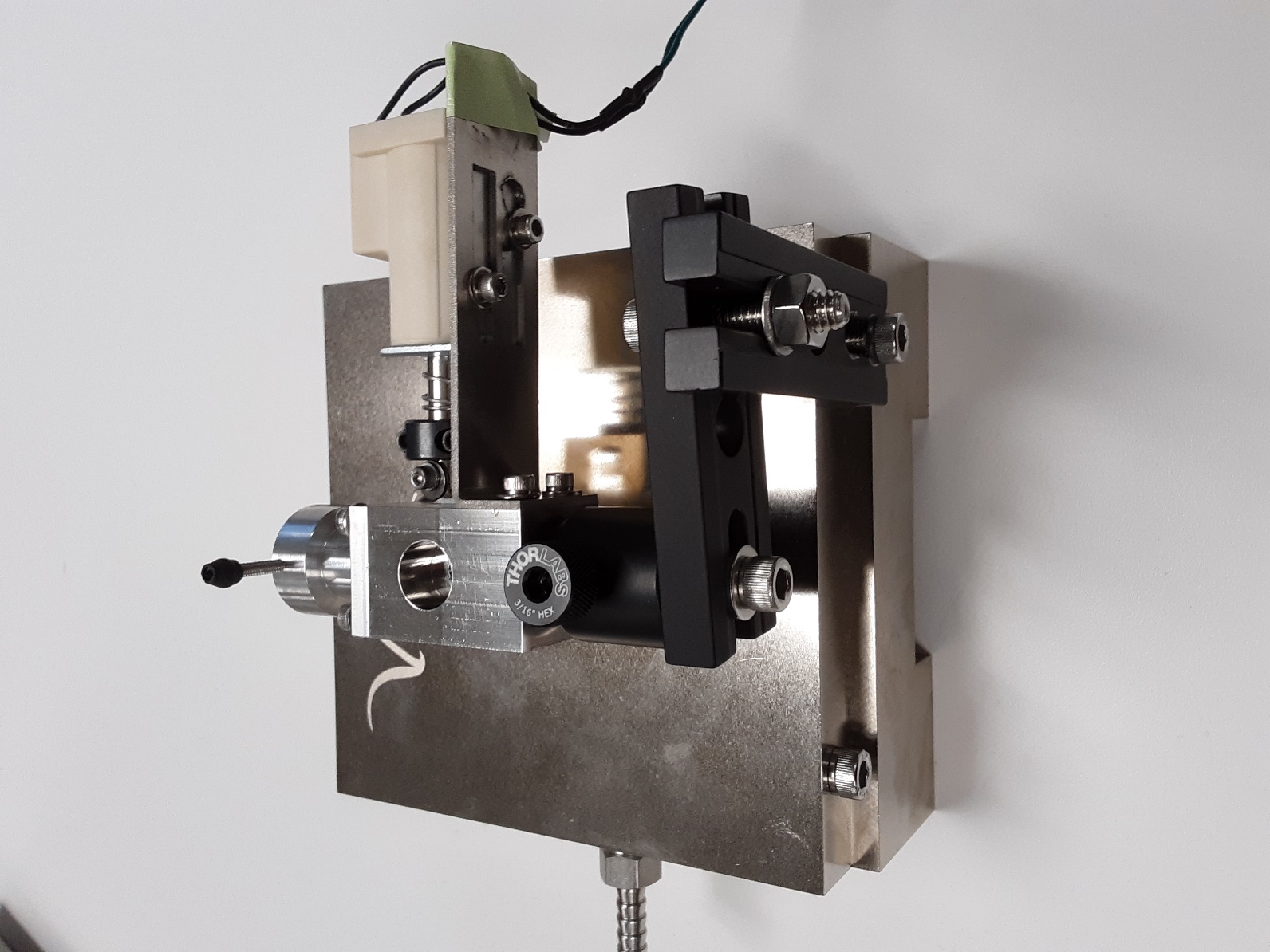
The following is a description of the SPME-DART device components and wiring as constructed and operated on an Orbitrap system. Knowledgeable people may find it useful to modify particular specifications for their needs. You may compare and contrast this Restek Arrow-compatible system with the system designed to be compatible with 10 mm long Supelco SPME fibers (<https://pubs.acs.org/doi/full/10.1021/acs.analchem.9b05691>). The actual DART interface, circuitry, and actuator assembly are unchanged from the earlier work, though there are helpful updates to the eMachineShop CAD diagrams. The different hardware here is the Restek-compatible cap to the DART interface and the fiber syringe. Write to G. Asher Newsome at [newsomeg@si.edu](mailto:newsomeg@si.edu) with questions or to borrow an intact system for a collaboration.

**Interface block, cap, and actuator mount**

* “block”: spme block 2.8.ems
* “cap”: spme block 2.5 cap restek arrow.ems
* spme actuator mount.ems

The cap guide for a Restek Arrow syringe is bolted onto the top of the interface block with four 6-32 screws with washers, and the actuator mount is bolted to the side with two 6-32 screws. The block and assembly can be mounted by the ¼-20 screw ports on either the base or the rear of the block (the second port serves as an additional vent). If the block is mounted from the bottom, the set screw must not be so deep as to be impacted by a fully-deployed Arrow fiber. A finger-tight 4-40 set screw on the cap is used to hold the Restek injection guide in place while the Arrow fiber is deployed into the interface from the syringe. (The set screw in the CAD diagram has been rotated 90 degrees from the prototype pictured here.) Arrow fibers should always be deployed in the interface once before conditioning and sampling to visually check the “height” of the stationary phase is properly aligned with the DART cap orifice when the fiber is set to desorb either end.

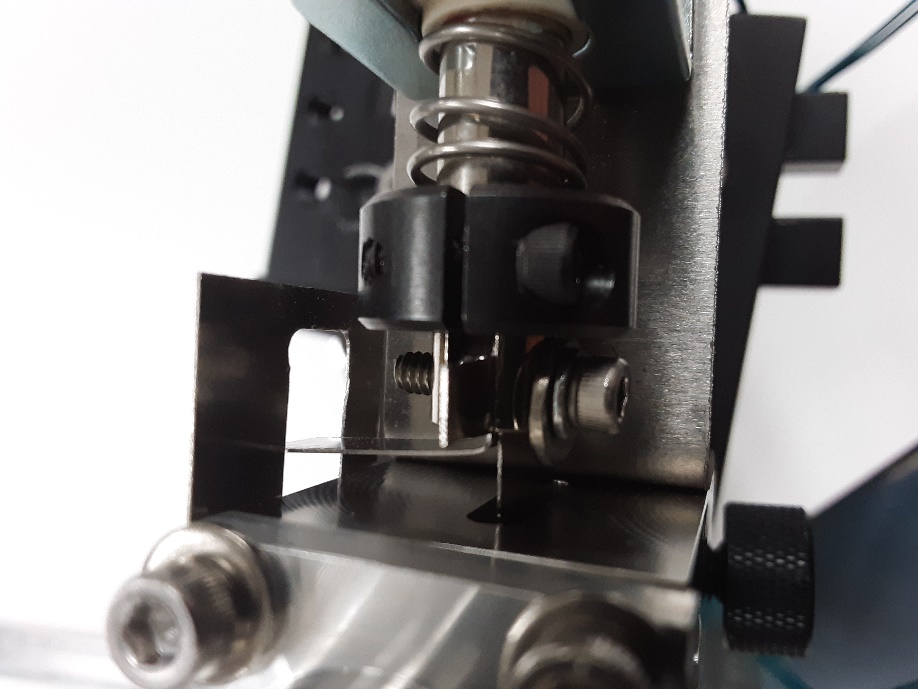
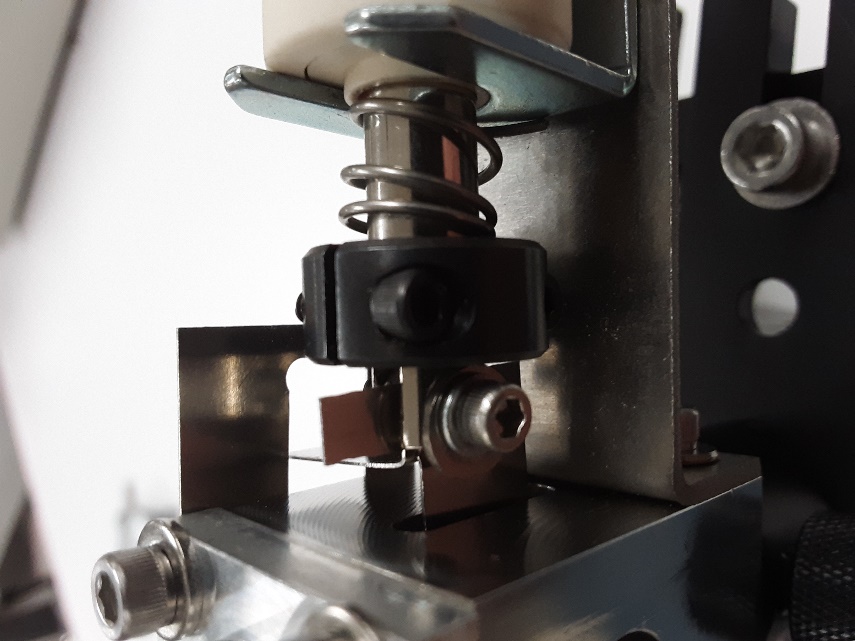


**Shutter Actuator**

* Push-pull actuator DSOL-0844-24 (or other appropriate voltage matched to supply)
* 302 Stainless Steel Compression Spring, 1.875" Long, 0.438" OD, 0.368" ID
* Clamping Two-Piece Shaft Collar for 5/16" Diameter
* dc voltage supply; laptop computer ac/dc converters are particularly cheap and easy to match to the actuator voltage

The shaft collar is fitted around the plunger immediately behind the fork. The compression spring must be clipped to approximately 11-12 mm long. The spring goes around the plunger in between the actuator body and the shaft collar.

The shutter vane is connected to the plunger with a bolt through the 1/8” orifice in the fork and held with a nut. A plunger travel guide may be a useful addition to the assembly, to keep the shutter from rotating in the 1/16” SPME interface slot. There is a threaded port on the rear of the block above the transfer tube to attach the stationary part of a guide. The guide pictured below (no CAD diagram) is made from the same material as the shutter vane.

The underside of the actuator, with shutter vane and spring in place, is bolted with 4-40 ¼”-long screws and washers to the mount, which is itself bolted on the side of the block interface. The exact position of the actuator on the mount (and perhaps the spring length, or shaft collar position on the plunger) should be adjusted for proper plunger motion. Too little spring strength for the actuator position will cause the shutter to close incompletely; too much will cause the returning plunger to bounce off the side of the block into an open position.

**Syringe**

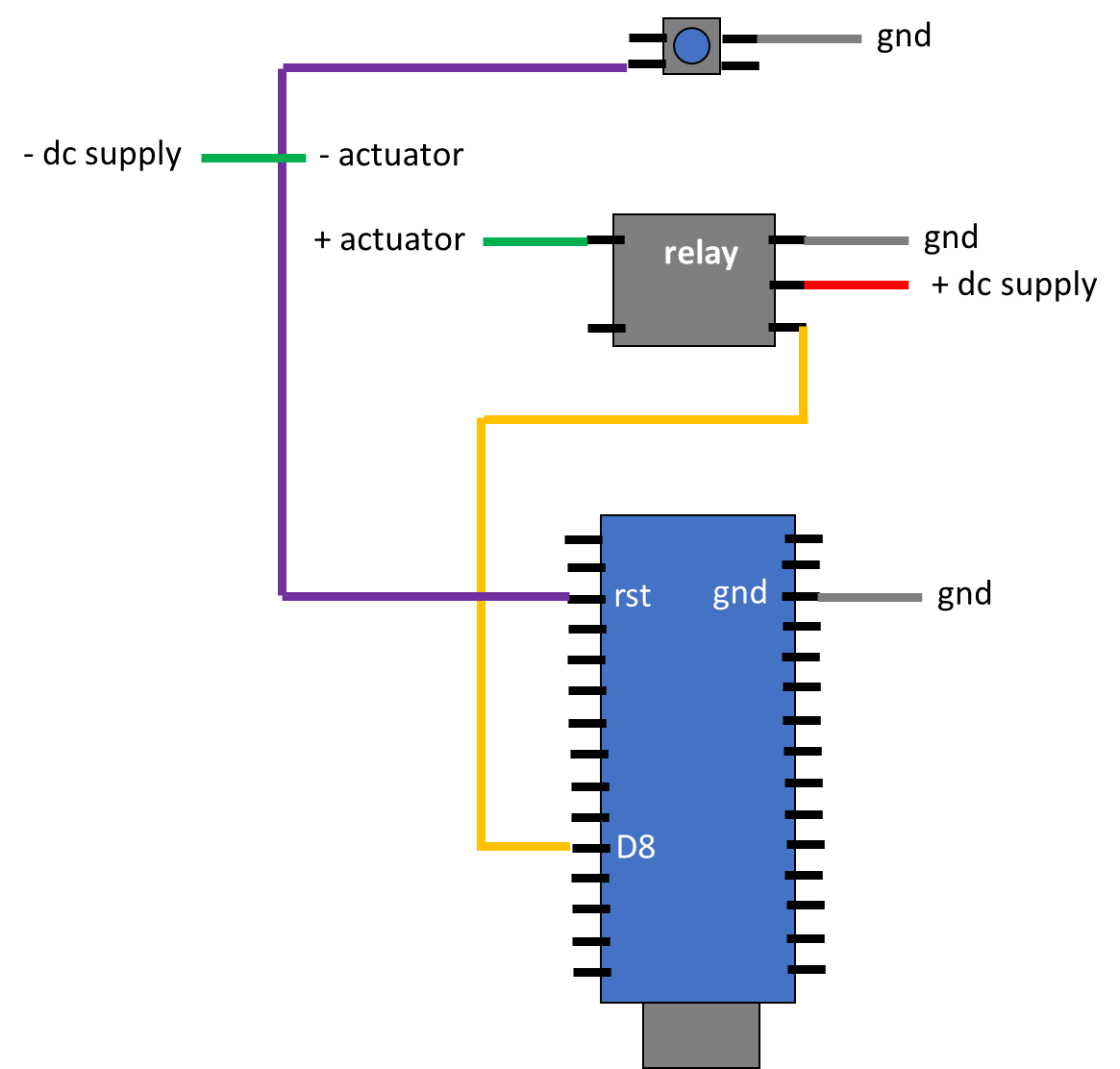
* Arrow syringe\_manual + DART\_rotate.ems
* Two washers, 0.125" ID, 0.25" OD

The washers should be placed around the needle underneath the screw-on cap to ensure the needle plunger is not loose within the syringe assembly. The large inner diameter screw shaft collar should be even with the base of the central channel on the syringe shaft. When deploying the Arrow fiber for sampling for DART desorption, the set screw should rest firmly against the base of each notch. The set screw is rotated through the side slot to change between sampling and DART desorption.

**Wiring diagram**

* Arduino Nano (powered by USB connection, or 5 V dc supply)
* relay (ORWH-SH-112D1F)
* momentary push button

This circuit was built on a test board. Contact closure for the mass spectrometer is also recommended for wiring to momentary push button but is not shown.



**Arduino script for pin D8 control**

const int TTL\_pin = 8; //Use anything other than 13 - because that one has a LED, it has a non zero resistance

const int LED\_pin = 13; //Just for a visual indication when the TTL has a HIGH signal

const float Duration = 2000; //Indicate the time period for which the TTL should be on HIGH (in ms)

// the setup function runs once when you press reset or power the board

void setup() {

//Initialize the serial port just in case you want to monitor it

Serial.begin(9600);

// initialize digital pins as outputs.

pinMode(LED\_pin, OUTPUT);

pinMode(TTL\_pin, OUTPUT);

digitalWrite(TTL\_pin, LOW);

digitalWrite(LED\_pin, LOW);

Serial.print("contact closure is: ON ");

delay(5000); // wait for the defined number of milliseconds after contact closure

// write the TTL pin for a certain duration

digitalWrite(TTL\_pin, HIGH); // turn the TTL on (HIGH is 5V)

digitalWrite(LED\_pin, HIGH); // turn the LED on

Serial.print("TTL trigger is: ON ");

delay(5000); // wait for the defined number of milliseconds

digitalWrite(TTL\_pin, LOW); // turn the TTL off (LOW is 0V)

digitalWrite(LED\_pin, LOW); // turn the LED off

Serial.print("TTL trigger is: OFF ");

delay(1000); // wait for the defined period

}

// the loop function runs over and over again

void loop() {

}