Gorgeous Stage Lighting Effect - DMX512

What is DMX512 ?

Although modern people are busy with their work, they will still go to see a vocal concert or stage drama in spare time. In fact, they are usually attracted by the colorful special effect of lightings, which are made by the engineers of special effect team. In early days, in order to control various lightings or devices with special effect, single controller was adopted, but the devices which can be connected had limited types and difficult to manage as well. Therefore, USITT developed the DMX512, a protocol applied in the communication between console and light modulator.

Advantages of DMX512

As the name of DMX512 implies, a single signal packet can once control 512 devices, including light fittings and even more advanced ones, such as fog machines, mobile lamps, etc.. Generally speaking, connection between device and device includes the following three modes:

XLR - 5 Pin :

XLR-5 Pin can transmit two data, which consist of Common, Data1-, Data1+, Data2- and Data2+.

XLR - 3 Pin :

XLR-3 Pin only can transmit one data, which consists of Common, Data1- and Data1+.

RJ - 45 :

Same as the XLR-5 Pin, RJ-45 also can transmit two data, but Common is different, which consists of Data1 Common and Data2 Common.



▲ Fig.1: male and female connecting ports of XLR-3 Pin

The connecting port on the device in the current market mainly focuses on XLR-3 Pin, see Fig.1 below.

DMX512 transmits data in a way of asynchronization, at a speed of 250K bps.

Each device's action is determined by the 8-bit data, each of which can provide the values from 0 to 255 to present different kinds of situation controls. With these 256 controlling capabilities, the adjustable LED fittings are very flexible to control. Take the light fittings of three original colors R, G and B for example, each color has 256 types, and all of them can compound 16777216 (256 x 256 x 256) colors, namely full color, in total.

Although DMX512 has provided a pretty convenient communication protocol, complex wiring engineering is still needed during the practical application. To perform more conveniently, DMX512 develops the wireless control technique adopting 2.4GHz as the medium.

In addition to the 2.4GHz wave range which is hard to be interfered, direct sequence DSSS and HOP technique is used, which makes DMX512 better ensure the accuracy of data during wireless transmission.

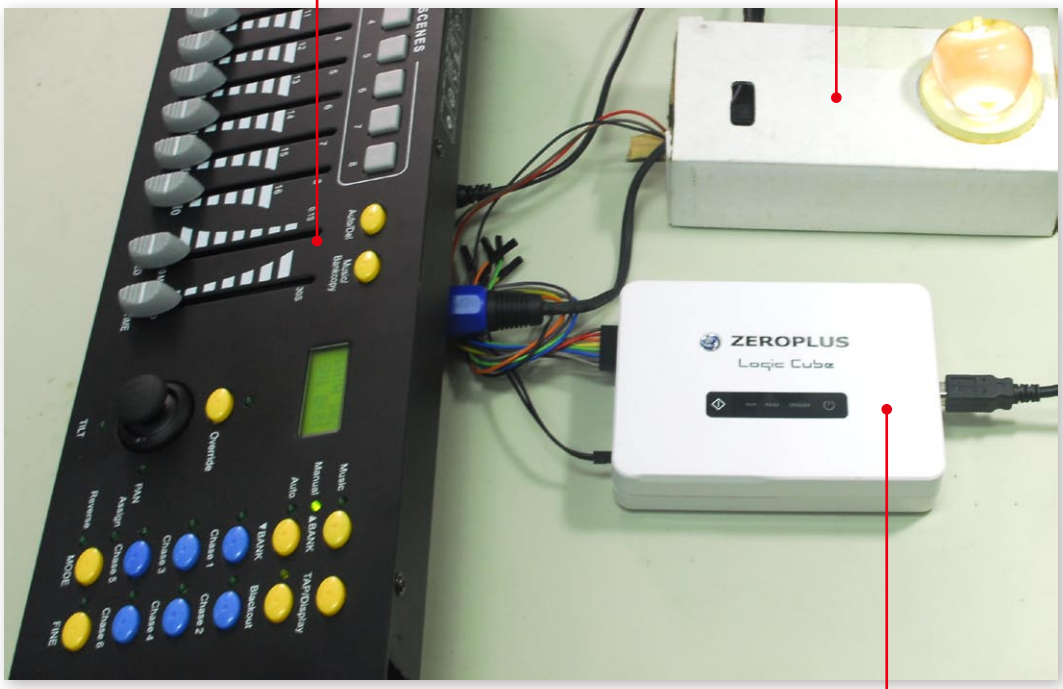
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Service for DMX512 provided by Zeroplus Logic Analyzer

Making long efforts in developing logic analyzer, Zeroplus currently issued a DMX512 Bus decoding module, by which users can analyze and research control system at a faster speed. Next, we will observe the functions of the logic analyzer by measuring the practical object of DMX512 under test.

Take the common DMX512 console in the market and Microchip LED lighting developing board to do test, see Fig.2 below for the completion of environment construction.



▲ Fig.2: DMX512 test environment

In the example, we set the Microchip LED lighting developing board as the light fitting of four colors R, G, B and L, and control them by the Channels 1~4 on the DMX512 console, then use the Zeroplus logic analyzer to capture the DMX512 signal.

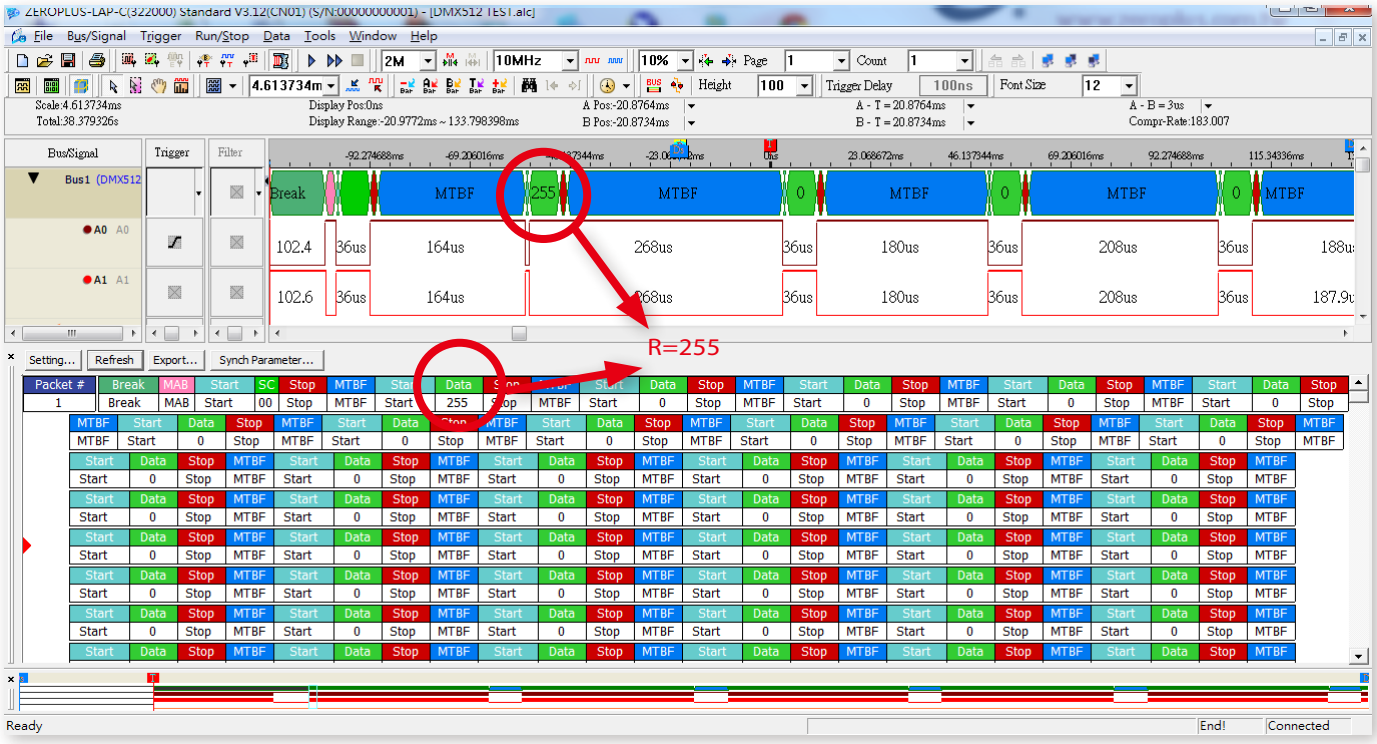
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Firstly, adjust the Channel 1 on the DMX512 console to see the performance of single-color lighting.



▲ Fig.3: R=255

Now, capture signal by Zeroplus logic analyzer, see Fig.4 below for the captured signal.

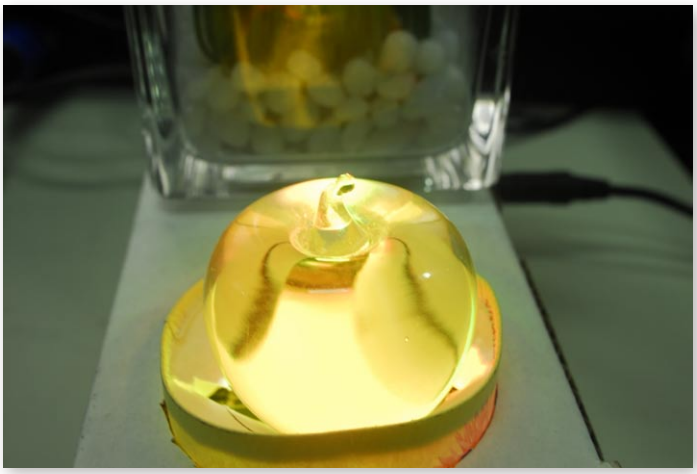


▲ Fig.4: DMX512 decoding of logic analyzer

Through the DMX512 Bus decoding module of Zeroplus logic analyzer, users can quickly learn about the data that the DMX512 is currently transmitting. It is a necessary tool either to develop DMX512 control device or to develop the device being controlled.

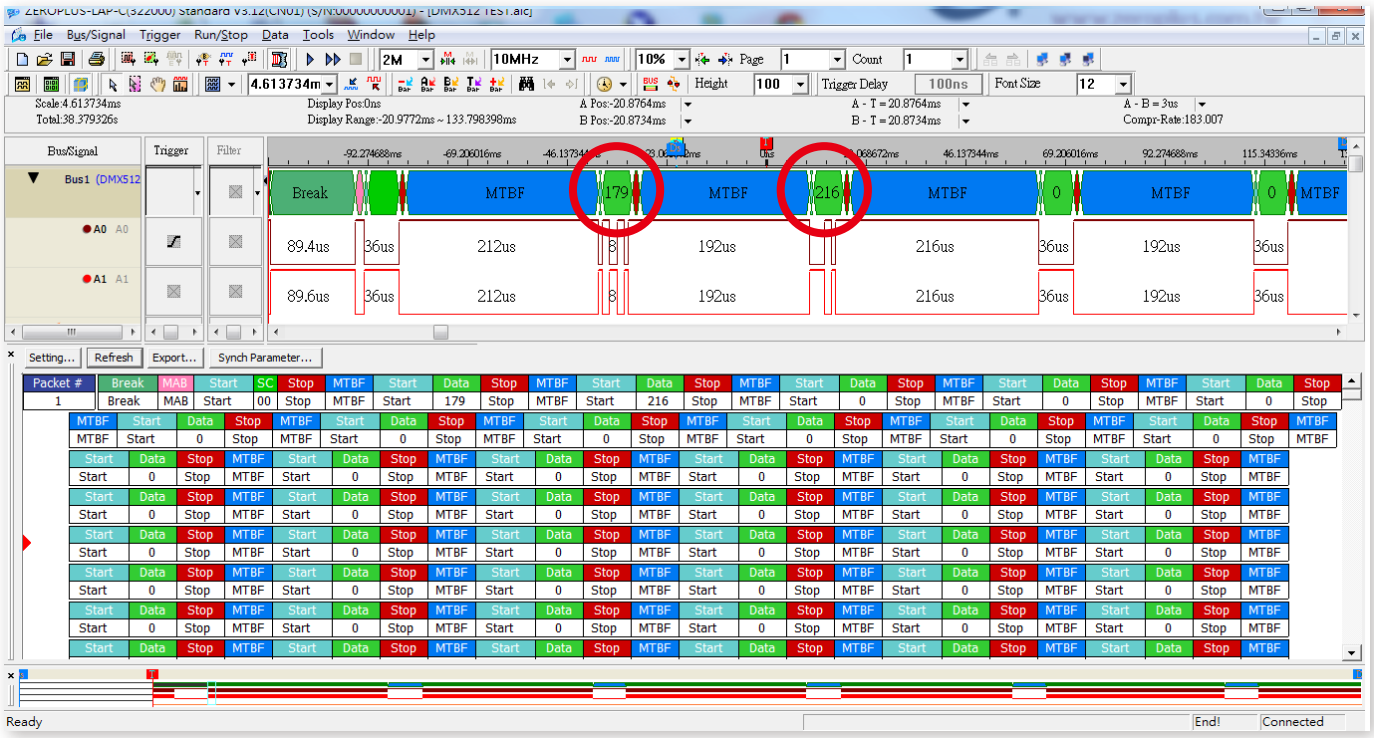
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Next, let's have a look at the compound effect of R and G.Next, let's have a look at the compound effect of R and G.



▲ Fig.5: R mixes with G.

Similarly, capture the present signal by logic analyzer once more.



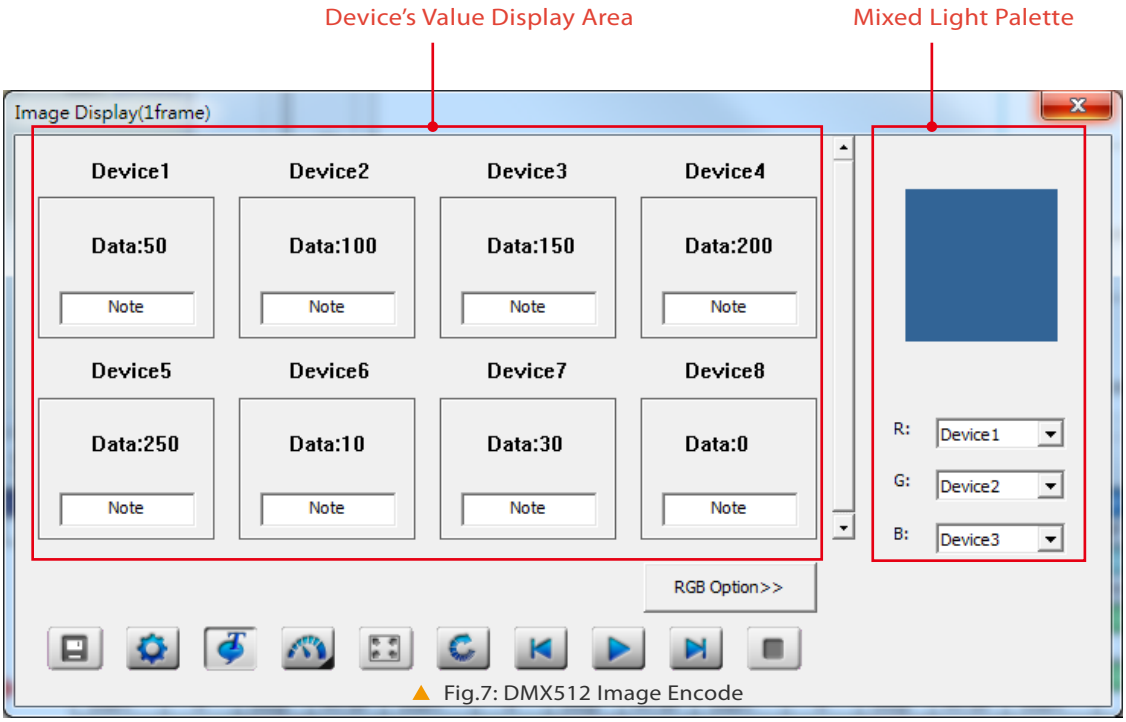
▲ Fig.6: DMX512 decoding of logic analyzer-R mixes with G.

From the Fig.5 above, we can see the yellow light is compounded by R and G. If there is no appropriate instrument to measure, it's unable to know how the yellow light is generated. However, after capturing and decoding its signal by the logic analyzer, we can clearly see that the yellow light is composed of R=179 and G=216, and can verify whether the control of DMX512 signal operates properly.

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In order to improve efficiency of analyzing DMX512 signal for users, Zeroplus Technology introduces the image encode function, through which users can quickly know about the value changes of device to be analyzed, they also can see the mixed color of these four colors by software analog function. See Fig.7 below for DMX512 Image Encode window.



▲ Fig.7: DMX512 Image Encode

In the device's value display area, users can lock the device program to be analyzed and tracked and input the note of what the device is in the Note box. After the light sources of R, G, B and L have been set, the right mixed light palette can show the values of light sources and their mixed color. In this way, it is faster and more convenient for users to analyze the DMX512 network devices.

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Summary

Bus protocol is usually used in all kinds of digital systems, but it is quite time-consuming to analyze these digital signals if only oscilloscope is used. Zeroplus logic analyzer provides hundreds of Bus protocol decoding modules and powerful software functions, which help the engineers work smoothly while developing products, and quickly solve various puzzles in circuit development.

Gary Hsu
Instrument Dept. / FAE

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