Setup Guide

Parts of the setup and their respective Detachable and Movable components

* Main Body
  + Petri dish + Threaded holder
  + Flexible spring collar
  + Removable roof of Perspex body
  + Linear bearing + Casing
  + Moving rod + Neodymium cylindrical magnet
  + 4Ω copper coil (Fixed in position)
* Amplifier + Power Supply Unit
* Signal Generator

Signal Generator

Main Body

Amplifier

Power Supply Unit

Steps to dismantle the setup

1. Remove all wired connections to the main body i.e. Coil wires to the amplifier
2. Empty the Petri dish if silicone oil is present (Use a syringe to empty it into a bottle)
3. Turn the dish to unscrew it from the rod head, place it somewhere on a table
4. Unscrew the spring collar using a flat head screwdriver (Be very sure to do this before removing anything else. Countless flexures have been broken because I accidently missed it)
5. Now unscrew the four screws on the Perspex roof in the corners and lift the roof off the body
6. The rod can be removed now
7. If there are any damage to individual components, they can be replaced and worked on separately

Operating Amplifier and PSU connections

* All black wires on the PSU are ground wires, hook up the -ve of the amplifier to any of the black wires. The +ve wire should be hooked up to any yellow wire which carries +12 volts
* The signal generator output has a polarity so hook up the input accordingly so that you can control the volume using the right speaker knob or the left speaker knob
* The third knob on the amplifier is the master volume knob, make sure its at zero when the system is powered up
* In order to power up the PSU, the green wire needs to be grounded hence, connect the green wire slot to any black wire slot

Creating Droplets and controlling their motion

* Fix the frequency at 50 Hz and slowly drive up the amplitude using the knobs on the amplifier and at some point, Faraday waves appear on the surface. From here slowly reduce the amplitude where the waves disappear. This is the range of amplitudes where droplet behavior can be observed.
* The intermediate state between Faraday instability and no instability looks like a ring of instability around the edge of the dish and no instability in the center.
* Simply pluck the surface by a sharp object such as an uninsulated wire or a toothpick. Different sizes of droplets form depending on the speed of the pluck and how much below the surface the pick is taken. We have not collected any data on the droplet sizes so keep experimenting with different sizes to see which works.
* To observe different droplet behaviors try driving droplets from one phase to another, meaning create the droplet in the range with no instability and slowly drive the amplitude to intermediate range for example.

Troubleshooting and Tips

* The setup still has many internal vibrations due to parts which are not properly fixed in place (Coil spool is stuck with double sided tape, Perspex roof screws are loose, Petri dish needs to be firmly attached to the holder). To reduce outer body vibrations, the setup can be mounted to the optical bench using the screws. This greatly reduced the vibrations directed towards the dish and helped in leveling the setup.
* It is recommended to run the system in bursts of 10-20 min because the coil heats up and becomes too hot which causes the double-sided tape to lose adhesive power and the spool starts to wobble more
* If the setup is running with lower power or not running at all, redo connections
* If any part with screws breaks and needs replacement, for example the flexible spring collar, then create the new part and make sure to thread the part carefully using the screw taps. Make sure the base and the part in fixed contact when threading so that it remains continuous.