

## **Brief Introduction**

The SFS V2.0 is a smart filament detection module for FDM 3D printers developed by Shenzhen Big Tree Technology Co., Ltd.

## **Feature Highlights**

1. The SFS V2.0 is bi-directional, there is no restriction on filament direction, giving the users more flexibility during installation.
2. It detects extrusion errors caused by filament runout, nozzle clogging, filament tying, and extruder trouble. It has two signal outputs and indicator lights to distinguish between clogging or filament runout.
3. Works with Marlin, Klipper, and RRF firmware.
4. Compact, lightweight, and easy to install.
5. Works with Bowden extruders and direct-drive extruders.
6. Support motherboards with available endstop ports or dedicated filament runout ports.

## **Instruction:**

The filament can be inserted through side of the SFS V2.0.

The red light will illuminate when there is no filament in the module.

The blue light will flash when the extrusion is normal.

The blue light will stay on or off when there is no extrusion.

## **Specifications**

Dimensions: 53.1 x 30.3 x 27.3 mm

Weight: 36 g

Rated Voltage: 3.3V-5V

Working Temperature: -10 to 50 °C

Working Humidity: 10% to 90%

Filament Diameter: 1.75mm

Mounting Hole Spacing: 12.4 x 24.7 mm

Detection Length: 2.88 mm (theoretical detection length, may need adjustment)

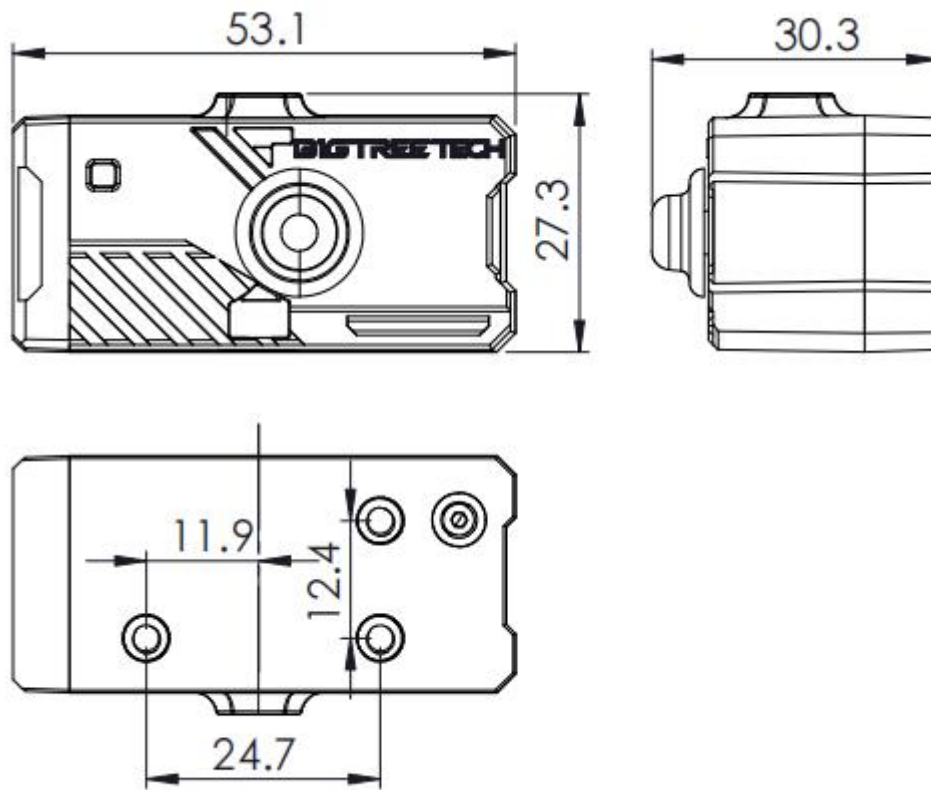


Figure 1

## Wiring

The SFS V2.0 uses a splitting cable, the 3-pin connectors plug into the motherboard, and the 4-pin connector plugs into the SFS V2.0. Take the SKR 3 motherboard as an example, the wiring is as shown in the figure below:

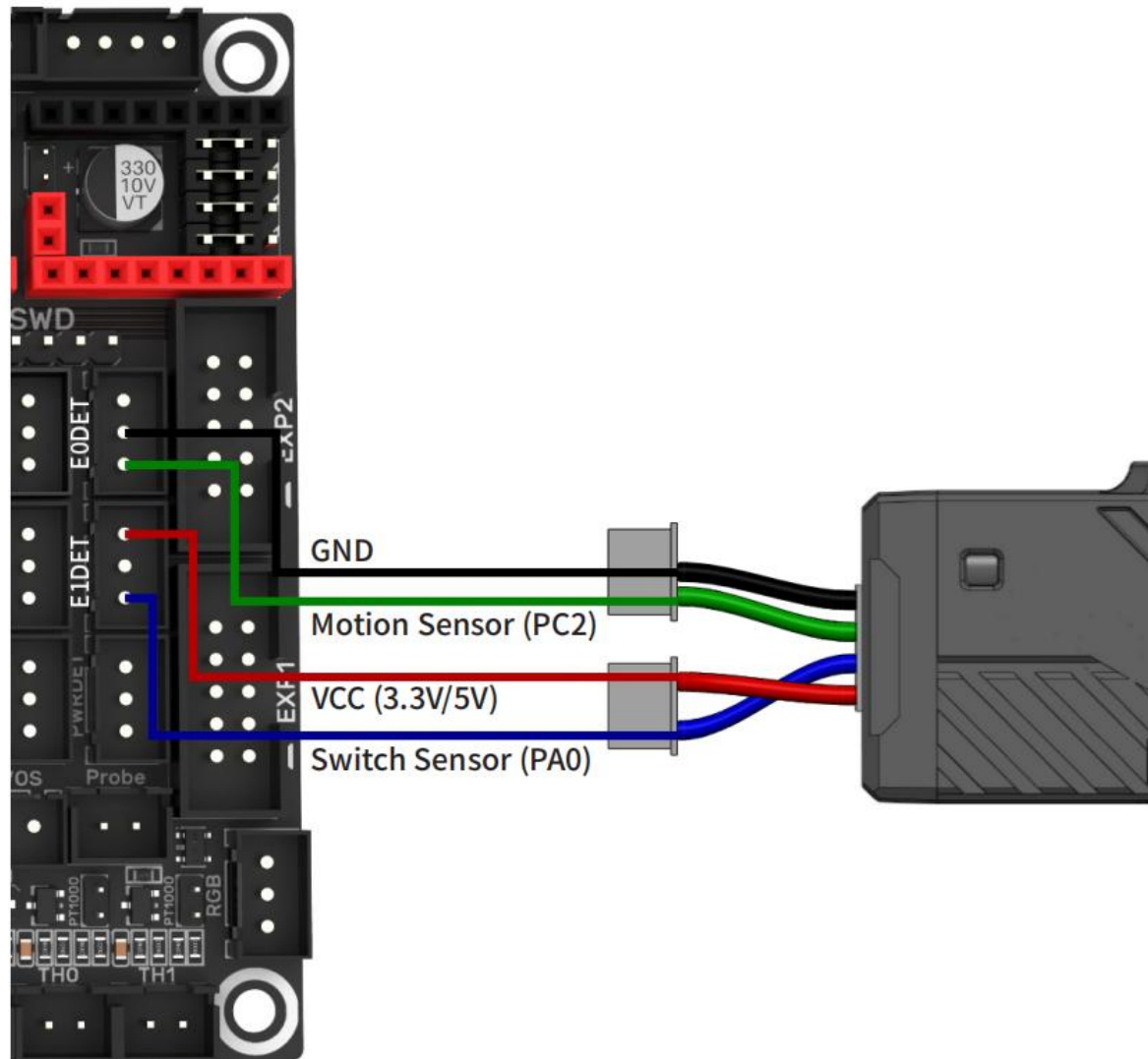


Figure 2

## Firmware Modification

1. The signal output of the switch sensor is at low level when no filament is detected, IO pin should be set to pull\_up input.
2. The signal output of motion sensor changes level at every 2.88mm of filament movement, the IO pin should also be set to pull\_up input.

For details about how to configure the firmware:

<https://github.com/bigtreetech/smart-filament-detection-module>

## 1. Klipper

[filament\_switch\_sensor switch\_sensor]

switch\_pin: ^PA0 # as shown in Figure 2, switch sensor IO is PA0

pause\_on\_runout: False

runout\_gcode:

PAUSE # [pause\_resume] is required in printer.cfg

M117 Filament switch runout

insert\_gcode:

M117 Filament switch inserted

References:

[https://www.klipper3d.org/Config\\_Reference.html#filament\\_switch\\_sensor](https://www.klipper3d.org/Config_Reference.html#filament_switch_sensor)

[filament\_motion\_sensor encoder\_sensor]

switch\_pin: ^PC2 # as shown in Figure 2, motion sensor IO is PC2

detection\_length: 2.88 # accuracy of motion sensor 2.88mm

extruder: extruder

pause\_on\_runout: False

runout\_gcode:

PAUSE # [pause\_resume] is required in printer.cfg

M117 Filament encoder runout

insert\_gcode:

M117 Filament encoder inserted

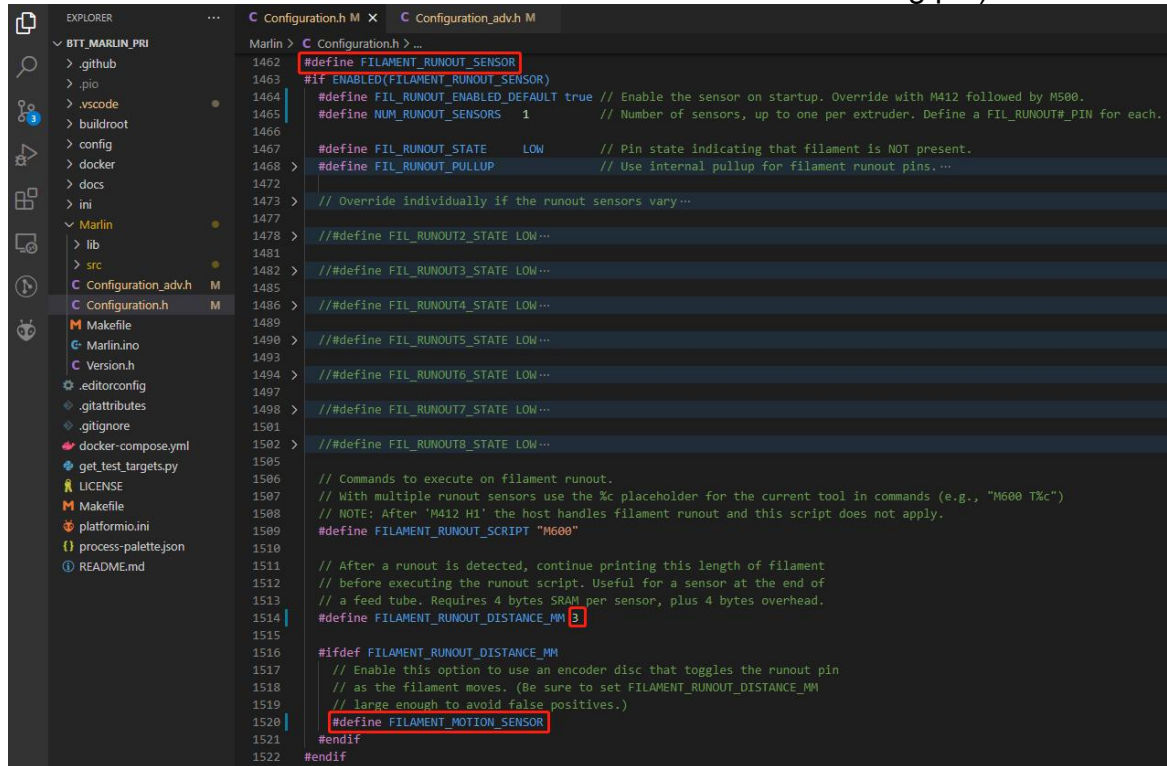
References:

[https://www.klipper3d.org/Config\\_Reference.html#filament\\_motion\\_sensor](https://www.klipper3d.org/Config_Reference.html#filament_motion_sensor)

**Note:** 2.88 mm is the minimum detection length required for the sensor to function properly. If you encounter problem of false triggers, try increasing the detection length by 1mm increments until the problem is resolved.

## 2. Marlin

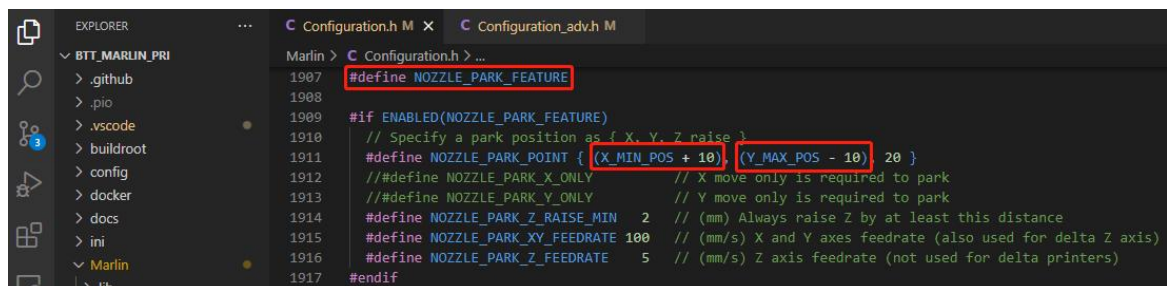
On Marlin, an extruder can only correspond to one filament detection, so we choose "motion sensor", follow the steps below to enable the motion sensor (Note: It is necessary to check whether the `FIL_RUNOUT_PIN` in the pin file of the motherboard is the same as the actual motion sensor connecting pin).



```
1462 #define FILAMENT_RUNOUT_SENSOR
1463 #if ENABLED(FILAMENT_RUNOUT_SENSOR)
1464 #define FIL_RUNOUT_ENABLED_DEFAULT true // Enable the sensor on startup. Override with M412 followed by M580.
1465 #define NUM_RUNOUT_SENSORS 1 // Number of sensors, up to one per extruder. Define a FIL_RUNOUT#_PIN for each.
1466
1467 #define FIL_RUNOUT_STATE LOW // Pin state indicating that filament is NOT present.
1468 #define FIL_RUNOUT_PULLUP // Use internal pullup for filament runout pins.
1472
1473 // Override individually if the runout sensors vary...
1477
1478 // #define FIL_RUNOUT2_STATE LOW...
1481
1482 // #define FIL_RUNOUT3_STATE LOW...
1485
1486 // #define FIL_RUNOUT4_STATE LOW...
1489
1490 // #define FIL_RUNOUT5_STATE LOW...
1493
1494 // #define FIL_RUNOUT6_STATE LOW...
1497
1498 // #define FIL_RUNOUT7_STATE LOW...
1501
1502 // #define FIL_RUNOUT8_STATE LOW...
1505
1506 // Commands to execute on filament runout.
1507 // With multiple runout sensors use the %c placeholder for the current tool in commands (e.g., "M600 T%c")
1508 // NOTE: After 'M412 H1' the host handles filament runout and this script does not apply.
1509 #define FILAMENT_RUNOUT_SCRIPT "M600"
1510
1511 // After a runout is detected, continue printing this length of filament
1512 // before executing the runout script. Useful for a sensor at the end of
1513 // a feed tube. Requires 4 bytes SRAM per sensor, plus 4 bytes overhead.
1514 #define FILAMENT_RUNOUT_DISTANCE_MM 3
1515
1516 #ifndef FILAMENT_RUNOUT_DISTANCE_MM
1517 // Enable this option to use an encoder disc that toggles the runout pin
1518 // as the filament moves. (Be sure to set FILAMENT_RUNOUT_DISTANCE_MM
1519 // large enough to avoid false positives.)
1520 #define FILAMENT_MOTION_SENSOR
1521 #endif
1522 #endif
```

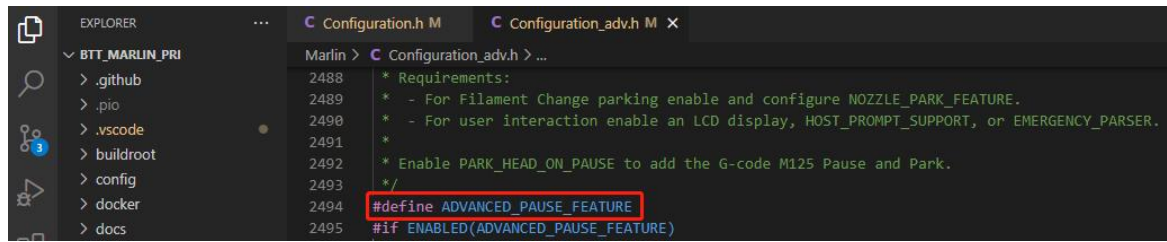
`#define FILAMENT_MOTION_SENSOR` // set encoder type  
`#define FILAMENT_RUNOUT_DISTANCE_MM 3` // set sensitivity, the recommended setting for SFS V2.0 is 3mm, which means if no signal of filament movement is detected after 3mm of filament travel command, filament error will be triggered.

The settings below also need to be set to instruct the printer to park the nozzle after filament error is detected.



```
1907 #define NOZZLE_PARK_FEATURE
1908
1909 #if ENABLED(NOZZLE_PARK_FEATURE)
1910 // Specify a park position as { X, Y, Z raise }
1911 #define NOZZLE_PARK_POINT { (X_MIN_POS + 10), (Y_MAX_POS - 10), 20 }
1912 // #define NOZZLE_PARK_X_ONLY // X move only is required to park
1913 // #define NOZZLE_PARK_Y_ONLY // Y move only is required to park
1914 #define NOZZLE_PARK_Z_RAISE_MIN 2 // (mm) Always raise Z by at least this distance
1915 #define NOZZLE_PARK_XY_FEEDRATE 100 // (mm/s) X and Y axes feedrate (also used for delta Z axis)
1916 #define NOZZLE_PARK_Z_FEEDRATE 5 // (mm/s) Z axis feedrate (not used for delta printers)
1917 #endif
```

`#define NOZZLE_PARK_FEATURE` // park nozzle  
`#define NOZZLE_PARK_POINT { (X_MIN_POS + 10), (Y_MAX_POS - 10), 20 }`  
// set the X, Y and Z offset coordinates of the nozzle



```
2488 * Requirements:
2489 * - For Filament Change parking enable and configure NOZZLE_PARK_FEATURE.
2490 * - For user interaction enable an LCD display, HOST_PROMPT_SUPPORT, or EMERGENCY_PARSER.
2491 *
2492 * Enable PARK_HEAD_ON_PAUSE to add the G-code M125 Pause and Park.
2493 */
2494 #define ADVANCED_PAUSE_FEATURE
2495 #if ENABLED(ADVANCED_PAUSE_FEATURE)
```

#define ADVANCED\_PAUSE\_FEATURE // retraction setting of nozzle park movement and filament purge distance after the print is resumed.

### 3. RRF

M591 D0 P7 C"e0stop" L2.88 R75:125 E9 S1; accuracy of motion sensor is 2.88mm, motion sensor pin: e0stop

### Caution

- 1) Power supply: 3.3V or 5V, please note that any higher voltage will cause damage.
- 2) The housing can be damaged if quick connectors are tightened frequently or incorrectly.
- 3) To connect to a motherboard without filament runout port, please consult our technical support.