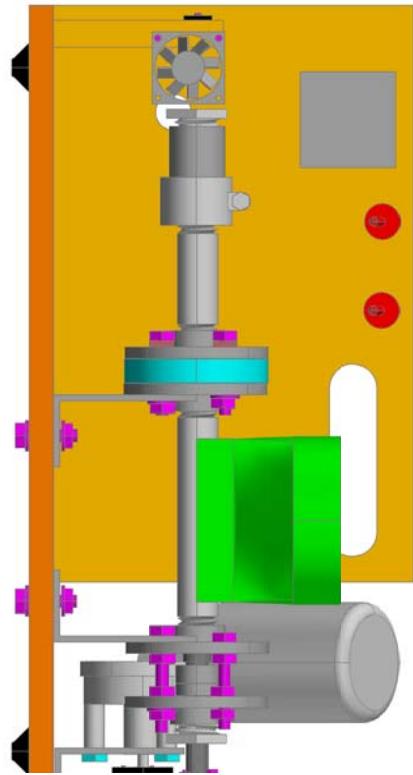
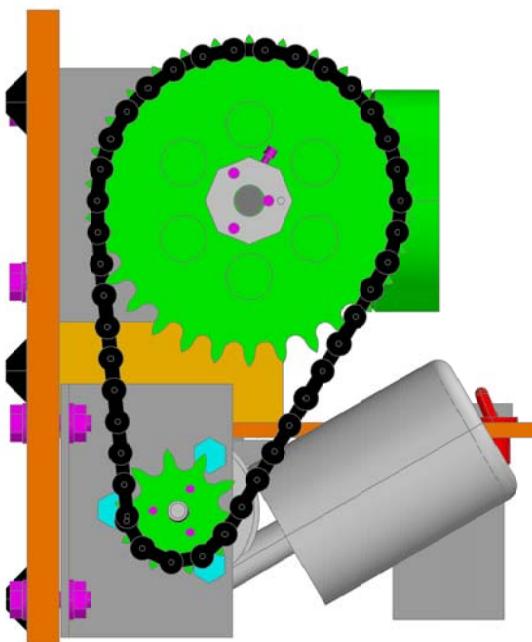
HUGH M LYMAN JR

Inventor

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596

DRAWING NO.	REVISION	SCALE	DATE	PROJECT #
A01	1 .	SCALE	DATE	PROJECT #
	2 .			
	3 .			
	4 .			
	5 .			

BOTTOM VIEWTOP VIEWFRONT VIEWEND VIEW

A02

DRAWING NO.	REVISION	DATE	SCALE	NONE	PROJECT #
1 .					
2 .					
3 .					
4 .					
5 .					

2D VIEWS of SOLID MODEL  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR

INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022P: 360-825-5036  
C: 253-569-9596

**SETUP & OPERATION INSTRUCTIONS:**

1. Place Extruder on a table top back 10" back from the table edge.
2. Plug it into a 110V outlet with a surge protector.
3. Load the hopper with ABS fine pellets. The machine is already setup for 1.75mm ABS filament.
4. Turn on the HEAT switch first.
5. Set temperature on the PID to 212° Celsius if not already set.
6. Let the machine heat up for 30 minutes. PID requires 15 minutes to stabilize.
7. After 30 minutes pellets should be at the extruding temperature. Turn on the Motor Switch to start extruding. Motor voltage is set at 3.1V.
8. As the filament starts to extrude feed the end over the filament guide with a pencil, then continue feeding it to the edge of the table top. If there are any kinks in the filament keep hand feeding it to the edge of the table top till it is straight. Then do not disturb and let it fall and coil on the floor.
9. The diameter of the filament can be controlled with the filament guide. Move it up so the filament is extruding in an upward direction from the nozzle to increase the diameter of the filament as the weight of the filament dropping to the floor can elongate it at the nozzle.



Extruding Filament at 8" per minute

**FRONT VIEW PHOTO OF EXTRUDER  
SETUP AND OPERATION INSTRUCTIONS  
LYMAN FILAMENT EXTRUDER**

DRAWN BY	H. LYMAN
DATE	6/30/12
CKD BY	
DATE	
SCALE	.
NOTE	
PROJECT #	1004

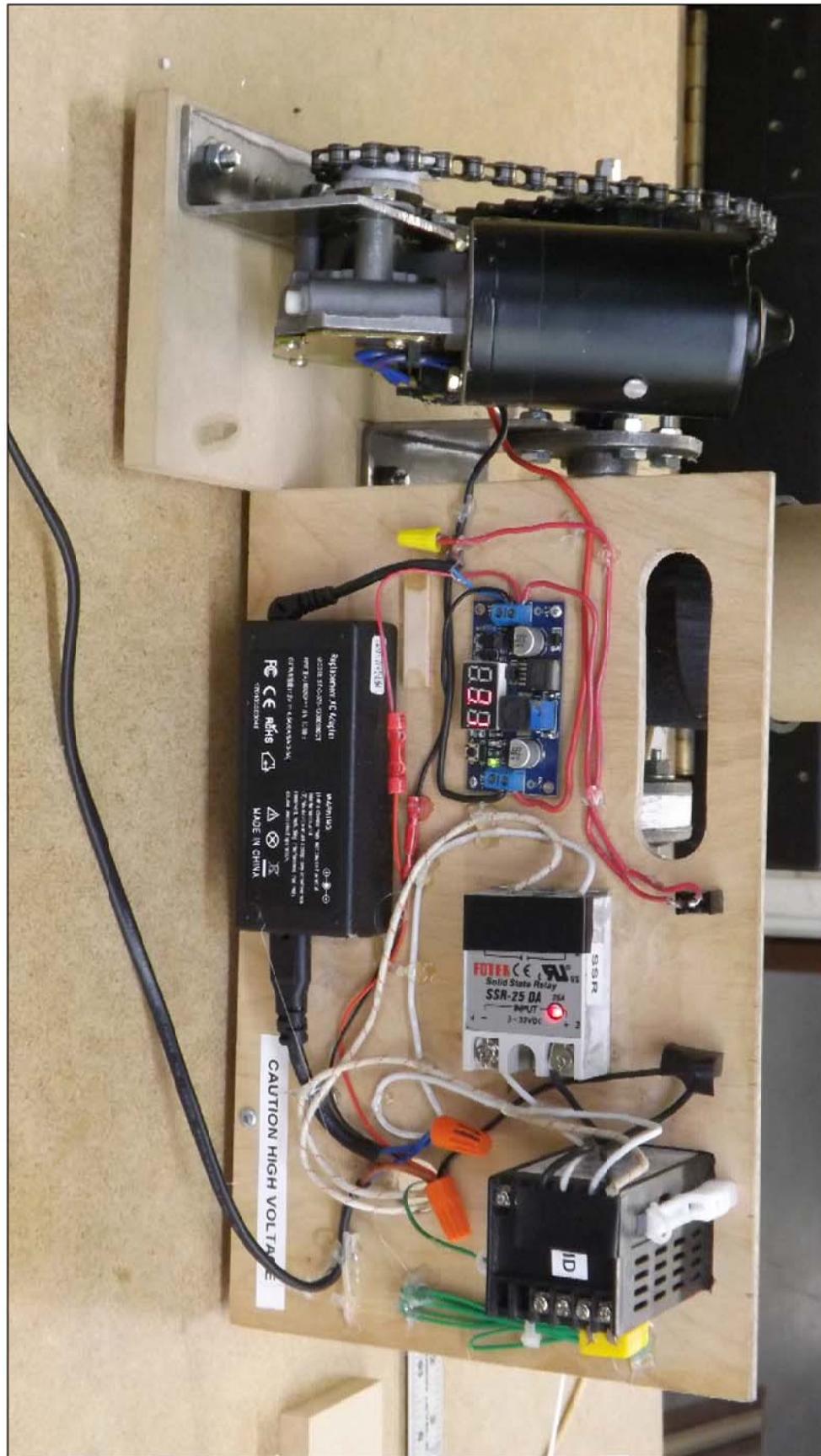
A03

DRAWING No.

**HUGH M LYMAN JR**  
Inventor

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596



BACK VIEW PHOTO OF EXTRUDER II  
LYMAN FILAMENT EXTRUDER

DRAWING NO  
**A04**

REVISION	DATE	SCALE	PROJECT #
1	10/24/12	1	NONE
2	.	.	1004
3	.	.	
4	.	.	
5	.	.	

**HUGH M LYMAN JR**  
Inventor

27639 SE 401st Street  
Enumclaw, WA 98022  
P: 360-825-5036  
C: 253-569-9596



PHOTO OF FILAMENT COILING ON FLOOR  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR  
Inventor

27639 SE 401st Street P: 360-825-5036  
Enumclaw, WA 98022 C: 253-569-9596

DRAWING NO.  
**A05**

REVISION	DATE	SCALE	PROJECT #
1 .			
2 .			
3 .			
4 .			
5 .			

ONE KILOGRAM OF 1.75mm FILAMENT FROM THE LYMAN FILAMENT EXTRUDER WOUND ON TO A ONE KILOGRAM SPOOL



PHOTO OF FILAMENT WOUND ON SPOOL  
LYMAN FILAMENT EXTRUDER II

DREW BY  
H. LYMAN  
DATE  
6/30/12

OKD BY

DATE

SCALE

None

PROJECT #

1004

REVISION

-1

2

3

4

5

HUGH M LYMAN JR

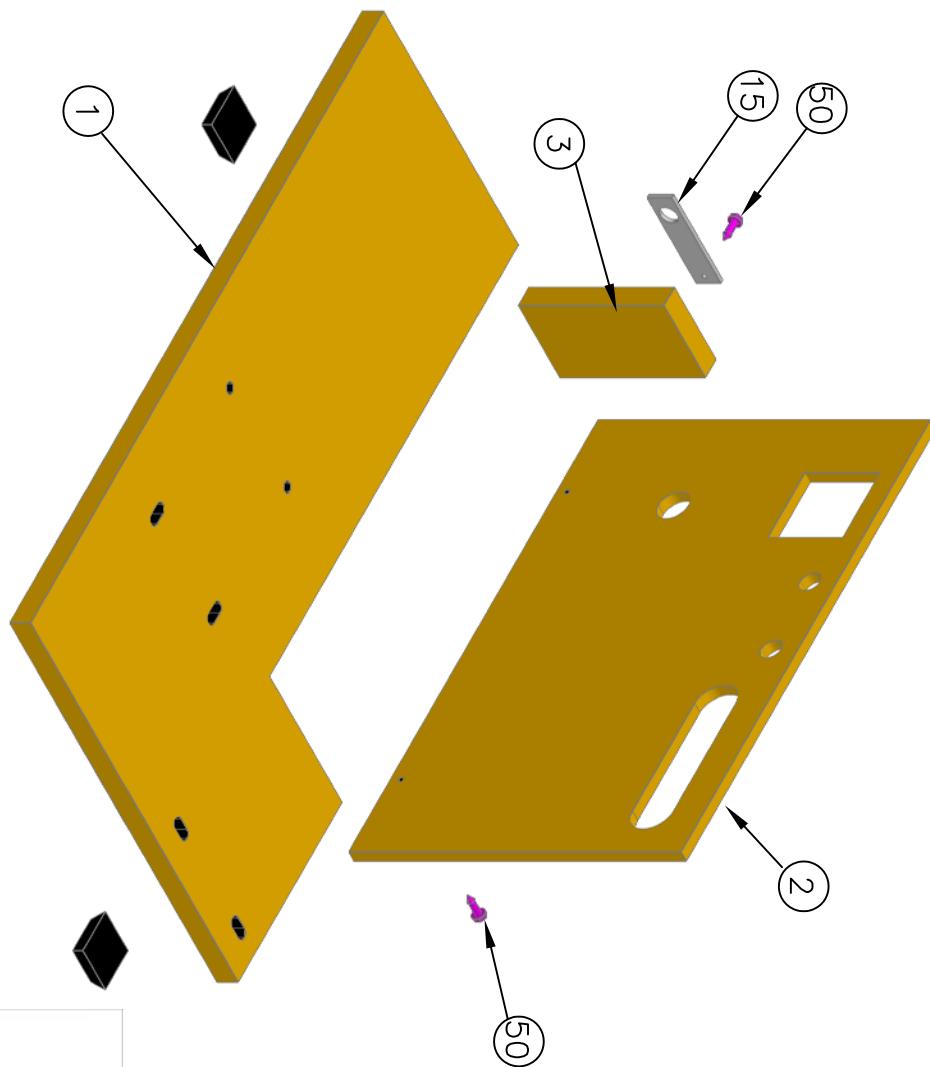
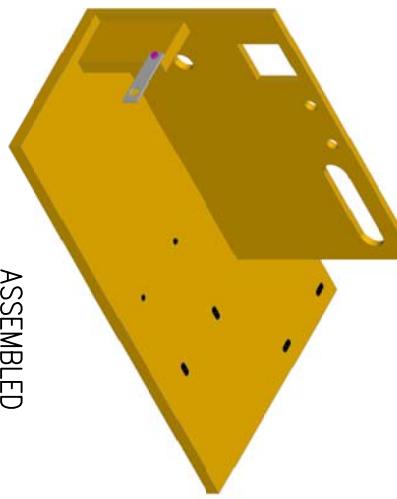
Inventor

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596

A06  
DRAWING No

SEE PART DRAWINGS FOR PART DIMENSIONS



E01

DRAWING NO.	REVISION	SCALE	DATE	DREW BY	DATE	CKD BY
1 .				HLYMAN		
2 .						
3 .						
4 .						
5 .						

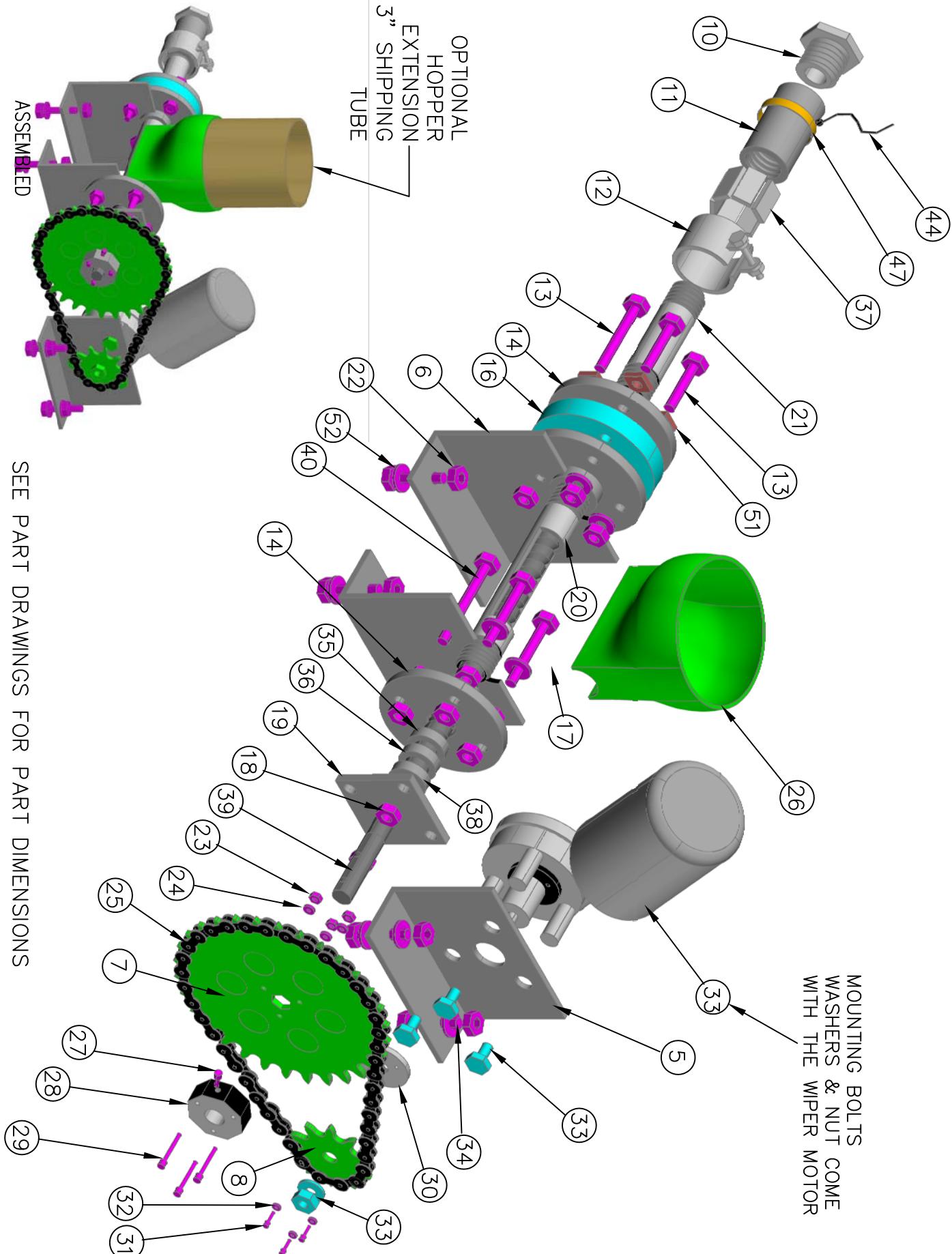
EXPLODED FRAME ASSEMBLY  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR

Inventor

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596



E02

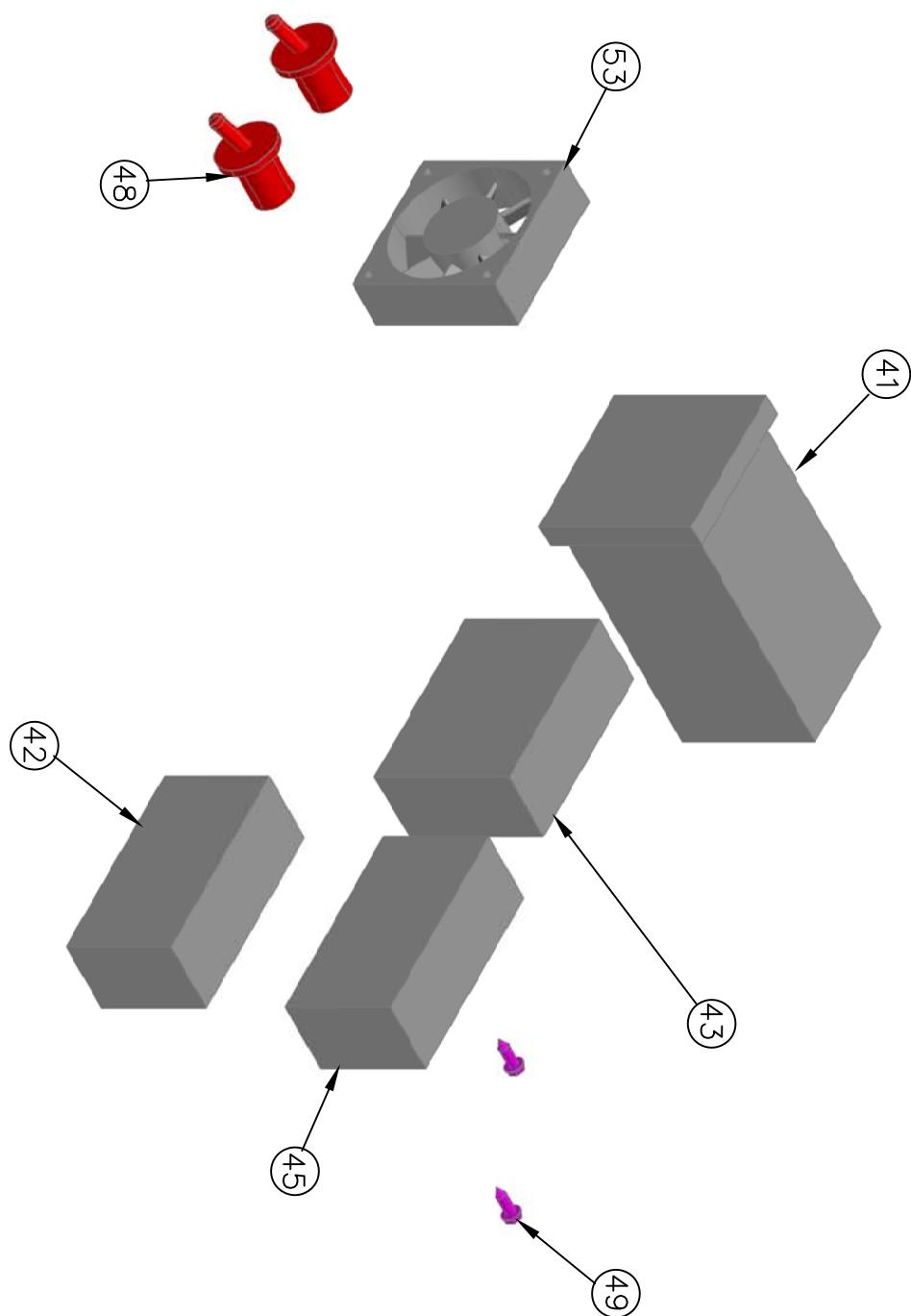
**EXPLODED EXTRUDER ASSEMBLY  
LYMAN FILAMENT EXTRUDER II**

**HUGH M LYMAN JR**  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022  
P: 360-825-5036  
C: 253-569-9596

DRAWING NO.	REVISION	DATE	SCALE	PROJECT #
1 .			1	
2 .			1	
3 .			1	
4 .			1	
5 .			1	

SYMBOLIC PRESENTATION  
OF ELECTRONICS



EXPLODED ELECTRONICS  
LYMAN FILAMENT EXTRUDER II

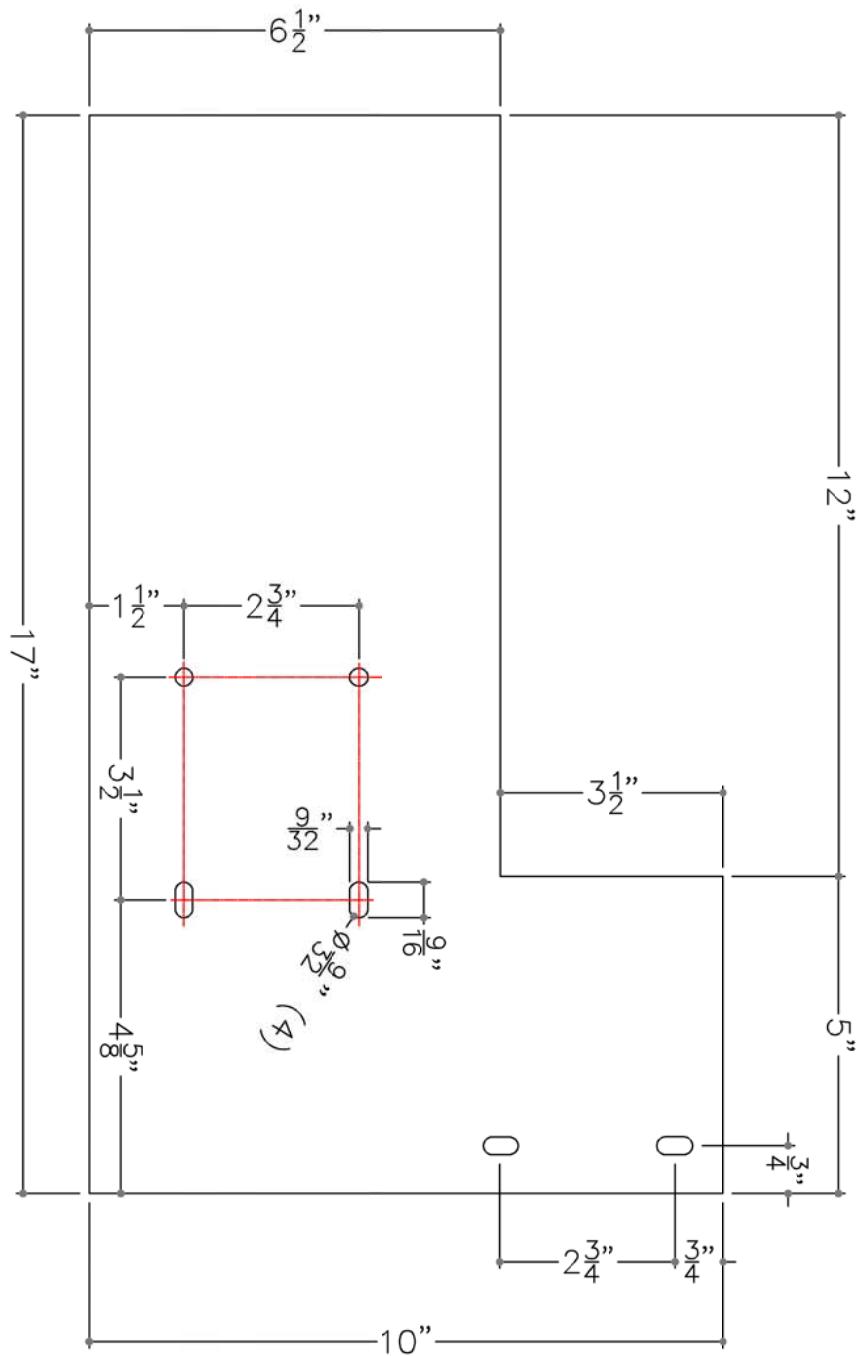
DRAWING No  
**E03**

REVISION	DATE	SCALE	PROJECT #	DRW BY	DATE
1 .				H LYMAN	
2 .					1/1/12
3 .					
4 .					
5 .					

**HUGH M LYMAN JR**  
Inventor

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596



## PART # (1) BASE

MATERIAL: 1/2" MDF BOARD

P01

REVISION	DATE	SCALE	DRAWN BY
1		1	H.LYMAN
2		1	
3		1	
4		1	
5		1	

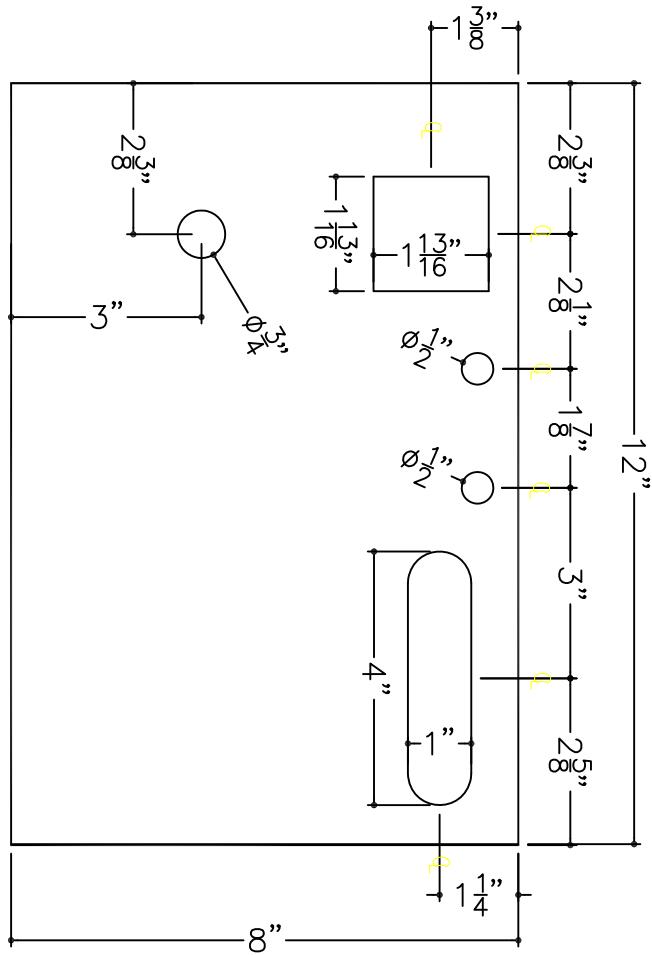
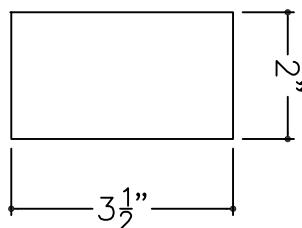
CUSTOM PART  
LYMAN FILAMENT EXTRUDER II  
-

HUGH M LYMAN JR  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596

SEE DRAWING E01 FOR ASSEMBLY

PART # (2) ELEC PANELMATERIAL:  $\frac{1}{4}$ " PLYWOODPART # (3) FAN MOUNT

MATERIAL: 1/2" MDF BOARD

PARTS  
LYMAN FILAMENT EXTRUDER II  
-

HUGH M LYMAN JR  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022

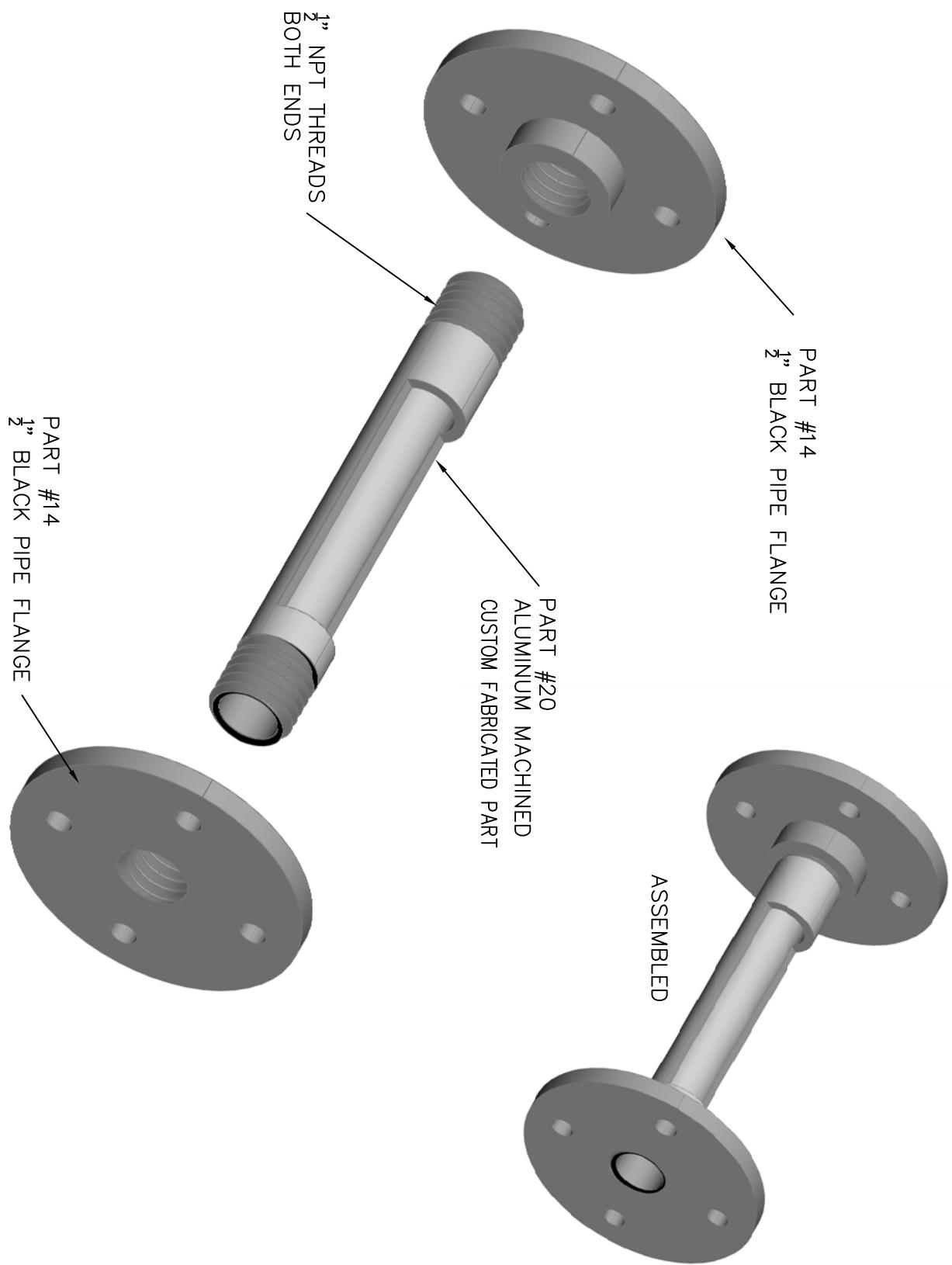
P: 360-825-5036  
C: 253-569-9596

DRAWN BY  
H. LYMAN  
DATE  
1/1/12  
CKD BY  
DATE

SCALE  
NONE  
PROJECT #  
1004

REVISION

DRAWING NO  
P02



PARTS  
LYMAN FILAMENT EXTRUDER II  
-

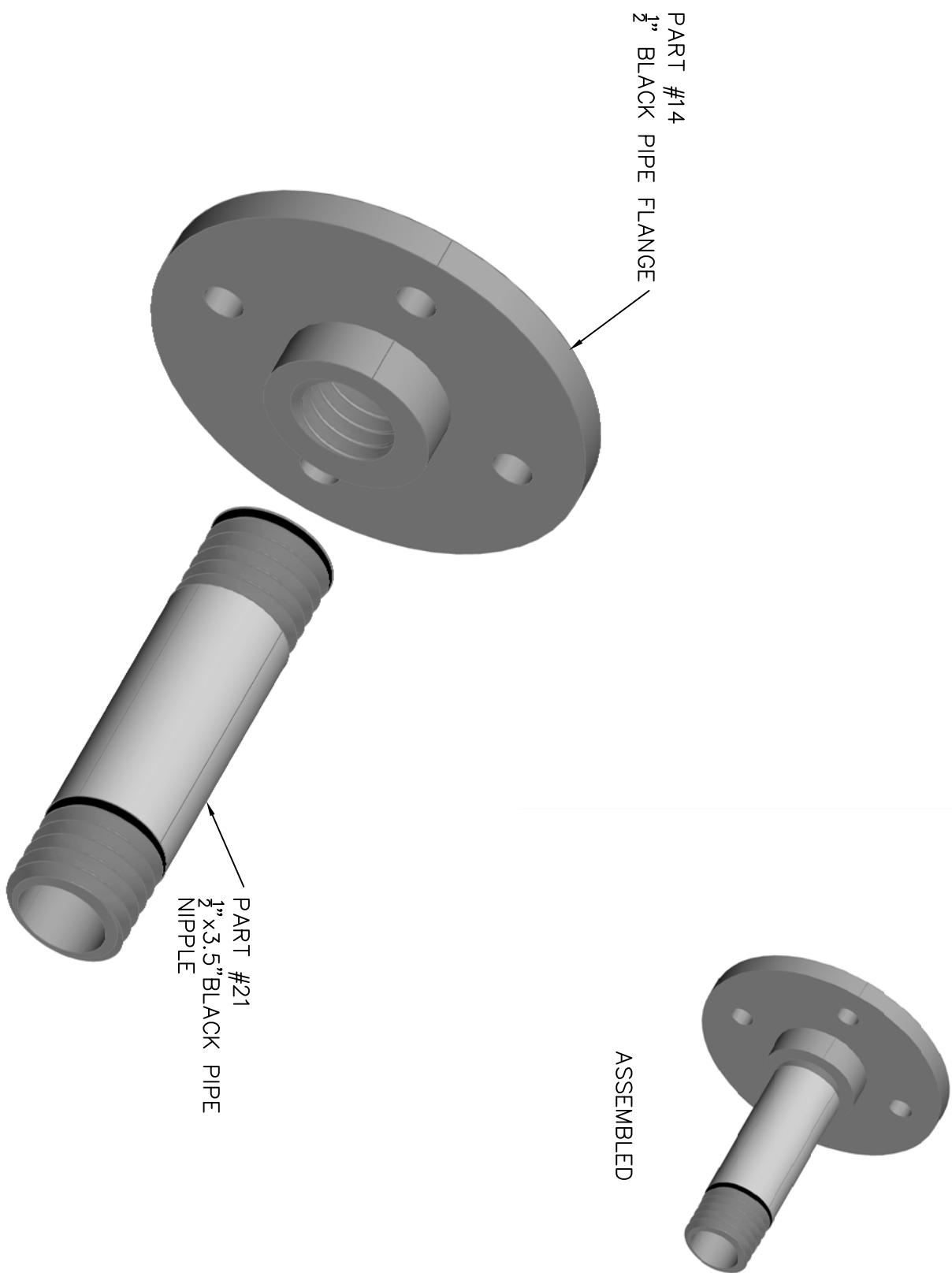
DRAWN BY	H. LYMAN
DATE	11/1/12
CKD BY	.
DATE	.
SCALE	.
NONE	.
PROJECT #	1004
REVISION	.

DRAWING NO  
P03

HUGH M LYMAN JR  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596



PARTS  
LYMAN FILAMENT EXTRUDER II  
-

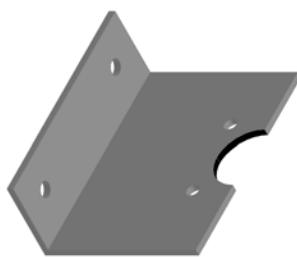
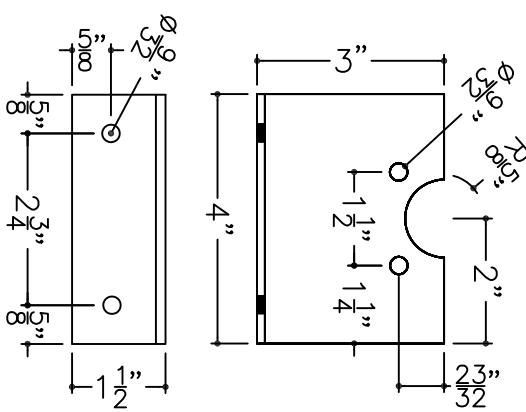
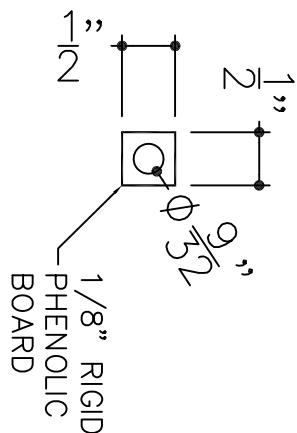
DRAWN BY	H. LYMAN
DATE	11/1/12
CKD BY	.
DATE	.
SCALE	.
PROJECT #	NONE

DRAWING No.  
**P04**

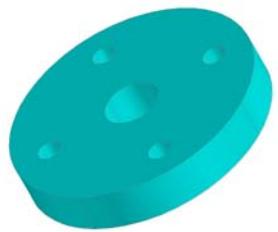
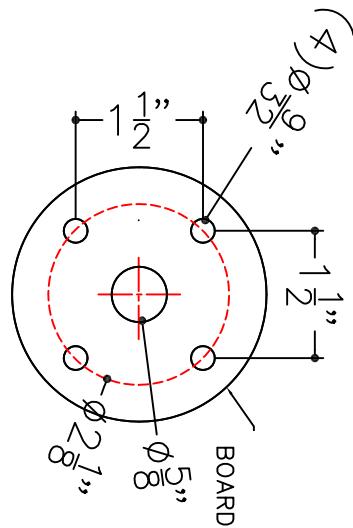
**HUGH M LYMAN JR**  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022

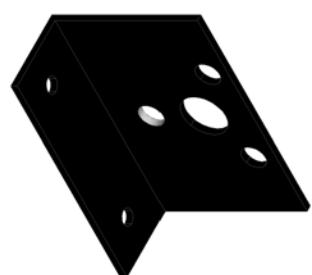
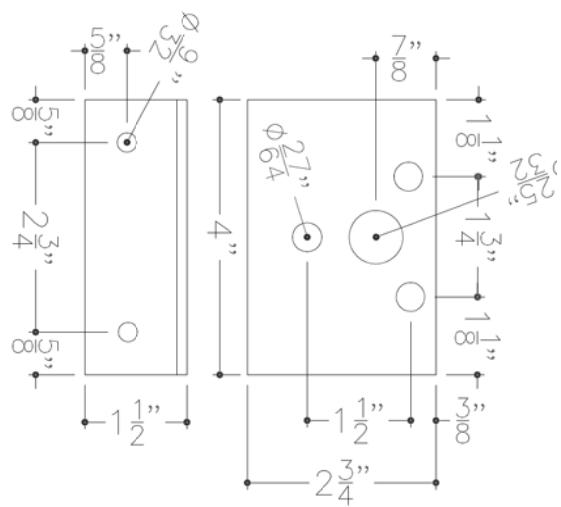
P: 360-825-5036  
C: 253-569-9596



PART # (16)  
HEAT BARRIER



PART #5  
WIPER MOTOR MOUNT  
BRACKET



CUSTOM PARTS  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR  
INVENTOR

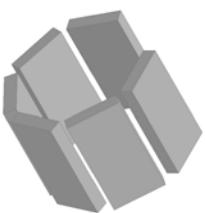
27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596

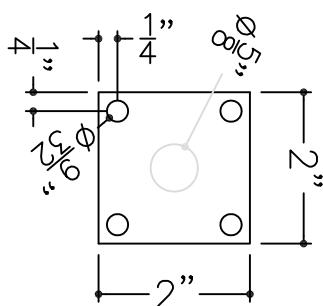
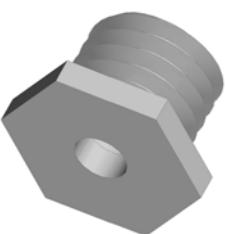
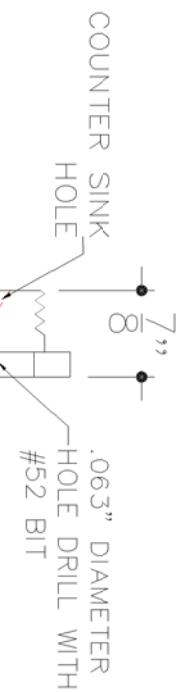
THERMOCO尤LER PART #44  
IS ATTACHED TO COUPLER WITH  
KAPTON TAPE



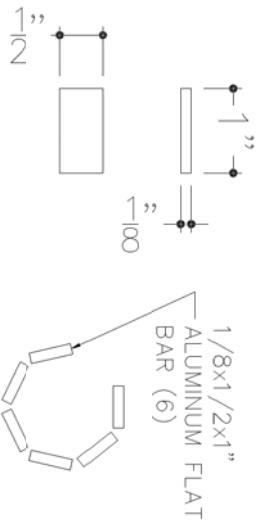
PART #11  
 $\frac{1}{2}$ " BLACK PIPE COUPLER



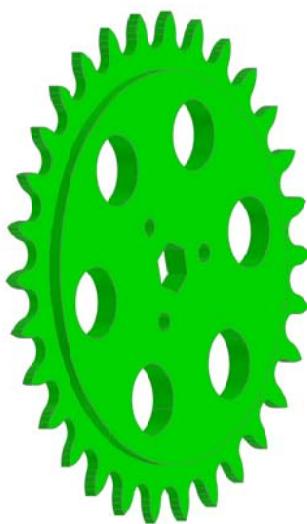
PART # (10)  
1.75mm ALUMINUM  
NOZZLE



PART # (19)  
AUGER BEARING PLATE  
MATERIAL  $\frac{3}{16}$  A36 STEEL PLATE



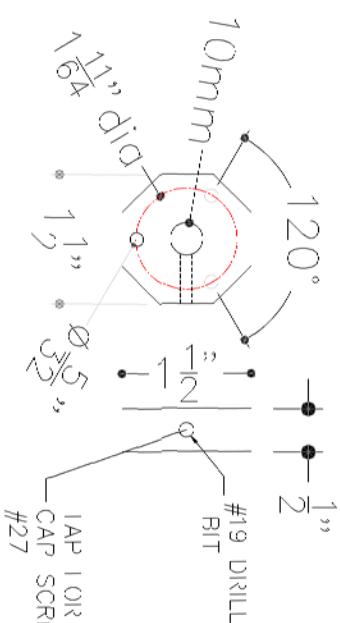
PART # (37)  
HEAT BAND  
SPACERS (6)  
END VIEW  
ASSEMBLY



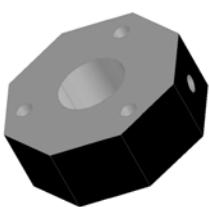
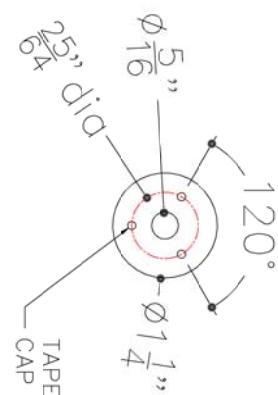
PART #8  
SMALL SPROCKET



PART #7  
LARGE SPROCKET



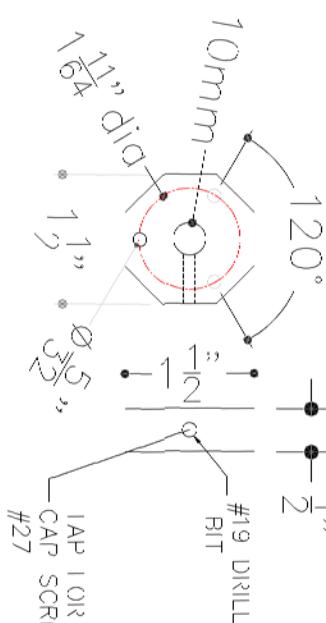
PART # (30)  
10 TOOTH SPROCKET ADAPTER  
1/8" ALUMINUM PLATE



PART # (28)  
50 TOOTH SPROCKET  
ADAPTER

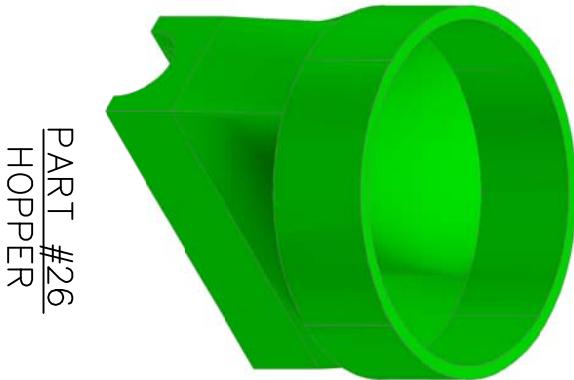
#27

IAP 10 or 5mm  
CAP SCREW PART



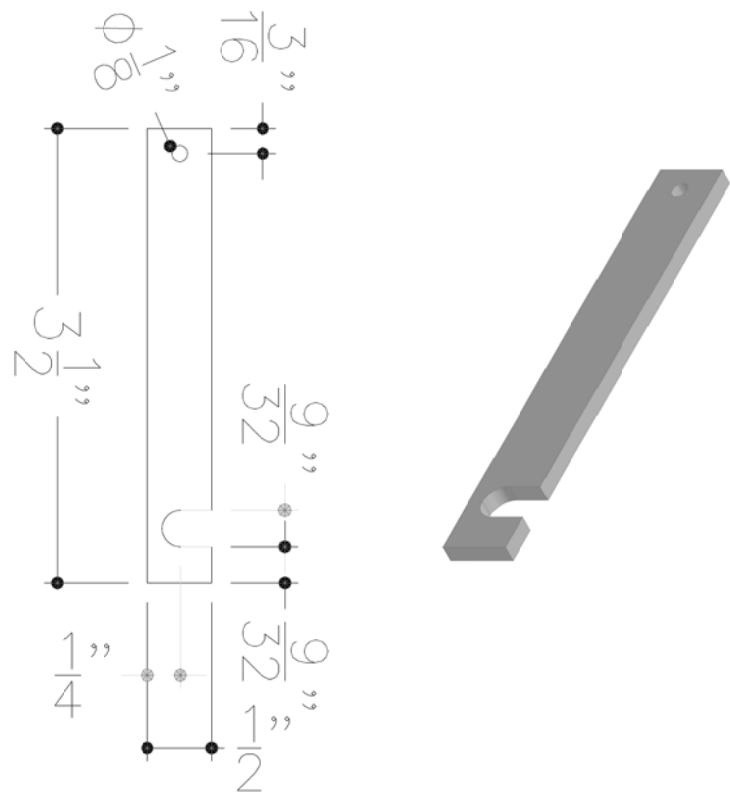
CUSTOM PARTS  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR  
INVENTOR  
27639 SE 401st Street  
Enumclaw, WA 98022 P: 360-825-5036  
C: 253-569-9596



PART  
#26  
HOPPER

PART  
#38  
BRASS  
BUSHING



PART  
#15  
FILAMENT  
GUIDE  
 $\frac{1}{8}$ " ALUMINUM FLAT BAR

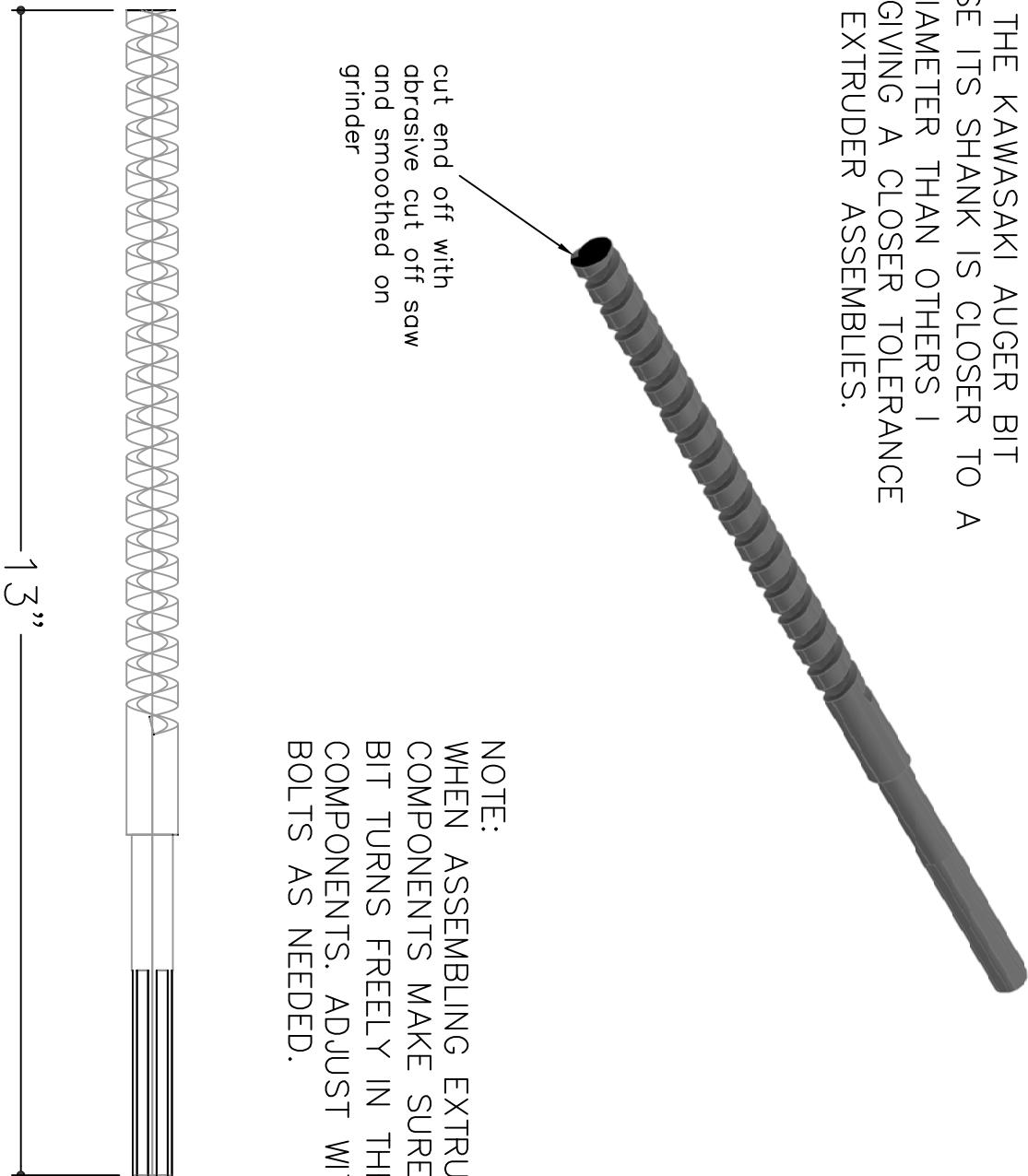
REVISION	SCALE	DATE	DRW BY
1.	NONE		H.LYMAN
2.			11/1/12
3.			CKD BY
4.			
5.			

CUSTOM PARTS  
LYMAN FILAMENT EXTRUDER II

DRAWING NO  
P08

HUGH M LYMAN JR  
INVENTOR  
27639 SE 401st Street  
Enumclaw, WA 98022  
P: 360-825-5036  
C: 253-569-9596

NOTE:  
I USED THE KAWASAKI AUGER BIT  
BECAUSE ITS SHANK IS CLOSER TO A  
5/8" DIAMETER THAN OTHERS I  
TRIED, GIVING A CLOSER TOLERANCE  
IN THE EXTRUDER ASSEMBLIES.



NOTE:  
WHEN ASSEMBLING EXTRUDER  
COMPONENTS MAKE SURE THE AUGER  
BIT TURNS FREELY IN THE 1/2" PIPE  
COMPONENTS. ADJUST WITH THE 1/4"  
BOLTS AS NEEDED.

PART # (39)  
KAWASAKI 5/8"  
AUGER BIT

5/8" AUGER BIT  
LYMAN FILAMENT EXTRUDER II

-

DRAWN BY  
HLYMAN  
DATE  
6/30/12

DATE

SCALE

PROJECT #

REVISION

1 .

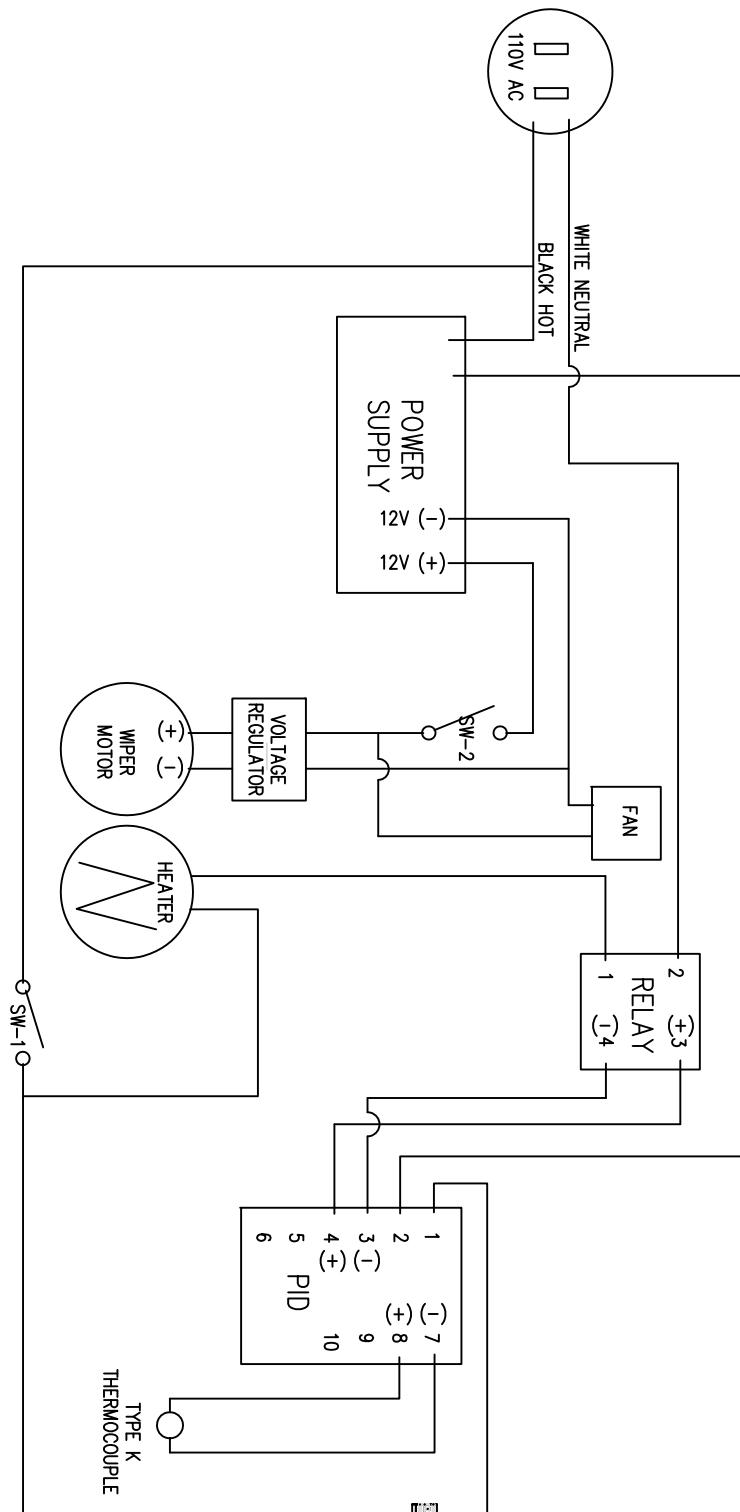
2 .

3 .

4 .

5 .

HUGH M LYMAN JR  
INVENTOR  
27639 SE 401st Street  
Enumclaw, WA 98022 P: 360-825-5036  
C: 253-569-9596



DRAWN BY  
H. LYMAN  
DATE  
1/1/12  
OKD BY  
.

SCALE  
NONE  
PROJECT #

DRAWING NO  
P10

WIRING DIAGRAM  
LYMAN FILAMENT EXTRUDER II

HUGH M LYMAN JR  
INVENTOR

27639 SE 401st Street  
Enumclaw, WA 98022

P: 360-825-5036  
C: 253-569-9596

Date: 10/29/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

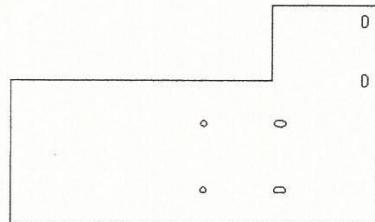
Machines	Parts qty	Weight	Bus. days to process
	400	609.43	31

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Large Shipment	Wrap in bulk	credit card	

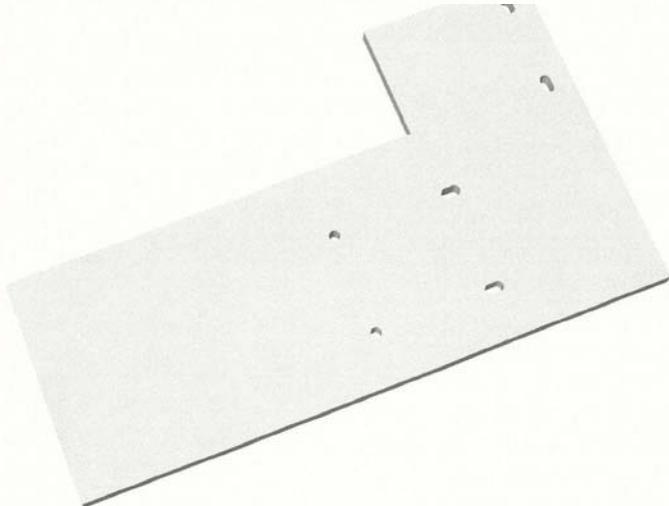
Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Wood Plywood For interior  
File name: Part #1 Frame Base.ems



\$ 1.71



<b>Subtotal:</b>	\$3110.31
<b>Shipping/Handling:</b>	\$524.51
<b>Total:</b>	\$3634.82

Date: 11/2/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

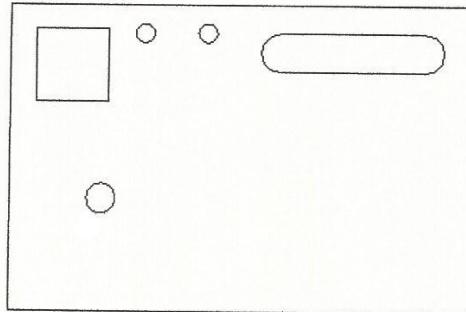
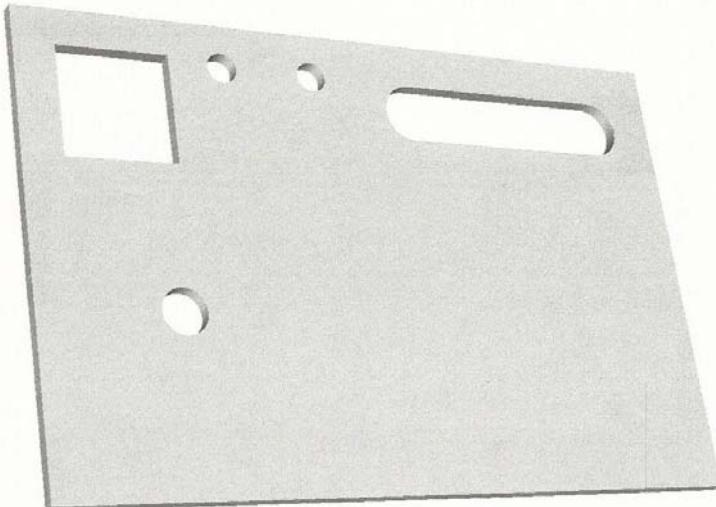
Machines	Parts qty	Weight	Bus. days to process
	400	158.96	23

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Hundredweight Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Wood Plywood For interior  
File name: Part #2 Electronic Panel.ems



740

<b>Subtotal:</b>	\$2960.04
<b>Shipping/Handling:</b>	\$149.06
<b>Total:</b>	\$3109.10

Date: 10/29/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**

**Enumclaw WA 98022  
U.S.A.**

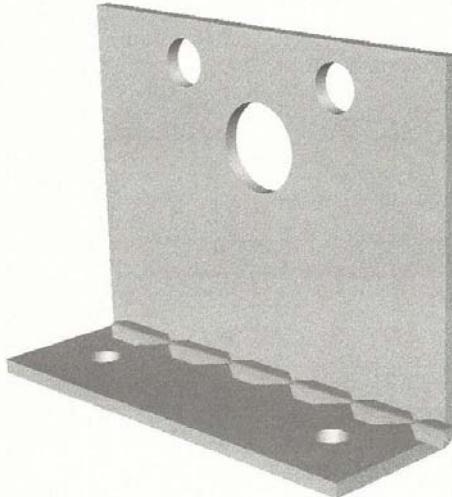
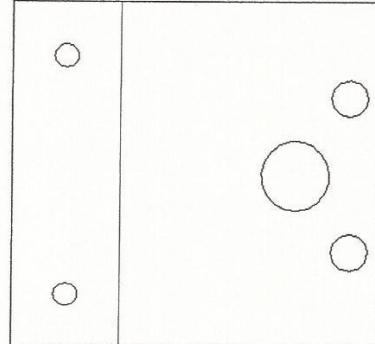
Machines	Parts qty	Weight	Bus. days to process
	400	234.50	12

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Hundredweight Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Steel A36 Hot rolled, 0.125" thick  
File name: Part #5 Motor mount brkt.ems



<b>Subtotal:</b>	\$1947.09
<b>Shipping/Handling:</b>	\$213.84
<b>Total:</b>	\$2160.93

Date: 10/29/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

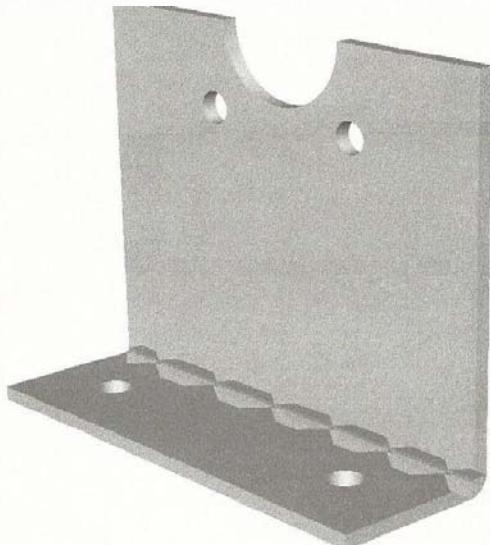
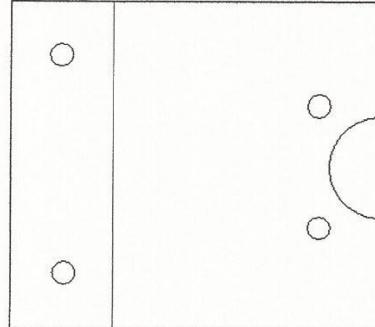
Machines	Parts qty	Weight	Bus. days to process
	800	497.74	13

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Hundredweight Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Steel A36 Hot rolled, 0.125" (+/- 20%) thick  
File name: Part #6 Hopper base mt brkts.ems



<b>Subtotal:</b>	\$4393.39
<b>Shipping/Handling:</b>	\$481.23
<b>Total:</b>	\$4874.62

Date: 11/5/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	64.59	32

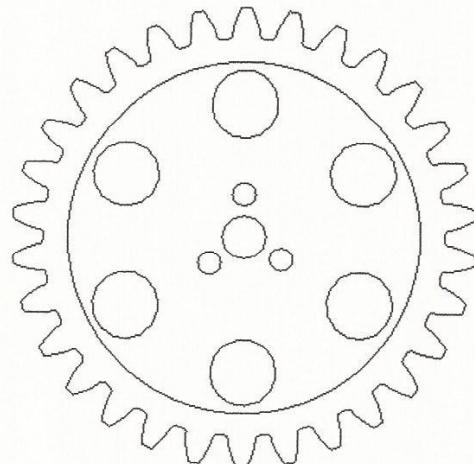
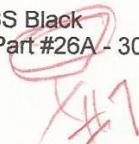
Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

Description:

Material: ABS Black

File name: Part #26A - 30 TOOTH GEAR.ems



<b>Subtotal:</b>	\$5749.78
<b>Shipping/Handling:</b>	\$57.00
<b>Total:</b>	\$5806.78

Date: 10/28/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430

Hugh Lyman

27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036

From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430

**Hugh Lyman**

**27639 SE 401st Street**  
**Enumclaw WA 98022**  
**U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	3.69	16

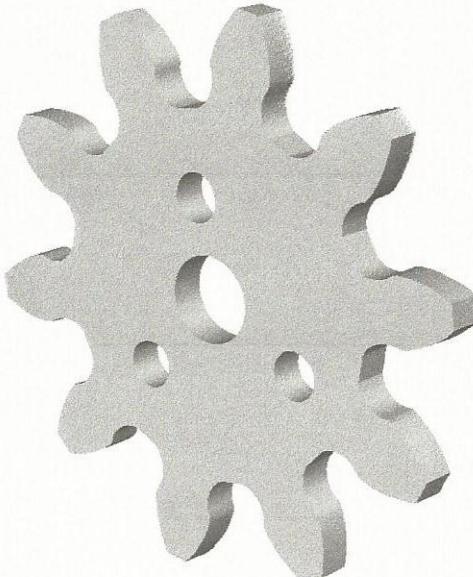
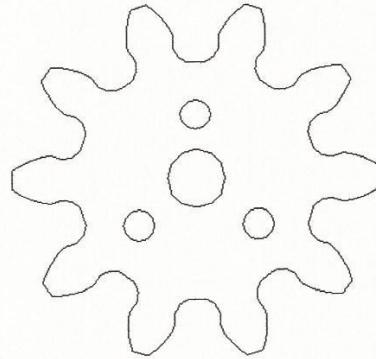
Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

Description:

Material: ABS Black, 0.125" (+/- 20%) thick  
File name: Part #26B - 10 TOOTH SPROCKET.ems

#8



<b>Subtotal:</b>	\$791.88
<b>Shipping/Handling:</b>	\$10.53
<b>Total:</b>	\$802.41

Date: 10/29/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.  
Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	53.48	32

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

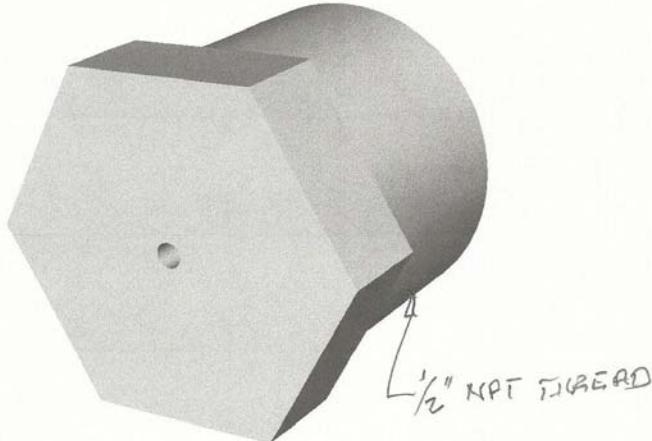
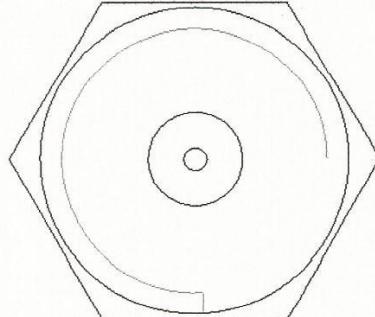
Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Brass 360 61.5% Cu 3.0% Pb 35.5% Zn Leaded (IS 319/89

Type II)

File name: Part #10 Brass Nozzle.ems



<b>Subtotal:</b>	\$2024.04
<b>Shipping/Handling:</b>	\$49.10
<b>Total:</b>	\$2073.14

Date: 11/5/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430

**Hugh Lyman**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

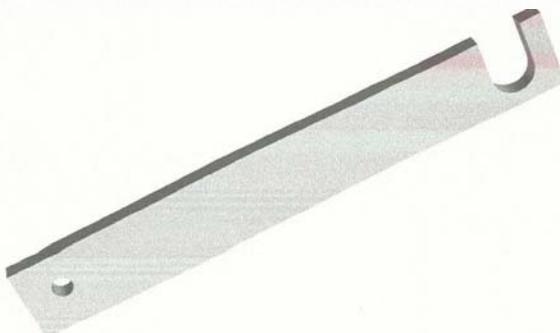
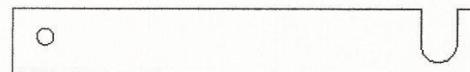
**Phone: 360-825-5036**

Machines	Parts qty	Weight	Bus. days to process
	400	7.96	16

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

Description:  
Material: Aluminum 6061 T6 (HE20), 0.125" (+/- 20%) thick  
File name: PART #15 FILAMENT GUIDE.ems



<b>Subtotal:</b>	\$435.57
<b>Shipping/Handling:</b>	\$12.47
<b>Total:</b>	\$448.04

Date: 10/29/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**

**Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	45.75	17

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

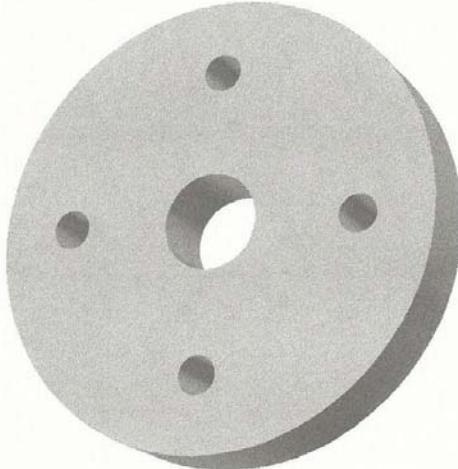
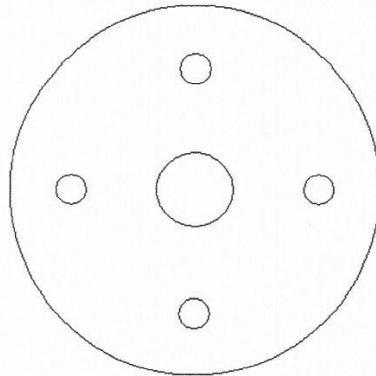
Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Polyethylene HDPE - High Density Black, 0.5" (+/- 20%)

thick

File name: Part #16 Large Ridgid Heat Bearer Insulator.ems



<b>Subtotal:</b>	\$1518.17
<b>Shipping/Handling:</b>	\$40.59
<b>Total:</b>	\$1558.76

Date: 10/29/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

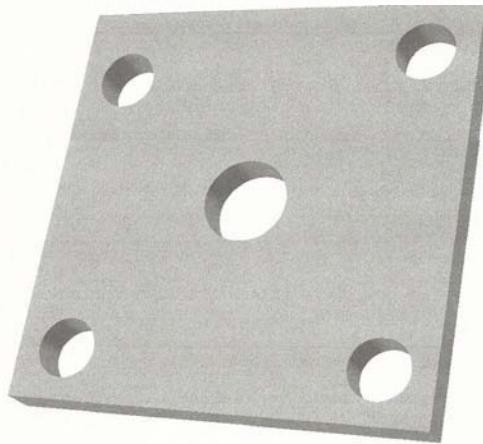
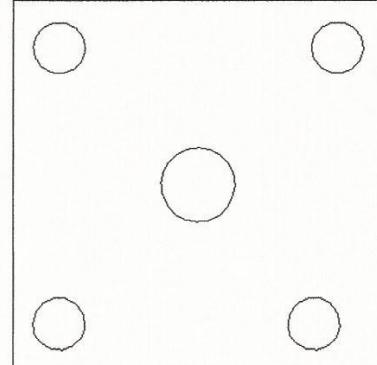
Machines	Parts qty	Weight	Bus. days to process
	400	76.79	14

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Steel A36 Hot rolled, 0.188" (+/- 20%) thick  
File name: Part #19 Steel bearing plate.ems



<b>Subtotal:</b>	\$1025.82
<b>Shipping/Handling:</b>	\$62.58
<b>Total:</b>	\$1088.40

Date: 10/29/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**

**Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	26.43	33

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

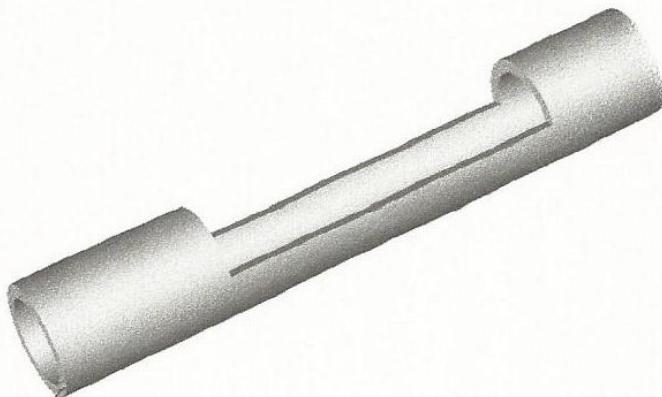
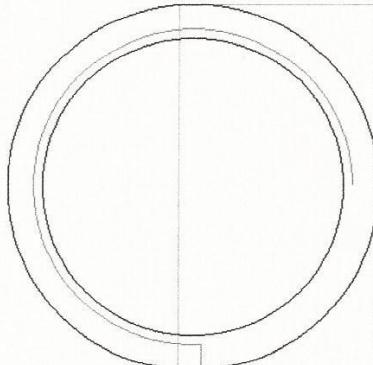
Visit [www.emachineshop.com](http://www.emachineshop.com)

Description:

Material: Aluminum 6061 T6 (HE20)

File name: Part #20 Machined Nipple.ems

+bore PASE



$\frac{1}{2}$ " NPT THREAD  
EACH END

<b>Subtotal:</b>	\$2292.69
<b>Shipping/Handling:</b>	\$29.36
<b>Total:</b>	\$2322.05

Date: 11/5/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	31.84	27

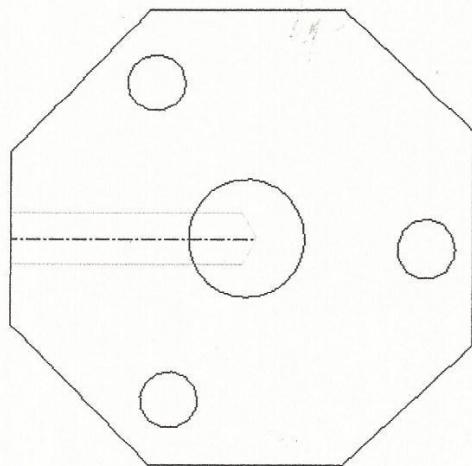
Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

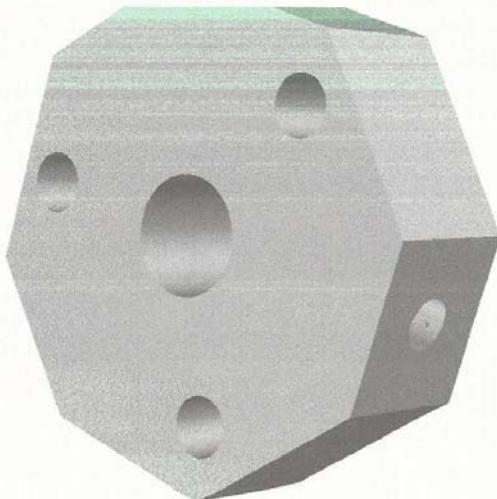
Description:

Material: Aluminum 6061 T6 (HE20)

File name: Part #28 - 30 tooth Sprocket Adapter.ems



hop.com 3D Preview



<b>Subtotal:</b>	\$1468.06
<b>Shipping/Handling:</b>	\$30.06
<b>Total:</b>	\$1498.12

Date: 10/28/2012

## Purchase requisition

**emachineshop.com,  
31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

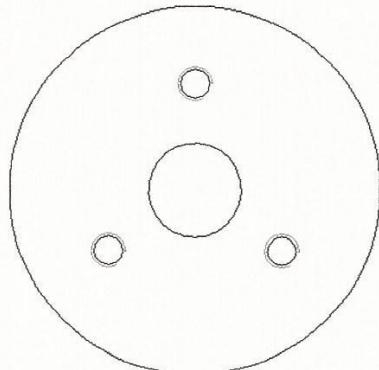
**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	400	5.46	14

Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**  
Material: Aluminum 6061 T6 (HE20), 0.125" (+/- 20%) thick  
File name: PART #30 SMALL SPROCKET ADAPTER.ems



<b>Subtotal:</b>	\$709.04
<b>Shipping/Handling:</b>	\$11.50
<b>Total:</b>	\$720.54

Date: 11/14/2012

## Purchase requisition

**emachineshop.com,**  
**31 Industrial Ave.**  
**Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**  
**Enumclaw WA 98022**  
**U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.**  
**Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**  
**Enumclaw WA 98022**  
**U.S.A.**

<b>Machines</b>	<b>Parts qty</b>	<b>Weight</b>	<b>Bus. days to process</b>
	400	10.33	25

<b>Shipping via</b>	<b>Packing options</b>	<b>Payment</b>	<b>PO# / Check #</b>
UPS Ground Small Shipment	Wrap in bulk	credit card	

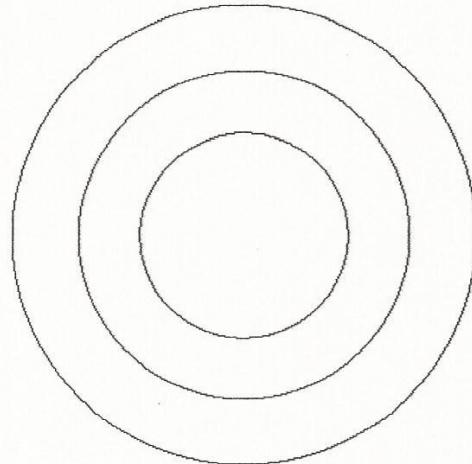
Visit [www.emachineshop.com](http://www.emachineshop.com)

Description:

Material: Brass 360 61.5% Cu 3.0% Pb 35.5% Zn Leaded (IS 319/89

Type II)

File name: Part #38 Brass Bushing.ems



**emachineshop.com** :



<b>Subtotal:</b>	\$1222.99
<b>Shipping/Handling:</b>	\$14.27
<b>Total:</b>	\$1237.26

Date: 10/29/2012

## Purchase requisition

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31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street  
Enumclaw WA 98022  
U.S.A.**

**Phone: 360-825-5036**

**From: emachineshop.com, 31 Industrial Ave.  
Mahwah, NJ 07430**

**Hugh Lyman**

**27639 SE 401st Street**

**Enumclaw WA 98022  
U.S.A.**

Machines	Parts qty	Weight	Bus. days to process
	1600	1.39	19

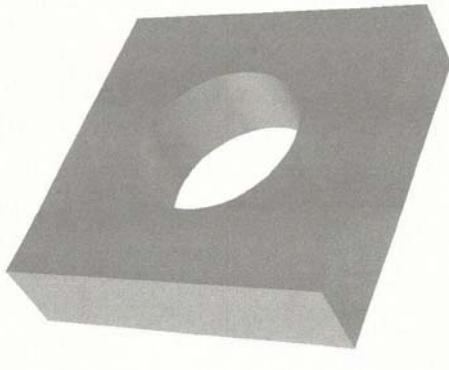
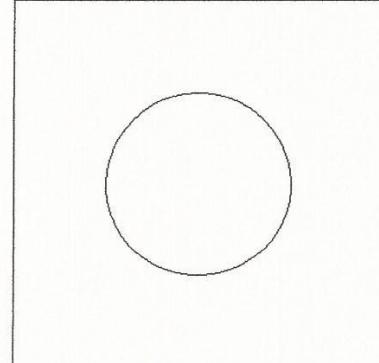
Shipping via	Packing options	Payment	PO# / Check #
UPS Ground Small Shipment	Wrap in bulk	credit card	

Visit [www.emachineshop.com](http://www.emachineshop.com)

**Description:**

Material: Polyethylene HDPE - High Density Black, 0.125" (+/- 20%) thick

File name: Part #51 Small Ridgid Heat Bearer Washer.ems



<b>Subtotal:</b>	\$2254.77
<b>Shipping/Handling:</b>	\$11.97
<b>Total:</b>	\$2266.74

**LYMAN ASSCIATES, INC.**

% Hugh Lyman or Leon Lyman, Pres.  
**25810 160th Avenue SE**  
**Covington, WA 98042**

**QUOTATION**

Date	Reference
10/29/12	DFC

**SHIP TO:**

**Att: Zack Kaplan**

**INVENTABLES**

**600 W. Van Buren #602**  
**Chicago, IL 60607**

DESCRIPTION	QTY	Due Date	PO#
		advise	na
Part #26 - Hopper - 3D Printed Part as per stl file supplied Material: ABS plastic	400	\$20.00	\$8,000.00
Shipping & Handling			\$200
Allow 70 days for delivery			
		Total	\$8,200.00

