

# **IT8951 Basic Operation and Frequently Asked Questions**

**2018 Apr.**

**Version v0.3**

## ■ Revision history

Revision History			
Version	Date	Description	Modified by
0.1	2017 Nov.	Document created	Richard Chen
0.2	2017 Dec.	v0.2 released	Richard Chen
<b>0.3</b>	<b>2018 Apr.</b>	<b>v0.3 released</b>	<b>Richard Chen</b>

## ■ Summary

The IT8951, EPD timing controller for products of E-ink, can take command from host through SPI or USB interface.

For driving E-ink EPD through IT8951, please contact us to get corresponding firmware. The different EPD may need different firmware to make IT8951 be able to drive it.

There are different host platforms can implement the control of IT8951. To remain the flexibility, we do not prepare the coding resource for specific platform, like Linux or Android; that is, there has no preferred host environment. You can control IT8951 by any system you want to use as long as the chosen communication method is realizable on it.

We also provide demo application and sample code of USB and of SPI. Please notice that the demo application was built for checking the working status of IT8951; the sample code are provided as referring resource for C language developing; neither of them is provided as implementation resource of Windows system. Again, you can implement the control of IT8951 on any host platform you want.

For the command formats of USB and of SPI, provided programming guide document has detailed introduction. Reading these documents before start to develop would make everything easier.

## ■ Basic Operation

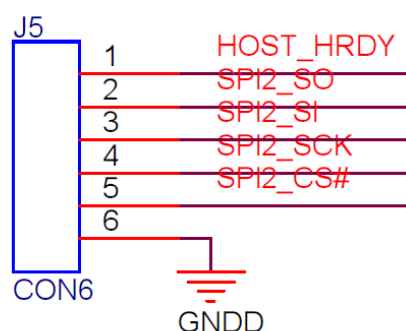
### USB

1. Check if the used host device supports USB device connection.  
(Install USB driver or realize it)
2. Implement program for sending **SCSI command** to a device through USB interface and then send SCSI command to the IT8951.
3. It should work normally if the sent SCSI command meets the required format described in *IT8951 USB Programming Guide*. Please refer to the documents we provided.

## SPI

1. Make sure that the used host device supports SPI communication before developing on the host device.  
(Install SPI driver or realize it)
2. Confirm following terms refer to the corresponding figure.
  - Check the SPI wire connection between host and IT8951.
  - The HOST\_HRDY pin should be connected to any GPIO for checking the working status of IT8951.

### SPI Slave I/F Connector (Optional)

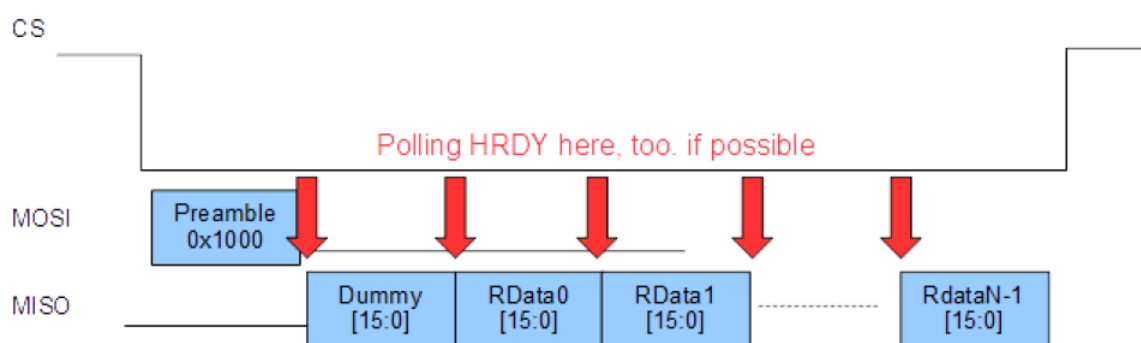


- Modify the setting properly to enable its **SPI slave** mode.

Table 8-1. Host Interface Selection

TEST_CFG [2:0]	I80CPCR [16]	Host Interface	Used Pins			
			HOST_*	SPI2_*	I2C2_*	UART_RTS UART_CTS
3'b000	1'b0 (default)	Intel 80	Yes	No	No	No
3'b000	1'b1	Motorola 68	Yes	No	No	No
3'b001	Don't care	SPI	No	Yes	No	No
3'b110	Don't care	I2C (Slave ID : 7'h46)	No	No	Yes	Yes
3'b111	Don't care	I2C (Slave ID : 7'h35)	No	No	Yes	Yes
Others	Don't care	Reserved	-	-	-	-

3. Refer to the *IT8951 I80 Programming Guide* file to ensure that the format of sent command is correct. The output wave of SPI command should look like:



Please notice that:

- A command set should be sent between a single low/high switch of CS output. Inappropriate switch timing of CS will interrupt the transmission.
  - SPI transfers **1 byte** each time. Please divide a word into two parts and sending them continuously.  
(Ex: The Preamble section 0x1000 should be sent as 0x10 and 0x00.)
  - For ensuring the data will be transferred completely, it's strongly recommended to insert an **HRDY\_Status\_Checking** procedure among every **two-byte** data transmission. This function should check if the HOST\_HRDY is back to HIGH state already before sending next data.
  - The IT8951 is **Big-Endian**. You should check the byte order of host, and modify the sending order if needed.
4. A command with appropriate format sent through SPI interface will make the IT8951 working.

## ■ FAQ

### IT8951 & E-ink EPD

#### Q: How to start to use IT8951?

A: At first, please **confirm the used EPD model**. It's recommended to contact us (and the E-ink) for **reviewing the circuit wiring to ensure the IT8951 (and EPD) can work**. You can also get helpful suggestion of product development from us.

We'll release firmware to you for the requested EPD model. If any customized function is needed, please feel free to discuss with us.

#### Q: How to upgrade FW?

A: The simplest way is to use **DemoAP** to upgrade it. Or you can use **IC programmer device to write it into the flash**, just start from address 0.

For the first time, IT8951 has no FW and cannot be reported as USB device. You have to update the FW directly into the flash.

#### Q: The maximum supported resolution of IT8951?

A: IT8951 supports resolution up to **2048x2048**. The higher resolution requires the larger flash space.

If the height or width over 2048, it still can supports as long as the **(width x height) is not over (2048 x 2048)**. In this case, please provide the panel frame rate to check if the CPU of IT8951 is able to support it.

If the height or width is x (over 2048), you can still ask IT8951 to deal with it as long as **divide the x into smaller parts** (less than 2048).

In this case, the limitation of IT8951 is reached, so it **cannot be guaranteed to work normally** for all supported functions.

**Q: Can the IT8951 show a certain image as it startup?**

A: Yes, we can write the assigned image into flash. For this function, please contact us and **provide the required image**. The image file should be a 4bpp raw data.

**Q: I just cannot use IT8951. Is it breakdown?**

A: We provided a demo application to check the working status of IT8951 through Windows USB interface. **Please use it for checking first.**

The most common reason is the **incorrect command format** that cannot be recognized by IT8951. Please refer to the **Programming Guide files** we provided.

In some case, the reason is that IT8951 wasn't powered properly (even not be powered), or some problem within circuit. We also provide service of review circuit for avoiding this.

**Q: The latest firmware version has not the function I asked for.**

A: Please remember to **restart IT8951 after upgrading** the firmware.

If the new firmware doesn't work or doesn't meet your request, please contact to us.



## SPI

**Q: The IT8951 didn't give any response to the sent SPI command.**

A: At first, please check the IT8951 is normally working. The **IT8951 demo application** can check it simply.

Then, please refer to the *IT8951 I80 Programming Guide* to **check if the format of sent command meets the requirement.**

There are many factors could generate an incorrect command, such as the **wrong switching timing of CS, wrong size of sending data, wrong byte order...etc.** Please check these terms by the documents we provided.

It's suggested to use IT8951 **UART pins** for debug. The UART log will show message as IT8951 **getting (and can recognize)** SPI command. You can use it to confirm that sent command can be understood by IT8951.

**Q: Occasionally, IT8951 won't respond my command.**

A: So it responds to the command sometimes. It's good because the sent command can be assumed as correct.

Please refer to the *IT8951 I80 Programming Guide*. If **the status of HOST\_HRDY** didn't be checked **every 2-byte transmission**, sent data is probable to be lost.

It's suggested that connecting the HOST\_HRDY pin of IT8951 SPI interface to any GPIO of host device to check it. If can't, a **lower transfer speed of SPI** (not over 2M) will be more safe.

**Q: Will the SPI sample code/driver that can be used on our host platform (Linux, Android...) be provided?**

A: As the same as the USB way, there have different host platforms to control IT8951 through SPI interface; we didn't test it on all kind of devices.

Generally, the IT8951 must be work if the sent **SPI command meets appropriate format**. Please refer to the *IT8951 I80 Programming Guide*.