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Hot Digital Signal-SCCB Decoding Overview

Brief Introduction

SCCB (Serial Camera Control Bus) is a kind of three-wire Bus, which is developed by OmniVision Technologies. And it is mainly used for the OmniVision Camera Sensor. A Master Device can be used to control multiple Slave Devices through the SCCB Bus, such as OV5620, OV2640 and OV9653. At the same time, according to the Decoding Function of the Protocol Analyzer SCCB, which is developed by Zeroplus Technology, the Packets of the SCCB Signal can be displayed with the graphical mode on the software, which will make the process of analyzing the signal more convenient.

The three-wire Protocol Analyzer SCCB consists of SCCB_E, SIO_C and SIO_D. Figure 1 shows that a Master Device is being connected with multiple Slave Devices.

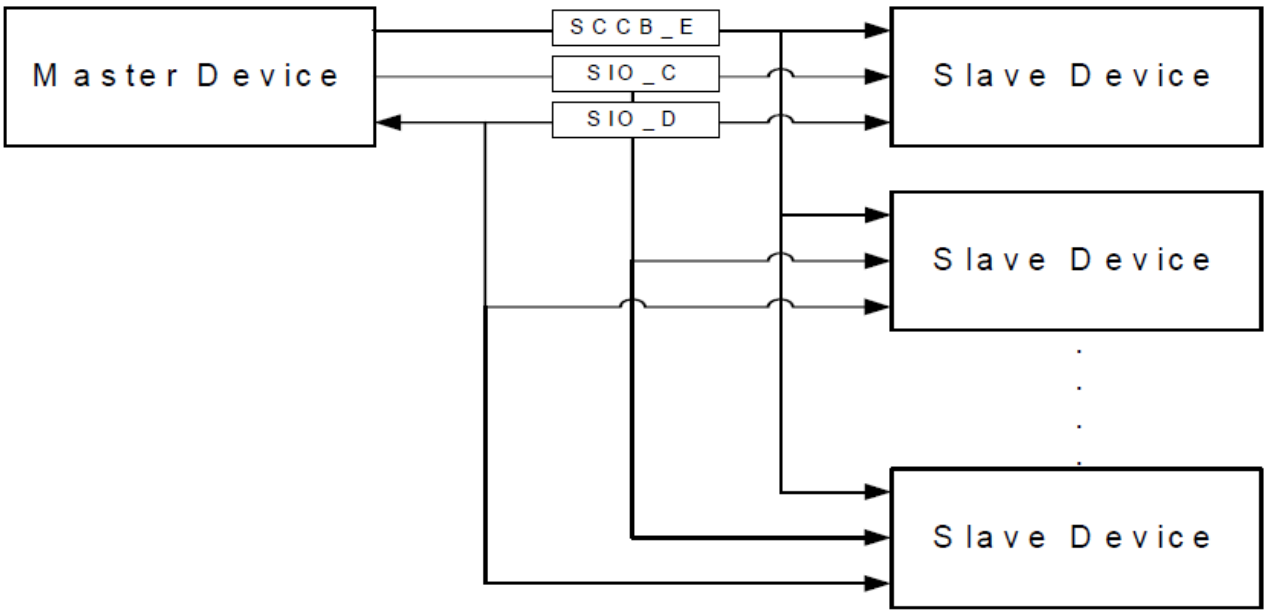

Figure 1: A Master Device connecting with multiple Slave Devices

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When the Master Device is being connected with multiple Slave Devices, if the Master Device needs transmitting the data to a Slave Device, the SCCB_E of the Slave Device will change into the Low Level Status, which denotes that the Master Device is transmitting the data to the Slave Device. Conversely, if the Slave Device is waiting for transmitting data with the Master Device, the SCCB_E is in the High Level Status.

When the Master Device is only connected with a Slave Device, the SIO_C and the SIO_D lines should be connected to use the Protocol Analyzer SCCB. Figure 2 shows that the Master Device is being connected with single Slave Device.

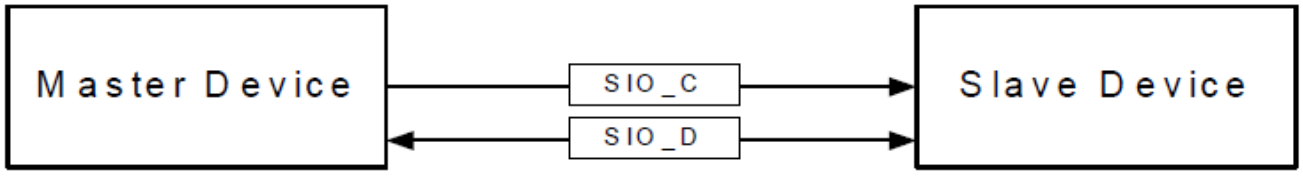

Figure 2: A Master Device connecting with single Slave Device

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Introduction for the Signal Format of the Protocol Analyzer SCCB

The Transmission Unit of Protocol Analyzer SCCB is denoted by Phase. Specifically, the Start and the Stop appear before and after the Phase, which are used to indicate the Start and the Stop of the Phase. Figure 3 shows the Start-bit and Stop-bit Diagram of Protocol Analyzer SCCB.

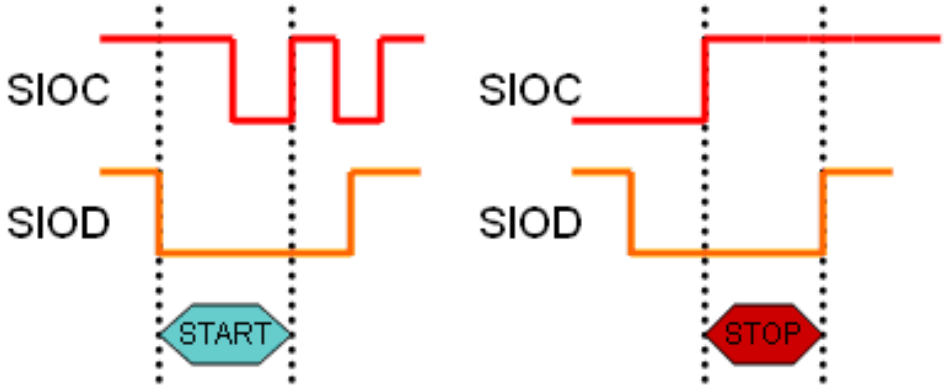

Figure 3: Start-bit and Stop-bit Diagram

When the Falling Edge appears in the SIO_D signal and the High Level appears in the SIO_C signal, it denotes that the Start bit is started; when the Rising Edge appears in the SIO_C signal, it denotes that the Start bit is stopped; see the left part of the Figure 3. When the Rising Edge appears in the SIO_C signal and the Low Level appears in the SIO_D signal, it denotes that the Stop bit is started; when the Rising Edge appears in the SIO_D signal and the High Level appears in the SIO_C signal, it denotes that the Stop bit is stopped.

The Length of each Phase is 9 bits, which are divided into two segments, namely, the previous 8 bits and the next 1 bit (the ninth bit). Hereinto, the previous 8 bits are used to denote the contents of the address or data, and the ninth bit is displayed by the NA or the Don't care bit, which denotes that the Phase is in the Read or Write Status.
Three kinds of the Transmission Status are defined for the Protocol Analyzer SCCB, namely, 3-Phase Write Transmission Cycle, 2-Phase Write Transmission Cycle and 2-Phase Read Transmission Cycle.

3-Phase Write Transmission Cycle is a complete Write action. Specifically, Phase 1 shows the ID Address, which denotes the Master Device is designated to transmit with a Slave Device; Phase 2 shows the Sub-address, which denotes the Address of the Register is designated to be accessed under the ID Address; Phase 3 shows the Write Data, which denotes the Write Data to be transmitted. At the same time, the ninth bit of the Phase 3 is displayed by the Don't care bit. Figure 4 shows the diagram of the 3-Phase Write Transmission Cycle.

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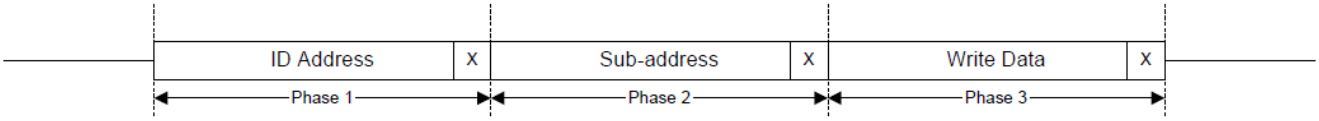

Figure 4: 3-Phase Write Transmission Cycle

2-Phase Write Transmission Cycle is a Address Write action, which is used to designate the Sub-address for the 2-Phase Read Transmission Cycle. And the ninth bit of the Phase 2 is displayed by the Don't care bit, too. Figure 5 shows the diagram of the 2-Phase Write Transmission Cycle.

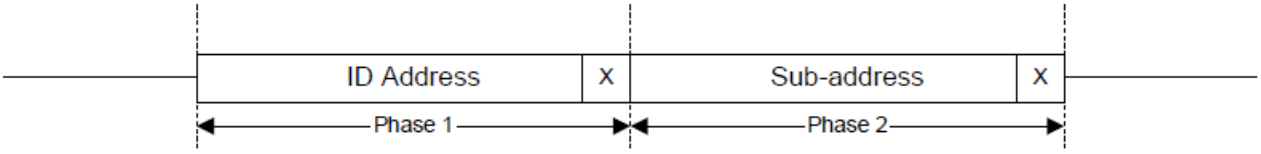

Figure 5: 2-Phase Write Transmission Cycle

The 2-Phase Read Transmission Cycle cannot judge the Sub-address in itself, and it must confirm the Sub-address through the 3-Phase Write Transmission Cycle or the 2-Phase Write Transmission Cycle. Figure 6 shows the diagram of the 2-Phase Read Transmission Cycle.

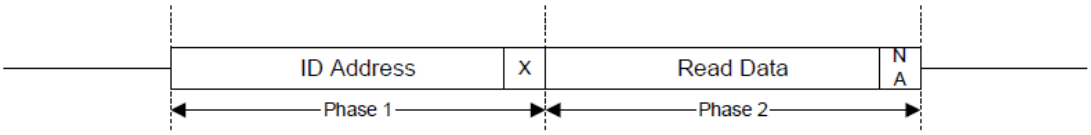

Figure 6: 2-Phase Read Transmission Cycle

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Measurement Tool-Protocol Analyzer SCCB

With the help of the Decoding Function of the Protocol Analyzer SCCB, which is issued by Zeroplus Technology, the Packets of the signal can be displayed on the software.
Figure 7 shows the Decoding Diagram of the SCCB Signal.

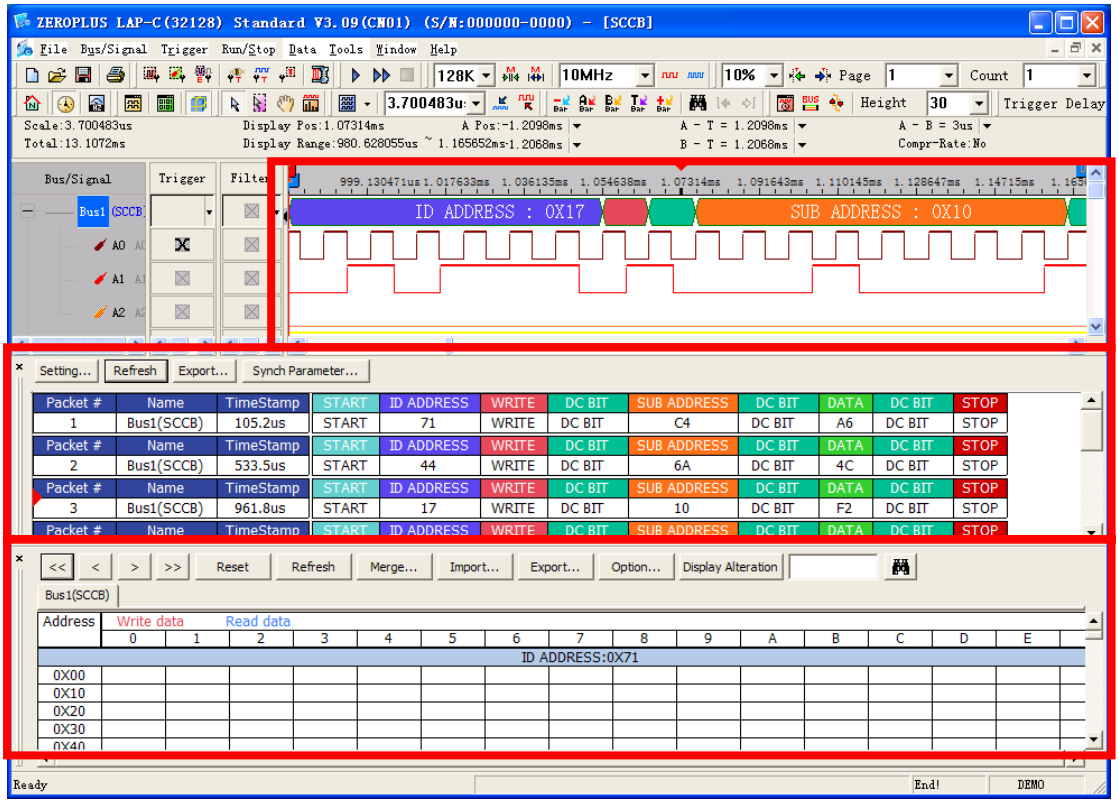

Figure 7: Decoding Diagram of the SCCB Signal

The **Waveform Display Area** in the Figure 7 shows the Packets of the SCCB Signal, which are decoded through the Protocol Analyzer SCCB; the **BUS Packet List** shows the Packets which are displayed in the Waveform Display Area with the List Mode. At the same time, it is convenient for learning the statuses of Packet Delivery of the SCCB Signal through the BUS Packet List; the **Memory Analyzer** can show the statuses of the Read Data or Write Data in the ID ADDRESS and the SUB ADDRESS clearly.

It is very convenient for using the Decoding Function of the ZEROPLUS Protocol Analyzer SCCB. Specifically, only when users connect the SCCB_E, SIO_C and SIO_D with the corresponding channels, they can decode the signal. Figure 8 shows the Configuration dialog box of the Protocol Analyzer SCCB.

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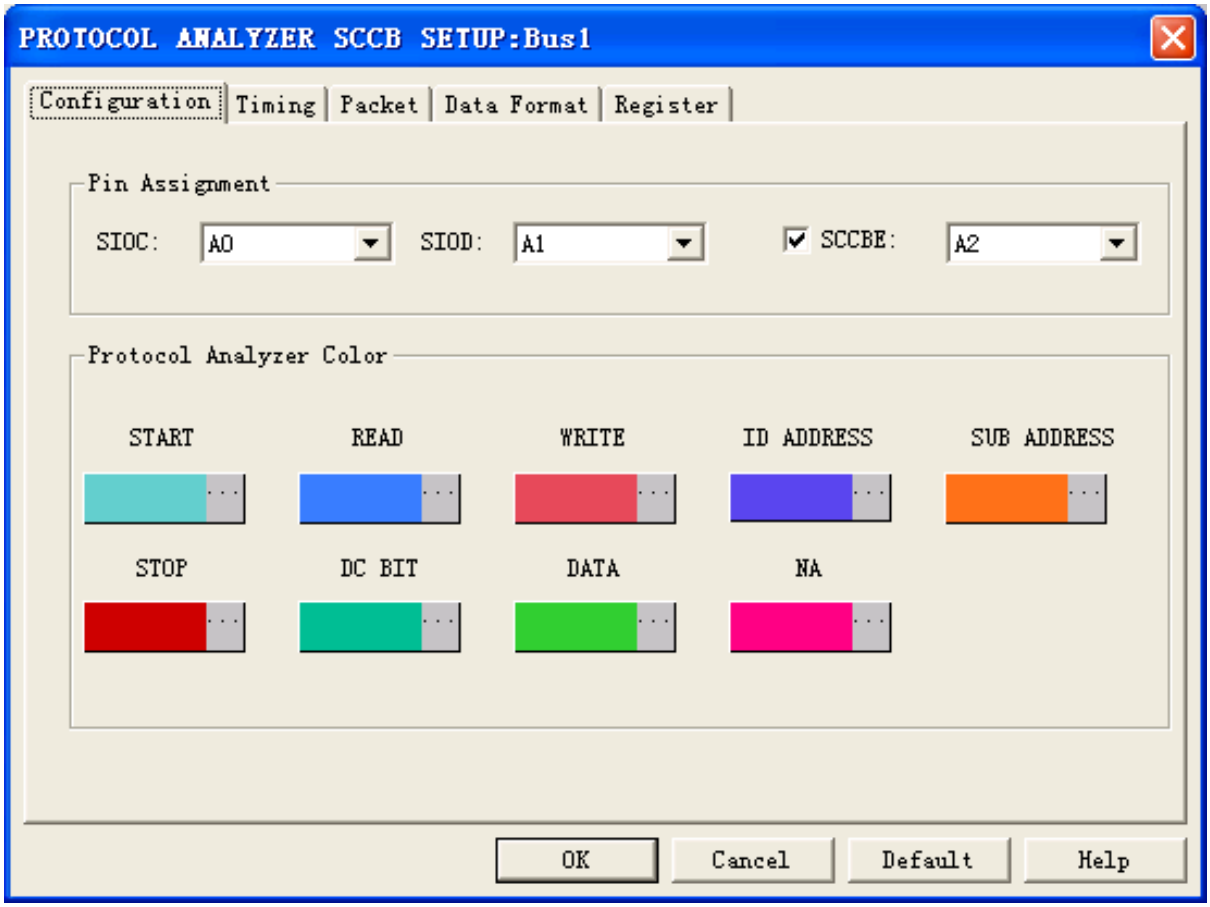

Figure 8: Configuration dialog box of the Protocol Analyzer SCCB

Zeroplus Technology take the possible change of the specification into account for manufacturers during using the Protocol Analyzer SCCB, so they design the Timing dialog box in the Protocol Analyzer SCCB and the users can set the Time Parameters for the signal according to their requirements, which will make the decoding more flexible.

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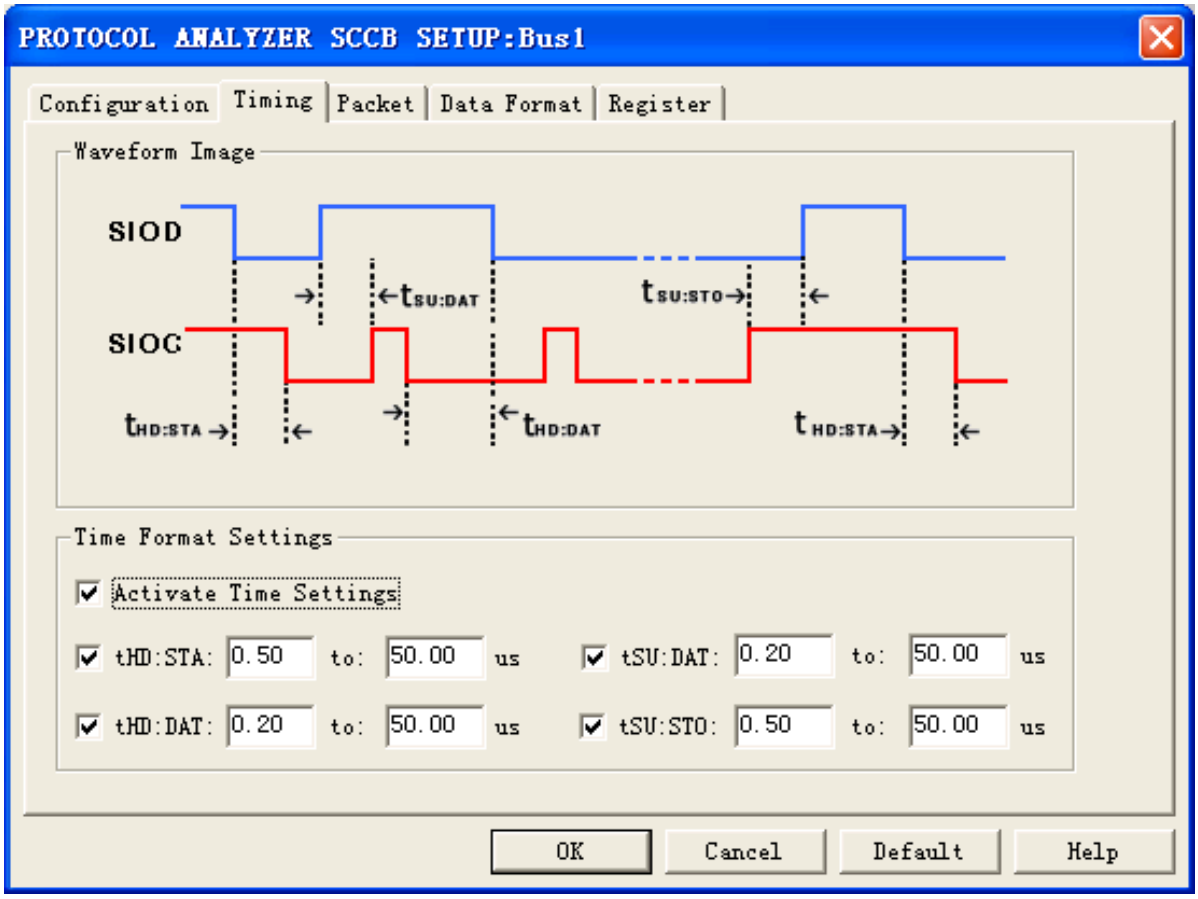

Figure 9: Timing dialog box of the Protocol Analyzer SCCB

In the **Data Format** dialog box, users can set the Data Format of the ID ADDRESS, SUB ADDRESS and DATA as their requirements respectively. And there are four kinds of Data Format for selecting in all, namely, Binary, Decimal, Hexadecimal and ASCII.

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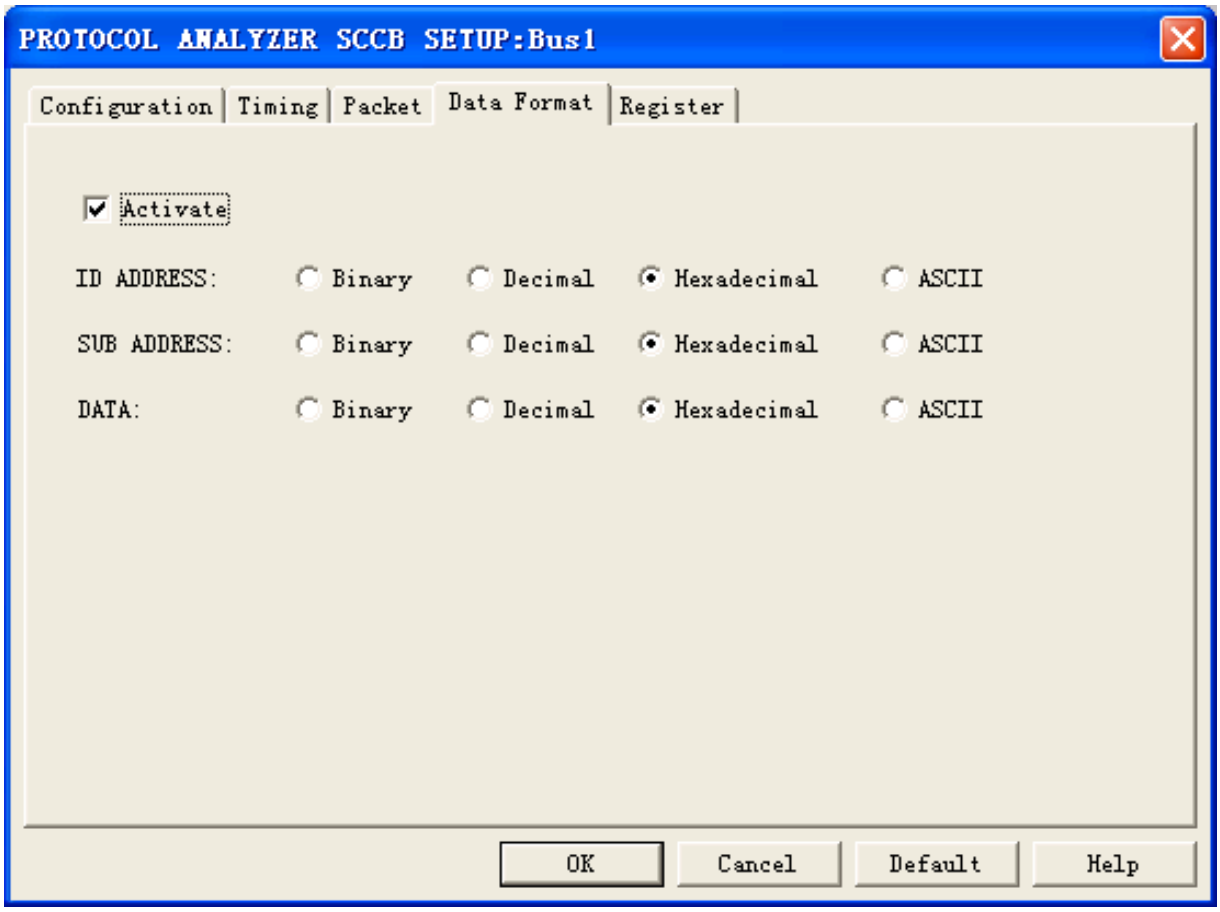

Figure 10: Data Format dialog box of the Protocol Analyzer SCCB

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Conclusion

The Digital Signals have been widely used for all kinds of Electronic Products, such as Mobile phone, PC and Walkman. It means that there are more and more Protocol Analyzers to be used in those Electronic Products, and the Protocol Analyzer SCCB is developed to adapt to this trend. At the same time, there is no need for many Circuit Pins, the Protocol Analyzer SCCB can own the powerful functions.

However, the trend brings the challenge to the R&D engineers. When the Digital Signal is analyzed, if only the oscilloscope is used to analyze the Digital Signal, it is very difficult.

Zeroplus Technology Logic Analyzer have issued more than seventy Protocol Analyzers. When engineers analyze the signals of Protocol Analyzer, the time of development can be reduced through the Automatic Decoding function of the Software and the product can come into the market early. At the same time, with the help of the software, it is unnecessary to decode the signal with the manual mode when facing various Digital Signals. If you want to learn more introductions about the Zeroplus Logic Analyzer, please visit the website of Zeroplus Technology, www.zeroplus.com.tw.

Reference:

Serial Camera Control Bus Functional Specification. PDF - http://www4.cs.umanitoba.ca/~jacky/Robotics/DataSheets/ov-sccb.pdf