fila·mint
desktop extruder

QUICK START GUIDE

REV 10.02.2012

From The Fila-Mint Team:

In keeping with the spirit of The Desktop Factory Competition, we went about designing a safe, durable, inexpensive, high production desktop extruder that can be made without specialized skills or tools.

We believe that innovators worldwide who utilize 3D printing should not hesitate to create their designs because of the high cost of filament or failed prints. To this end, we hope to have built a solid framework that others will improve upon.

Our thanks to The Kauffman Foundation and Inventables for the opportunity to contribute to this important cause.

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SAFETY WARNINGS

The vented Fila-Mint housings are for your safety and the safety of others. Always operate the extruder with the safety housings in place.

The extruder pipe and extruder tip will get very hot during operation. Even after the heat zones have been off for several minutes, they will still be very hot.
DO NOT TOUCH

The auger is very sharp, and the motor is very strong.
KEEP YOUR FINGERS OUT OF THE FEED CHAMBER

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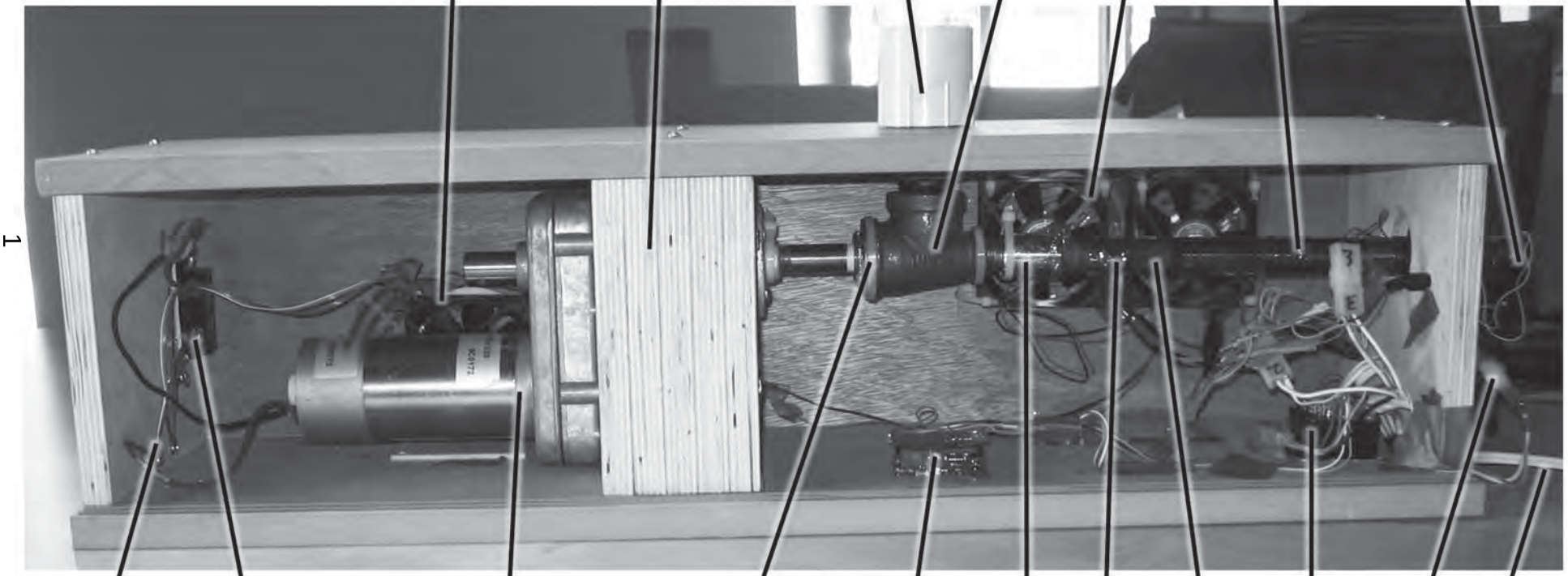
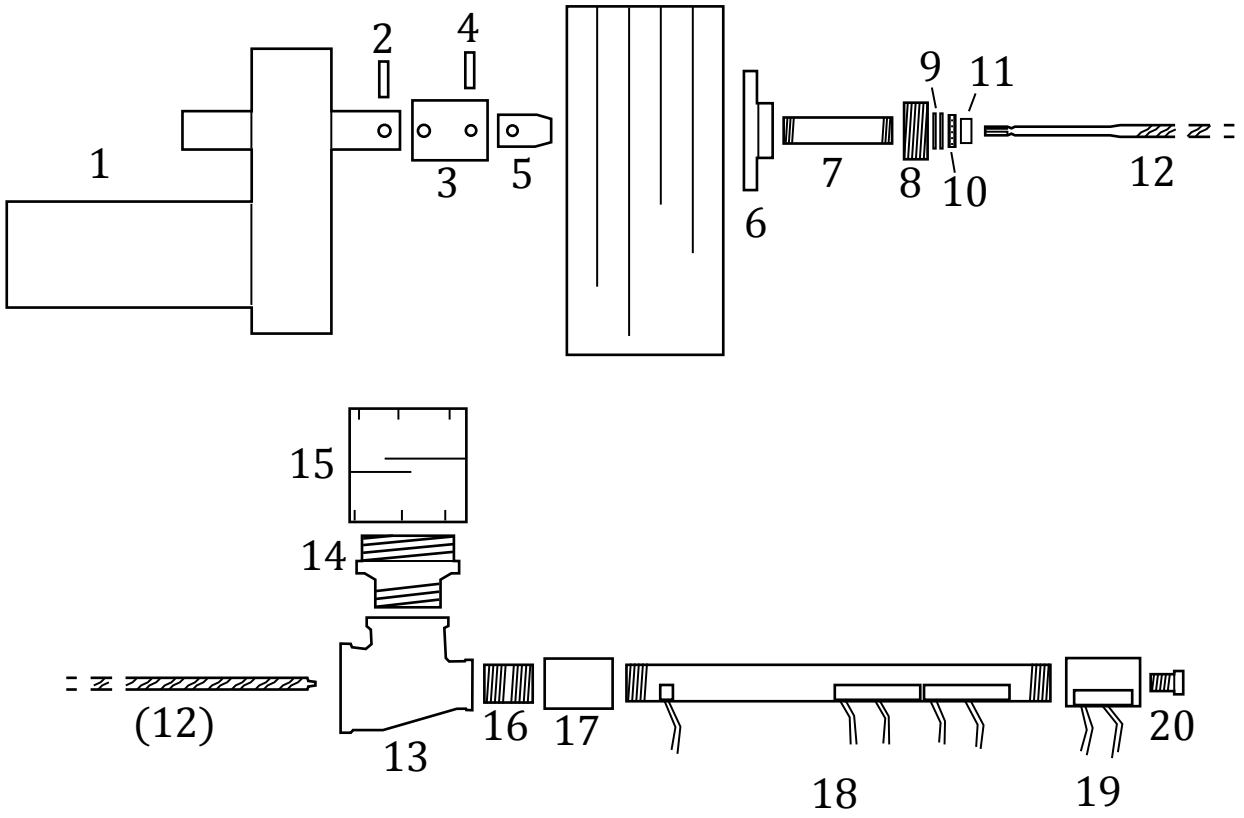
COMPONANT OVERVIEW



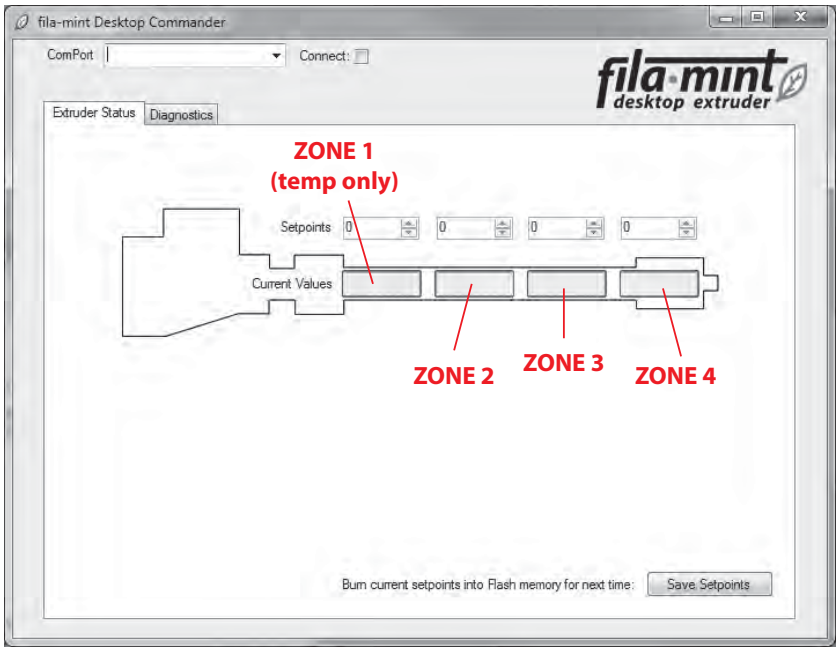
BASIC MECHANICAL DIAGRAM



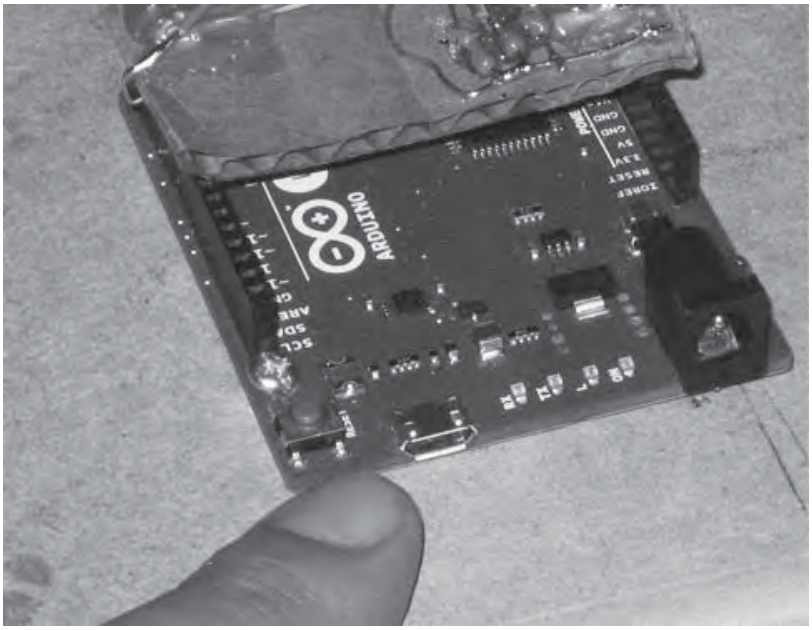
1 12 VDC Motor
2 Roll Pin
3 Socket Adapter
4 Roll Pin
5 5/16” Socket
6 3/8” Steel Floor Flange
7 3/8” x 2 1/2” Steel Pipe Nipples
8 3/8” fpt x 1 1/2” mpt Adapter
9 1/2” Flat Washers
10 Thrust Bearing Cage & Washer
11 3/8” Clamping Shaft Collar
12 1/2” Auger Bit
13 Large T-Joint 1” x 1” x 1/2” (Feed Chamber)
14 Large Plastic Pipe Adapter m/m
15 Large Plastic Pipe Coupling f/f
16 Feed Chamber/Heat Break Connector
17 1/2” fpt Stainless Coupling
18 1/2” x 10” Seamless sch 80 Pipe (Temp Zone 1/Heat Zones 2 & 3)
19 1/2” fpt x 1/8” fpt Coupling (Extrusion Tip/Heat Zone 4)
20 1/8” mpt End Plug (Extrusion Die)

PRE-START UP

1. Download and install the Fila-Mint Desktop Commander application

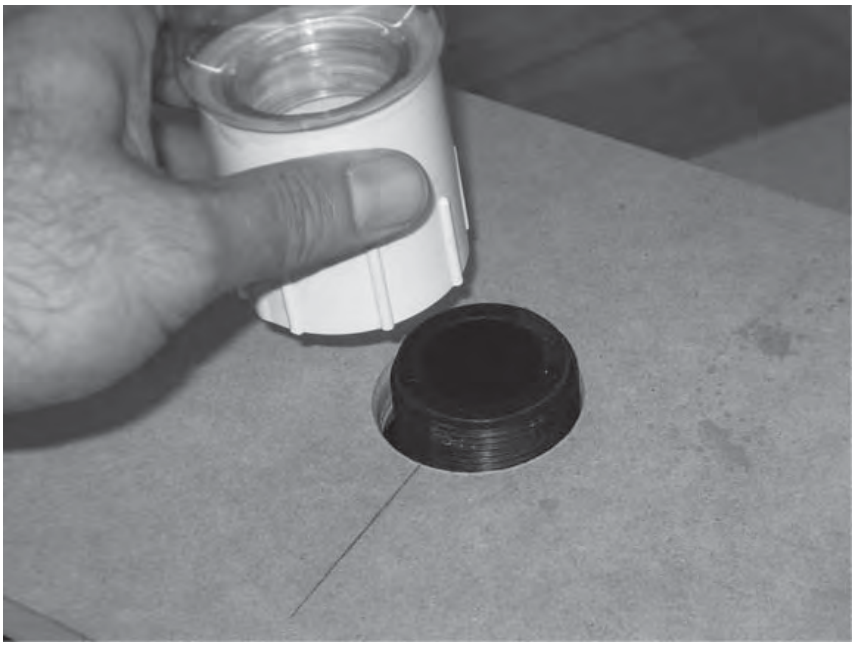


2. Plug computer into Arduino USB port



PRE-START UP

3. Attach hopper to hopper receiver

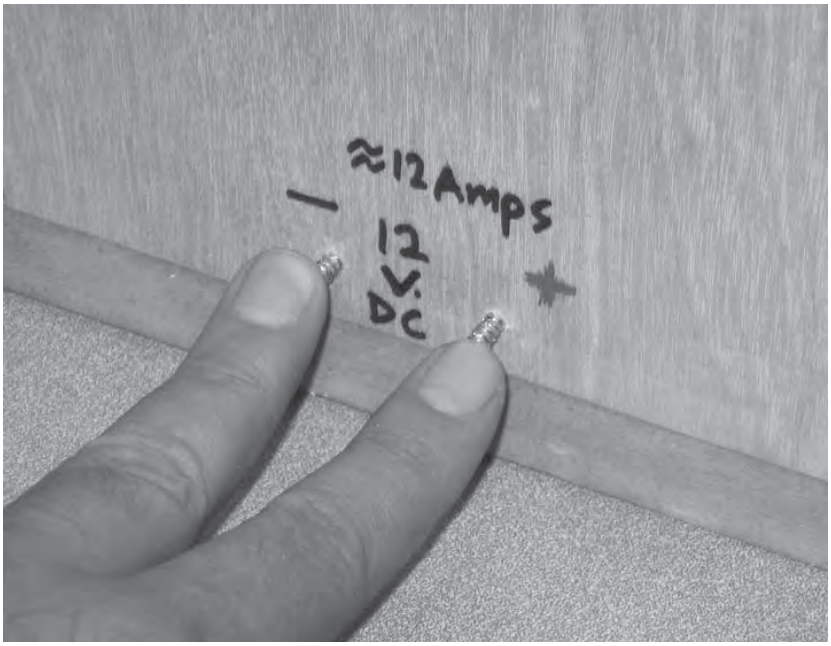


4. Position extruder over the edge of the table (at least 8 inches)

PRE-START UP

5. Make sure auger switch is in the OFF position

6. Attach 12 V power supply to connector luggs



7. Plug in white AC power cord

FIRST TIME START UP

1. Turn on heaters and enter the correct zone temperatures for the type of plastic being extruded. Allow the temperatures to stabilize for about five minutes.

2. Turn on the auger rotation.

3. Pour pellets into the hopper.

4. See "EXTRUDING" section

NORMAL START UP

1. Ensure extrusion nozzle is removed from pipe, but electrically connected. Set it on a heat-resistant surface (a ceramic coaster on top of the Fila-Mint housing works well).

2. Turn on heaters and enter the correct zone temperatures for the type of plastic being extruded. Allow the temperatures to stabilize for about five minutes. Ensure the nozzle is clean.

3. Turn on the auger rotation.

4. Pour pellets into the hopper.

5. Extrude a barrel-length slug of plastic from the open end of the pipe. It will look flaky, crispy, or stringy (this is the plastic residue from the last extrusion). Extrude this slug until the plastic is smooth, free of flakes or burned plastic, and stretches easily without tearing.

6. Unplug the heater circuits from the mains.

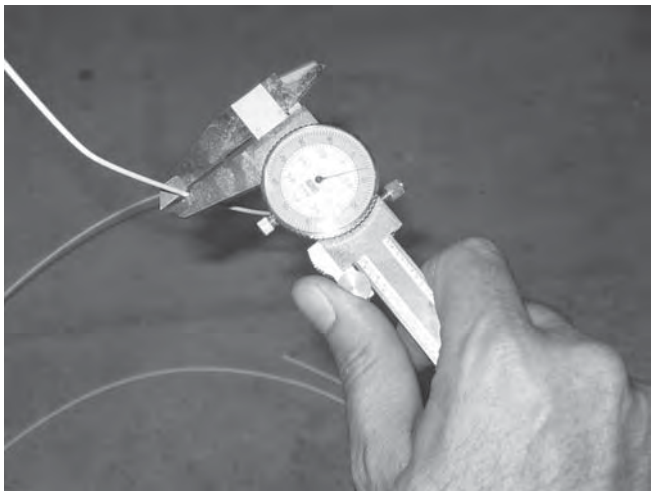
7. Quickly turn off the auger rotation, unplug the nozzle connectors, remove any plastic that is protruding from the pipe, screw the nozzle onto the pipe, reconnect the nozzle connectors, plug the heater circuit back into the mains, and re-start the auger rotation.

8. See "EXTRUDING" section

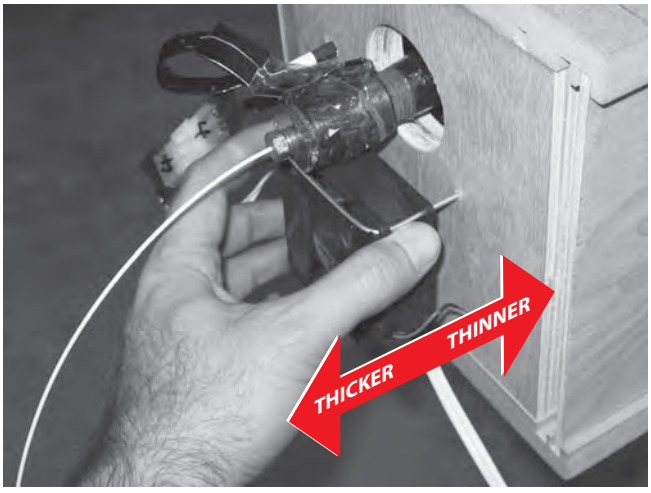
EXTRUDING

1. Make sure the floor area under the extruder head is smooth and flat. The extruded filament strand will begin to gently coil on its own, and is best left undisturbed. Expect extrusion rates of 20-24 inches per minute.

2. Many variables can affect the diameter of the extrusion including ambient air temperature, air currents in the room, the height of the extruder from the floor, humidity, etc. After several feet have been extruded, check the diameter of the strand with calipers.



3. Use the front mounted nozzle fan to make fine adjustments. Pull the fan OUT for a thicker filament. Push the fan IN for a thinner filament.



SHUT DOWN

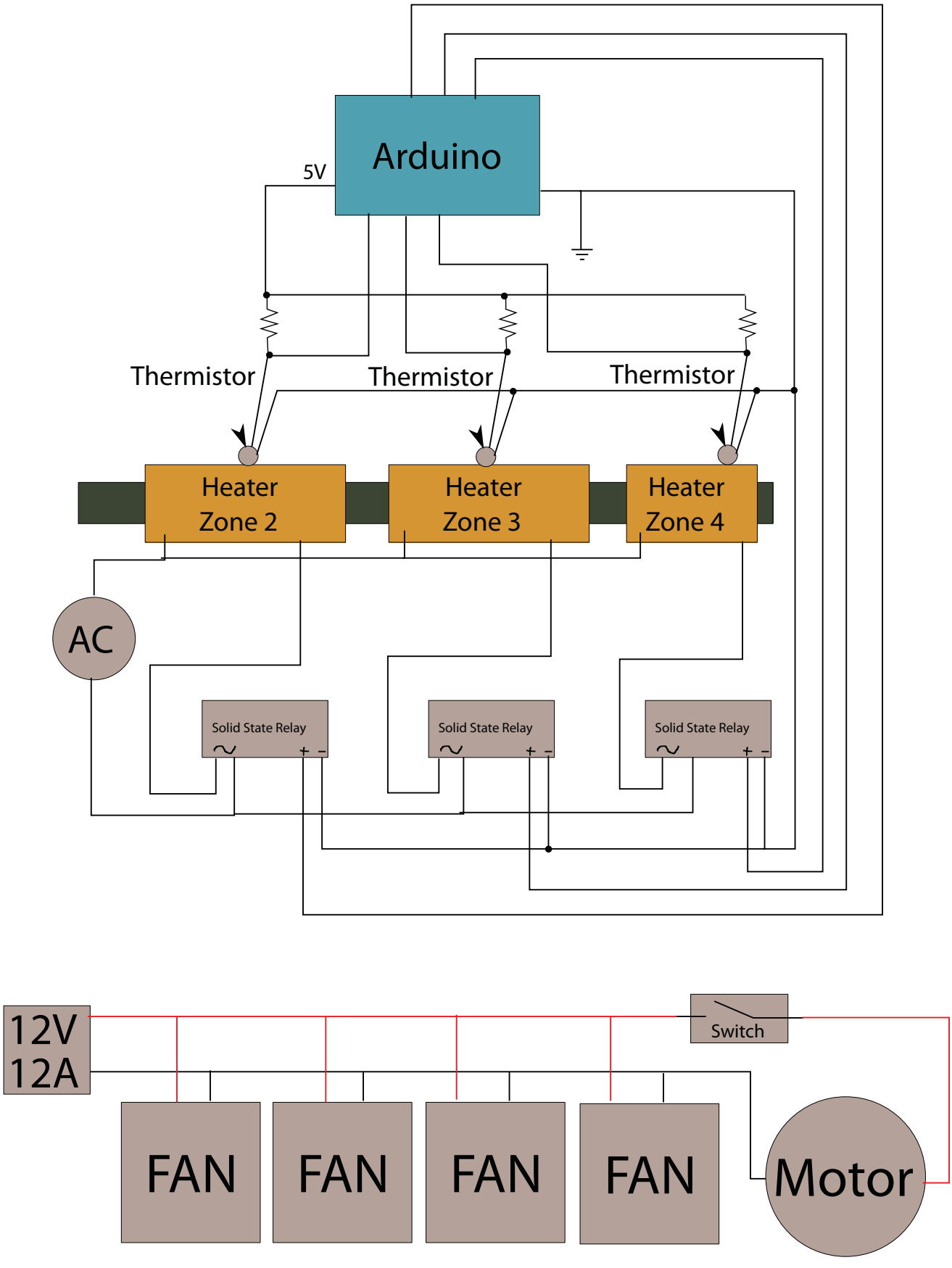
1. Unplug the heater circuit from the mains.

2. Remove the nozzle and squish a forked metal object (such as a pair of slightly open needle-nose pliers) deep into the soft plastic

3. Let the motor run until the hottest area of the pipe is below 100°C (monitor temperatures using the Desktop Commander software).

4. When the plastic in the nozzle is nearly hard, but still quite hot, pop the whole slug out of the nozzle in one piece. If it has cooled down too much and it's fully hardened, it usually can be unscrewed it in one piece

WIRING DIAGRAM



BILL OF MATERIALS

Motor/Auger Assy.				
	qty	total cost		
12VDC surplus motor	1	$59.99	SurplusCenter.com #5-1748	surpluscenter.com
5/16" Socket	1	$1.80	GlobalIndustrial.com #T9FB641193	globalindustrial.com
Socket Adapter	1	$10.00	custom machined	
roll pin	2	$0.14	98296A926	mcmaster
1/2" flat washers	2	$0.15	91081A033	mcmaster
1/2" auger bit	1	$23.97	Irwin Speedbor #3043005	home depot
3/8" clamping shaft collar	1	$1.99	6435K13	mcmaster
thrust bearing cage	1	$2.91	5909K31	mcmaster
thrust bearing washer	2	$1.96	5909K44	mcmaster
SUBTOTAL		$102.91		
Extrusion Barrel				
large T-joint 1x1x1/2	1	$6.05	44605K379	mcmaster
3/8"x2.5" steel pipe nipple	1	$1.47	44615K443	mcmaster
3/8" steel floor flange	1	$5.11	B0058DQJK4	amazon
3/8"fpt x 1.5"mpt adapter	1	$2.92	44605K267	mcmaster
1/2"fpt stainless coupling	1	$5.41	4464K354	mcmaster
1/2" x 10" seamless sch 80 pipe	1	$9.22	7727K205	mcmaster
1/2"fpt x 1/8"fpt coupling	1	$7.74	4464K434	mcmaster
1/8"mpt end plug	1	$0.96	50785K334	mcmaster
large plastic pipe adapter m/m	1	$2.88	46885K307	mcmaster
large plastic pipe coupling f/f	1	$0.86	4880K85	mcmaster
SUBTOTAL		$42.62		
Housing				
5x 7" square 12mm plywood		$1.15	166073	home depot in OK
4x 1/4-20 x 3.5 hex bolts		$0.74	91236A556	mcmaster
4x 1/4" fender washers		$0.02	91090A108	mcmaster
4x 1/4" plain washers		$0.09	90126A029	mcmaster
4x 1/4" spring washers		$0.07	91102A029	mcmaster
4x 2.25" by .25" diam dowels		$0.06	amazon	amazon
wood glue		$0.10	estimated	various
4x 10-24 tee nuts		$0.35	90975A042	mcmaster carr
4x 10-24 flat head screws		$0.21	90273A245	mcmaster carr
various boards		$5.00	?	
various wood screws		$2.00	?	
SUBTOTAL		$9.79		
Electronics/Heaters				
Arduino leonardo	1	$19.96	DEV-11286	sparkfun
nichrome wire 32awg 50'	1	$0.63	8880K32	mcmaster
kapton tape	1	$0.95	Super wide	makerbot
4x solid state relays	4	$15.84	COM-10636	sparkfun
resistors	4	$1.06	RN55C1501BR	mouser
thermistors	4	$5.88	B57560G104F	mouser
2ft high-temp wire	1	$3.56	602-3112010-100	mouser
2.5ft low-temp wire	1	$0.10	602-882205-100-09	mouser
wall outlet plug	1	$1.66	562-221001-08	mouser
power connectors	3	$0.87	571-7703401, 571-7703421	mouser
power connector pins	6	$0.70	571-7940181, 571-7940191	mouser
thermistor connectors	4	$2.01	737-ADC-002-1, 173-5521-ST-EX	mouser
Fans	3	$11.70	670-OD8025-12HSS	mouser
SUBTOTAL		$64.92		
TOTAL		$220.24		