新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

I2C-SPI Control Center (2)

Preface

I2C-SPI Control Center, a new product of ZEROPLUS Technology, can simulate the signal of I2C/SPI devices. It has I2C/SPI Trigger function and supports the Batch Mode which makes the device response simulation more flexibly.

Since the data packet transmitted in the I2C/SPI communication is very huge, so for analyzers, the Trigger function becomes very important. The powerful Trigger function can help users find the position to be analyzed in the complicated data packet very quickly.

In the I2C-SPI Control Center, users can set the I2C/SPI value to trigger, and its Batch Mode can meet the action function requirements for completely simulating the circuit under test.

Next we will introduce the I2C/SPI Trigger and the Batch Mode of the I2C-SPI Control Center.

I2C Trigger

Below image is the interface of the I2C-SPI Control Center software after starting. Users can click the I2C Trigger to set parameters.

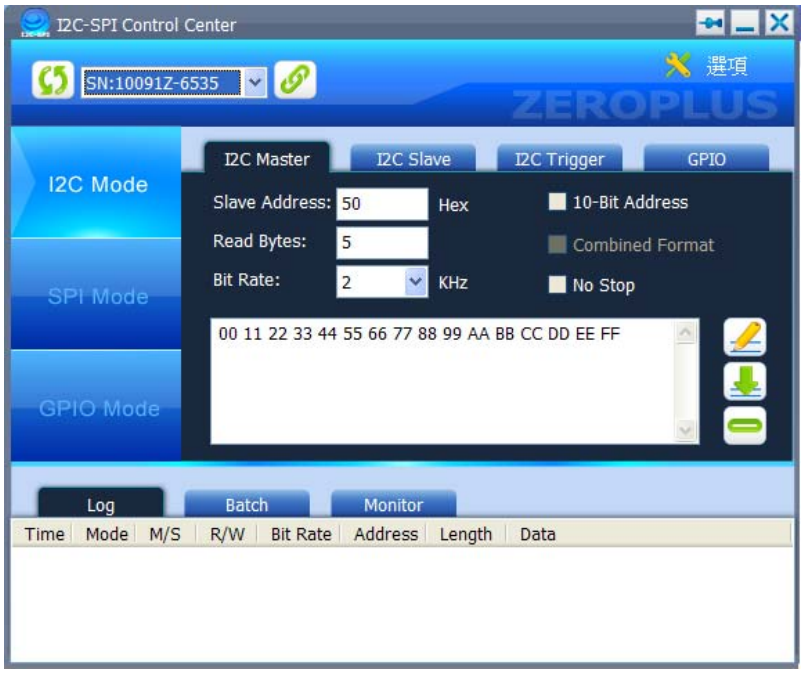

Image 1: I2C-SPI Control Center software interface.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Below image is the interface after clicking the I2C Trigger. Users can set two groups of conditions according to the I2C content. Each condition can be set at 8 bytes at most, users also can set according to the write or read action.

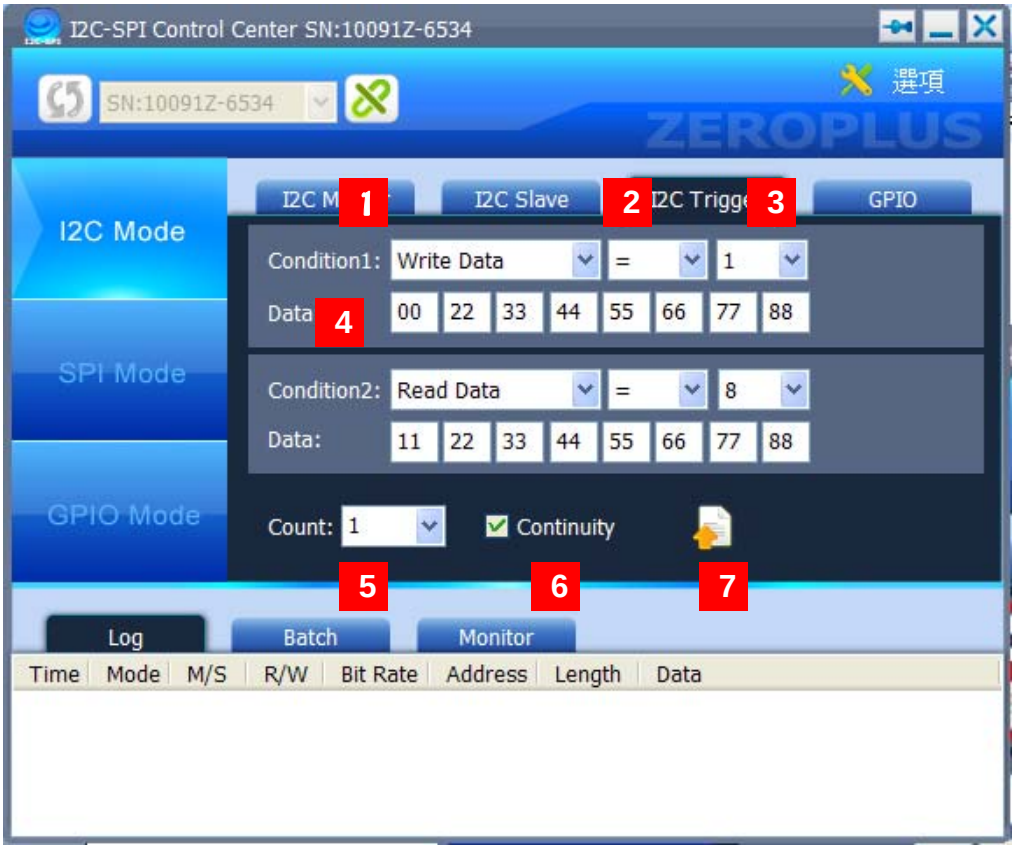

Image 2: I2C Trigger setting interface.

1. Data Action Option: It can be set as Write Data, Write Data(1st), Read Data or Read Data(1st). If Write Data(1st) or Read Data(1st) is selected, the software will only judge the first byte data packet.

2. Calculation Condition: Write Data and Read Data can only be set as 『=』; Write Data(1st) and Read Data(1st) can be set as 『=』, 『>』 or 『<』.

3. Data Length: The data byte will change following the length. The data length of Write Data (1st) and Read Data(1st) can only be 1.

4. Data Content: Users can input the data value as the trigger condition.

5. Count: It can start triggering after the trigger condition reaches the set times.

6. Continuity: Set the two groups of conditions to judge continuously or not.

7. Enable: After the I2C Trigger setting is completed, click Enable to apply.

The external Switch Mode needs to be switched to 8 Pin Mode when the I2C Trigger is used, and the I/O Ctrl is the trigger status output pin, the outputted signal will be displayed in level change.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Then users can use the Logic Analyzer of ZEROPLUS to operate the I2C Trigger. Connect the I/O Ctrl of I2C-SPI Control Center to the Pin A2 of Logic Analyzer, and connect the SDA and SCL to A0 and A1.

At the same time, in the I2C Trigger interface of I2C-SPI Control Center, set the trigger condition as “Write Data”, and set the data value as “0x11, 0x22”. Below is the interface after the setting is completed.

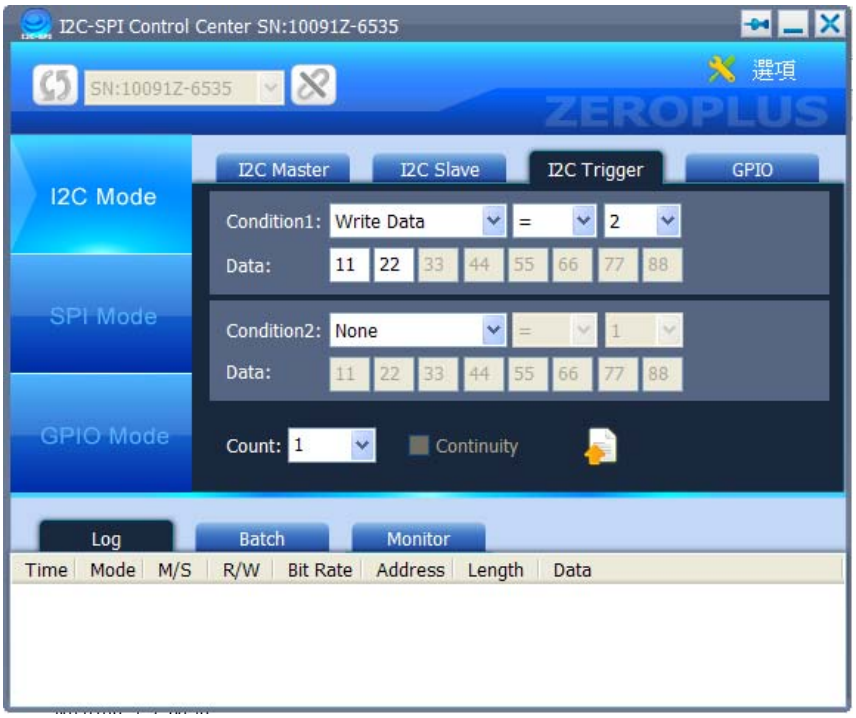

Image 3: 0x11 and 0x22 condition setting.

Click the “Enable” after the setting is completed, then open the ZEROPLUS Logic Analyzer software, set the environment parameters and I2C decoding, then users can begin to analyze the decoding. Below image shows the trigger result.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

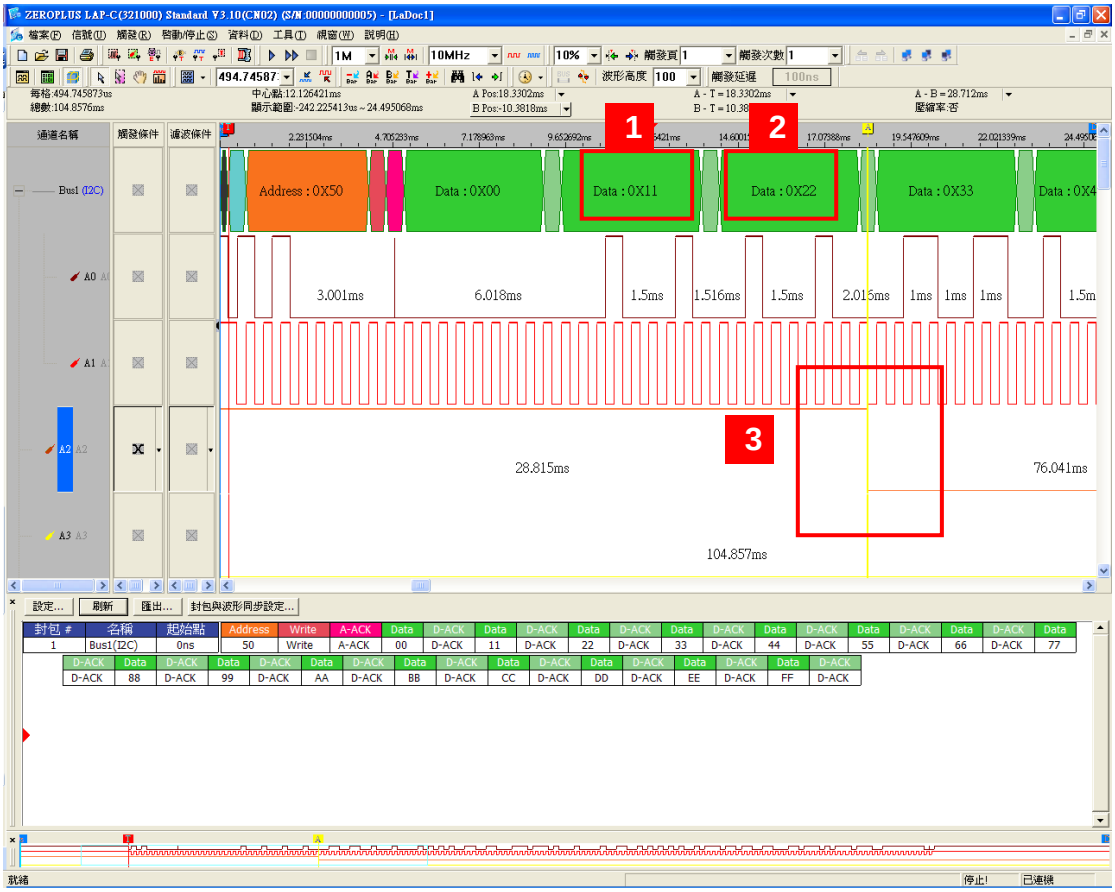

Image 4: The trigger is completed.

In image 4, the selected area 1 shows the first trigger condition data is 0x11,

the selected area 2 shows the first trigger condition data 0x22,

the selected area 3 shows the position where the I2C-SPI Control Center-I2C Trigger judges that the trigger is established.

From the above image we can see that the I/O Ctrl will have a waveform after the I2C-SPI Control Center-I2C Trigger judges that the trigger is established.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

SPI Trigger

The operation of SPI Trigger is similar with that of I2C Trigger. Start the I2C-SPI Control Center, select the SPI Mode, and click the SPI Trigger to set. Below image is the setting interface.

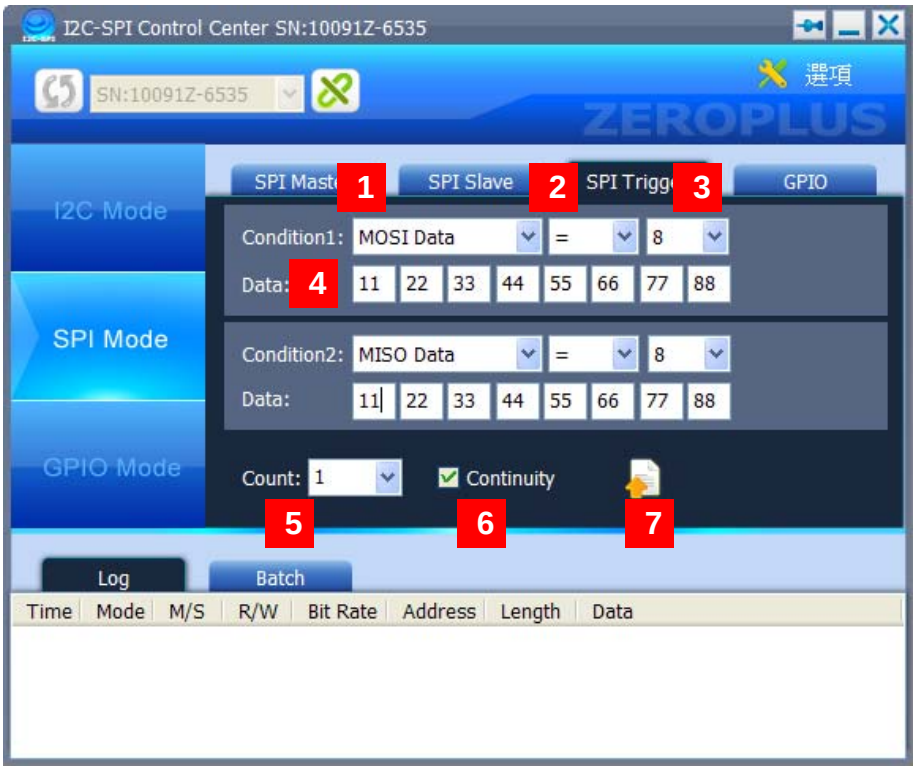

Image 5: SPI Trigger setting interface.

1. Data Action Option: It can be set as MOSI Data, MOSI Data(1st), MISO Data or MISO Data(1st). If MOST Data(1st) or MISO Data(1st) is selected, the software will only judge the first byte data packet.

2. Calculation Condition: MOSI Data and MISO Data can only be set as 『=』; MOSI Data(1st) and MISO Data(1st) can be set as 『=』, 『>』 or 『<』.

3. Data Length: The data byte will change following the length. The data length of MOSI Data(1st) and MISO Data(1st) can only be 1.

4. Data Content: Users can input the data value as the trigger condition.

5. Count: It can start triggering only after the trigger condition reaches the set times.

6. Continuity: Set the two groups of conditions to judge continuously or not.

7. Enable: After the SPI Trigger setting is completed, click Enable to apply.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Then users can use the Logic Analyzer of ZEROPLUS to operate the SPI Trigger. Connect the 5V Ctrl of I2C-SPI Control Center to the Pin A4 of Logic Analyzer, connect SS to A0, connect MOSI and MISO to A1 and A2, connect SPI SCL to A3.

At the same time, users can set two groups of trigger conditions in the I2C-SPI Control Center -SPI Trigger interface. The first group is “MOSI” , its data value is “0x11”; the second group is “MISO”, its data value is “0x01”; the “Continuity” is selected, see the below image.

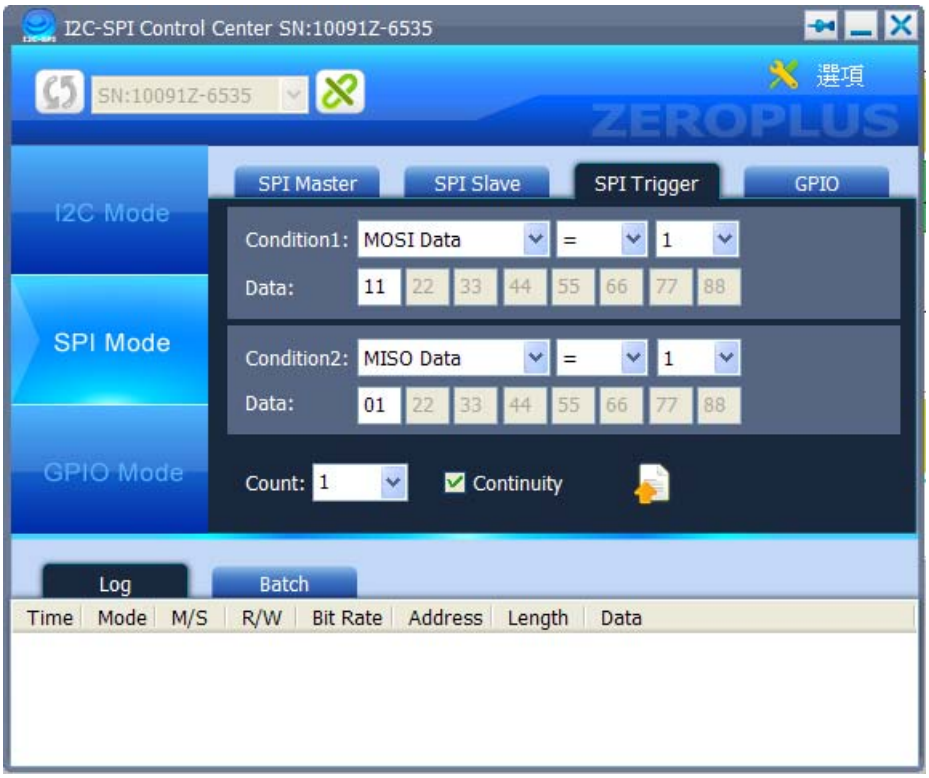

Image 6: MOSI=0x11 and MISO=0x01 trigger condition setting.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Next set the environment of Logic Analyzer and SPI decoding. Since there are two trigger conditions, so the software will judge according to the SS Low Enable status. Below image shows the trigger is completed.

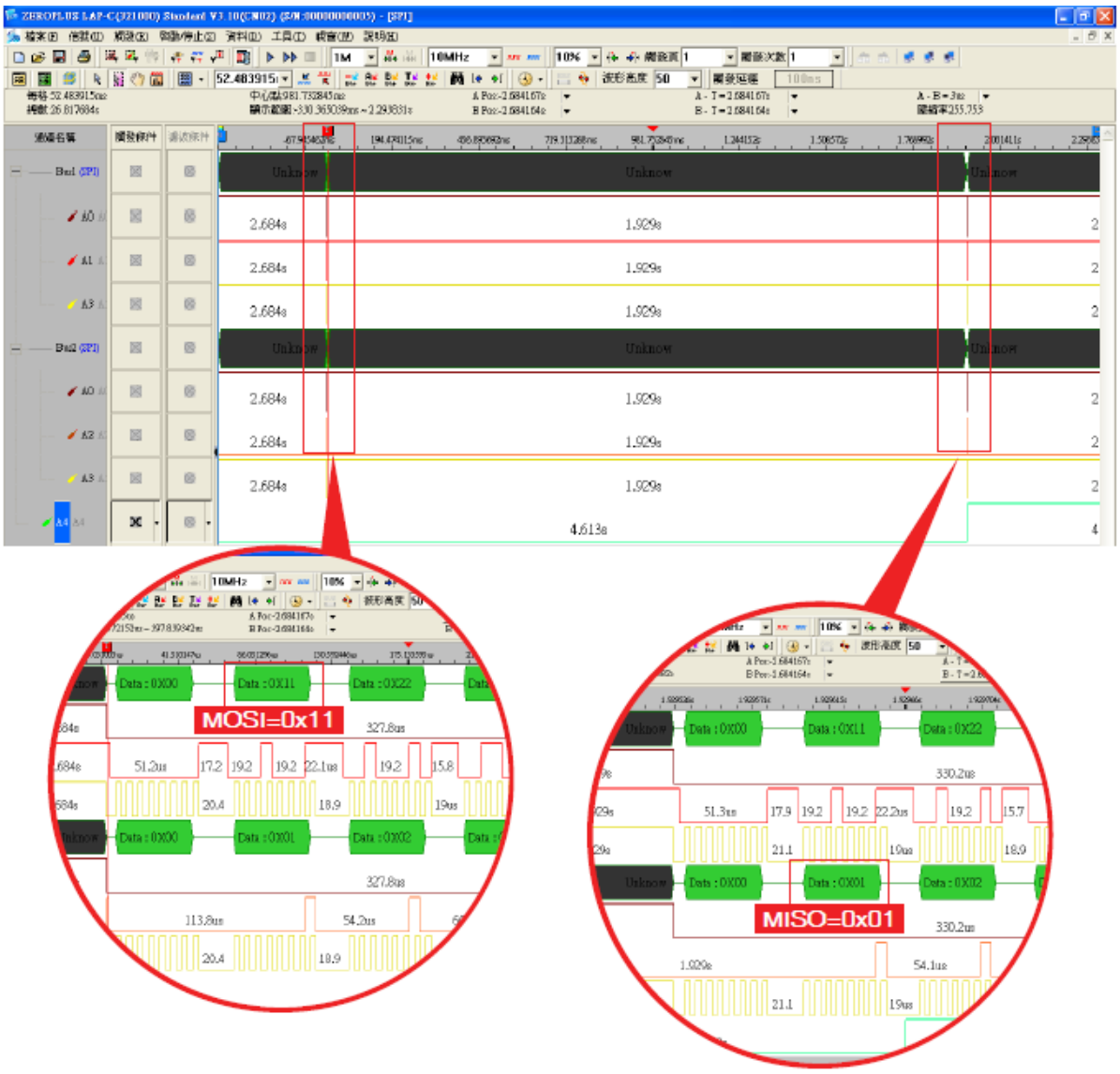

Image 7: SPI trigger is completed.

In image 7, the left selected area is the position of condition 1 established, and the SPI includes MOSI=0X11; the right selected area is the position of condition 2 established, and the SPI includes MISO=0X11.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Batch Mode

According to the Batch Mode, users can define the data transmission status and content, and simulate the response of actual device.

Click the Batch in the I2C-SPI Control Center software interface, then users can input the Batch Program Code in the blank to set the action mode of I2C-SPI Control Center, or click the right key to load the example file.

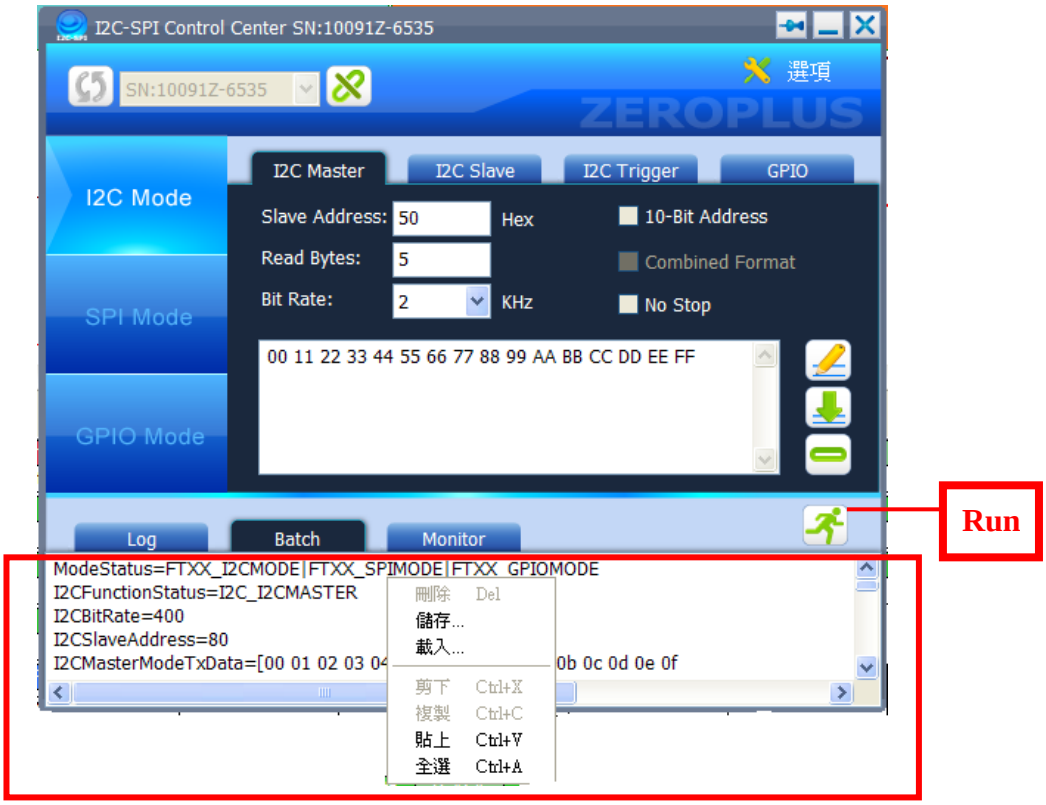

Image 8: Batch Mode.

Below is an example of I2C Batch Program.

ModeStatus=FTXX_I2CMODE // Set the control mode of hardware, there are three control flags, FTXX_I2CMODE, FTXX_SPIMODE and FTXX_GPIOMODE to be used compositively.

I2CFunctionStatus=I2C_I2CMASTER // Set the control flag of the I2C Mode. It consists of I2C_I2CMASTER, I2C_I2CSLAVE, I2C_10BITADDR, I2C_COMBINEDFORMAT and I2C_NOSTOP.

I2CFunctionStatus=I2C_I2CMASTER:

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

I2CBitRate=400// Set the Bit Rate of the I2C Mode. The unit is KHz.

I2CSlaveAddress=80 // Set the Slave Address of the I2C Mode. It supports 7 or 11 bytes address, the input value format is Decimal.

I2CMasterModeTxData=[00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21] // Set the TX Data of the I2C Master Mode. It can judge the start and the end of Data.

I2CMasterModeReadByteLength=10 // Set the read Byte length of the I2C Master.

I2CFreeBus=true // Set the Free Bus Enable or Disable of the I2C Mode.

I2CSlaveModeTxByteLength=10 // Set the TX Byte length of the I2C Slave Mode.

I2CSlaveModeRxByteLength=10 // Set the Rx Byte length of the I2C Slave Mode.

I2CSlaveRespondData=[00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21] // Set the Respond Data of the I2C Slave Mode. It can judge the start and the end of Data.

I2CSlaveModeEnabled=true // Set the I2C Slave Mode Enable or Disable.

After inputting the Program Code, click the “Run” to run the Batch Program. Then we can check the Batch Program action through ZEROPLUS Logic Analyzer.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

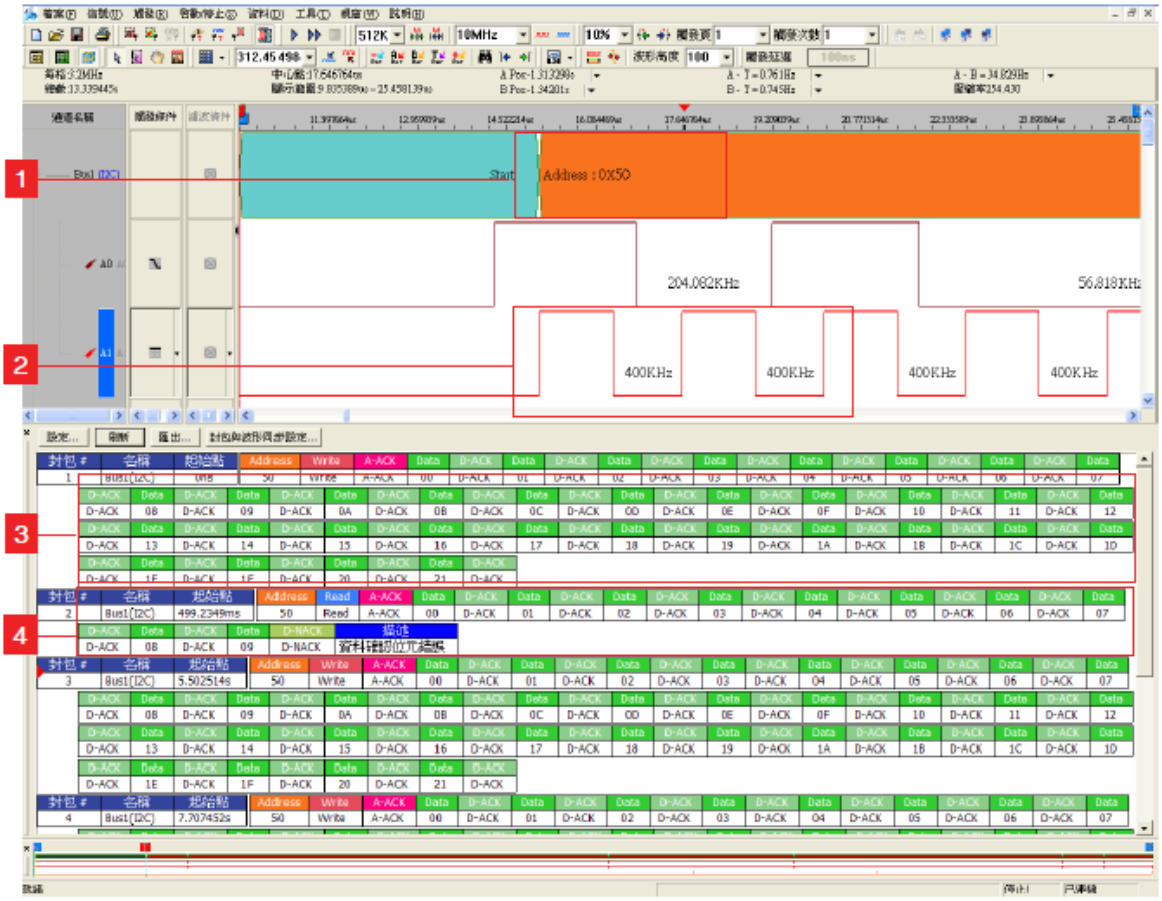

Image 9: Capture the I2C Batch Program action through LA.

The selected area 1 shows the current I2C Slave Address is 0X50.

The selected area 2 shows the I2C Byte Rate is 400KHz.

The selected area 3 shows the written data of the Master.

The selected area 4 shows the read data of the Master.

If users need to add other Buses or transmit different address or data, they only need to add the specified action content in the Batch Program field, so as to simulate the communication status of the object under test.

新北市中和市區八路 123 號 2F
電話：886-2-66202225
傳真：886-2-22234362
www.ZEROPLUS.com.tw
2F., No.123, Jian 8th Rd., Zhonghe Dist.,
New Taipei City 23585, Taiwan ,R.O.C.
Tel: 886-2-66202225
Fax: 886-2-22234362

Conclusion:

The I2C-SPI Control Center is developed by ZEROPLUS Technology based on the I2C and SPI. It can be used to store the data of I2C/SPI interface and send the trigger signal if the data is satisfied with the condition, or send the signal through GPIO. In the Batch Mode, users can send the signal by writing commands. It can be used along with ZEROPLUS Logic Analyzer to research more efficiently, analyze and detect more quickly, and measure more data. It is a necessary tool for electronic R&D personnel, electronic testers, electronics students and personal research studios.

by ZEROPLUS Instrument Division FAE

Gary Hsu

About ZEROPLUS

ZEROPLUS Technology Co., Ltd was established in 1997. It focuses on the design of the peripheral products of computer games. In 2004, the business scope was extended to the electronic measurement instruments. Applying the advanced MCU programming technology, the company successfully developed the latest patented measurement instrument, PC-Based Logic Analyzer. The unique and innovative technology was accredited by a number of patents granted, and the regions or countries where the company applied for patents have covered the whole world and the number of the patent and the country continues to grow. Since the release in 2005, the Logic Analyzer has been widely adopted by tens of dozens of public-listed technological manufacturers in the IC industry and the tertiary educational institutions. The excellent sale has made the Logic Analyzer the most popular in the market.