



# SX70R Mark II Modification Manual

\*Very important note added →PAGE 8

## ⚠Important Tips and WARNING

This information is for training purposes only. This information does not make express or implied, written or oral performance commitments on product performance. The content involved in this information requires professional skills, and the operator should be evaluated before proceeding. Otherwise, it will cause operation failure and damage to personal safety, which is very dangerous. This document will not make any explicit or implied, written or oral (Including but not limited to the above) security guarantee, the loss caused by this, no responsibility and compensation, please note.

### Tools To Be Prepared

Soldering Station with Small-K pen. (ESD SAFE*)	 The image shows a black soldering station with a small-K pen. To the left, a diagram illustrates ESD grounding: a red circle with a white 'C' and a red square with a white 'G'. A red arrow points from the text '必须具有接地功能' (Must have grounding function) to the 'G' symbol.
Tweezers (ESD SAFE*)	 The image shows a grey, textured protective case for tweezers. The case is open, revealing five pairs of tweezers with black handles and silver tips, each stored in its own individual compartment.
Screwdriver in 1.2mm square shape	 The image shows a black screwdriver with a 1.2mm square shaft, lying horizontally on a light-colored surface.
Screwdriver extension (optional)	 The image shows a red screwdriver with a silver extension, lying horizontally on a white background.

ESD wristband	
Black tape	
Multimeter (recommend)	

\* Note that the soldering station must have a grounding (ESD SAFE) function, and the tweezers must be insulated, otherwise the circuit board may be damaged, which is very important.

## ● Preparation and Confirmation Before Installing

A. AC socket grounding must be reliable.

B. ESD wristband must be wear and grounding.

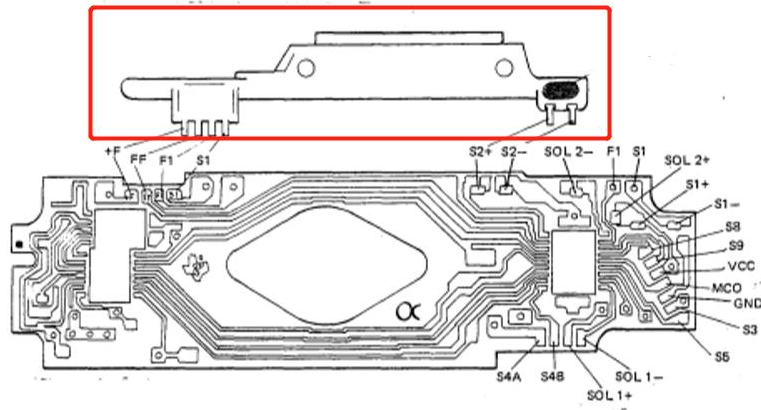
C. Temperature of soldering station must be accurate ( $\pm 5^{\circ}\text{C}$ )

Remove a total of four screws (use the square screwdriver in the table) on the left and right side of the fuselage, and keep them in a safe place.



## ● FFA Confirmation **(Manually Focus Camera Only)**

SX-70, including the original model, MODEL2, ALPHA, ALPHA1, ALPHA1 MODEL2, etc., on its flash FPC circuit board, there is an IC used for triggering the flash. This IC has been improved many times, so different models have different flash trigger types, the IC is installed on the socket inserted into the flash FPC and its accessory components, called FFA, as shown in the picture below:

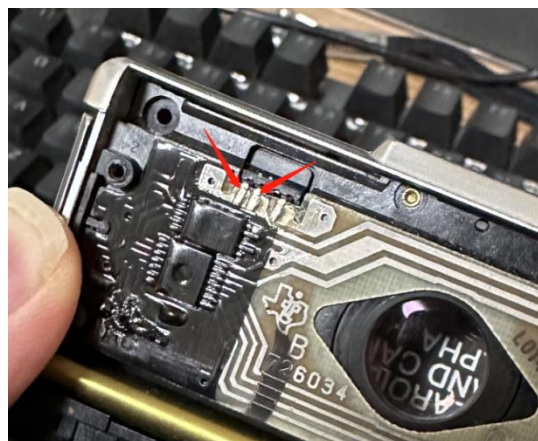


So, before installation, you need to confirm the type of FFA, otherwise it will cause failures such as failure to trigger the flash. There are three types of FFA: high-voltage trigger type, low-voltage trigger type, and thyristor type. You need to confirm the FFA type before installing the circuit board. Here are how to do:

**Step1:** Before remove the old board, insert a empty 600 film pack with fresh battery, remove four screws, then place the head of camera on the deck of camera .



**Step2:** Insert a flash like MINT Flash Bar, when flash **ready**, short two pins show below with a metal tweezer, that is, the first pin and the second pin of FFA

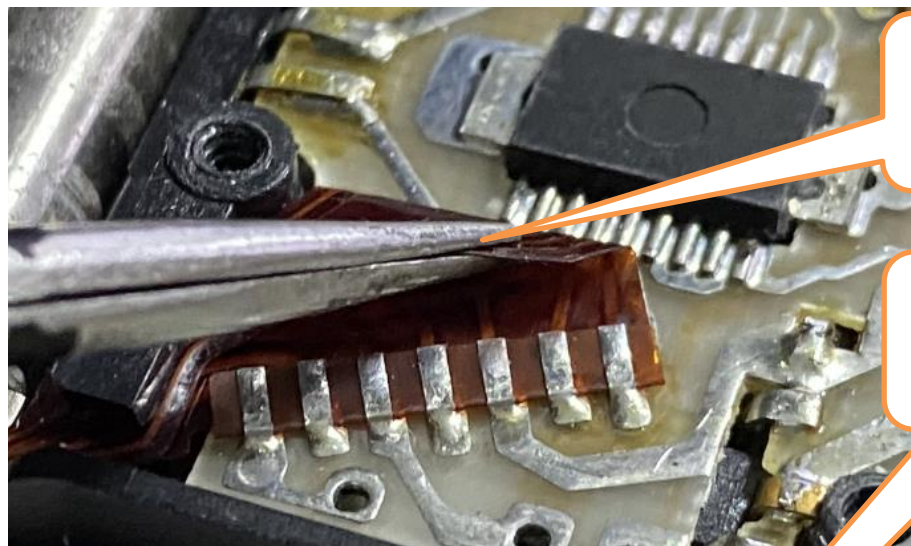


**Step3:** Does the flash fire? Fired——**Set A**, Not fired——**Set B** (showed as below)

## ● Modification and Precautions

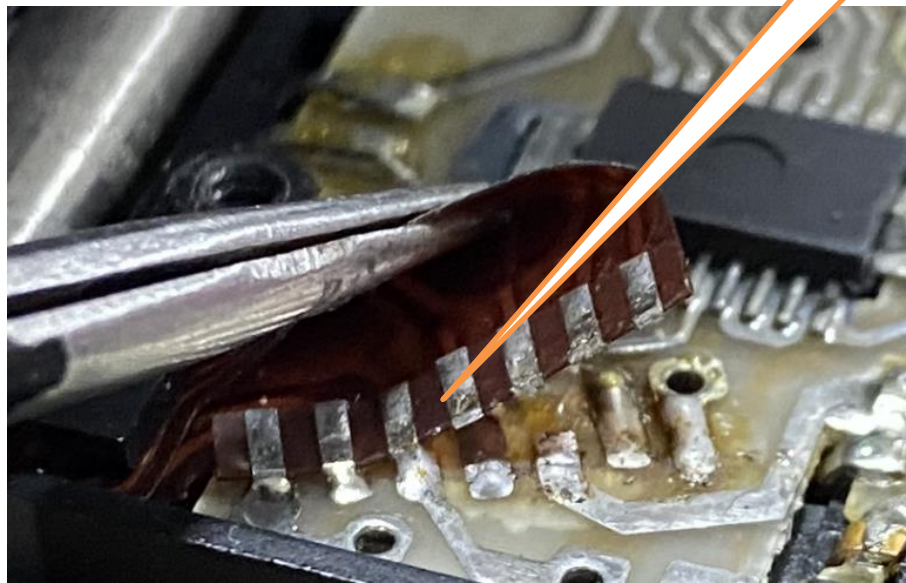
**Step1:** Adjust the soldering station to 280 degrees Celsius, then use tweezers to hold the cable, and desolder the pins of the cable pin by pin until all the pins are completely separated from the machine head.



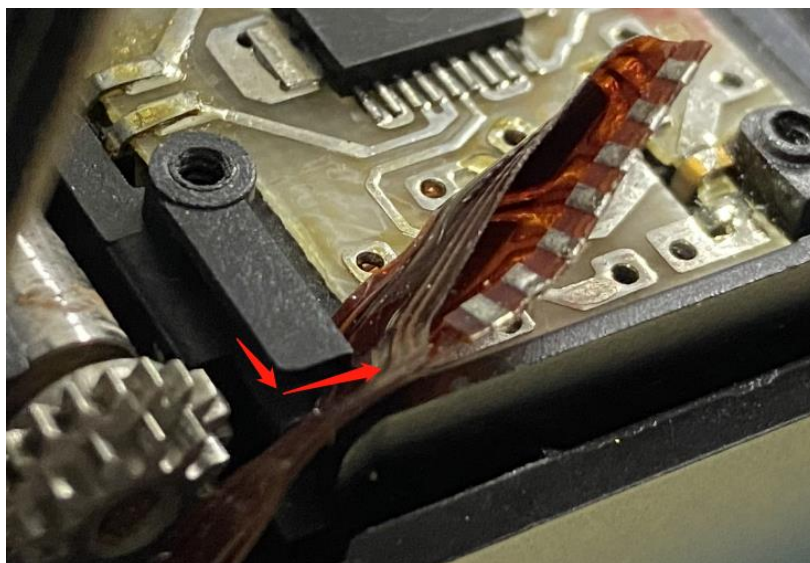


Hold here

Pin by pin

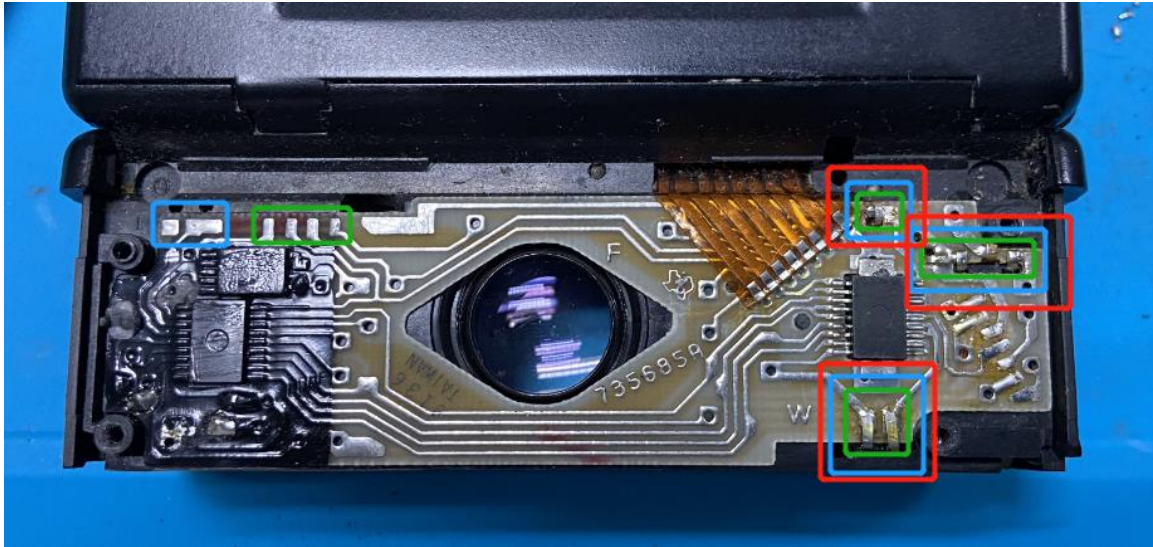


**Step2:** Slide out the cable.



**Step3:** Pins to be desoldered:

- A. **SX70 camera without sonar module** need to desolder the pin in **GREEN**.
- B. **SX70 camera with sonar module** need to desolder the pin in **BLUE** and the flex cable.
- C. **680** need to desolder the pin in **RED** and the flex cable.



Note: The pins need to be desolder and pull to a vertical position and separated from the solder pad.



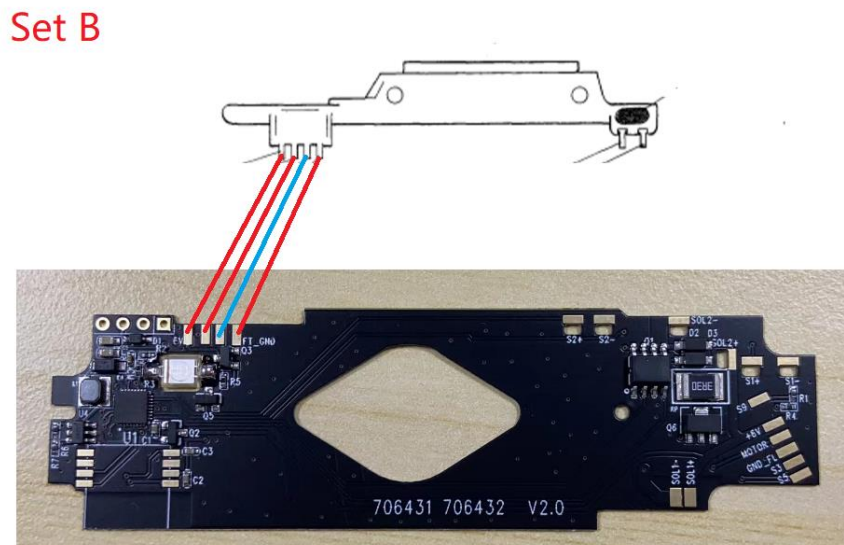
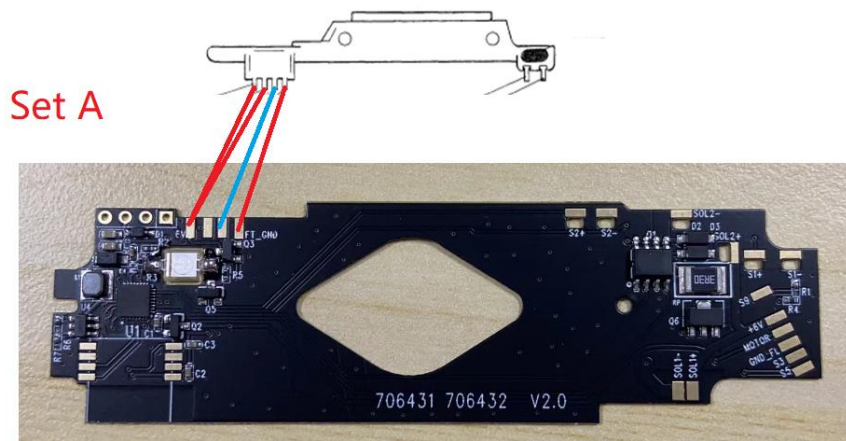
**Step4:** Totally remove the old PCB. **IMPORTANT NOTES:**

- 1.No conduct between SOL2+ and S1+.
- 2.No conduct between SOL1+ and SOL1-.
- 3.DO NOT apply a power source to the board which is higher than **6.5V**
- 4.Solenoid with 4pins **MUST** be convert to 2pins (refer to appendix).
- 5.The camera which comes with a metal frame, please apply a tape between the metal frame and the 4 pins (for firmware update) for isolation.



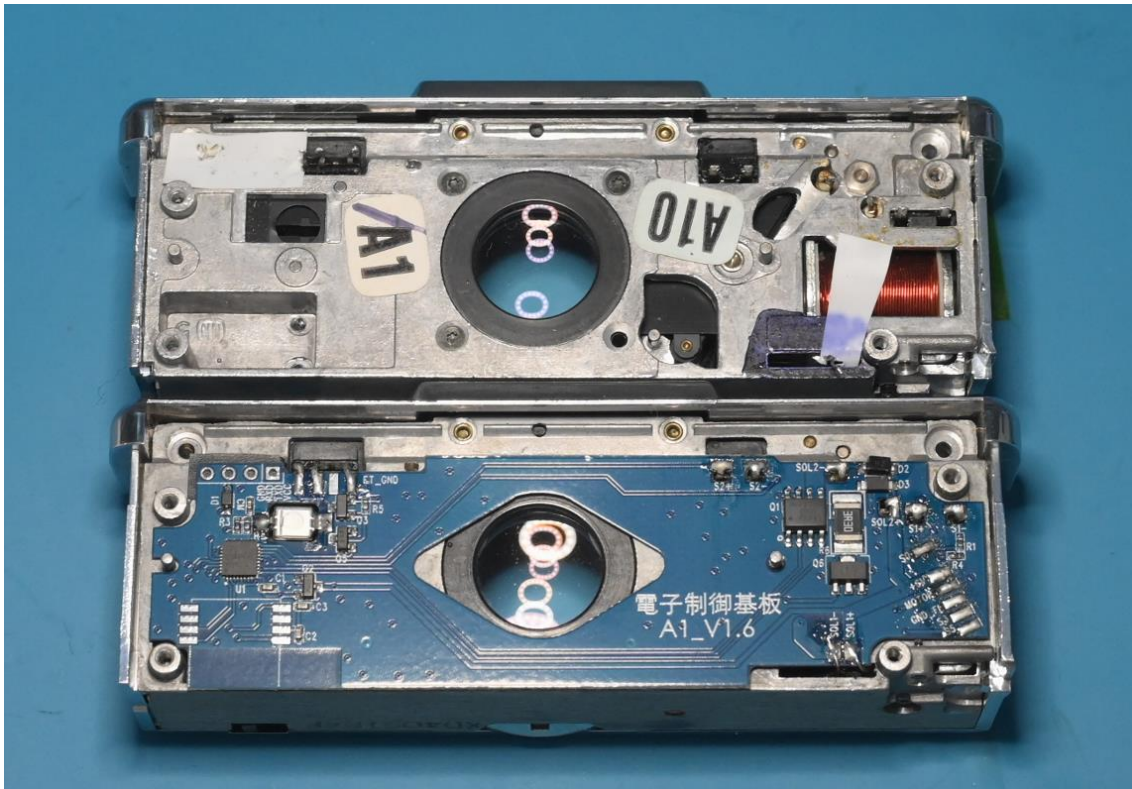


**Step5:** According to the FFA type (A or B) tested in the "FFA Confirmation" chapter, solder the FFA pins as below, set A and set B, in different pin connection. You don't need to solder the pin shown in blue below whether the FFA does has such pin.

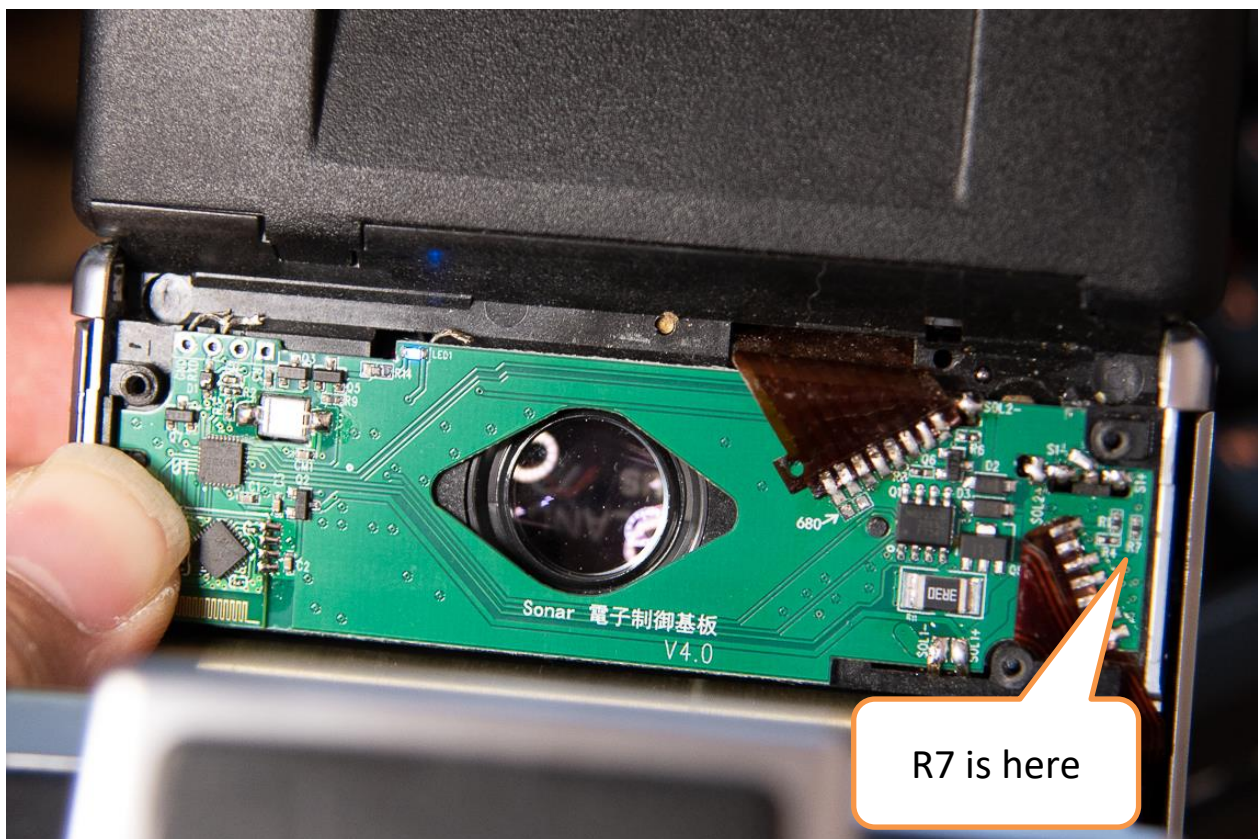


**Step6:** For other pins, re-press the pins, then solder them as they soldered on the old boards before. And please solder them firmly, as shown in the photo below, which is a comparison image after removing the old circuit board and installing the new one, please pay attention to Step3 and ensure reliable solder joints and no adhesion. If it is a 4-pin solenoid, it needs to be converted into a 2-pin solenoid, please refer to the operation in the appendix.

Tips: For sonar and 680, you need to re-solder the flex cable and then make sure that there's no adhesion between each pin.

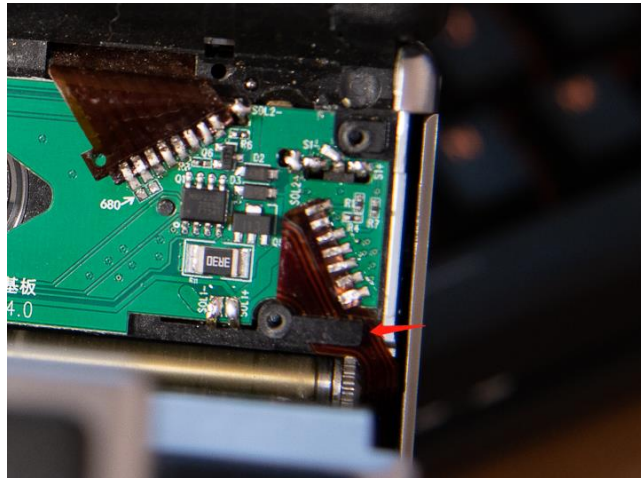


A sample for installing the new board.

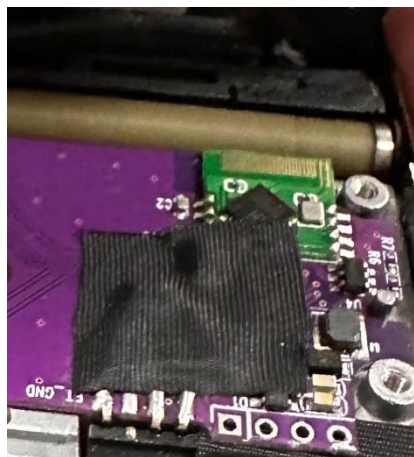


**Step7:** Solder the flex cable which connect the body and ECM. **Then PLEASE DEFINE YOUR CAMERA MODEL, FOR SLR680 YOU HAVE TO REMOVE R7 to disable the fill flash function (please pull out the battery before you do this) you don't have to do this on a Sonar (this note added after June 18, 2024)**





**Step8:** Apply a black tape used for covering the back side of the sensor, to prevent the light from the back side of the camera.



**Step9:** Reassemble the camera.

## ● Function Checking

After the installation, it is necessary to check the function of the camera. It is recommended to use a fresh but empty 600 film pack for the following checks, some developed photos also be used for function checking:

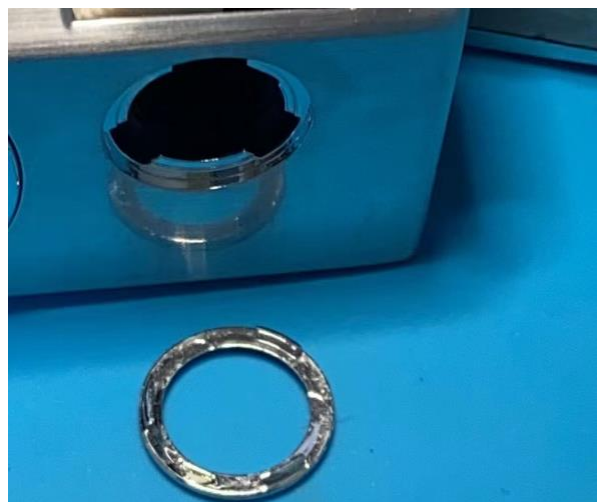
- A. The shutter speed should change automatically when the light goes up and down.
- B. Use the mobile app to connect the camera (named CH9141BLE2U default) and make sure that the communication between the camera and the mobile phone works properly.
- C. Remove the film pack and insert it again, then try to switch the ISO, make sure that the switching works properly.

## ● Remove the ND Filter

Polaroid SX-70 use a ND filter to calibrate the exposure of internal ECM, but it's useless after installation. No such calibration needs to be done when using a new SX-70R ECM, because there's an internal auto calibration function in the firmware of the new ECM called ACC(Accurate Curtain Control).

**Step1:** Use a utility knife. Pry the edge of the silver ring in the front of the metering window, then remove the ND

filter,



**Step2:** Re-install the ring.

Tips: To prevent dust, the original filter can be replaced by a transparent plastic disc or glass disc with a diameter of 12mm and a thickness of 0.5mm.

## ● Diagnostic

### 1.The camera won't work then pressing the shutter button.

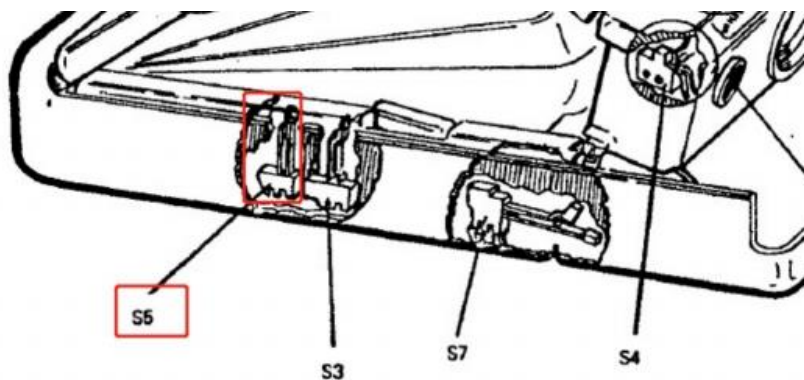
Usually, it is caused by no power, measure the voltage between the +6V pin and any GND pins, there should be a 5-6.5V.

### 2.The camera body works normally but not the shutter blade.

The conduct of SOL1+ and SOL1- not good or shorted. Sometimes it is caused by sticking solenoid, please check the solenoid and make sure that the solenoid works properly.

### 3.Camera won't stop after pressing the shutter button.

S5 on the flex cable which connect the camera body and camera conducting not well, check the conduction of S5. Sometimes that S5 (in the right side of the camera) fault, you need to make sure that the S5 works properly.



**4.The camera stop working when shooting under a strong light or the photo goes black and nothing developed.**

Also caused by sticking solenoid.

**5.Camera powered, but no respond after pressing the shutter button or ISO setting fault.**

S9 on ECM conduction not well or the film counter fault.

**6. The flash not working, or the flash keeps firing repeatedly after firing once.**

Please that connect the pins of FFA correctly.

**7.The motor of camera works slowly, and the shutter blade not closed fully.**

Mostly caused by solenoid fault, and don't forget to mod the 4-pin solenoid into a 2-pin.

**8.The camera works properly, but the brightness of photo incorrect (too dark or too bright).**

Over/under exposure just a little ——you need to adjust the solenoid speed of the camera (shown in appendix)

Over/under exposure serious: sticking solenoid.

**9.Flash mode not present.**

The failure is manifested as after pressing the shutter button, the shutter speed is still in automatic mode, and will not become a fixed shutter speed. There should be a 3V between S2+ and S2- when no flash bar inserted, S2+ S2-will be 0V when flash bar inserted. Check the FFA and make sure that the voltage changes correctly.

**10.All function works properly but Bluetooth connection drop after a full cycle of operating.**

Please make sure that the voltage of film pack higher than 5.5V, and don't use an old film pack for testing.

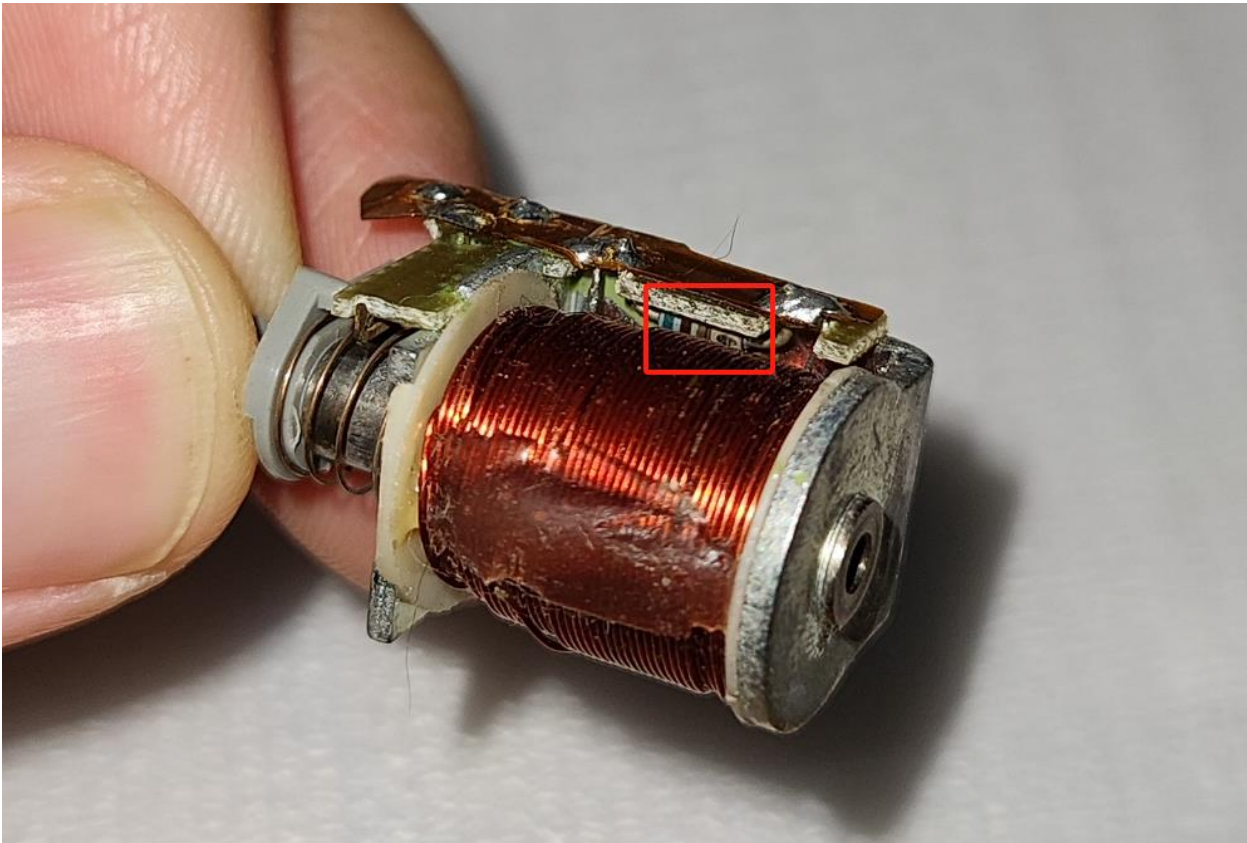


# Appendix

## 1. How to mod a 4-pin solenoid to 2-pin type.

In the earlier 4-pin solenoid, there is a diode connected in parallel at both ends of the solenoid, and S4 for recharge FFA. The diode will cause the speed of the shutter to be unstable, so please remove it. You need to disassemble the solenoid first. After disassembling:

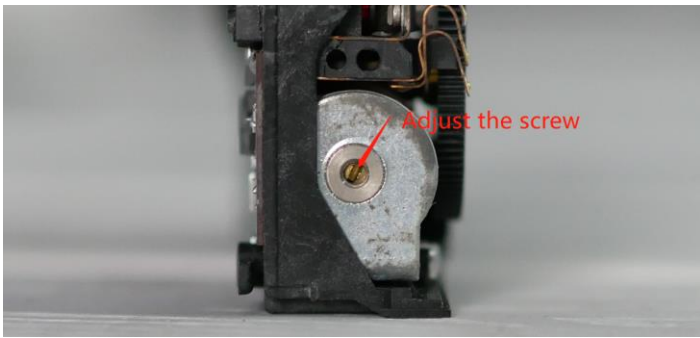
There's a resistor/diode under the coil of solenoid 1, Please remove it (or, just disconnect one of two pins and let it unavailable in circuit).



## 2. Shutter Speed Calibration

Because some cameras need to replace the ECM due to faulty ECM PCB or serious aging of the light sensor, the shutter possibly adjusted before. The speed of the solenoid is not accurate. If the SX-70R ECM is installed, the exposure may not be very accurate, and there is a tendency of overexposure or underexposure. First, please confirm whether the tendency of each image is the same, and that is to say, whether the brightness and darkness of each image are consistent, if so, it may be that the speed of the solenoid is not accurate, and the shutter speed need to be adjusted.

You only need to remove the casing of camera, and then use a small screwdriver to adjust the air valve at the end of the solenoid. Turn the screw clockwise will slow down the shutter blades and counterclockwise will increase the shutter blades speed.



You need to use a high speed and global shutter USB camera for calibration, for example we are now using a camera which is capture the video at 420FPS, 2.38ms for each frame:



You can use your mobile phone LED for lighting the camera shutter blades, then capture the video in the front of your camera. Make sure:

- You will be able to see the blades from the video clearly.
- Connect the camera with app, this will help you to release the shutter easily.

Then:

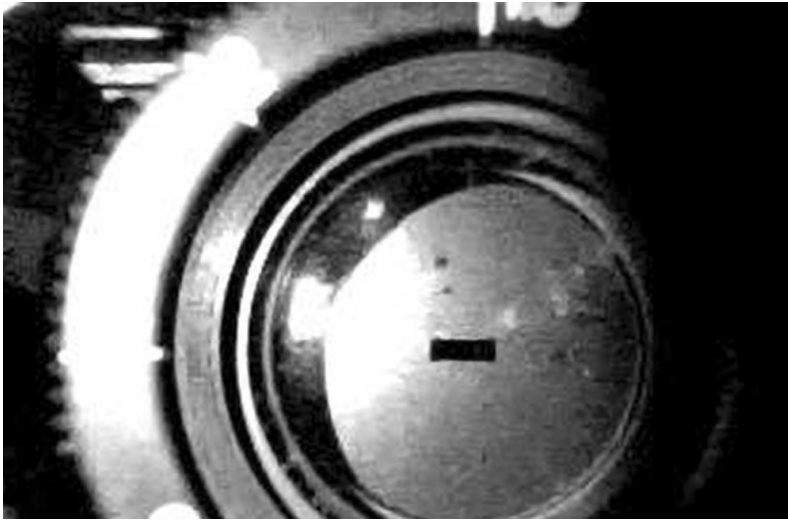
- Start the capturing of video, then set the camera to 1/8000 from app, release the shutter from app wirelessly, when the exposure is ended, stop capture.
- Check the video, when the shutter is fully opened and before closing, the aperture will looks like below, adjust the screw until you get the shape in the video almost the same as below picture.

**NOTE:** You will be able to search a single frame of the video in some video player, make sure that you have seen the frame which aperture shows the largest size. ALSO, some smart phone that has high frame rate video also help.



The small corner almost not present

- For a MODEL 1 camera, after the calibration the small corner should not be present:

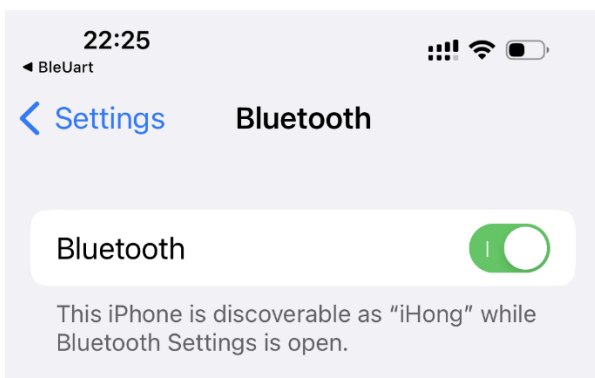


### 3. Control the camera using a BLE UART interface.

You can use the mobile app below for controlling the camera, we also provide the app for Android user, please contact [sx70r\\_inquiry@163.com](mailto:sx70r_inquiry@163.com) for more information.

<https://apps.apple.com/app/id1603743502>

After installing the app, please turn on Bluetooth on your iPhone or iPad.



Then launch the app and choose the “连接蓝牙” (connect to device) button.





Bluetooth device will be listed.



Connect to the device with "CH9141BLE2U", it's the name of the camera default.

When connected, select the both options with "HEX 显示" ( Display data in hexadecimal)



Then you will be able to control the camera with the commands below, input the command in the green box and tap “发送”(send), the command will be sent to the camera.

The camera is controlled by sending a 4bytes command. When the camera is connected, you will be able to control the camera by service uuid **0000FFF0-0000-1000-8000-00805F9B34FB**, there's two characteristics in the service uuid:

**0000FFF2-0000-1000-8000-00805F9B34FB** for writing 4bytes command in hex to control the camera.

**0000FFF1-0000-1000-8000-00805F9B34FB** for read data from camera.

### Supported 4bytes command:

#### Set shutter speed (millisecond): ffffxxxx (0xFF 0xFF 0x?? 0x??)

XXXX stands for shutter opening time, hexadecimal, two bytes, from 0002 to 7d00, the shutter opening time can be set from 2ms to 32000ms, 00 01 stands for auto exposure, and 00 02 for T mode.

#### Shutter release once: eeeeeeee (0xEE 0xEE 0xEE 0xEE)

Camera will take a photo with the shutter speed you set, if you want to take picture with manual shutter opening time, you need to set the shutter opening time before you send this command.

When T mode, the camera will start exposure then stopped when the shutter is opened, you need to send this command to close the shutter and eject the film.

#### Read ISO from camera (**International firmware ONLY**) : dddddddd (0xDD 0xDD 0xDD 0xDD)

When you send this command to camera, the camera will return 0xAA or 0xBB in the characteristic 0000FFF1-0000-1000-8000-00805F9B34FB, you must read the return yourself. 0xAA stands for ISO 600 and 0xBB stands for SX70.

**Setting ISO (International firmware ONLY) :**

Send fefefefe (0xFE 0xFE 0xFE 0xFE) or fdfdfdfd (0xFD 0xFD 0xFD 0xFD), FE for setting ISO to 600, and FD for setting ISO to SX70. The camera will remember the ISO until you change it yourself.

**For Sonar and 680:**

**Auto focus ON: afafafaf (0XAF 0XAF 0XAF 0XAF)**

Auto focus will be started and locked in position.

**Autofocus OFF: cfcfcfcf (0xCF 0xCF 0xCF 0xCF)**

The lens will return to infinity.