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# The Measurement Application of Protocol Analyzer

# MANCHESTER

## MANCHESTER

The Manchester Encoding is also called PE (Phase Encoding). It is a Synchronous Clock Encoding technology, which is used for the Physical Layer to encode the Clock and Data of a Synchronous Bit. The Manchester Encoding is mainly applied in the Ethernet or the Wireless Transmission with Low-power.

The Manchester Encoding uses a kind of simple Binary Sequence Encoding, which can avoid the lost of the Synchronous Clock and the Displacement Error from the low Bit. The character of the Manchester Encoding is that whether the Data Bit is 0 or 1 (Refer to Figure 1), it will appear the High and Low Levels Transition in every Bit Time; when the level is transmitted from High to Low, it stands for “0”; when the level is transmitted from Low to High, it stands for “1”. So it is convenient to get the Synchronization Effect at the Transmitting terminal and Receiving terminal, for instance, the IEEE802.3 CSMA/CD Network is adopting the technology of the Manchester Encoding.

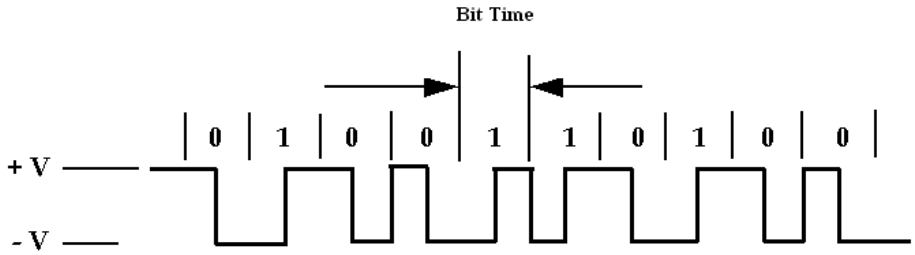


Figure 1: MANCHESTER Bit Explanation

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The theory of the Differential Manchester is the same as the Manchester Encoding Mode roughly, but there is a fixed Level Transition for each Data Bit in the Differential Manchester. When there is a High and Low Levels Transition at the start of the Data Bit, the Data Bit is noted as “0”; when there is not a High and Low Levels Transition at the start of the Data Bit, the Data Bit is noted as “1” (Refer to Figure 2). Otherwise, in the Differential Manchester, there is other definition; when there is not a High and Low Levels Transition, it stands for “1”; when there is a High and Low Levels Transition, it stands for “0”. The High and Low Levels Transition during the transmission of each Data Bit stands for the Clock; the High and Low Level Transition appearing at the start of the Data Bit stands for the Data. The advantage of this mode is to separate the Clock and the Data, and it is convenient for analyzing.

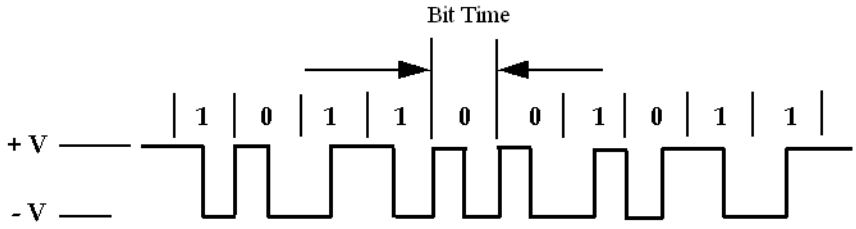


Figure 2: Differential Manchester Bit Explanation

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# The Introduction of the Protocol Analyzer MANCHESTER Analysis Module of Zeroplus Logic Analyzer

MANCHESTER Analysis Module of Zeroplus can support all Zeroplus Logic Analyzer models. Users can select the customized mode, set the data for the Bit Clock, length of Data Bit, Trigger edge, Parity and the Inaccuracy Rate in the Configuration interface as users' requirements.

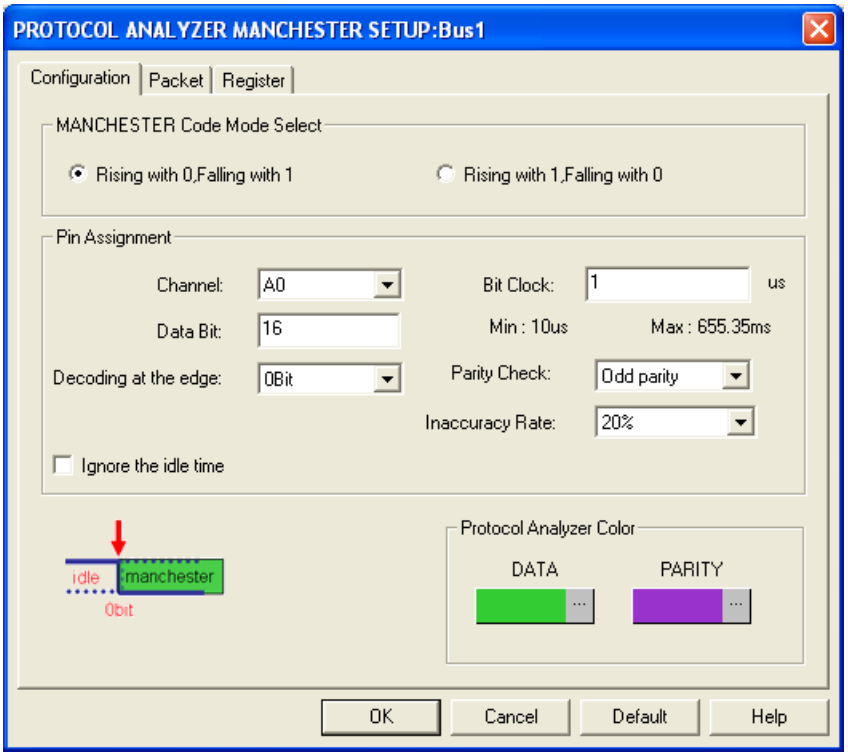


Figure 3: The Configuration Interface of Protocol Analyzer MANCHESTER Analysis Module of Zeroplus Logic Analyzer

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# MANCHESTER Code Mode Select

## Rising with 0, Falling with 1

Refer to the Figure 4; the range between A Bar and B Bar marked a red oblong is denoting the length of a Data Bit. It appears a High and Low Levels transition during the time of the Data Bit. Refer to Figure 4; the value is judged as “0” in the Code Mode Select.

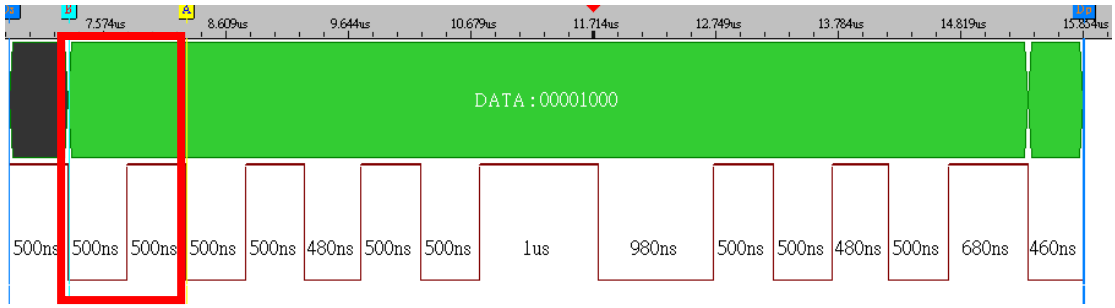


Figure 4: The MANCHESTER Decoding Image when Selecting the **Rising with 0, Falling with 1**

## Rising with 1, Falling with 0

Refer to Figure 5; it is similar to the “Rising with 0, Falling with 1” Mode. In order to supply the flexible selection for engineers, Zeroplus designs the “Rising with 1, Falling with 0” Mode.

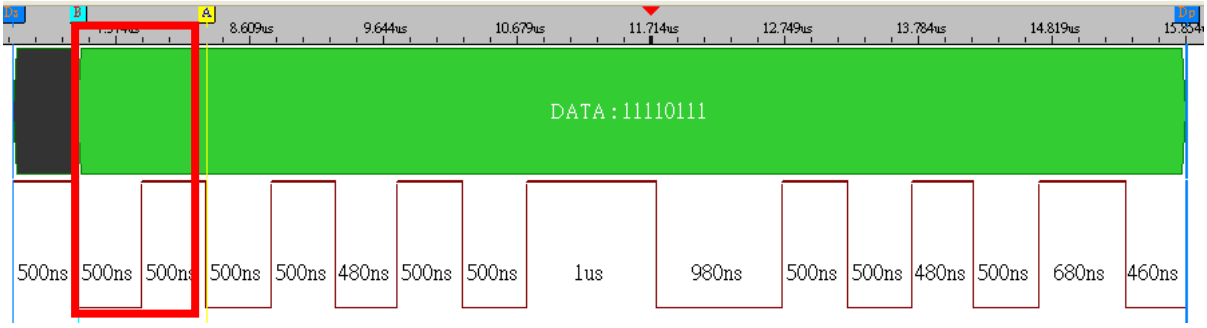


Figure 5: The MANCHESTER Decoding Image when Selecting the **Rising with 1, Falling with 0**

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**Bit Clock：**

It represents the time length of the Data Bit in Manchester Encoding. According to the different Bit Time, users can set the time of Data Bit for signal as required.

**Data Bit:**

The number of the Data Bit in the Manchester Encoding, users can set number of each Data Bit.

**Decoding at the edge:**

In the idle status, this function will denote with the High Level persistently; when the signal appears a Falling Edge, it denotes that it starts to transmit the Data. The function of the **Decoding at the edge** is that whether it needs to do the forward decoding or the backward decoding when users adjust the start of the transmission; there are Front 0.5bit, 0bit, Back 0.5bit, Back 1bit, Back 1.5bit and Back 2bit in total. See the Figure 6 as below:

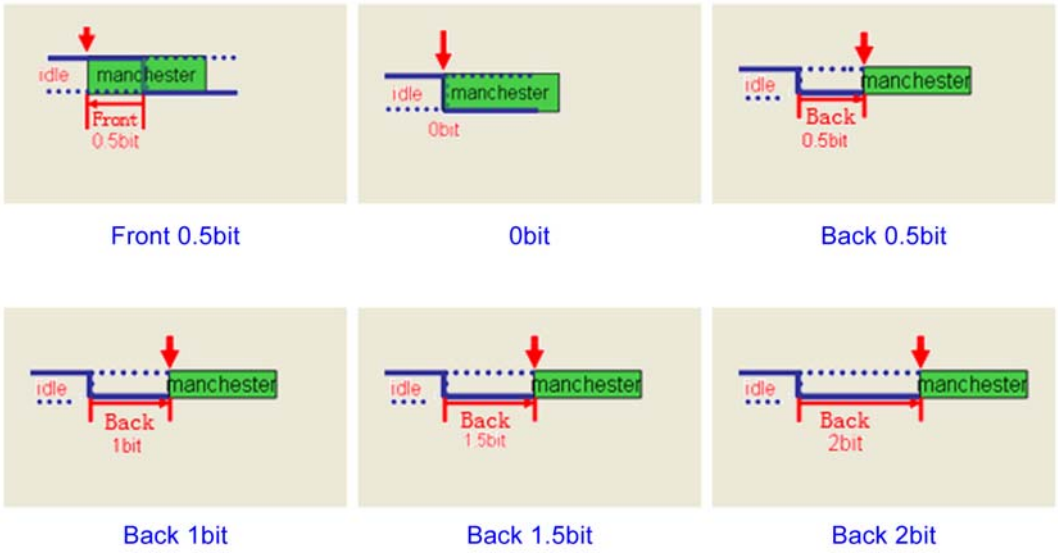


Figure 6: Decoding at the edge

**Parity Check:**

Parity Check is used to evaluate Data when transmitting. The Parity Check can be set to the Even parity, Odd parity or None parity 3 mode.

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**Inaccuracy Rate:**

When transmitting the Data, the Data Bit might be different from speed transmitting that caused by device problem, the transmission cable problem or other interruptions. The **Inaccuracy Rate** is designed to resolve this condition. The Software modifies the decoding and avoids the incorrect decoding. The setting range of **Inaccuracy Rate** is 10%, 15% and 20%.

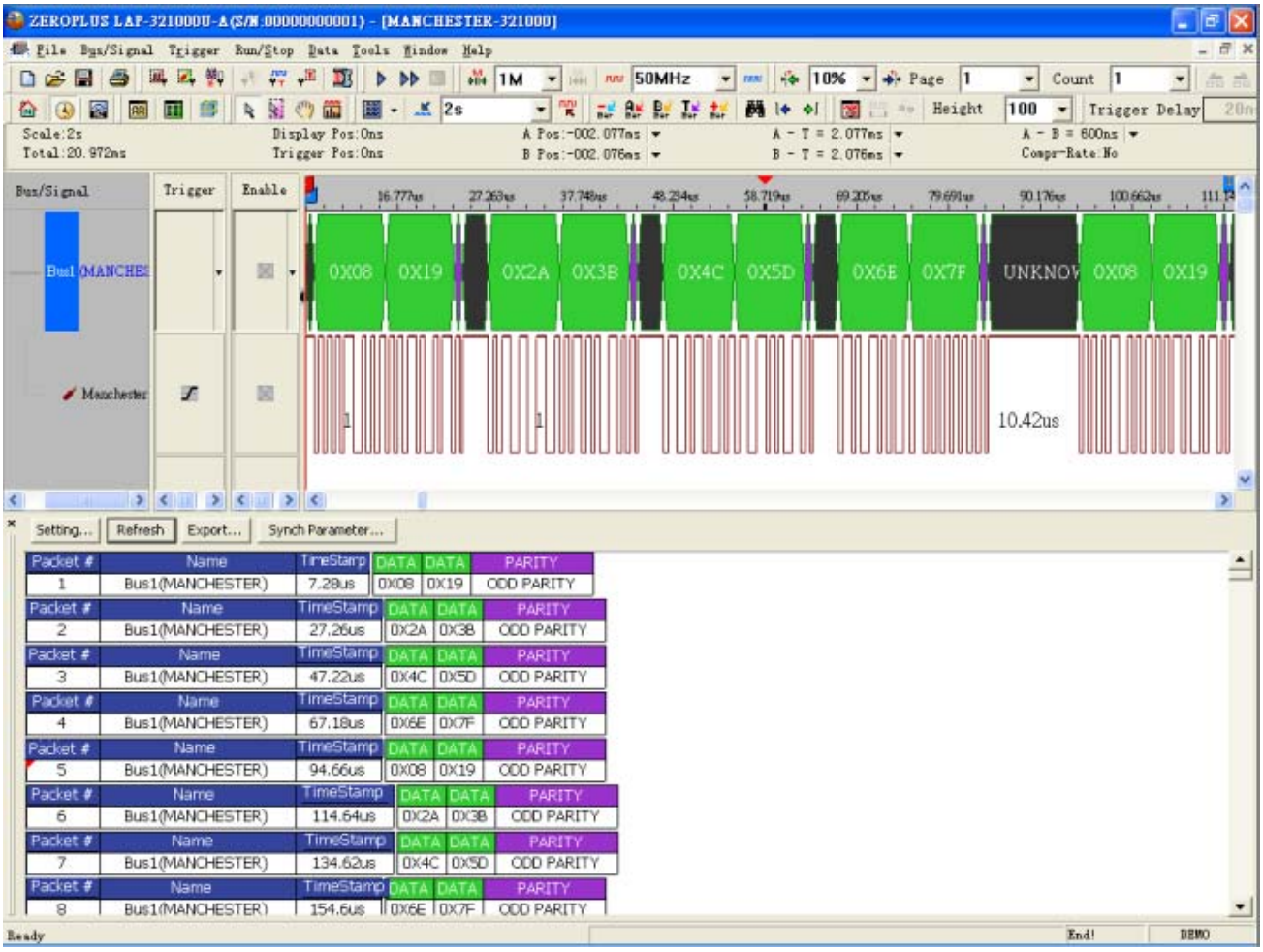


Figure 7: The Waveform Image of the Protocol Analyzer MANCHESTER Analysis Module of Zeroplus Logic Analyzer

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## Other Application of the Manchester Encoding

The Manchester Encoding is also widely applied in RFID system, such as FeliCa.

The FeliCa is a communication technology, using ASK10% Modulation and Manchester Encoding; the frequency is 13.56MHz. Adopted the Symmetrical Transmission, it only needs 0.1 second from the Data Encrypting to the Read Completion; the Data Transmission Rate can reach to 212Kbps. It is standardized to the ISO 18092 (Near Field Communication, NFC) later. NFC Technology is widely applied in the Stored Value Ticket, the Building Access Control and the Micro-payment of the convenience stores. The NTT DoCoMo of Japan even introduces the FeliCa technology to the mobile phone, which becomes the Wallet Phone. The application of the FeliCa in the mobile phone is called as Mobile FeliCa IC Cheap.

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## Conclusion

Ever Since 2004 , ZEROPLUS Technology invested our passion and technical knowledge in Logic Analyzer. Today, ZEROPLUS supports more than fifty Protocol Analyzer decoding modules from Automotive, PC System, IC interface, Digital Audio, Basic Logic, to Memory and RF system Please contact us for more information of logic analyzer and new customized protocols service_2@zeroplus.com.tw ; www.zeroplus.com.tw.

**Reference:**

Chapter Two of *Local Area Networks*, Physical Layer and Coding Schemes from http://www.cs.nthu.edu.tw/~nfhuang/chap02.htm.

FeliCa from http://zh.wikipedia.org/w/index.php?title=FeliCa&variant=zh-tw.

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