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Development of graphical user interface based DOS environment for USB to RS232 converter

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Abstract : *This paper discussed on the successfully developed of graphical user interface (GUI) by QBasic for transmitting asynchronous binary data of ASCII character via USB to RS232 converter to max232. The system consists of Personal computer (PC), QBasic software, USB to RS232 converter, driver software for USB to RS232 converter, and Max232. The oscilloscope is used to display the transmitted asynchronous binary data by GUI to input and output pins of max232, respectively. The American standard code for information interchange (ASCII) code character from PC is transmitted via keyboard using serial communication protocol. The result showed the transmitted w characters observed at input and output pins of max232, respectively. The result showed the voltage level of asynchronous binary data w at the input and output pins are in RS232 format and TTL format, respectively. The transmitted asynchronous binary data of ASCII character via USB to RS232 converter conveyed binary data in RS232 voltage level while Max232, binary data is in TTL voltage level.*
Keywords – *USB to RS232 converter, GUI, serial communication, QBasic, max232*

I. INTRODUCTION

A graphical user interface (GUI) have been developed by using various high level language programs such as visual basic, MATLAB, Visual studio, etc. for various applications. Most computers today have been developed with Universal serial bus (USB) port for connection with peripheral devices and equipped with higher memory space. One of popular programmed to support the USB communication port of computer is by programming GUI using Visual Basic. It is designed by Microsoft for graphical user interface programming which is different with general purpose programming language as well as procedural language. Microsoft calls visual basic an event-driven programming language. Since the sequence of events that a user chooses is practically unlimited, the programmer must code each event independently in such a way that it can interact with other events. In industrial application the GUI based on DOS environment is suitable used for small memory application. Although, the GUI based DOS environment does not support a new communication port in computer environment such as the USB port and therefore, configuration of COM port of USB is needed. The ASCII characters are normally transmitted signal used via COM port of PC to outside world such as Max232, RS485, microcontroller, etc. [1-3]. The transmitted of ASCII character is normally in binary code and in RS232 voltage level. However, the RS232 voltage level is not compatible with voltage level use by microcontroller. The Max232 change the RS232 voltage level to TTL voltage level. The RS232 voltage level is high above +12 and -12 V. The TTL voltage level is low between 6 V to 5 V [5,6].

In order GUI communicate via USB to RS232 converter to Max232, the GUI need to be programmed and the USB to RS232 converter need to be configured. Here we report the development of GUI based DOS environment and configuration and identification of USB to RS232 converter device for transmitting The American standard code for information interchange (ASCII) character to Max232. The objective of this research is to develop GUI based QBasic program and to configure the COM USB port in window system connected for the USB to RS232 converter. As far as we knew, the development of GUI based DOS environment and configuration USB COM port for USB to RS232 converter device is rarely been reported.

II. MATERIAL AND METHOD

The ASCII code character is transferred from USB port of PC via USB to RS232 converter to max232. The USB to RS232 converter is plug in at any USB port of PC to be identified or configured by the windows system. The first step is to identify the USB to RS232 converter device connected to USB port of PC.

The detected of un-configured and un-identified of USB to RS232 converter device is displayed as the USB serial controller in device

manager of setting window as shown in Fig. 1 (a). For identifying USB to RS232 converter device, a corresponding driver is installed into the PC. This can be done by double clicking the USB serial controller and clicking the driver install button in device manager system. The driver software is automatically installed into PC by clicking the "search automatically for updated driver software" as shown in figure 1 (b). The successfully installed driver software of USB to RS232 converter will recognize the used of COM port of USB port connected to USB to RS232 converter device as shown in figure 3. The recognized of COM port will be used in QBasic program for setting the COM port link to USB to RS232 converter device.

A complete GUI based DOS environment for transmits ASCII character programmed by QBasic is shown in Fig. 4. The successfully installed QBasic64 will display QBasic screen. The command of "OPEN "COM3:9600,N,8,1,CD0,CS0,DS0" FOR RANDOM AS #1" is used to interpret the GUI with COM port 3 of connected USB to RS232 converter device where the ASCII character can be transmitted via COM port 3. The baud rate, parity bit, number of data bit, and stop bit used is 9600, N, 8,1, respectively.

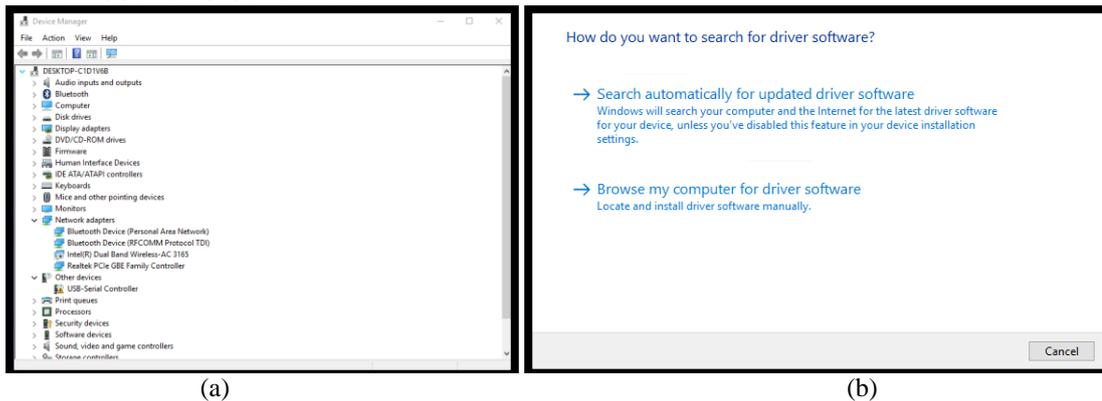(a)   (b)

Fig. 1 (a) the unidentified USB-serial controller and (b) The install driver software

The keyboard is used key-in any character to be transmitted unless the character q. The q character is reserved to quit the program. ASCII character can be received and located at GUI when microcontroller activates the corresponding signal. However, in the paper, we will only report the transmitted ASCII character from PC to Max232.
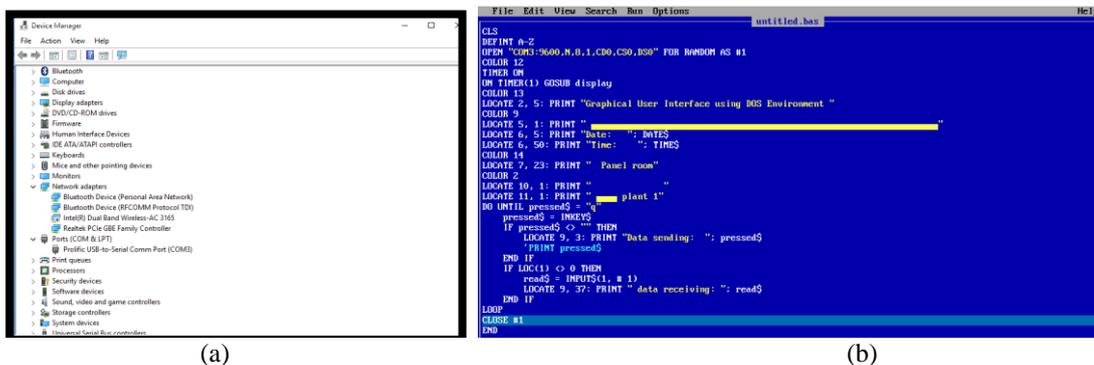

(a)   (b)

Fig. 2 (a) The successfully detected COM port 3 and (b) the QBasic program of GUI for transmitting ASCII character to MAX232

```
DO UNTIL pressed$ = "q"
    pressed$ = INKEY$
    IF pressed$ <> "" THEN
        LOCATE 9, 3: PRINT "Data sending:  "; pressed$
        'PRINT pressed$
    END IF
    IF LOC(1) <> 0 THEN
        read$ = INPUT$(1, # 1)
        LOCATE 9, 37: PRINT " data receiving: "; read$
    END IF
```
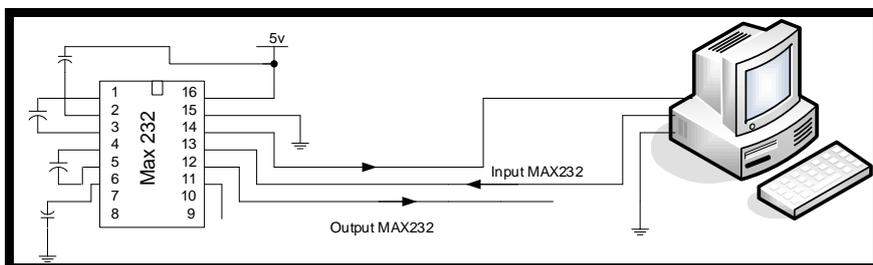
LOOP
CLOSE #1
END

Fig. 5 The MAX232 output and input pin connection

The asynchronous signal of ASCII character transmitted from PC to MAX232 and the asynchronous signal of ASCII character transmitted to microcontroller are captured by oscilloscope at MAX232 input and output pins, respectively as shown in Figure 5. The form of character transmitted by GUI to MAX232 is captured by an oscilloscope and the binary code data is analyzed.

III.   RESULTS AND DISCUSSION

The completed connection hardware between PC and USB to RS232 converter device to Max232 is shown in Fig. 6. The identified port used by USB to RS232 converter is connected at USB of COM port 3 and for GUI DOS environment. The Max232 is connected from female to male of RS232 to USB converter.
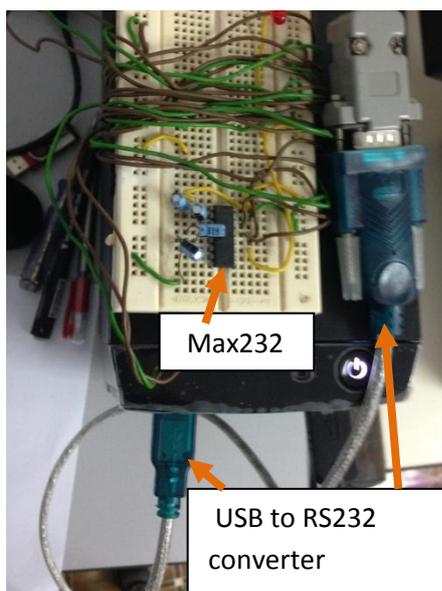

Fig. 6 The connection of USB to RS232 converter to MAX232

The running mode of GUI is done by clicking the run button as depicted in Fig. 8. The GUI showed the entered and transmitted of 'w' character via USB to RS232 converter device. Note that, any ASCII character can be key-in through this process i.e character 's', 'f', 'j', etc.. As can be seen in Fig. 8, the transmitted 'w' character in binary code is captured at input and output pins of MAX232. The results showed two different voltage levels of transmitted ASCII w character at input and output pin MAX232. The channel 1 showed the amplitude voltage of w character in binary code is around 21.8 V while channel 2 showed amplitude voltage of binary w character around 5.8 V. The result showed the amplitude voltage level of binary code observed at the input pin of Max232 is smaller than the output voltage level. The MAX 232 change the amplitude level voltage of binary code of w character from 21.8 V to 5.8 V. The voltage level of binary code is comparable in the range given in data sheet of Max232 where the minimum and maximum of voltage level is +30 V to -30 V [6-8]. It is observed that, the transmitted binary code of w character is in asynchronous binary mode or serial transmission mode with one

start bit, none parity bit, 8 data bit, and one stop bit. Note that, the w character in decimal and binary value is 119, 1110111, respectively. The asynchronous binary data observed at channel 1 is reciprocal with binary data code of w character, 0001000. However, the asynchronous binary data at the output of Max232 is consistent with asynchronous binary data of w character which is

110111. It is clear that, the binary code amplitude voltage level is not compatible with voltage level used for microcontroller such as PIC microcontroller, Audrino, etc. since them only received the voltage low (6 V). The Max232 however, dropped the voltage level asynchronous binary data required for microcontroller.
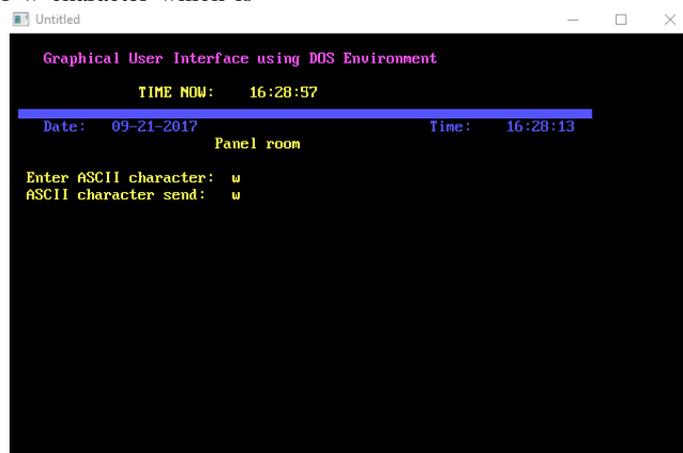

Fig. 7 The GUI based QBasic for transmitting ASCII character to MAX232

As can be seen in channel 2 of Fig. 8, the asynchronous binary data at the output of max232, the voltage level is dropped to 5. 8 V. As we knew that, MAX232 is used to change the RS232 voltage level into TTL voltage level [6-8]. Thus, the voltage level is reduced to 5.8 V. This range of voltage level is compatible with PIC microcontroller. The result confirmed the role of max232 at the output is dropped from 22.1 V to 5.8 V.
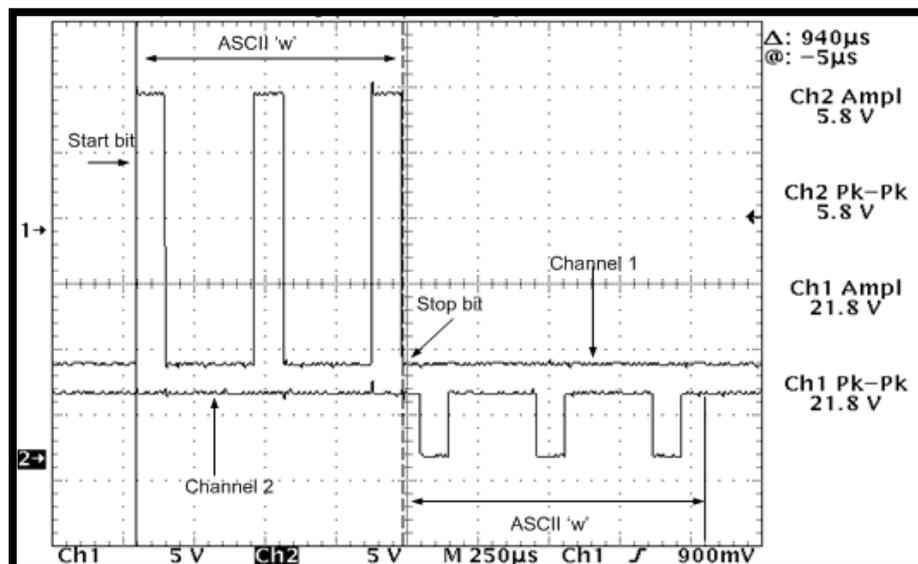

Fig. 8 ASCII 'w' character in RS232 form and TTL form

IV.   CONCLUSION

This paper discussed on the successfully developed of graphical user interface by QBasic program for transmitting asynchronous binary data of w ASCII character via USB to RS232 converter to max232. The ASCII code character from PC has successfully transmitted from GUI to Max232. The transmitted w characters at input and output pins of max232, respectively has different voltage level. The result showed the voltage level of

asynchronous binary data w at the input and output pins are in RS232 format and TTL format, respectively. The transmitted asynchronous binary data of ASCII character via USB to RS232 converter conveyed binary data in RS232 voltage

level while Max232, binary data is in TTL voltage level.

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