

Canon Camera

Reverse Engineered by William Joanes

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Parts list

I will reverse engineer a Canon PowerShot S70 camera. I chose it because a camera will be more interesting to reverse engineer than a phone, for example, because the moving parts mean that there will be mechanical and optical aspects to explore (as well as electronic)

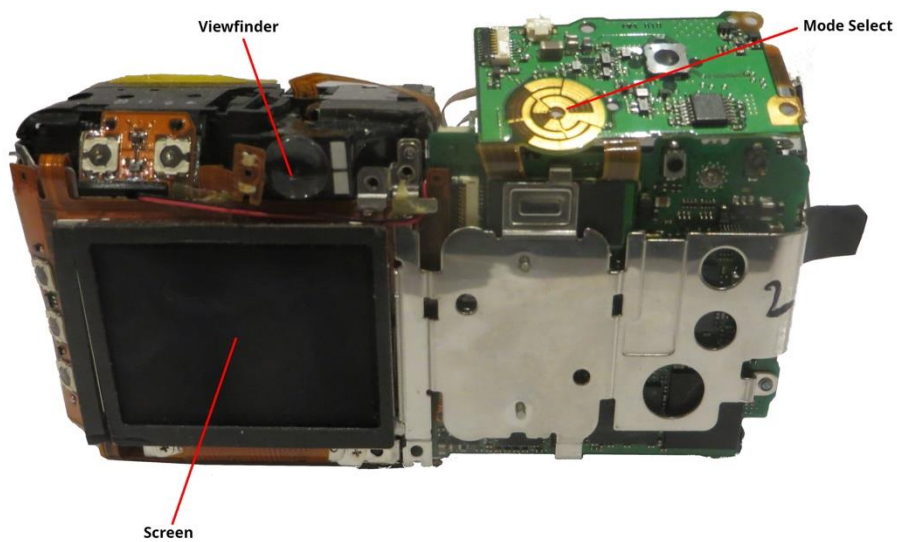
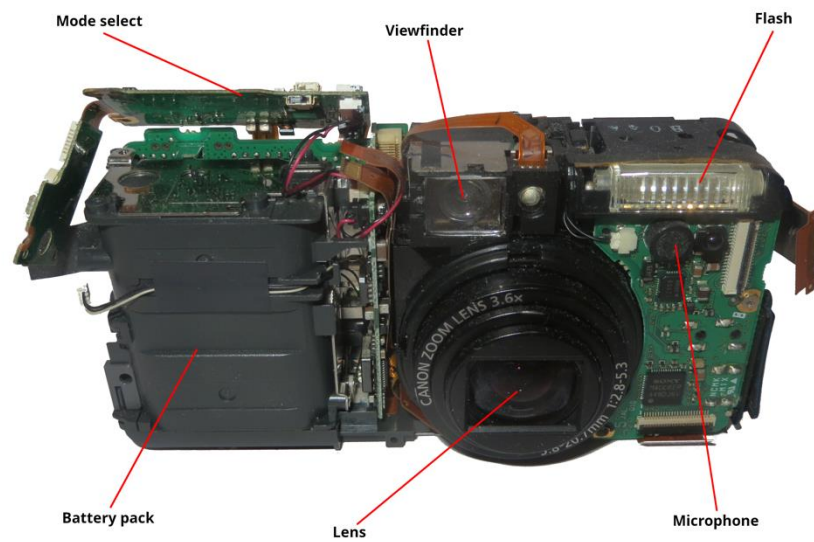


To deconstruct the camera, I used the Rolson 9-in-1 precision screwdriver. The camera screws have PH000 heads



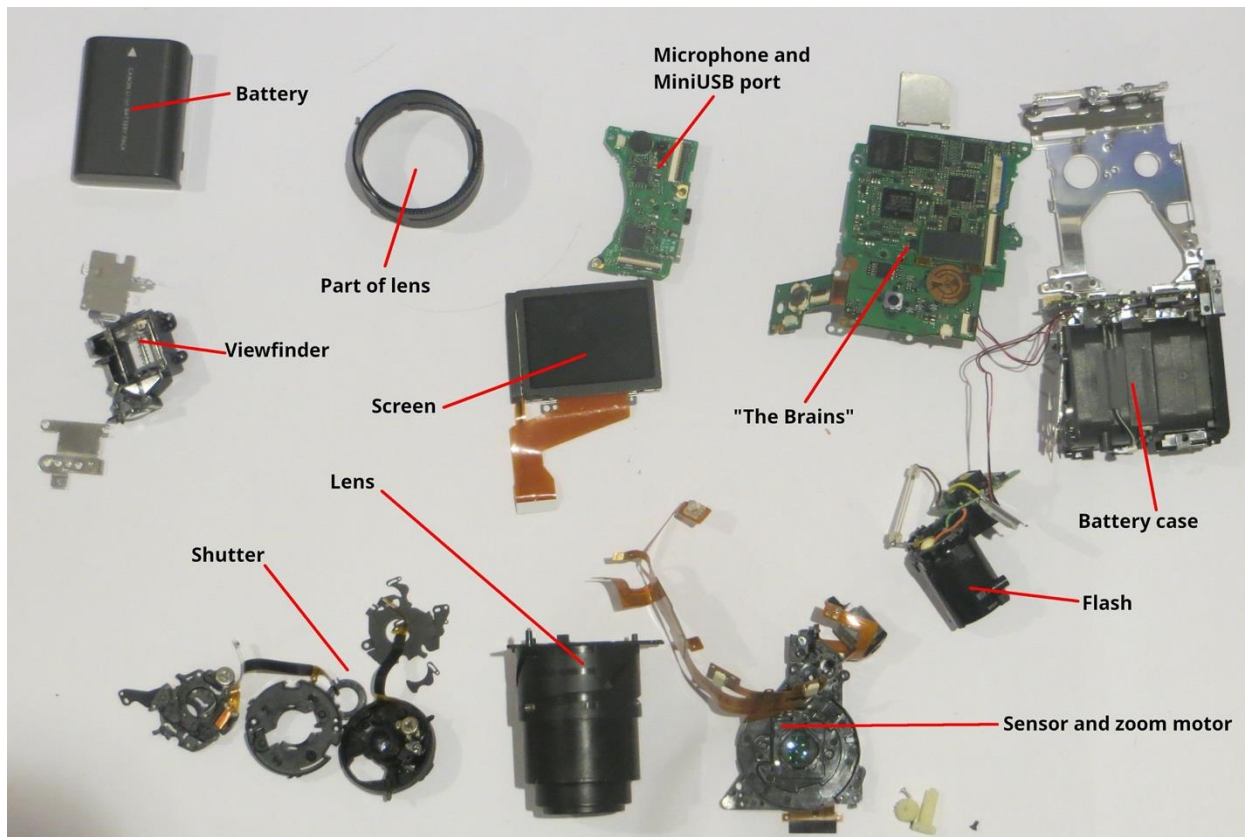
Reverse engineering

Removing the outer metal casing, the different parts of the camera are clearer:



From here, taking the camera apart is just a matter of unscrewing screws.

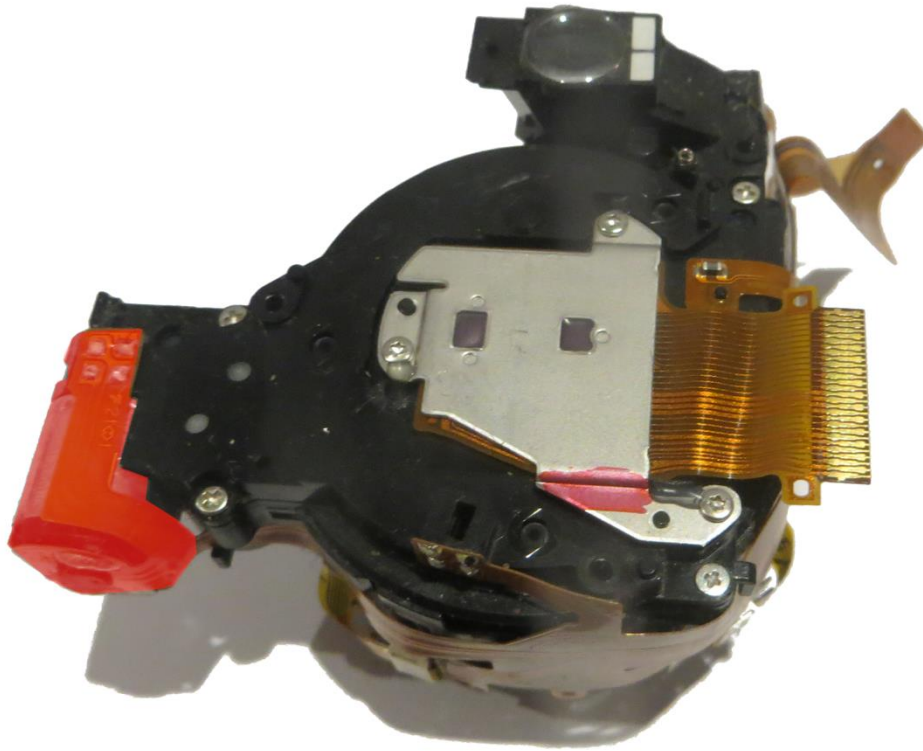
Now that all of the camera parts are separate, I have identified them:



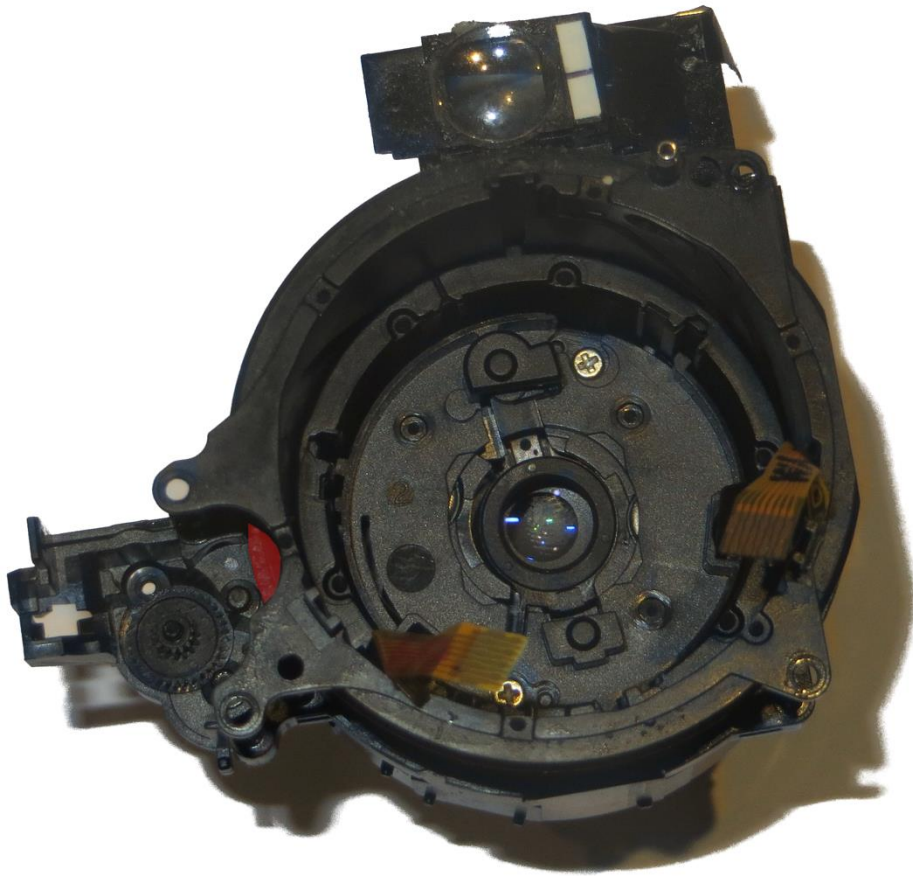
It is now relatively easy to unscrew the metal plates to release the lens and viewfinder



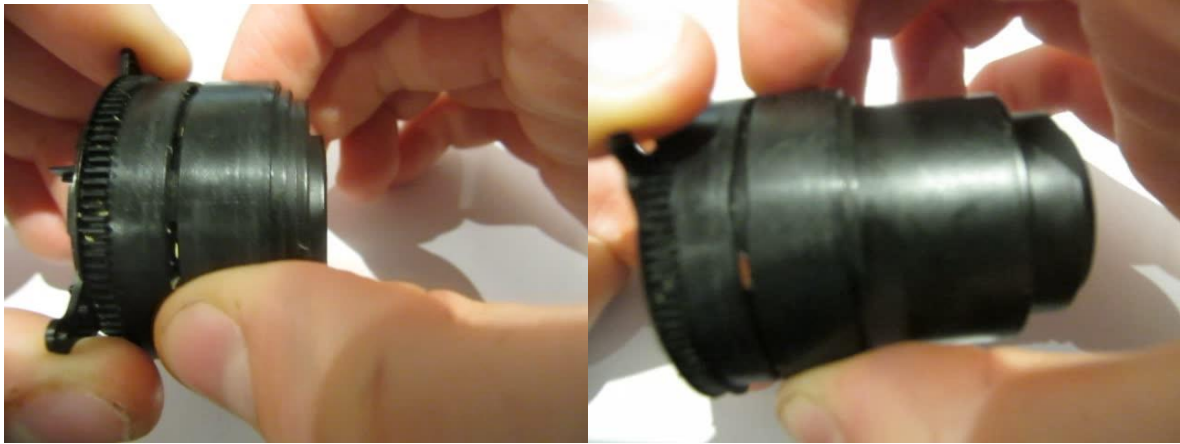
On the back of the lens is a metal plate which holds the camera's sensors. Highlighted in red in this photo is the motor which drives the movement of the lens



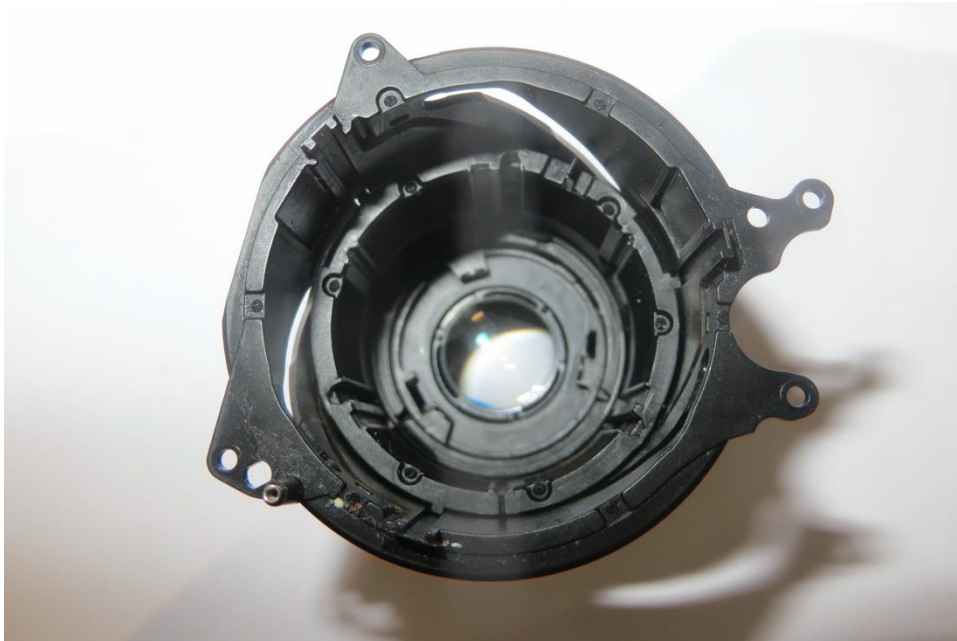
Taking off the metal plate which holds the sensors, the actual lens is visible from the inside (I have also removed the motor; the cog which actually makes the lens move is highlighted in red):



It is still not possible to see through the lens because the shutter is closed, but if the motor housing and viewfinder are removed, the cog which moves the lens can be turned:



And when the part containing the shutter is removed, light can pass through the lens:



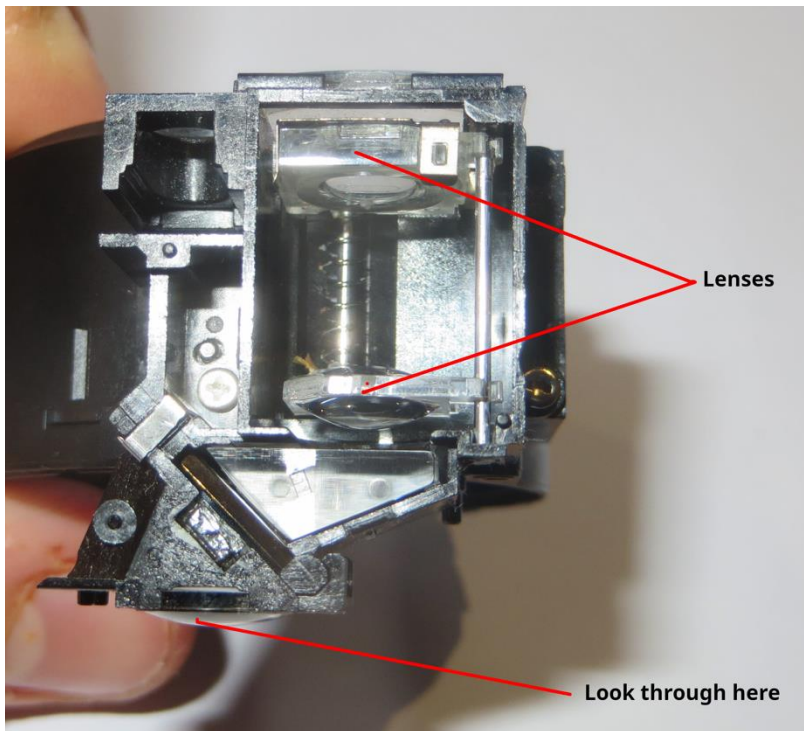
The shutter has an interesting system where 2 small parts move outwards at once:



It has another part containing 6 thin sheets which move outwards:

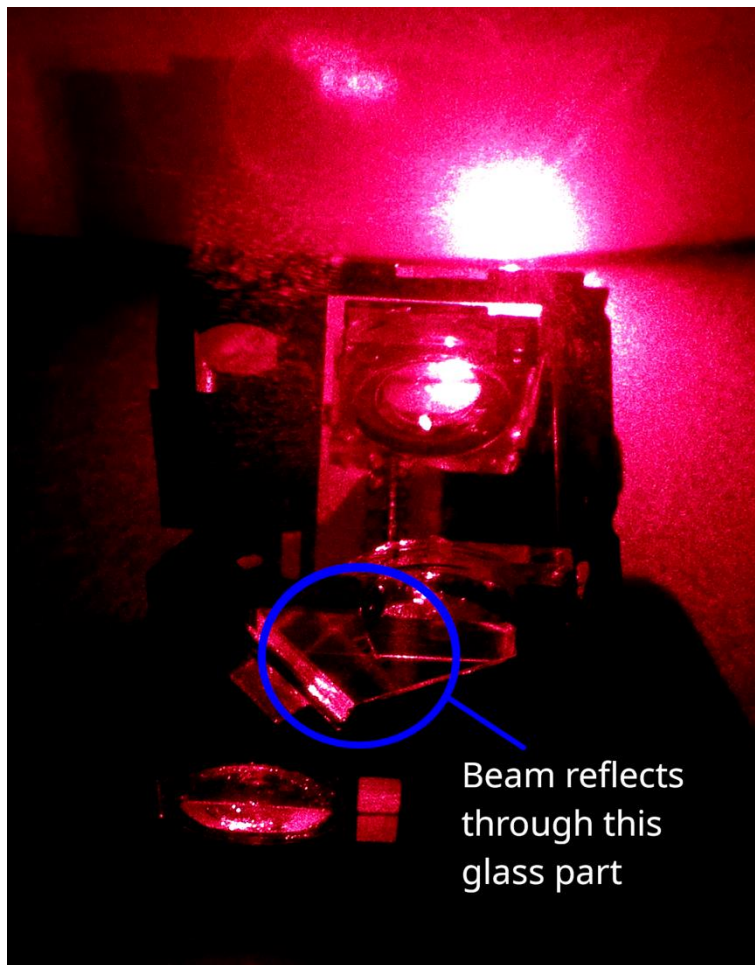


The viewfinder is also optically interesting. This is what it looks like:



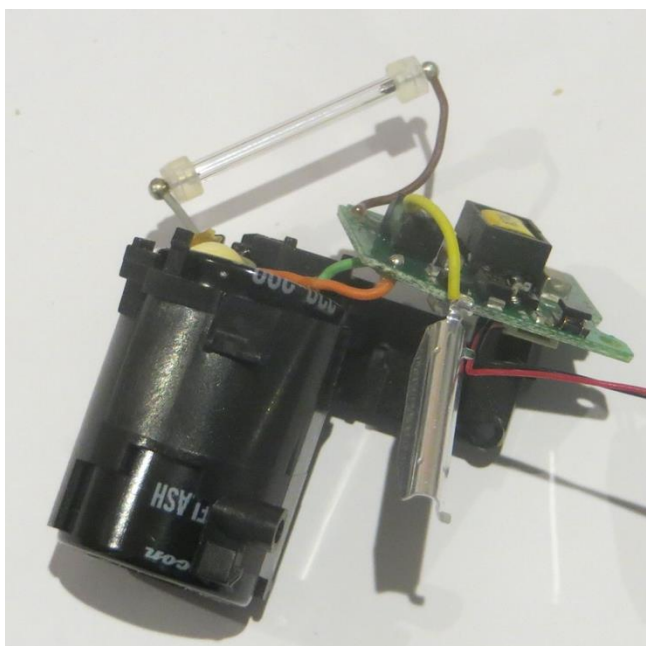
There are two lenses; the top lens controls magnification and the bottom one controls focus. Below the bottom lens is a glass part. To work out how a light beam reflects through this, we can shine a laser through it.

I have used a red laser, and it is now clear how the glass component works.



The function of the glass component could be to correct an effect of the lenses (for example the image being upside-down) or to make the image appear as if it were from in front of the lens and not the viewfinder.

The flash of the camera is also worth looking at. It contains a capacitor and a glass tube.



The capacitor has a capacitance of $200\mu\text{F}$. When the flash is required, the capacitor is charged then suddenly discharged through the glass tube. The glass tube contains xenon gas, which produces light when the electricity flows through it. This discharge creates the sudden bright flash.