Future Technology Devices International Ltd.

Application Note AN_126

User Guide For FT232B/R Factory Test Utility

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Version 1.0

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This application note explains how to use the FT232B or FT232R factory test utility which provides a user interface to program and test FTDI FT232B or FT232R devices.

The accompanying software, ST232_ver1.4, replaces the previous FTDI utility (ST232R and ST232-245) used for this purpose.

Table of Contents

1   Introduction

The ST232_ver1.4 program is intended for use in a FT232B or FT232R manufacturing test environment. ST232_ver1.4 replaces the previous FTDI utility used for this purpose called ST232R and ST232-245. It has a single button user interface and returns a simple pass or fail for USB - RS232 designs. The executable version is hard-coded for use with the default VID (0x0403) and PID (0x6001) and it can also support other VID and PID combinations by EEPROM.ini modification. The source code for this program is provided on the FTDI website at the C++ Builder examples page and can be built by C++ Builder 2009. The test program also requires a special cable to operate correctly.

The features of ST232_ver1.4 are:

1. Auto-detect FT232B and FT232R

2. Support two testing methods: Y cable (The same with old method) and COM2 direct testing.

3. Selection test only or programming and testing.

4. Support EEPROM data programming by EPPROM.ini file or FTDI default.
    The EEPROM.ini file will be generated automatically.

5. Restore current setting

ST232_ver1.4 is available as a free download from the Utilities page of the FTDI website.

2 Hardware Configuration

EEPROM Configuration:

The FTDI FT232R device has an integrated 1024 Bit EEPROM, but the FT232B does not have such an integrated EEPROM. It requires an external 93C46 EEPROMs organized in 16-bit words. The FT232B also supports the 93C56 and 93C66 EEPROMs organized in 16-bit words.

CABLE Configuration:

This utility supports two testing methods. Both require a cable to be manufactured. Users require to select one test method and manufacture the appropriate cable. The following details the DB9 female connections for this cable:

1. Y cable (The same with old method):

   USB(DUT)Serial Pin 3 (TXD) to COM2 Pin 2 (RXD)

   USB(DUT)Serial Pin 2 (RXD) to COM2 Pin 3 (TXD)

   USB(DUT)Serial Pin 7 (RTS) to COM2 Pin 8 (CTS)

   USB(DUT)Serial Pin 8 (CTS) to COM2 Pin 7 (RTS)

   USB(DUT)Serial Pin 6 (DSR) to COM2 Pin 4 (DTR)

   USB(DUT)Serial Pin 5 (GND) to COM2 Pin 5 (GND)

   USB(DUT)Serial Pin 4 (DTR) to COM2 Pin 6 (DSR)

   USB(DUT)Serial Pin 1 (CDET) to COM1 Pin 4 (DTR)

   USB(DUT)Serial Pin 9 (RI) to COM1 Pin 7 (DTR)

2. COM2 direct testing:

   USB(DUT)Serial Pin 3 (TXD) to COM2 Pin 2 (RXD)

   USB(DUT)Serial Pin 2 (RXD) to COM2 Pin 3 (TXD)

   USB(DUT)Serial Pin 7 (RTS) to COM2 Pin 8 (CTS)

   USB(DUT)Serial Pin 8 (CTS) to COM2 Pin 7 (RTS)

   USB(DUT)Serial Pin 6 (DSR) to COM2 Pin 4 (DTR)

   USB(DUT)Serial Pin 5 (GND) to COM2 Pin 5 (GND)

   USB(DUT)Serial Pin 4 (DTR) to COM2 Pin 6 (DSR)

   USB(DUT)Serial Pin 1 (CDET) to COM2 Pin 4 (DTR)

   USB(DUT)Serial Pin 9 (RI) to COM2 Pin 4 (DTR)

Operation System setting:

To use this utility, the PC running the test must have one or two COM port.

If the PC has two COM ports then one of two testing methods can be used.

If the PC has one COM port then only the "COM2 Direct test" can be used. This requires that the user sets the COM port number to COM2. To do this, open the PC Device Manager and click the Port (COM & LPT), then choose the COM port of motherboard. This is illustrated below.
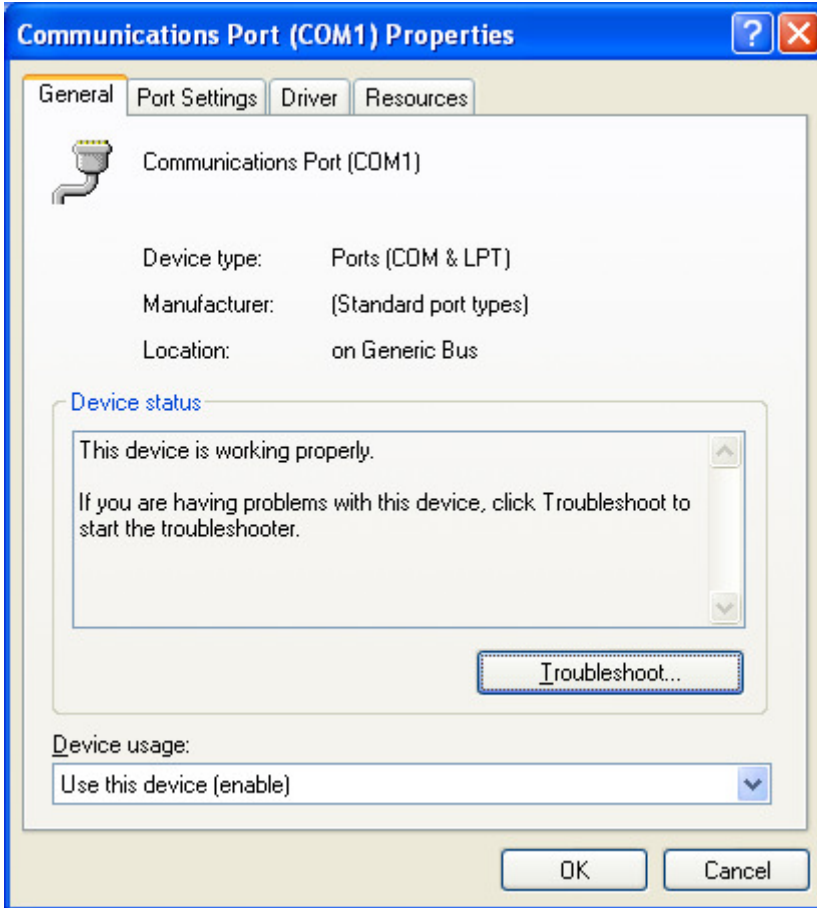

Figure 2-1 Re-assign COM port number 1

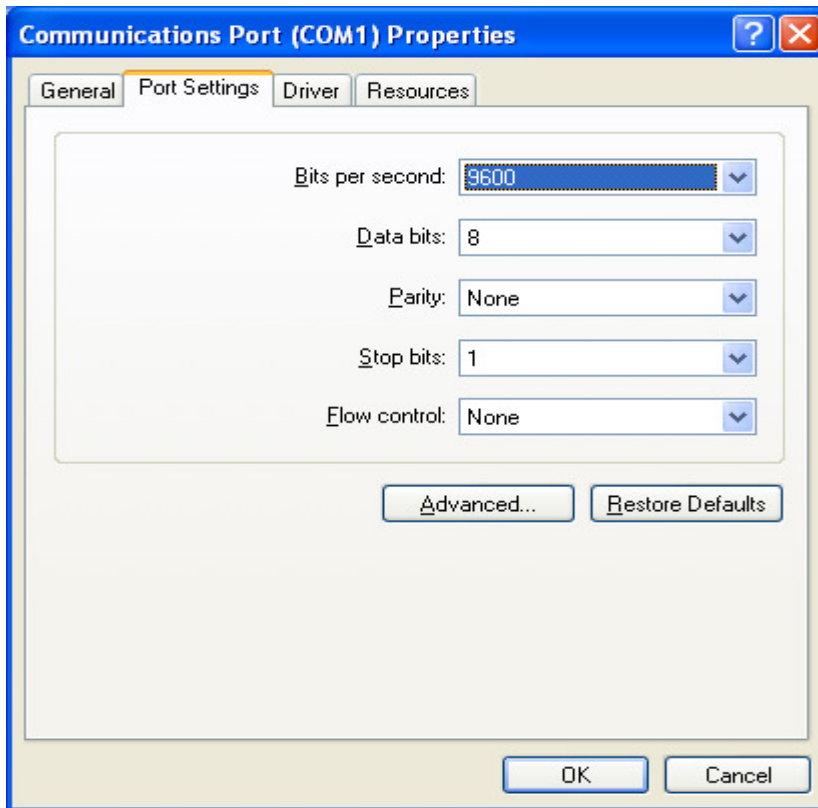Select the Port Settings then click "Advanced"

Figure 2-2 Re-assign COM port number 2

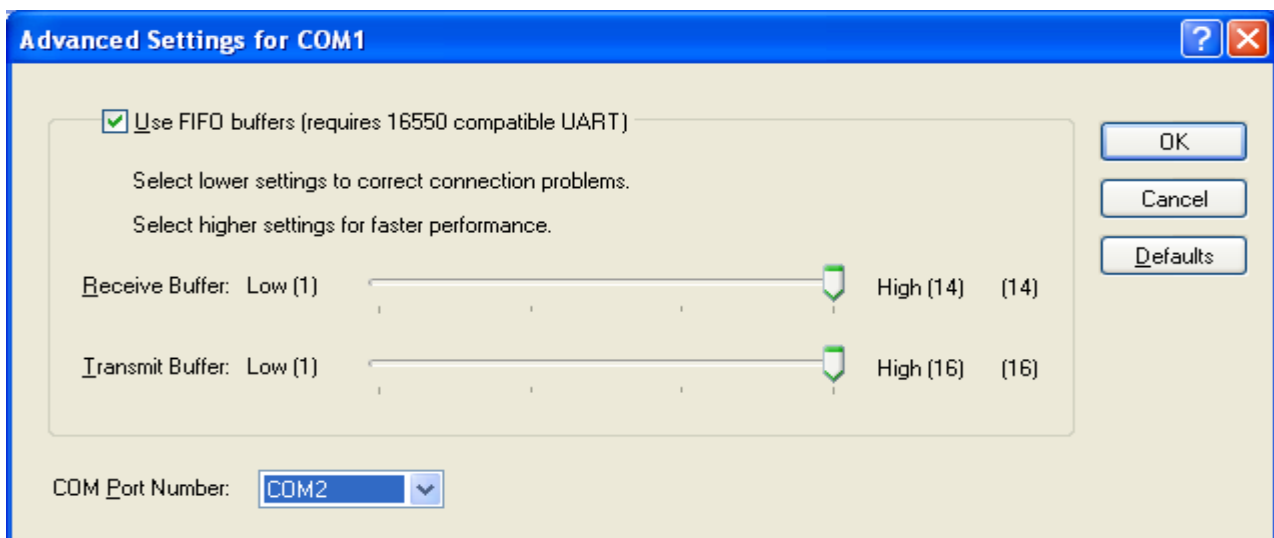Change the COM Port Number to COM2, and then click OK to finish the setting.

Figure 2-3 Re-assign COM port number to COM2

3   Utility Basics

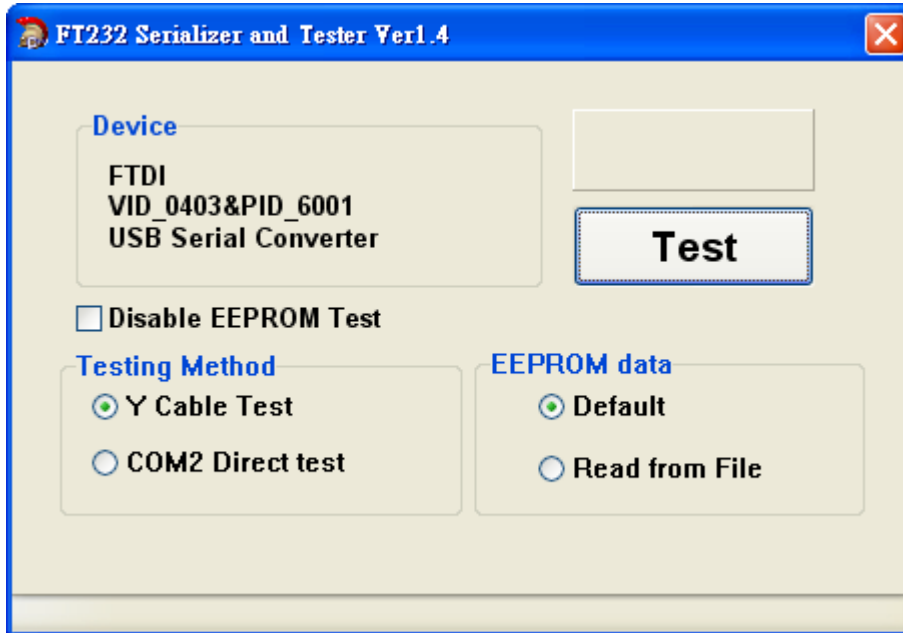When the test utility is run then the following screen appears:

Figure 3-1 Default GUI

The following sections explain how to use the selections on the GUI shown above.

3.1 Operation

The utility has three sections:

Device:

This section displays **existing** setting of the EEPROM.

Testing Method:

There are two testing methods: the Y-cable test and the COM2 Direct Test.

Test Method	Description
Y-cable test	Using DB9 Y cable that is defined in section2 and the PC onboard Com1,Com2 for testing
COM2 Direct Test	Using DB9 Direct test cable that is defined in section2 and PC onboard Com2 for testing.

Table 3.1 Test Method Selection switch

EEPROM data:

The following table describes the functions of these buttons:

Disable EEPROM Test	EEPROM Data	Description of operation
not selected	Select "Default"	Update Default data to EEPROM
not selected	Select "Read from file"	Update EEPROM from EEPROM.ini
selected	No function	No update EEPROM

Table 3.2 EEPROM Data Selection switch

The EEPROM data section has a switch, the default setting of EEPROM data is open. If "Disable EEPROM test" is selected, then the EEPROM data section will be hidden. In this state then the RS232 function only is tested.
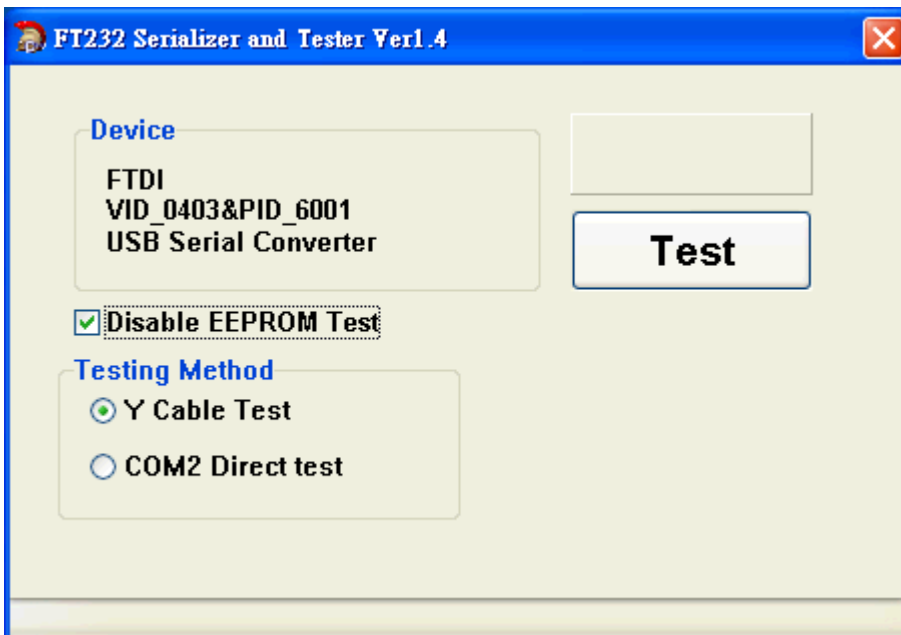

Figure 3-2 The GUI of Test Only

If "Default" is selected then the EEPROM data will use the FTDI default setting.

If "Read from file" is selected then the EEPROM data will use the setting from the "EEPROM.ini" file.

When the utility is run, an EEPROM.ini file will be created automatically.

When all settings have been selected then, press the "Test" button. If the test passes and the device has been programmed then the following is displayed.
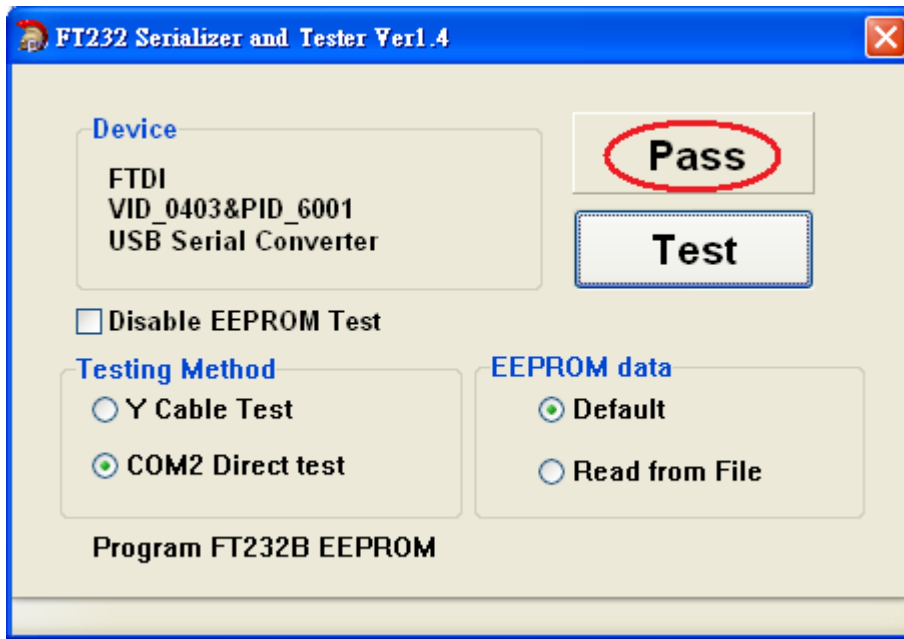
Figure 3-3 The GUI shows Pass message after testing

4   Edit EEPROM.ini Parameters

When user executes the test utility, it will automatically generate an EEPROM.ini file in the same folder. The EEPROM.ini file stores some EEPROM programming parameters and saves recent utility settings automatically. When user runs the utility, it will load the recent settings stored in EEPROM.ini file. The default contents of EEPROM.ini are list below.

```
[GENERNAL]
FT_VENDOR_ID=0x0403
FT_PRODUCT_ID=0x6001
FT_MANUFATURER_STRING=FTDI
FT_MANUFATURER_ID=FT
FT_PRODUCT_STRING=USB Serial Converter
FT_MAX_POWER=44
SELF_POWERED=0
REMOTE_WAKEUP=1
[FT232B]
SERNO_ENABLE=0
[FT232R]
SERNO_ENABLE=1
[SETTING]
EPPROM_EN=1
TEST_METHOD=0
READ_FROM=0
```
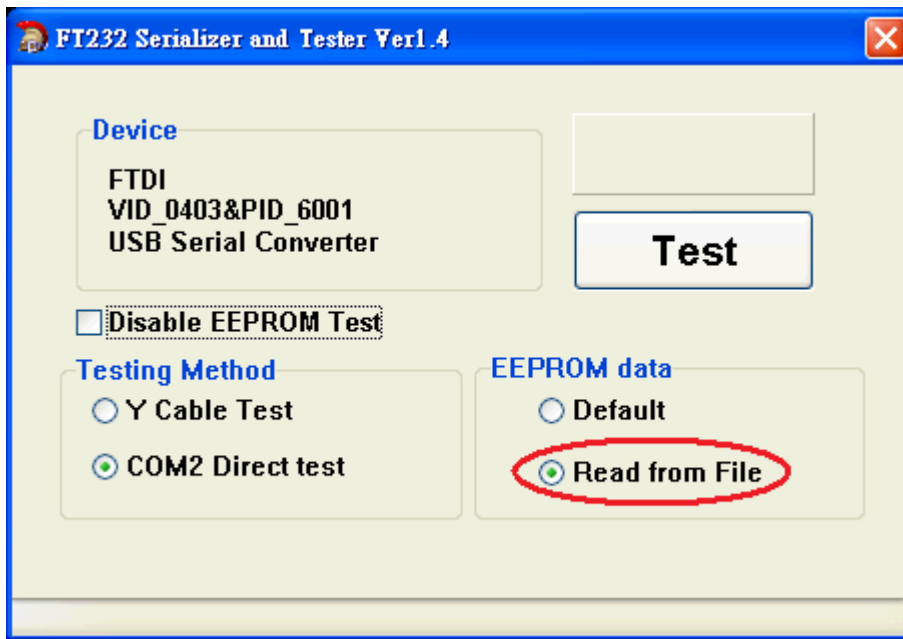
Figure 4-1 Read EEPROM configuration from EEPROM.ini file

If a user selects the "Read from File" setting and then presses the "test" button, the utility will also load the EEPROM parameters from the EEPROM.ini and program into the device. Please check the detailed EEPROM.ini parameters explanation in the following paragraphs.

4.1 VID/PID ID

In the EEPROM.ini file, the parameters of "**FT_VENDOR_ID**" and "**FT_PRODUCT_ID**" can be used to set Vendor ID and Product ID of USB configurations. If the FTDI default values are used, the VID and PID are fixed to 0x0403/0x6001. If custom USB Vendor ID and Product ID are used then it is necessary to change value of the "FT_VENDOR_ID" and "FT_PRODUCT_ID" in EEPROM.ini file to match these custom VID and PIDs. Please refer to the following example to modify the EEPROM.ini file.

FT_VENDOR_ID=**0x1234 // Set VID to 1234 of HEX**
FT_PRODUCT_ID=**0xABCD // Set PID to ABCD of HEX**

Note that if non-standard VID and/or PID values are used the driver INF and INI files must be modified to accommodate the new VID and PID combination. Please refer to the application note AN-107.

4.2 Description

In the EEPROM.ini file, "**FT_MANUFATURER_STRING**"," **FT_PRODUCT_STRING**" and "**FT_MANUFATURER_ID**" can be modified to change the description of device. The serial number is automatically chosen as a random value.

Note that the Maximum length of descriptors is 48 words. The descriptors include the manufacturer/produce Description and serial number that total 48 words.

4.3 Power selection

The "**FT_MAX_POWER**" and "**SELF_POWERED**" can be used to set USB description power selection.

The value of SELF_POWERED is 0, the device description is set in BUS powered mode.

The value of SELF_POWERED is 1, the device description is set in Self powered mode.

When a device is set in BUS powered mode, the value of "**FT_MAX_POWER"** will be used. Please refer the following example on how to modify the EEPROM.ini file.

FT_MAX_POWER=**100 // Set the description of USB Max power to 100mA**
SELF_POWERED=**0 // Set USB description of power mode to Bus Power**

All USB Devices:

- The maximum current that can be supplied over the USB bus without violating the USB specification is 500mA. Do not enter a value of more than 500mA in the Max Bus Power field.
- High power bus powered products. These products consume between 101mA and 500mA from the USB bus and can be plugged into any USB host. However, such products can only be plugged into self powered USB hubs (hubs that have their own power supply) as bus powered USB hubs can only supply 100mA per hub port.

Bus Powered USB Devices

These fall into two categories:

- Low power bus powered products. These products consume 100mA or less from the USB bus and can be plugged into any USB host or hub port.
- High power bus powered products. These products consume between 101mA and 500mA from the USB bus and can be plugged into any USB host. However, such products can only be plugged into self powered USB hubs (hubs that have their own power supply) as bus powered USB hubs can only supply 100mA per hub port.

![FTDI Chip]

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Self Powered USB Devices

These devices fall into two categories:

- True self powered products. These products have their own power supply and do not require any current from the USB bus. Enter a value of zero in the Max Bus Power field.

- Hybrid self powered products. These products have their own power supply, but also draw some of their operating current from the USB bus. Enter the current draw from the USB bus in the Max Bus Power field.

4.4 USB Remote Wakeup

The FT232R and FT232B are capable of resuming a PC from the USB suspend (sleep) state via the RI# pin. To use the remote wake-up capability, enable this option by value of "**REMOTE_WAKEUP**".

REMOTE_WAKEUP = 0 means disable.

REMOTE_WAKEUP =1 means enable.

4.5 Serial number

Because the utility supports two devices (FT232B and FT232R), the EEPROM.ini file has two serial number selections.

Users can set [FT232R] and [FT232B] with different items.

SERNO_ENABLE =0 means disable serial number

SERNO_ENABLE =1 means enable randomly generated serial number.

 Please refer the following example to modify the EEPROM.ini file.

[FT232B]
SERNO_ENABLE=**0 // If the device is FT232B, disable the USB serial number description.**
[FT232R]
SERNO_ENABLE=**1 // If the device is FT232R, generate the USB serial number description automatically.**

4.6 Other settings

The utility saves any setting changes automatically. When a user runs the utility, it will load the settings stored in the EEPROM.ini file. Additional settings of the EEPROM.ini are listed below.

EPPROM_EN:

0: enable EEPROM Data section

1: disable EEPROM Data section

TEST_METHOD:

0: use the Y Cable test

1: use the COM2 Direct test

READ_FROM:

0: set in Default

1: set in read from file

5   Definition of Error Messages

The following section shows some error messages which may be displayed if issues occur. It also indicates possible reasons for the failure to help with factory debugging.

- If the PC used to test the device does not recognise the motherboard COM ports, then the following message is displayed. To avoid this issue, please use a PC that has a COM ports. If user uses "COM2 Direct test", the PC must have COM2 port. If user selects"Y cable test", the PC must have COM1 and COM2 ports.
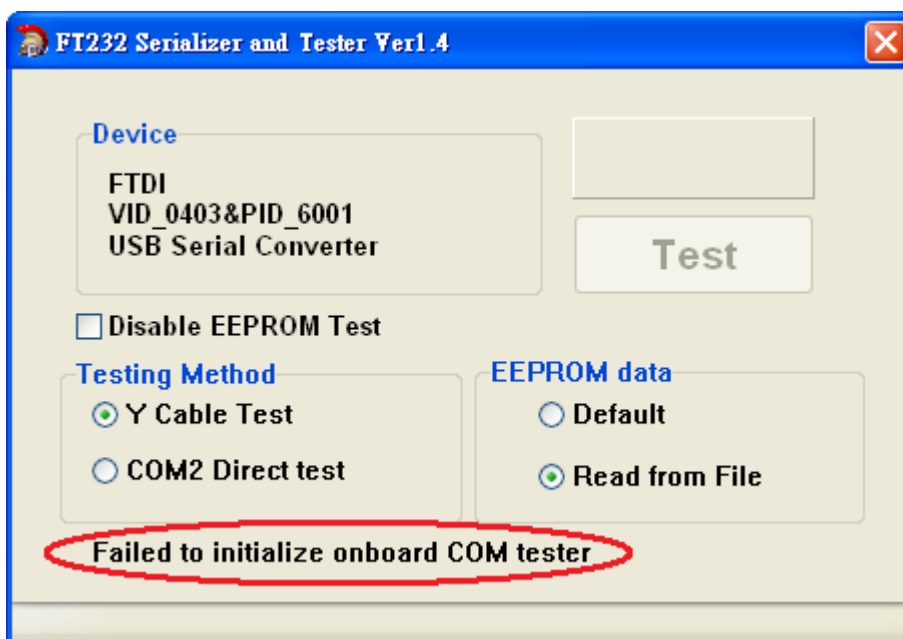
Figure 5-1 Failure message 1

- If the COM port test cannot detect the DTR signal, then the following message is displayed. Please check your DTR connection of the board or cable.
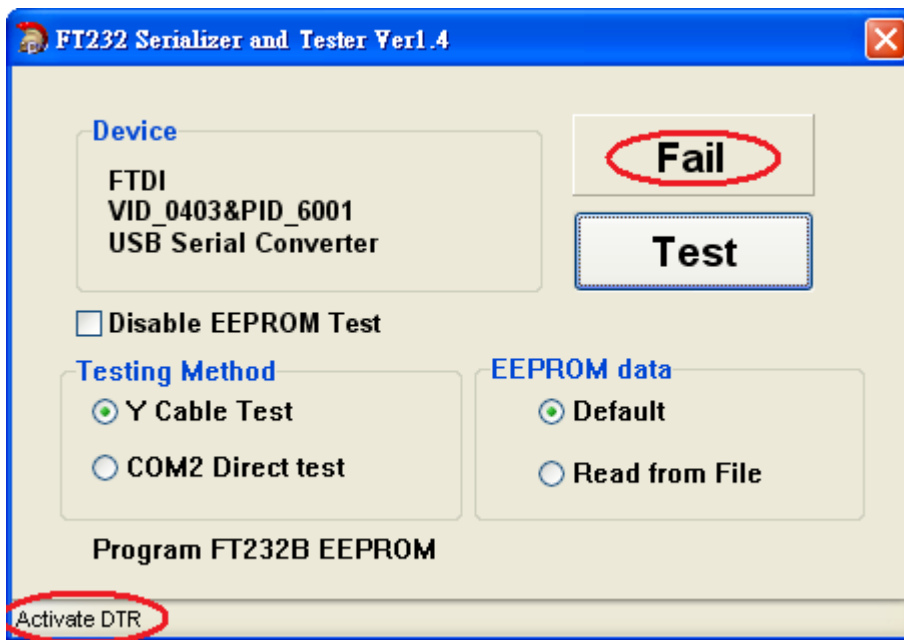
Figure 5-2 Failure massage 2

● If the COM port test cannot detect the CD signal, then the following message is displayed. Please check your CD connection of the board or cable.
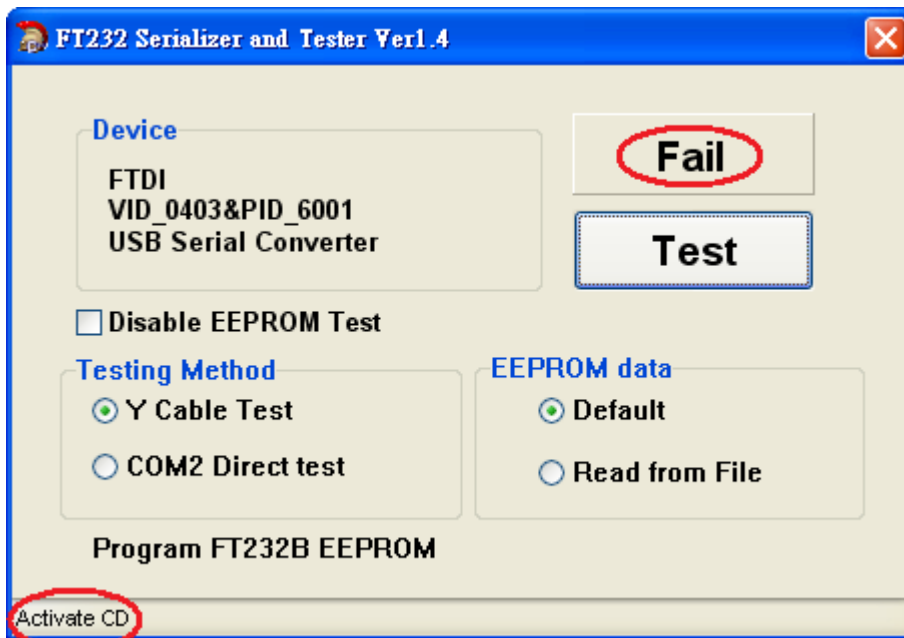

Figure 5-3 Failure message 3

● If the device cannot be seen by the PC, then the following error message is displayed. Please check the device is connected to the PC and that the PC has recognised the device.
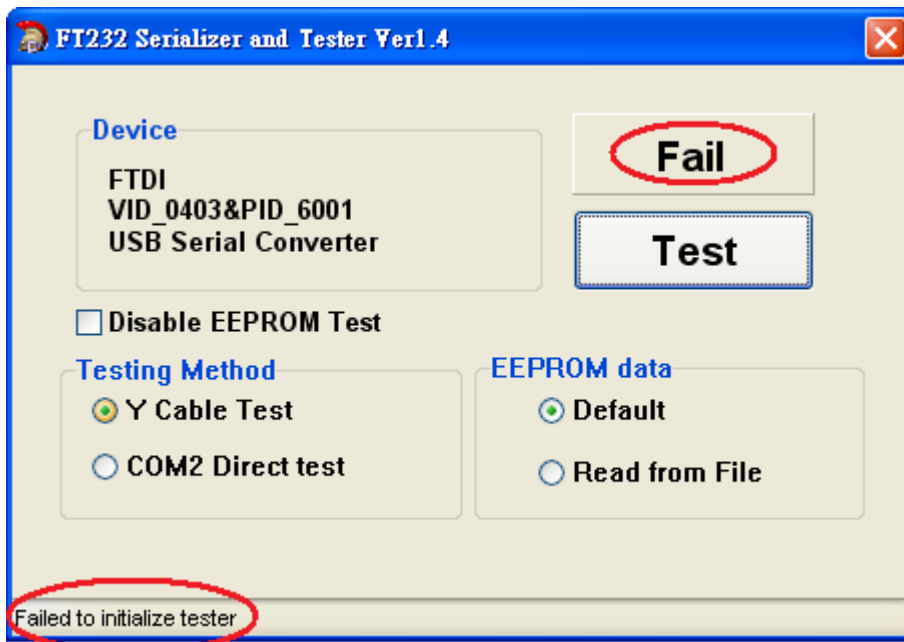
Figure 5-4 Failure message 4

● If the test fails with the following message then the utility cannot program the EEPROM. Please check your EEPROM or device soldering.
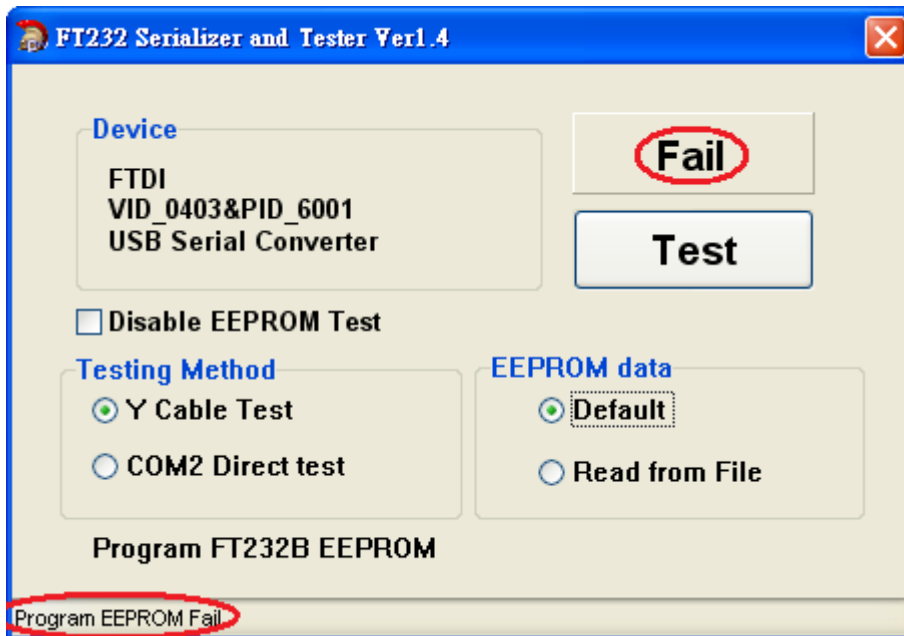
Figure 5-5 Failure message 5

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Distributor and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

Appendix A - Revision History

Revision History

Version 1.0   First Release   20/10/2009