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MB9B100A/MB9B300A/MB9B400A/MB9B500A Series

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# FM3 family inverter solution GUI User Manual

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## Revision History

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## 1 Introduction

This user manual describes how to use FUJITSU'S FM3 Inverter Platform GUI.

In Chapter 2, it explains system requirements for the GUI software.

In Chapter 3, it explains how to install the GUI software.

In Chapter 4, it explains how to install the communication driver (FTDI).

In Chapter 5, it explains how to use the GUI.

## 2 System requirements

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The GUI software supported environment on PC

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### 2.1 Supported Operating Systems:

Windows Server 2003, Windows Server 2008, Windows Vista, Windows XP, Windows 7

#### 1. Microsoft Windows XP Service Pack 2 or Service Pack 3

Minimum of 192 MB of RAM (384 MB preferred)

At least a 1 GHz processor (1.6 GHz preferred)

#### 2. Microsoft Windows Vista or Windows Vista SP1

Minimum of 768 MB of RAM (1 GB preferred)

At least a 1.6 GHz processor (2.2 GHz preferred)

#### 3. Microsoft Windows Server 2003 Service Pack 2 or Windows Server 2008

Minimum of 768 MB of RAM (1 GB preferred)

At least a 1.6 GHz processor (2.2 GHz preferred)

### 2.2 Supported software environment.

Microsoft.NET Framework 2.0(over this version preferred)

**Note: This software is necessary.**

### 3 Install GUI

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Install the GUI software in your PC

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This FUJITSU'S FM3 Inverter Platform GUI is given by compressed file, please copy and unzip the "FUJITSU'S FM3 Inverter platform GUI.zip" file to your PC. Then, you will find 10 files in the "FUJITSU'S FM3 Inverter platform GUI" folder.

Table 3-1: GUI files

	File name	Remarks
1	ARMInverterPlatform.exe	the Software Executable file
2	Electromotor_Ch.xsd	Parameter type file
3	Electromotor_En.xsd	
4	System_Ch.xsd	
5	System_En.xsd	
6	employeeCompressor.xml	the palm parameter database (Configuration file)
7	employeeFan.xml	
8	employeeSystem.xml	
9	WaveGUI.DLL	wave widget dynamic link libraries
10	[UM]ARM_INV-GUI.doc	User manual

## 4 Simply install steps about the communication Driver

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A simply install steps for the FTDI.

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### 4.1 To install FTDI driver in Windows XP

Simply install steps:

1. Connect the FTDI device (board) to a USB port on the PC.
2. New Hardware Wizard will launch.
3. Select "Install from a list or specific location (Advanced)".
4. Select "Search for the best driver in these locations" and enter the file path in the combo-box.
5. Install the "ftd2xxx.dll" file in the PC.
6. The same way to install the "ftserui2.dll" file in the PC.

The particular install steps, please refer Chapter 6.1.1

### 4.2 To install FTDI driver in Windows 7

1. Connect the FTDI device (board) to a USB port on the PC.
2. Open Control Panel, select Hardware and Setting, Device Manager, and Other Devices, then click right button on the mouse, select Update Driver Software, select the second option to browse manually, select address of drivers have been saved and finally install the "ftd2xxx.dll" in the PC.
3. The same way to install the "ftserui2.dll" file in the PC.

The particular install steps, please refer Chapter 6.1.2



## 5 How to use the GUI

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### Introduce the GUI software

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#### 5.1 Overview

This GUI use to cooperate with the FUJITSU'S FM3 inverter platform, customer can use this GUI to:

1. Real-time control the motor and PFC module function;
2. Real-time setting the motor functions and parameters;
3. Real-time observation of motor running state, used variables and current waveform shape.
4. Real-time observation of system information, and so on.

It's means that the GUI is ordered to help customer debug the inverter platform and motor rotation.

#### 5.2 PC Connection with the hardware

The hardware need to use Serial Port connected FTDI, and FTDI connects with PC use USB port. Please refer Figure 5-1: Connect

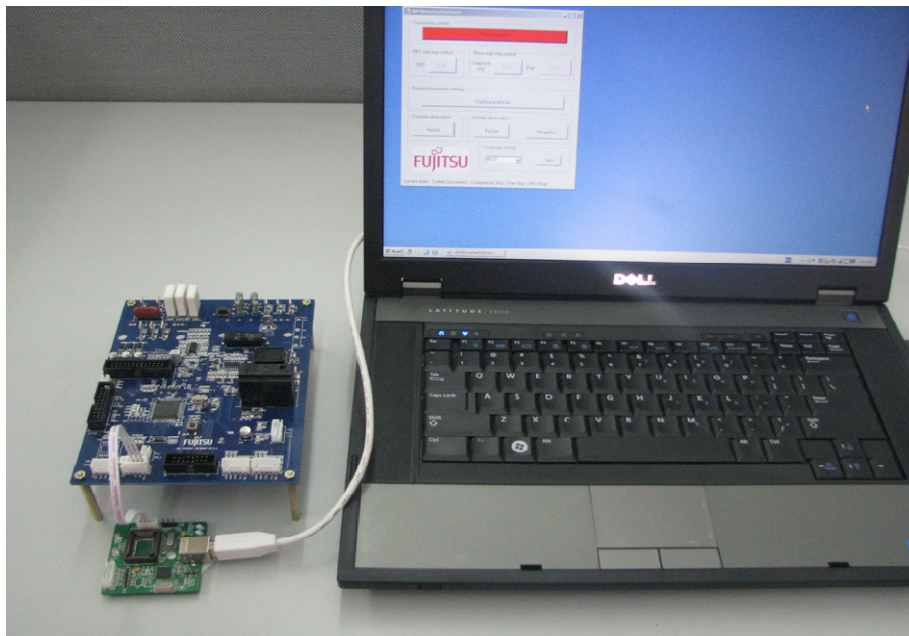


Figure 5-1: Connection

### 5.3 GUI Startup

Open the folder; double click the “**ARMInverterPlatform.exe**” to run the software, as Figure 5.2.

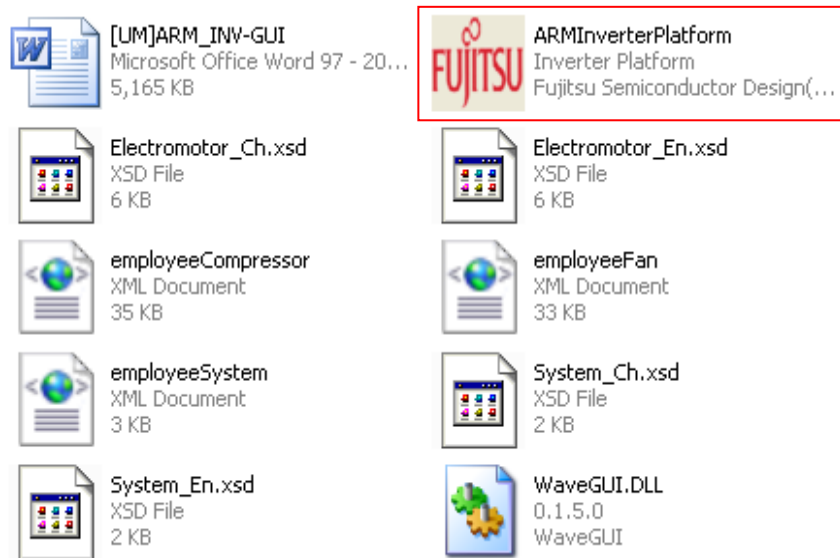


Figure 5-2: GUI files

## 5.4 GUI software windows' name and function

### 5.4.1 Inverter Platform software introduce.

- **Name:** Platform
- **Function:** language setting, contain all function windows, and so on.

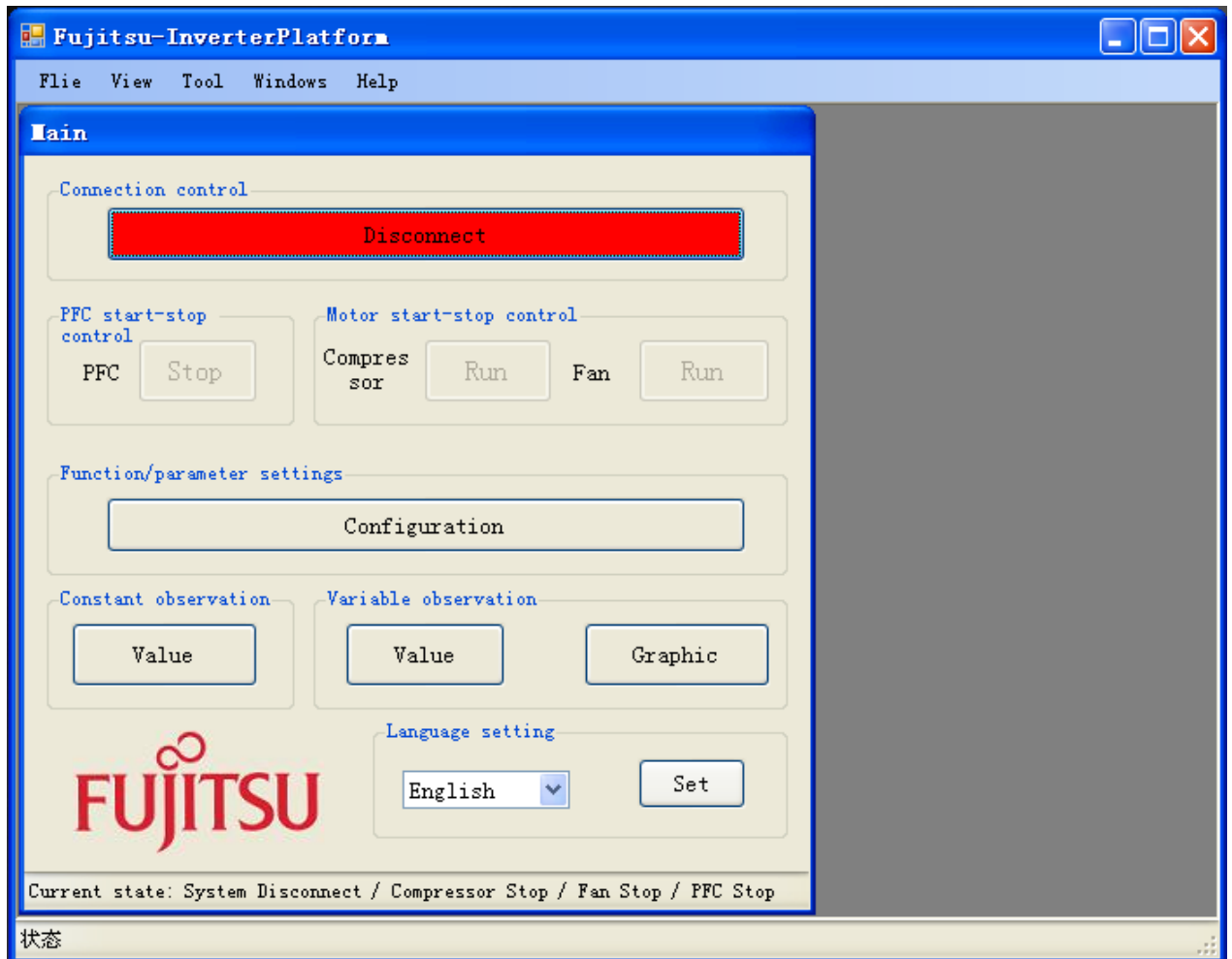


Figure 5-3: Inverter Platform

## 5.4.2 Main window

- **Name :** Main window
- **Function:** connect control, start/stop control, function/parameter setting, Constant/variable observation, language setting, and current state.

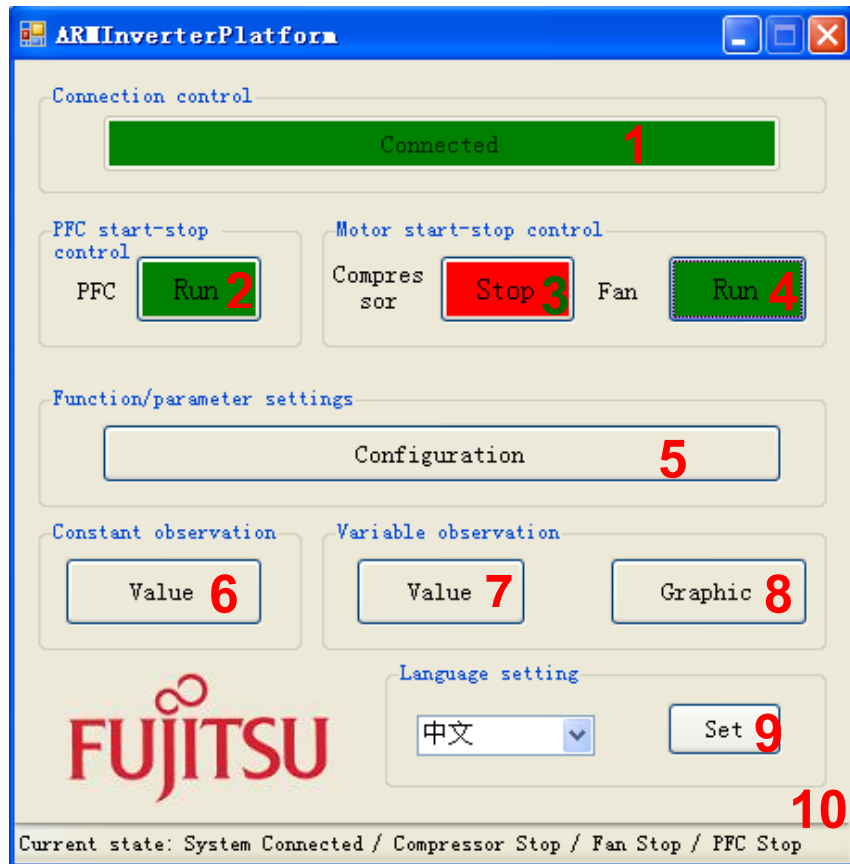


Figure 5-4: main window

Table 5-1: main window function

	Name of button	Specification
1	Connect	Init the FTDI and Connect with MCU
2	PFC start-stop control	Operate PFC module function start / stop
3	Compressor start-stop control	Operate compressor start/stop
4	Fan start-stop control	Operate fan start / stop
5	Function/Parameter setting	Set motor function and parameter. If the button is pushed, the configuration window opens. (See Chapter 4.4.2)

6	Constant observation	Observe system state, motor state, motor parameter, and so on. If the button is pushed, the constant window opens. (See Chapter 4.4.6)
7	Variable observation	Observe measure value with variable. If the button is pushed, the variable window opens. (See Chapter4.4.5)
8	Graphic	Observe measure value with wave. If the button is pushed, Figure4-3 of the graphic window opens. (See Chapter 4.4.4)
9	Language setting	Set system language Chinese or English
10	System current state	Show the current state: connect, PFC, compressor, Fan

- Notice:

- The hardware cannot be mounted Fan motor. So the function is ignored.
- The hardware is mounted PFC function. And the firmware control PFC function automatically. So, GUI cannot control the PFC function.  
(If you push green PFC function button in running compressor, the function is ignored.  
After that, if you push red PFC function button again, the compressor stops.)

## 5.4.3 Function/parameter settings window

- **Name :** function/parameter settings window
- **Function:** motor selection, motor function setting and comeback default, motor parameter setting and comeback default, save config file, load config file.

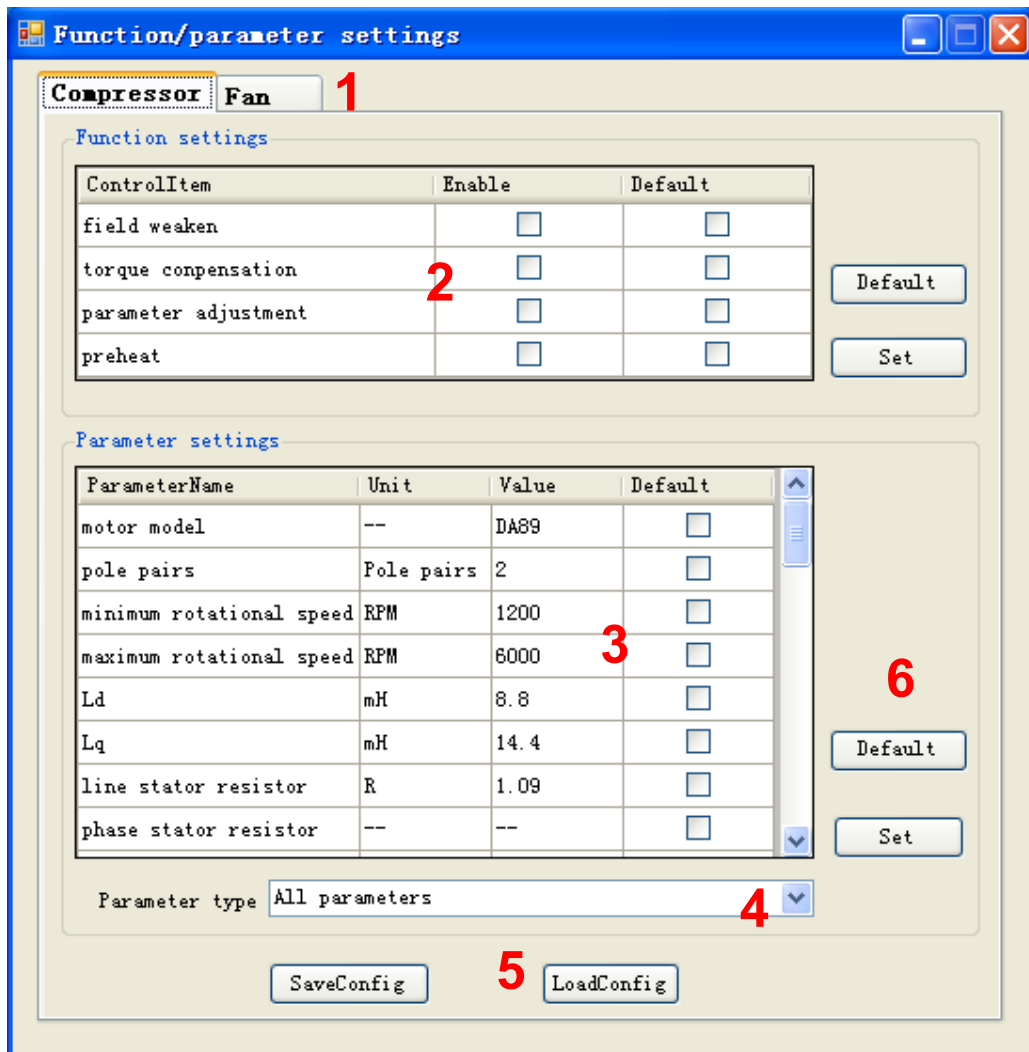


Figure 5-5: setting window

Table 5-2: setting window function

	Name of area	Specification
1	Motor selection	Select which motor need to set, compressor / fan
2	Motor function set	Function set
3	Motor parameter set	Parameter set
4	Parameter type selection	Selection motor parameter type
5	Config file save and load	Save and load config file
6	Set and default button	Set/default the parameter and function to hardware

- Notice:

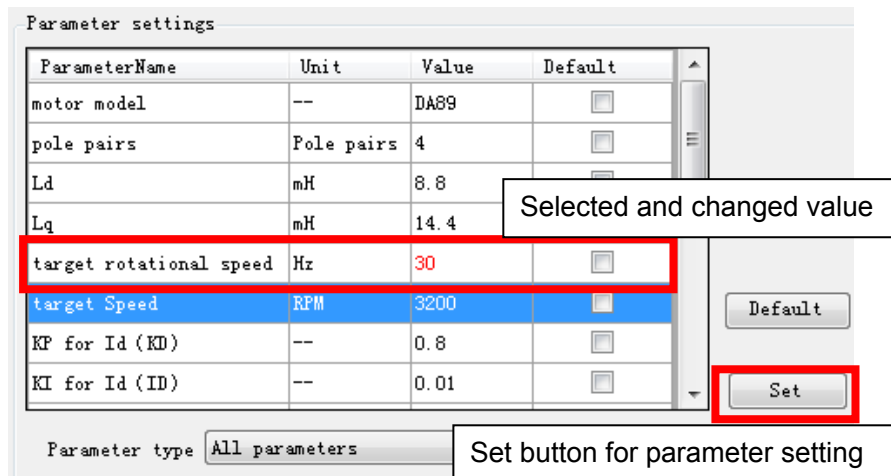
- The hardware cannot be mounted Fan motor. So the function is ignored.
- Some parameters cannot change the value. (In that case, the parameter is exist as a constant value in the firmware.)

- How to operation of “Function/parameter settings window”

Open this window and you can see the default parameters values.

If you want to change the value, after connecting to the board,

- (1) Select the parameter
- (2) Change the value directly (and the changed value becomes red)
- (3) Push “set” button on the right.
- (4) Be sent the value to MCU and set it.

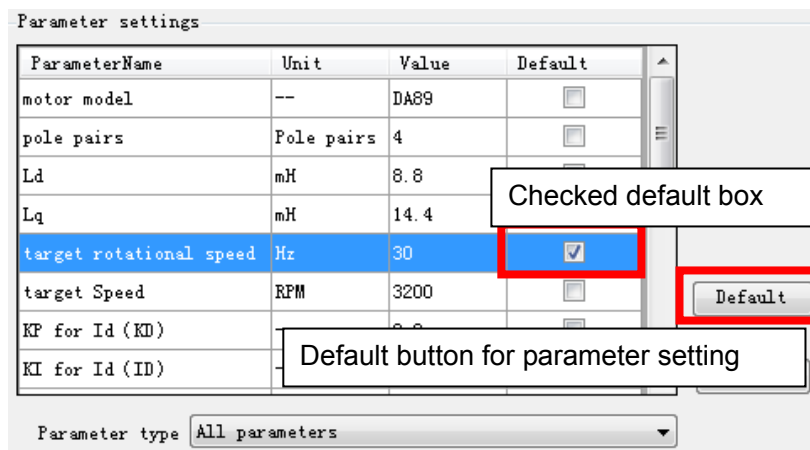


If you want to change the default value, after connecting to the board,

- (1) Select the parameter
- (2) Check “default” button (and fill the checking symbol in the box)
- (3) Push “default” button on the right.
- (4) Be sent the default value to MCU and set it.

The default values are saved on the configuration files.

You can change the default value to load the configuration file.



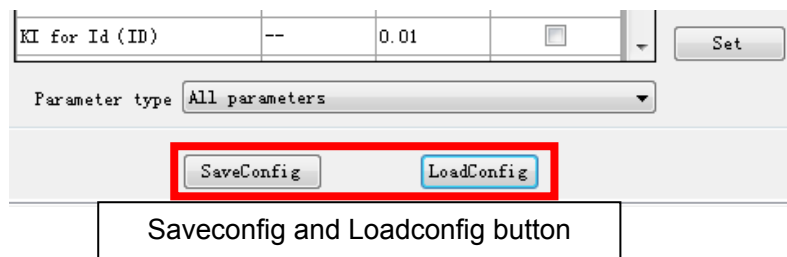


If you want to save the setting value, after connecting to the board and setting some parameters,

- (1) Push “saveconfig” button under the window.
- (2) Select the saving folder and name the .aip file
- (3) Push save button and the configuration file is saved.

If you want to load the configuration file, after connecting to the board,

- (1) Push “loadconfig” button under the window.
- (2) Select the loaded .aip file
- (3) Push open button and the configuration file is loaded.



Some parameters can be set as an over-range value, but the firmware can modify as a maximum or minimum value automatically.

## 5.4.4 Signal selection window

- **Name :** select signal window
- **Function:** signal page selection, signal selection, signal type select, selected signal shown and some button

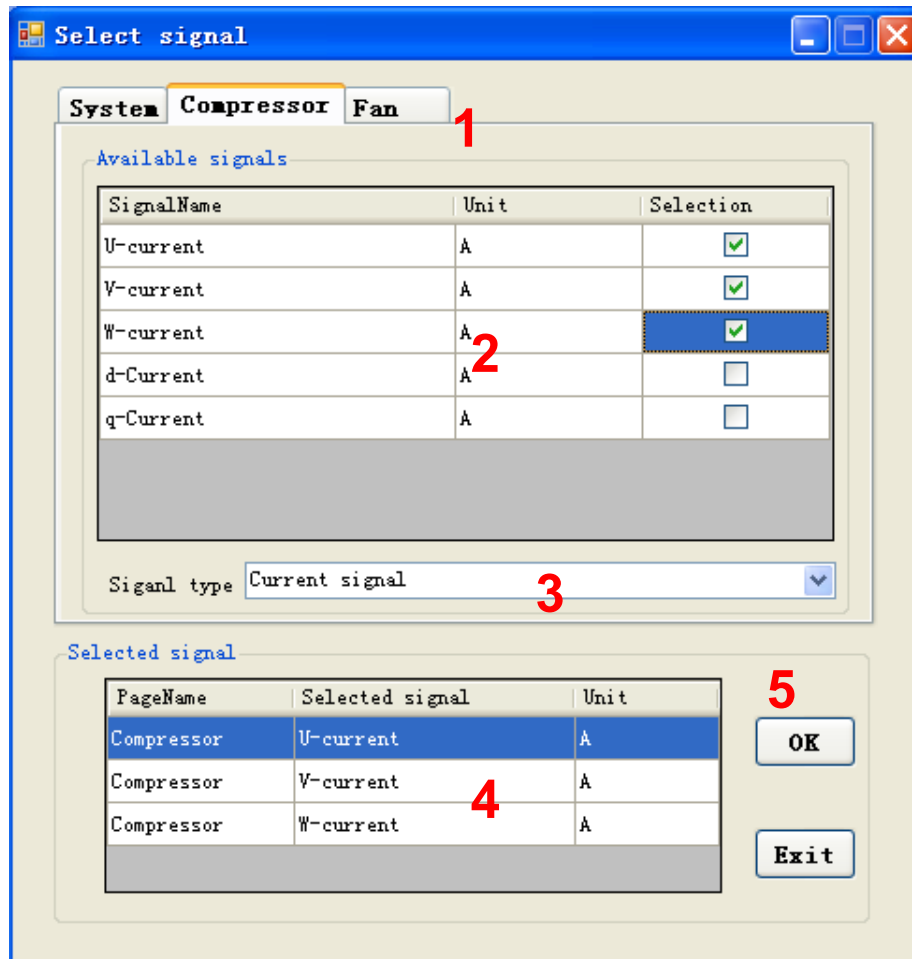


Figure 5-6: select signal window

Table 5-3: select signal function

	Name of area	Specification
1	Signal page selection	Select the signal page
2	Available signals	Select the signal (most 4 signals in wave, most 10signals in variable )
3	Selected signal type	Select the signal type
4	selected signals	Show the selected signals
5	Operation button	Set / cancel. If the button is selected, Figure4.4-5 of the graphic window opens. (See Chapter 4.4.4)

- Notice:

- This window can select compressor contents. System and Fun contents cannot be selected.

- How to operate Signal selection window

Please refer the chapter "Example of total operating Procedure"

## 5.4.5 Graphic window

- **Name :** wave observer window
- **Function:** window name set, real-time drawing the wave, showing the selection signal name, setting the wave station, run/pause set, save/load wave data, current state.

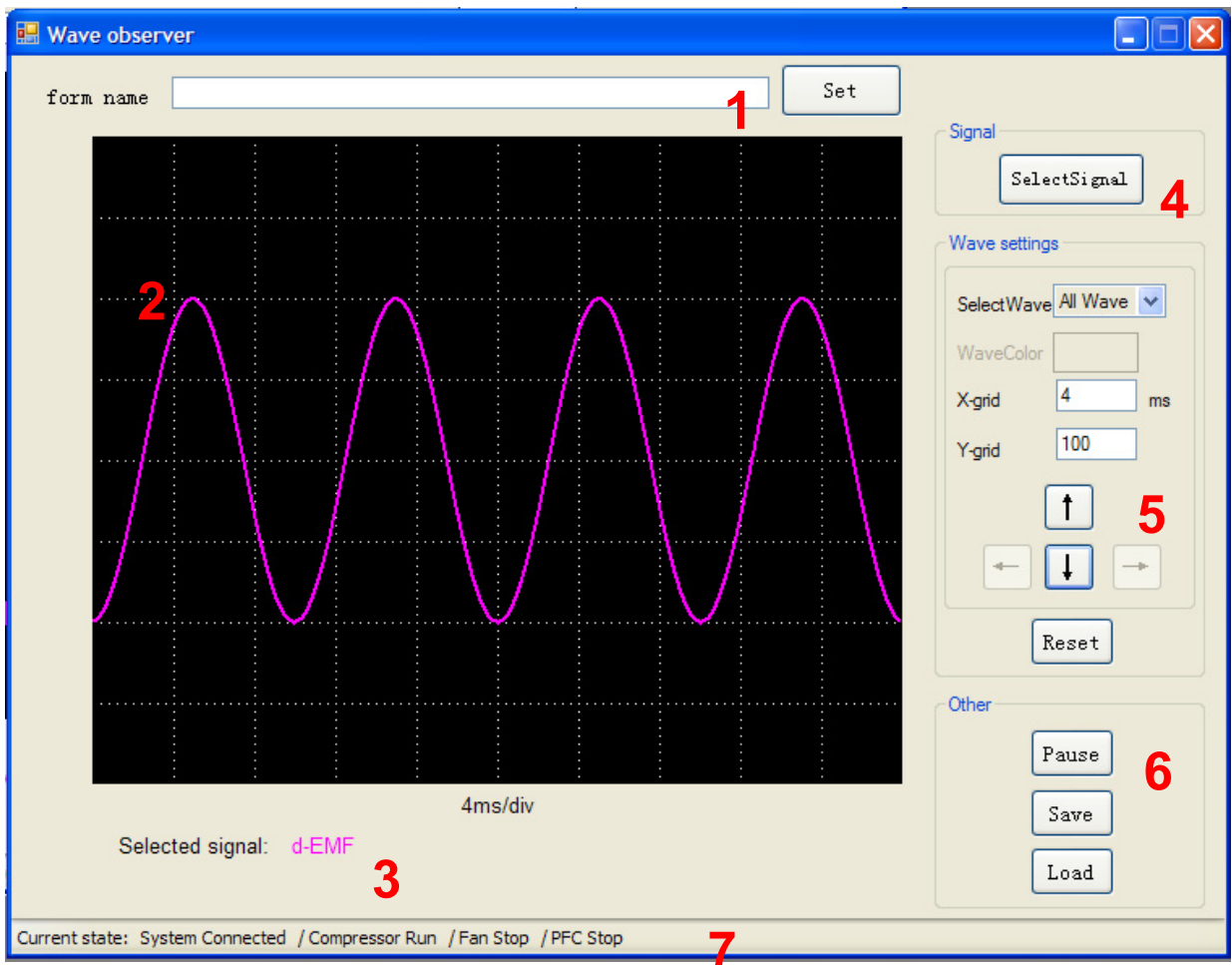


Figure 5-7: wave observer window

Table 5-4: wave observer function

	Name of area	Description
1	Form name	Custom the name of this wave window.
2	Show wave	Draw the wave of_signal needing to show.
3	Waveform name	Shown the waveform name, it's come from select signal
4	Select signal	Select the signal to show the wave If the button is clicked, the signal selection window opens. (See Chapter4.4.3)
5	Wave setting	Select waveform; set waveform color; set the X-grid, Y-grid; waveform up, down, left, right move; and all setting reset.
6	Other function	Pause/run and save/load wave data.
7	System current state	Show the current state: connect, PFC, compressor, Fan

- Notice:

- This window can select compressor contents. System and Fun contents cannot be selected.
- Wave save and load function are not prepared.

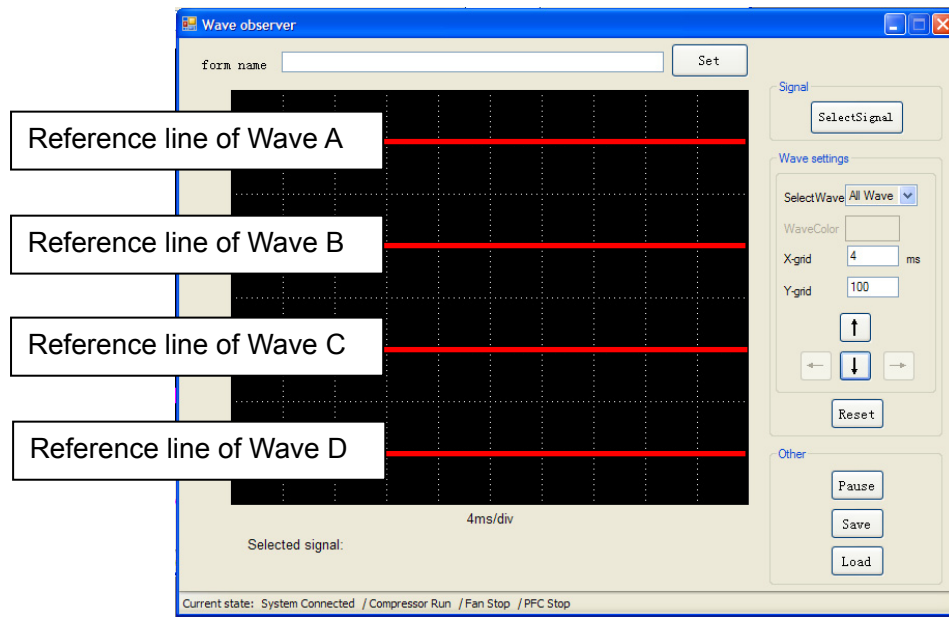
- How to operate Signal selection window

Please refer the chapter "Example of total operating Procedure", too

You can select the data to show the waveform.

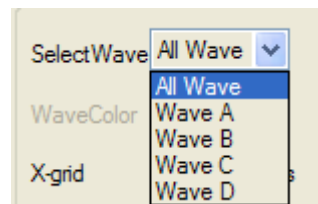
The selected parameters are defined wave A through wave D in order.

After selecting, the waveforms are shown the window. As a default, each reference lines are defined as follows;



You can change the waveform color each other.

Select the waveform you want to change at the select wave menu.

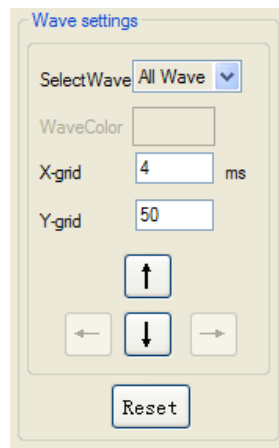


Then, choose Wave Color button and select the color you want to change.



Also, you can adjust the waveform position each other.

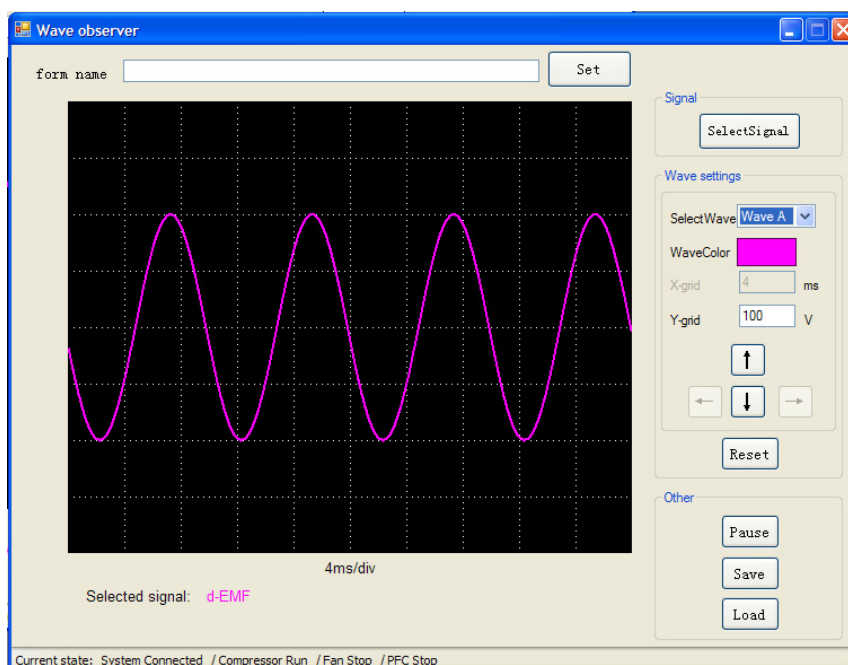
Select the waveform you want to adjust at the selectwave menu, and push the up / down arrow button, so the waveform can be adjusted.



You can adjust the X and Y grid unit each other.

Set the value in the X and Y grid box directly, you can set them.

When you select one waveform, you can see the unit under the window. But when you select over two waveforms, you cannot see it. If you want to confirm the unit, please select one wave by select wave pull-down menu and you can see the unit on the right of Y-grid box.



## 5.4.6 Variable window

- **Name:** variable observation window.
- **Function:** show the signal value, select signal.

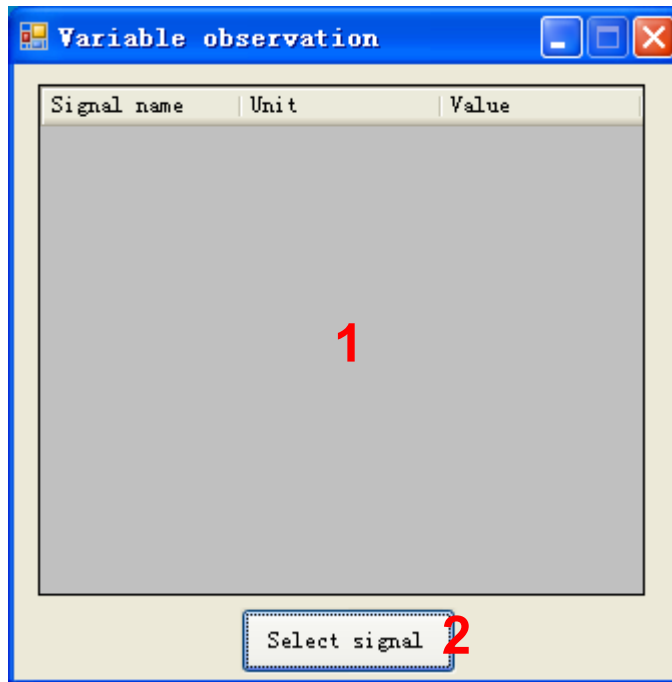


Figure 5-8: variable observation window

Table 5-5: variable observation function

	Name of area	Specification
1	Variable value	Show the value form hardware
2	Select signal button	Into select the signal window

## - Notice:

- This window can select compressor contents. System and Fun contents cannot be selected.



## 5.4.7 Constant window

- **Name :** Constant observation window
- **Function:** show the signal value; select signal.

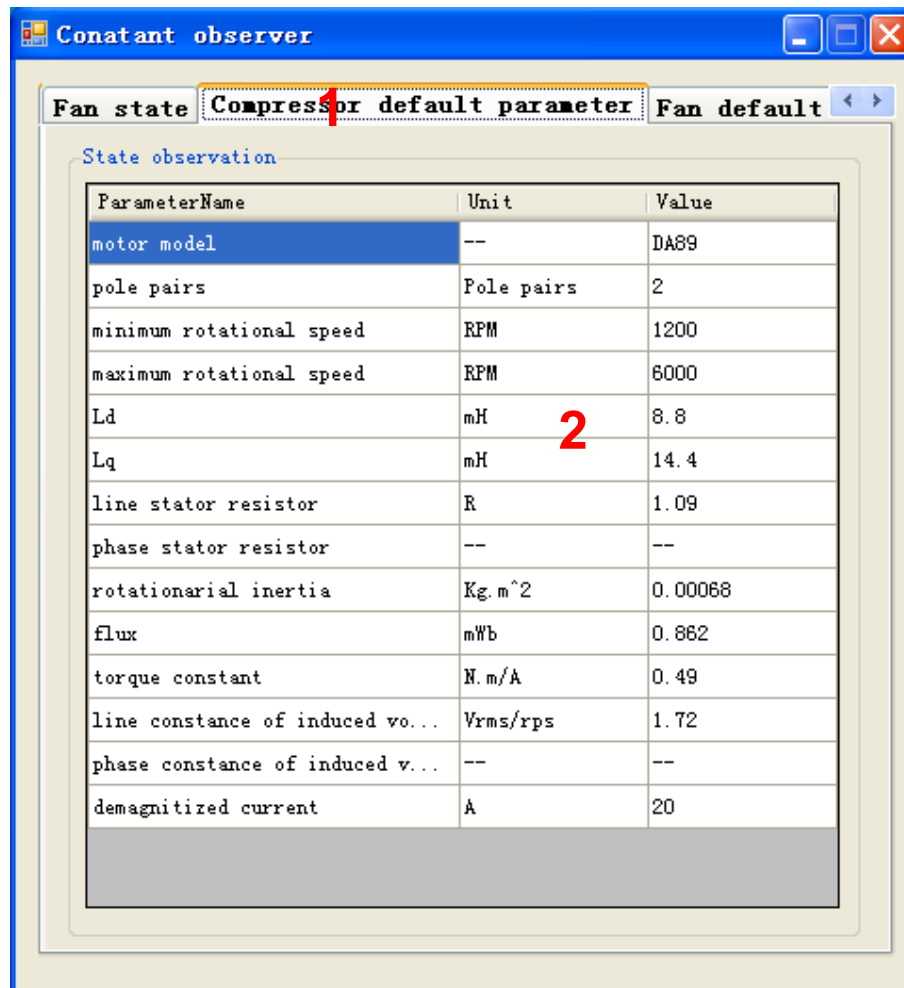


Figure 5-9: Constant observation window

Table 5-6: Constant observation function

	Name of area	Specification
1	Select page	Select need to show page
2	Parameter constant	Show the constant about parameter

- Notice:

- This window can be shown compressor contents. Fun contents cannot be shown.

## 5.5 Example of total operating Procedure

This chapter introduces the operating method of GUI.

### 5.5.1 Hardware preparation

Before operating GUI, prepare hardware according to the following procedure.

1. Install the FTDI driver (Only once)
2. Prepare the hardware environment
3. Connect the wires among the hardware board, FTDI device, PC and so on.
4. Turn on the Hardware power.

### 5.5.2 GUI software operating step

The following part is an example of GUI operating method.

#### (1) PC and hardware communication Connect:

First, click **Connect** button in Main Window to connect PC with hardware (1 in Figure 5-10). If connection succeeds, the color of **Connect** button changes from red to green. The button text changes from **Disconnect** to **Connected**.

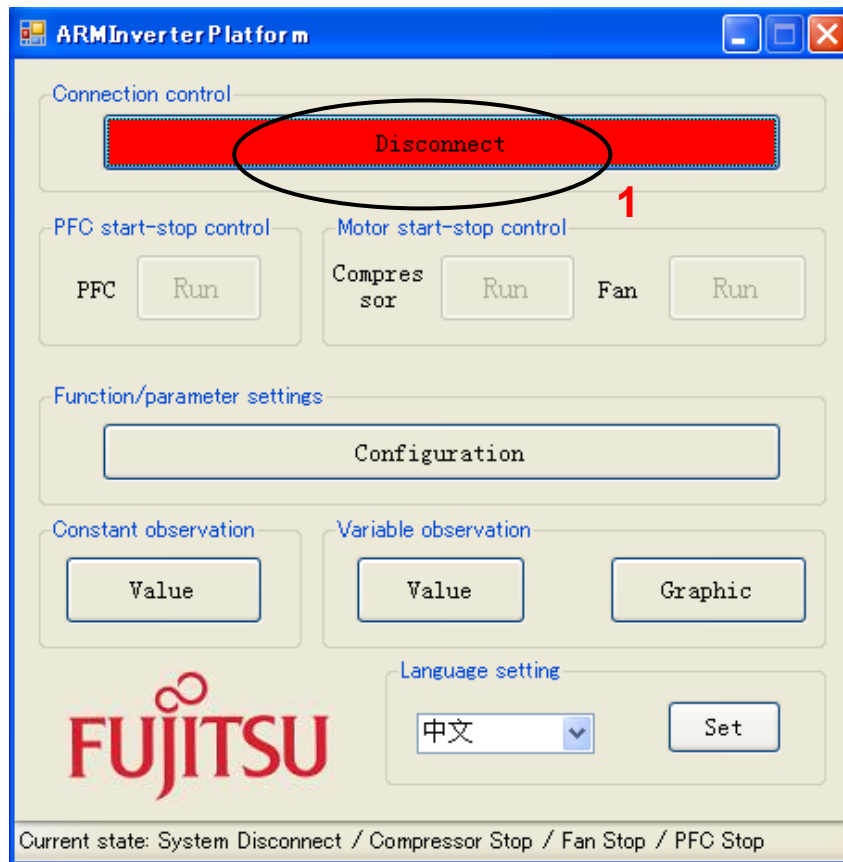


Figure 5-10: operation: connect

## (2) Start running the motor

Next, click **Compressor Start-stop Control** button in Main Window to start the motor (1 in the Figure 5-11). If succeeds, the color of **Compressor Start-stop Control** button changes from green to red. The button text changes from **Run** to **Stop**.

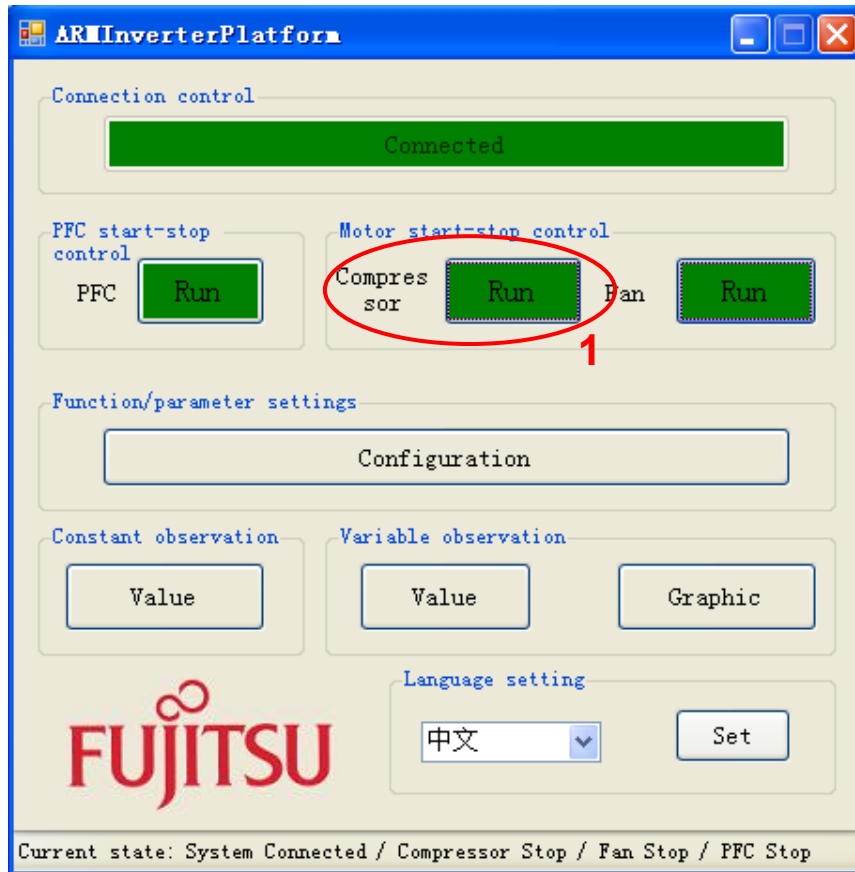


Figure 5-11: operation: run compressor

## (3) Set the motor function/parameter

To set the function/parameter of motor, click **Function/Parameter Setting** button in Main Window (1 in Figure 5-12), and the **Configuration** Window in Figure 4.5-4 is displayed.

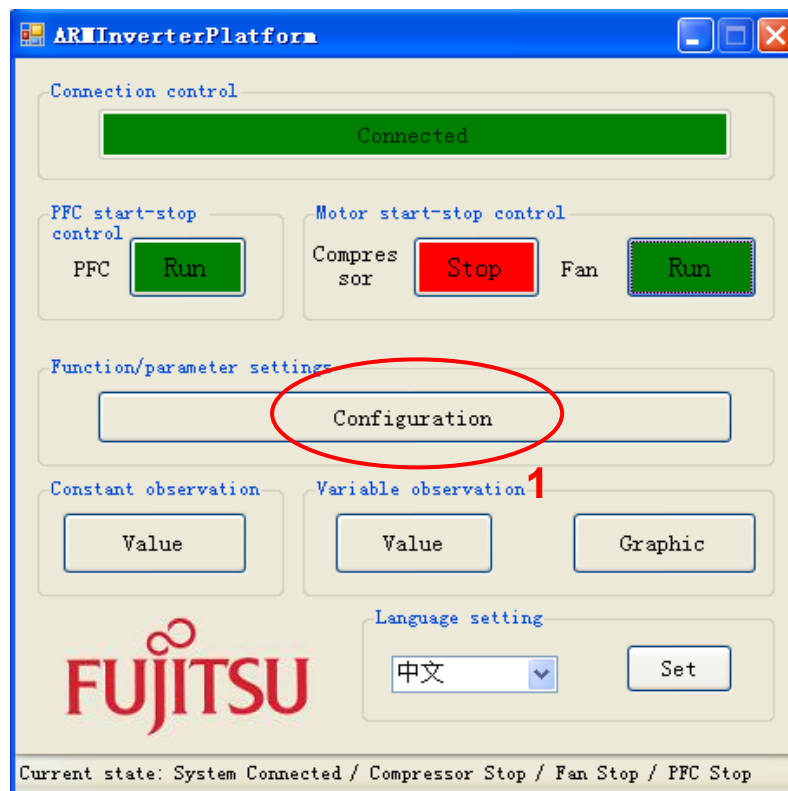


Figure 5-12: operation: open configuration window

The following example shows the operation of changing motor speed.

Select **Compressor** tab in **Function/parameter Settings** window (1 in Figure 5-13). To change the motor speed, select **All Parameters** or **Motor Running Parameter** in **Parameter type** (2 in Figure 5-13). Find **Target Speed** in **Parameter Name** column. Input the speed value to be changed in **Value** cell (3 in Figure 5-13). Then, click **Set** button and the value is changed (4 in Figure 5-13).

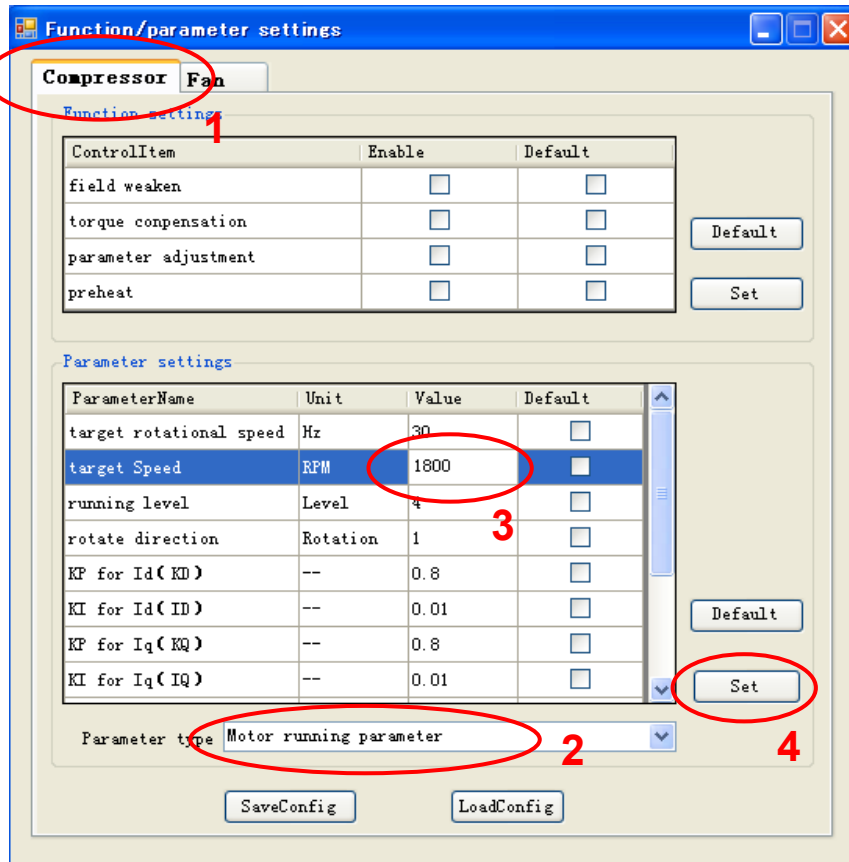


Figure 5-13: operation: set compressor parameter

## (4) Show the wave

To display the waveform, click **Graphic** button in Main Window (1 in Figure 5-14), and the **Graphic** Window in Figure 5-15 is displayed.

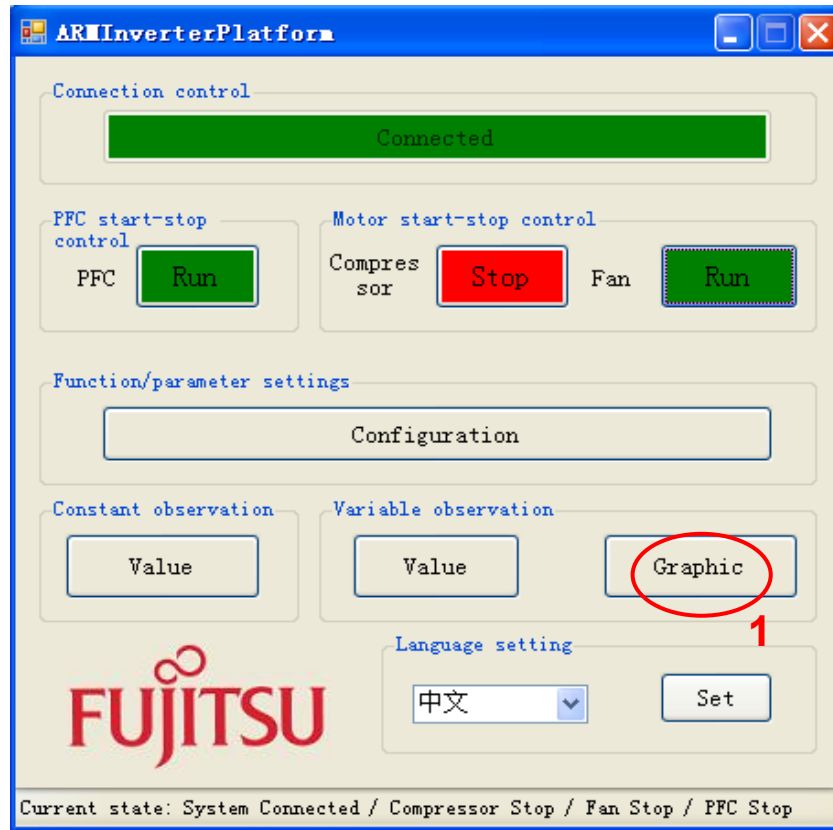


Figure 5-14: operation: open the wave window

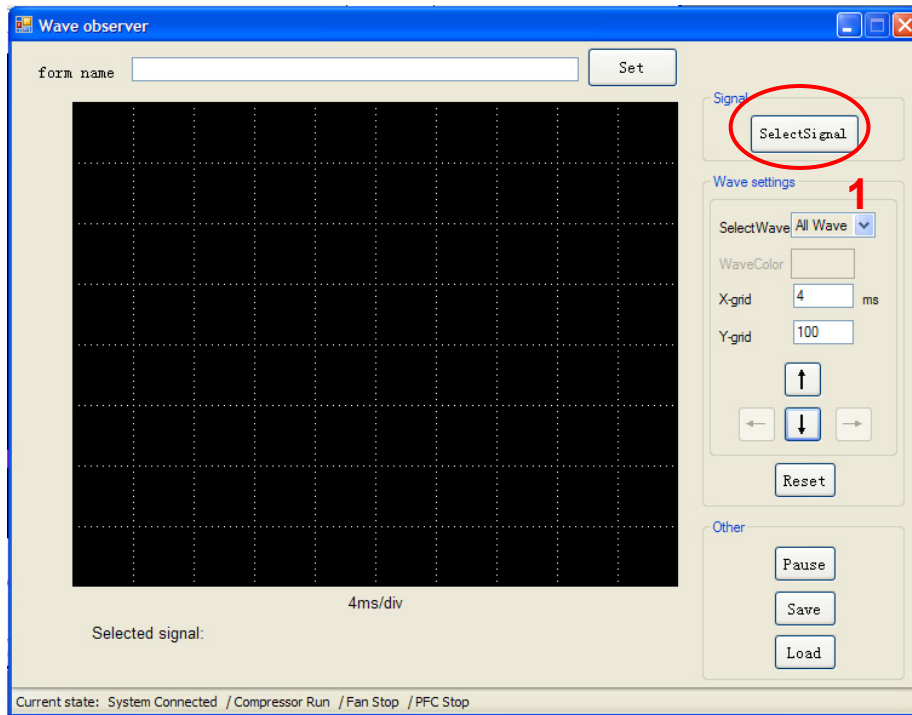


Figure 5-15: operation: open the select signal window

Click **Select Signal** button (1 in Figure 5-15) to select the signal for waveform display, and the **Signal Selection** Window in Figure 5-16 is displayed.

The following example shows the waveform display of U, V, and W phase current. Select **Compressor** tab in **Signal Selection** Window (1 in Figure 5-16). Select **Current signal** or **All signals** in **Signal type** (2 in Figure 5-16). Check the **Selection** checkboxes of U-current, V-current, and W-current (3 in Figure 5-16). At this time, make sure that the signal is selected (4 in Figure 5-16). After that, click **OK** button (5 in Figure 5-16). The **Graphic** Window of Figure 5-17 is displayed and the waveform can be observed in real time.



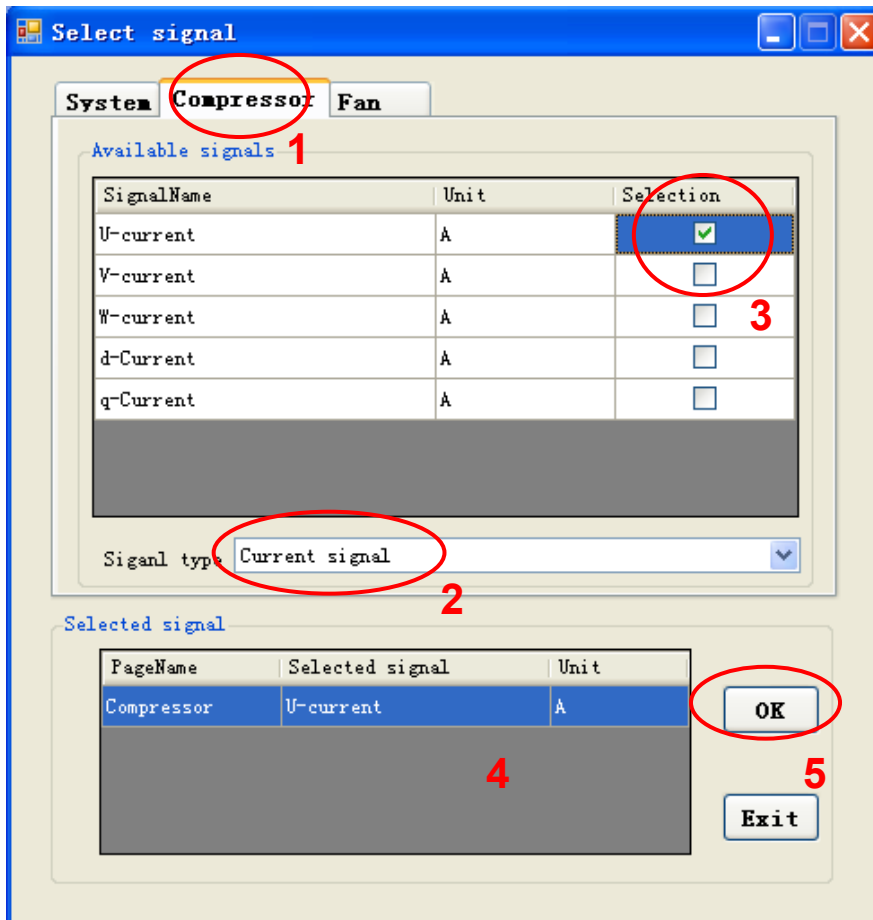


Figure 5-16: operation: select signal

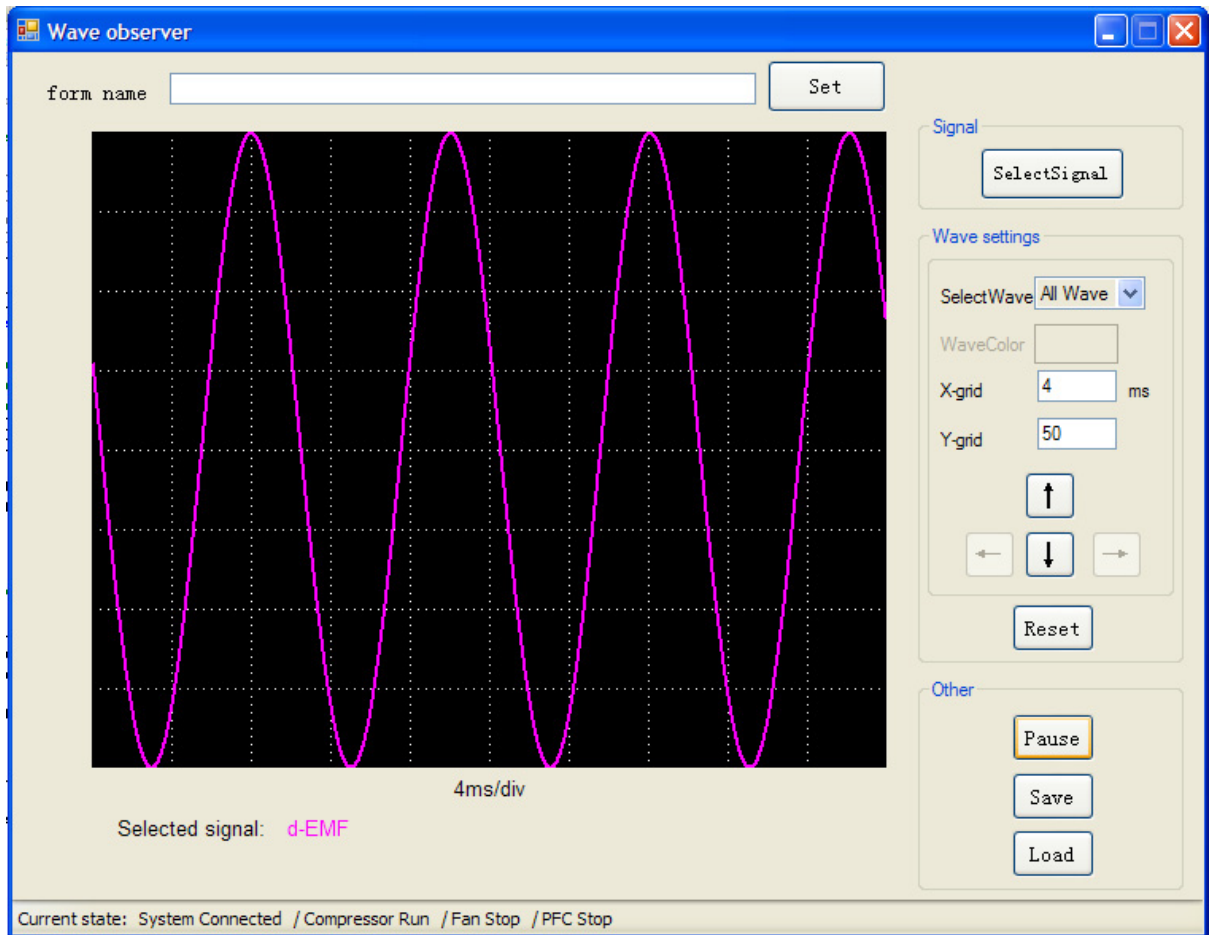


Figure 5-17: operation: draw the waveform

## 6 Appendix

### 6.1 Particular Install steps about the communication Driver

#### 6.1.1 To install FTDI device in Windows XP

- Copy and unzip the FTDI driver on the PC.
- Connect the device to spare USB port on the PC. If the device is based on the FT2232, the Microsoft composite device driver is automatically loaded in the background. Once the composite driver has been installed Windows Found New Hardware Wizard will launch. If there is no available Internet connection or Windows XP SP 2 is configured to ask before connecting to Windows Update, the screen shown in Figure 3-1 is displayed. Select "No, not this time" from the options available and then click "Next" to proceed with the installation. If there is an available Internet connection, Windows XP will silently connect to the Windows Update website and install any suitable driver it finds for the device in preference to the driver manually selected.



Figure 6-1

- Select "Install from a list or specific location (Advanced)" as shown in Figure 3-2 below and then click "Next".



Figure 6-2

- Select "Search for the best driver in these locations" and enter the file path in the combo-box ("¥CDM 2.02.04" in Figure 2.3 below) or browse to it by clicking the browse button. Once the file path has been entered in the box, click next to proceed.



Figure 6-3

- If Windows XP is configured to warn when unsigned (non-WHQL certified) drivers are about to be installed, the message dialog shown in Figure 3-4 will be displayed unless installing a Microsoft WHQL certified driver. Click on "Continue

Anyway" to continue with the installation. If Windows XP is configured to ignore file signature warnings, no message will appear.



Figure 6-4 warning

- The screen shown in Figure 3-5 will be displayed as Windows XP copies the required driver files.



Figure 6-5

- Windows should then display a message indicating that the installation was successful (Figure 3-6). Click "Finish" to complete the installation for the first port of the device.



Figure 6-6

- If the device is based on the FT2232, the Found New Hardware Wizard will continue by installing the USB Serial Converter driver for the second port of the FT2232 device. The procedure for installing the second port is identical to that for installing the first port from the first screen of the Found New Hardware Wizard. This is done automatically if the driver is Microsoft WHQL certified. If the device is not based on the FT2232, the COM port emulation driver is loaded as indicated in the following steps.
- The Found New Hardware Wizard will launch automatically to install the COM port emulation drivers. As above, select "No, not this time" From the options and click "Next" to proceed with the installation (Figure 3-7).



Figure 6-7

- Select "Install from a list or specific location (Advanced)" as shown in Figure 2.8 below and then click "Next".



Figure 6-8

- Select "Search for the best driver in these locations" and enter the file path in the combo-box ("¥CDM 2.02.04" in figure 3-9 below) or browse to it by clicking the browse button. Once the file path has been entered in the box, click next to proceed.



Figure 6-9

- If Windows XP is configured to warn when unsigned (non-WHQL certified) drivers are about to be installed, the message dialogue shown in Figure 3-10 will be displayed unless installing a Microsoft WHQL certified driver. Click on "Continue Anyway" to continue with the installation. If Windows XP is configured to ignore file signature warnings, no message will appear.



Figure 6-10 warning

- The screen shown in Figure 3-11 will be displayed as Windows XP copies the required driver files.





Figure 6-11

- Windows should then display a message indicating that the installation was successful (Figure 3-12). Click "Finish" to complete the installation for the first port of the device.



Figure 6-12

- If the device is based on the FT2232, the second port must also be installed. The procedure for installing the second port is identical to that for installing the first port from the first screen of the Found New Hardware Wizard for the USB Serial Port device. If the driver is Microsoft WHQL certified, this is done automatically.

- Open the Device Manager (located in "Control Panel\System") then select the "Hardware" tab and click "Device Manger") and select "View > Devices by Connection", the device appears as a "USB Serial Converter" with an additional COM port with the label "USB Serial Port" (Figure 3-13). If the device is based on the FT2232, two ports will be available from a composite USB device.

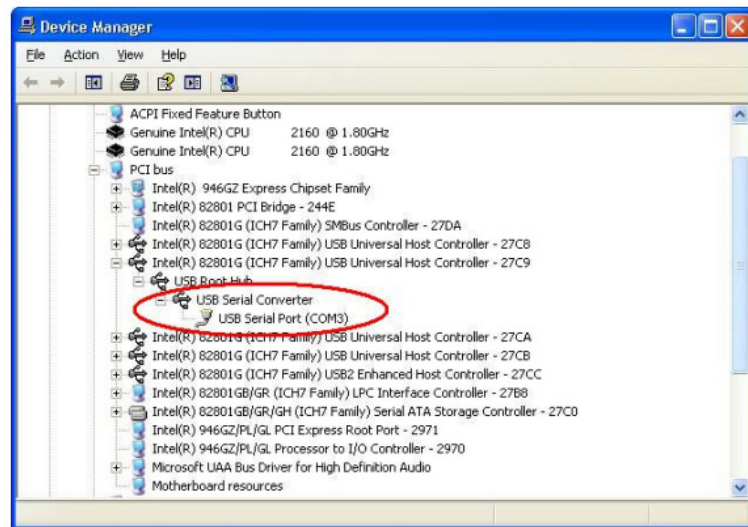


Figure 6-13

- In the case of the FT2232, port A of the FT2232 will be installed as COMX and port B will be installed as COMX+1 where COMX is the first available COM port number.

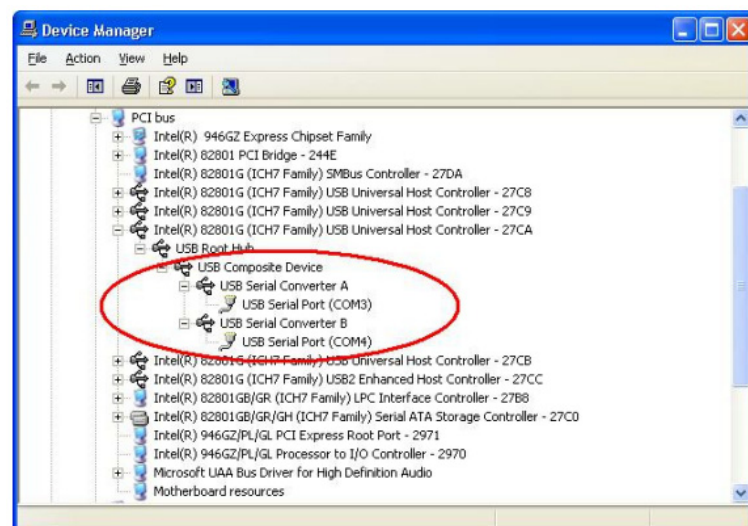


Figure 6-14

### 6.1.2 FTDI Drivers Installation guide for Windows 7

- Connect the device to a spare USB port on your PC.
- If there is an available Internet connection, Windows 7 will silently connect to the Windows Update website and install any suitable driver it finds for the device. If the automatic installation takes place there is no need to continue with the procedure outlined below. If no suitable driver is automatically found then the following procedure should be followed. Press the Windows start button to bring up the start menu and select “Control Panel”.

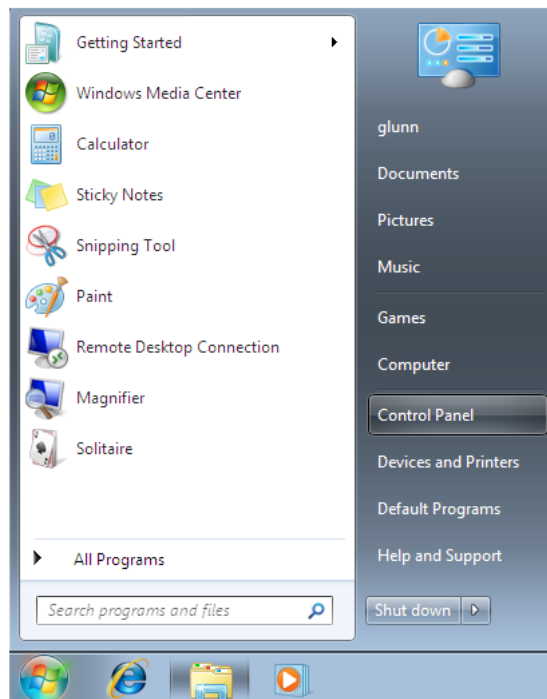


Figure 6-15

- From the Control Panel window select Hardware and Sound.

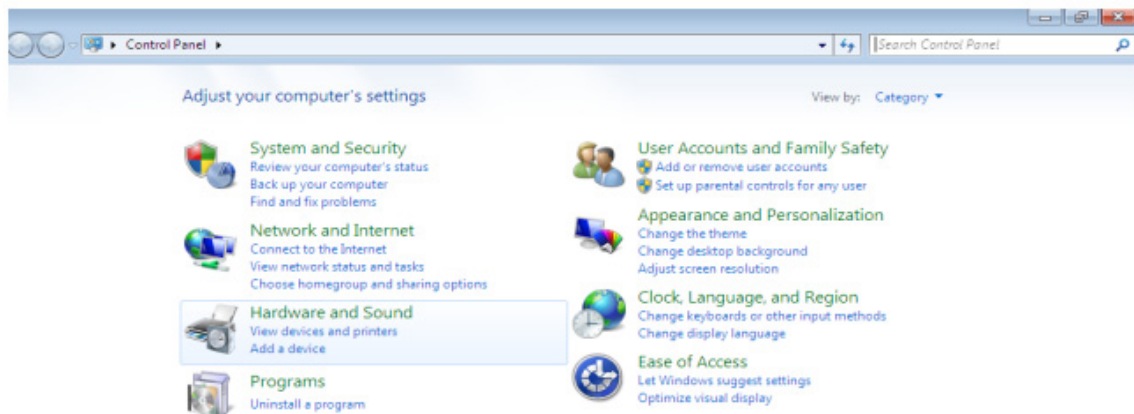


Figure 6-16

- At the next screen select Device Manager:

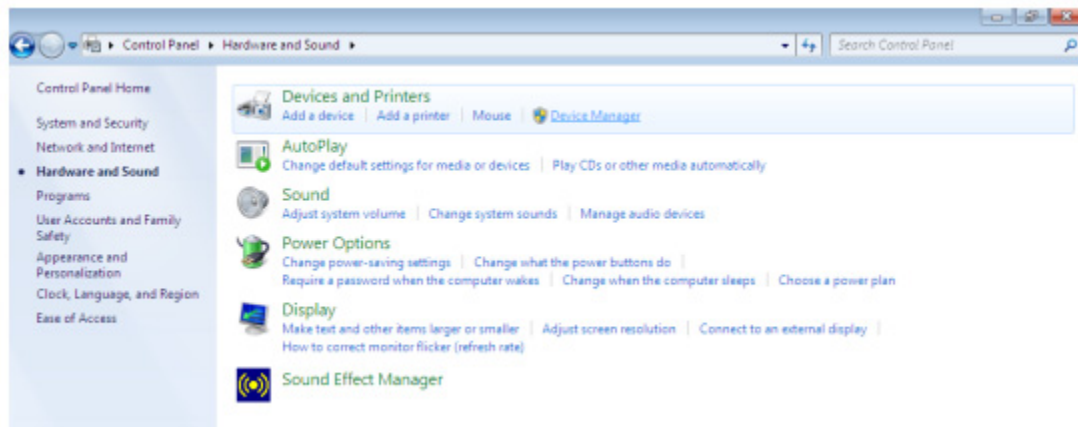


Figure 6-17

- In the Device Manager window there will be a device under Other Devices with a yellow warning symbol to indicate a problem ie no driver installed. The text next to this device will depend on the device attached. In this example the device was a TTL232R device.

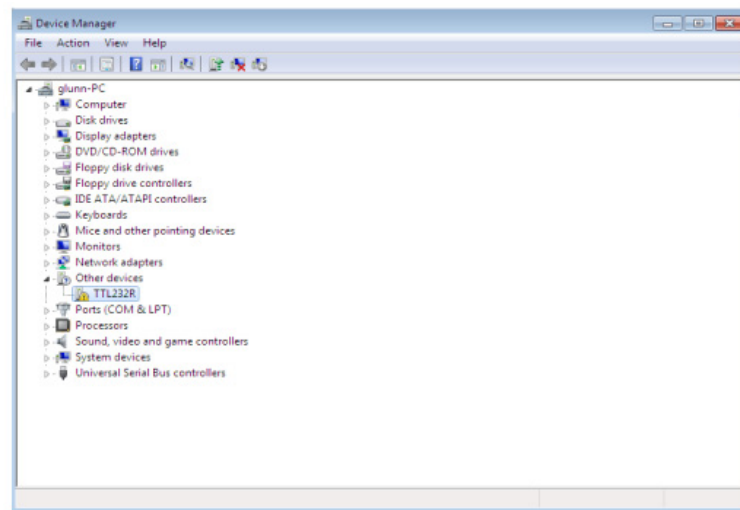


Figure 6-18

- Right click on the other device (TTL232R in this example) to bring up a menu as shown below.

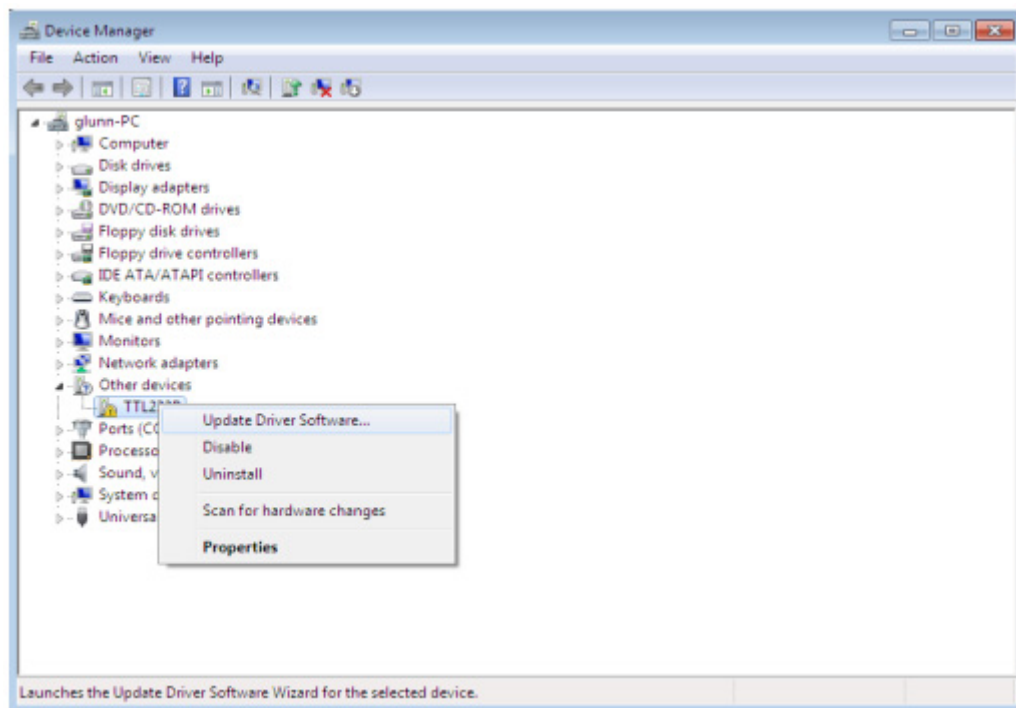


Figure 6-19

From the displayed menu select “Update Driver Software...” This then displays the option for an automatic search or a manual search.

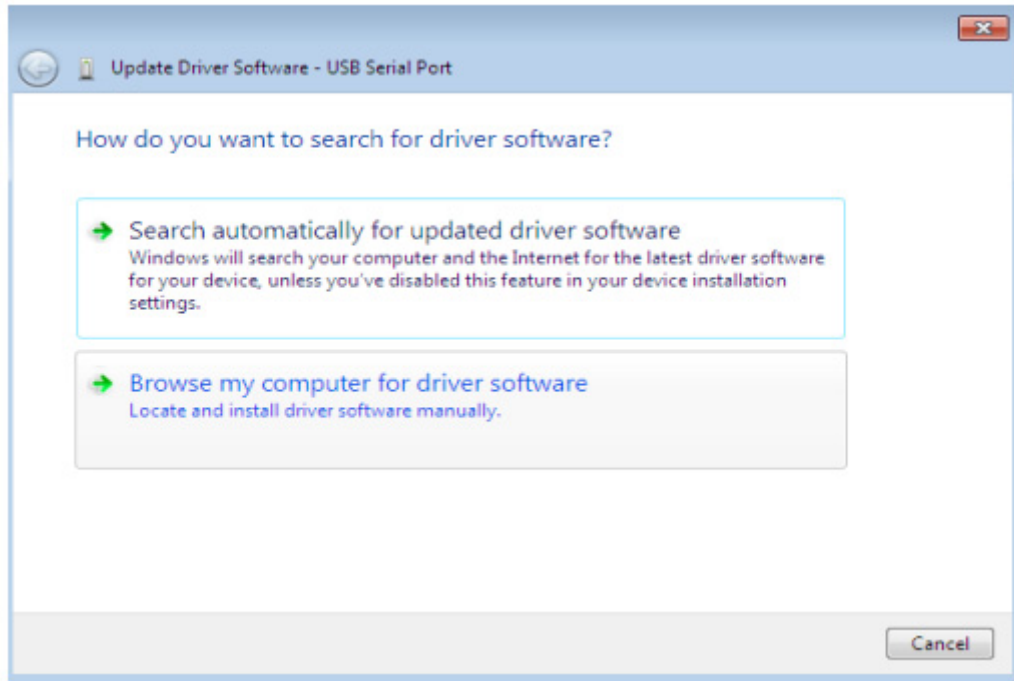


Figure 6-20

- Select the second option to browse manually.

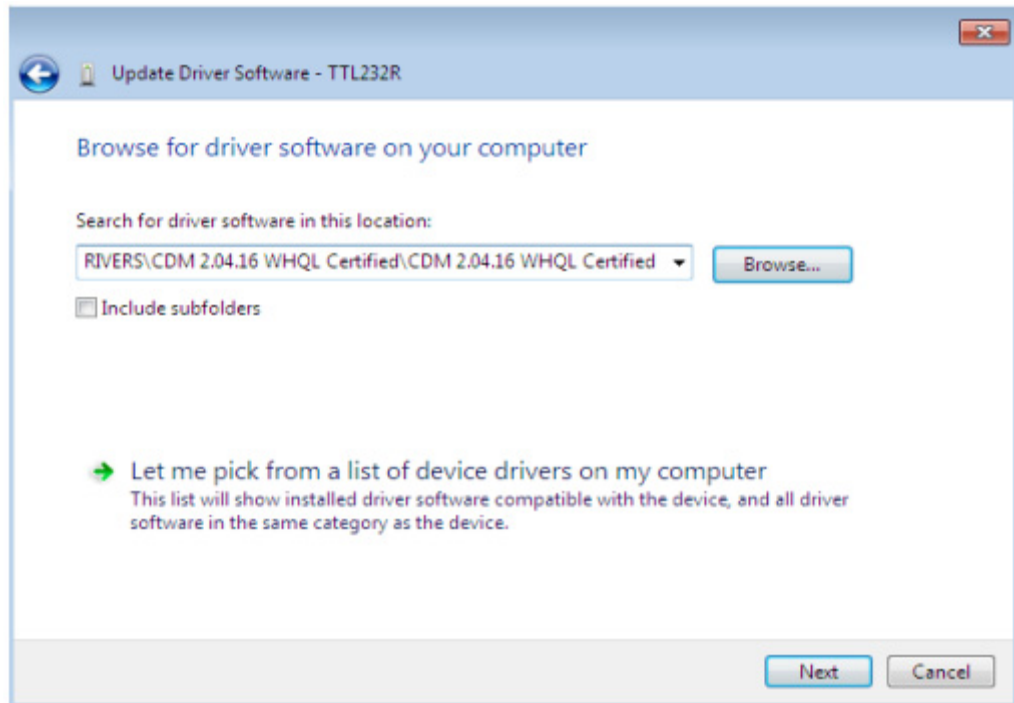


Figure 6-21

- In the address box put the exact location where the drivers have been saved to. This may be on a CD or in a folder on the PC. It is not necessarily the exact same location as shown in the screenshot. The drivers could have been saved anywhere of the users choosing. After entering the address select "NEXT" to start the installation.

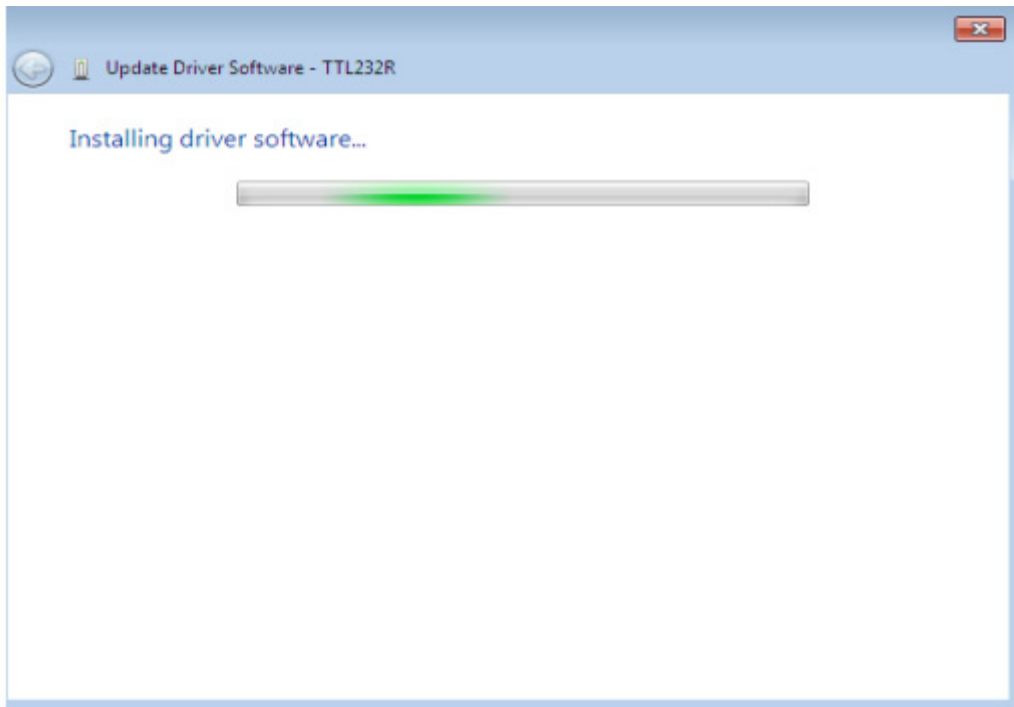


Figure 6-22

- When the installation has finished a completion screen is displayed.



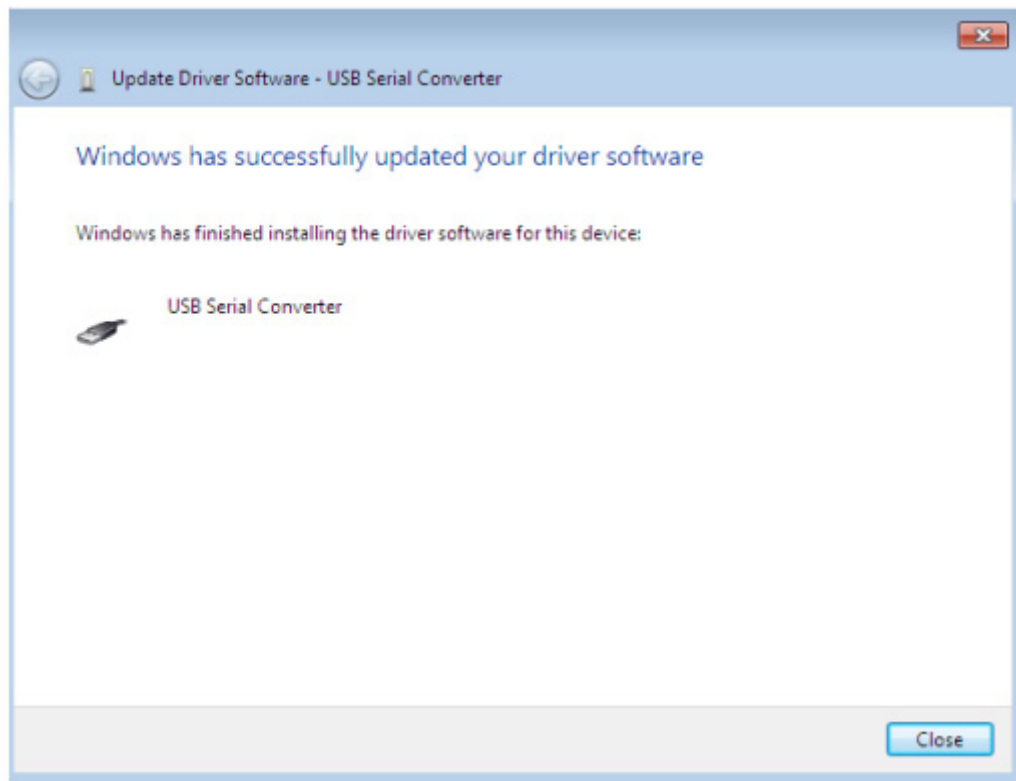


Figure 6-23

- Press Close button to close this window and go back to the Device Manager Window.

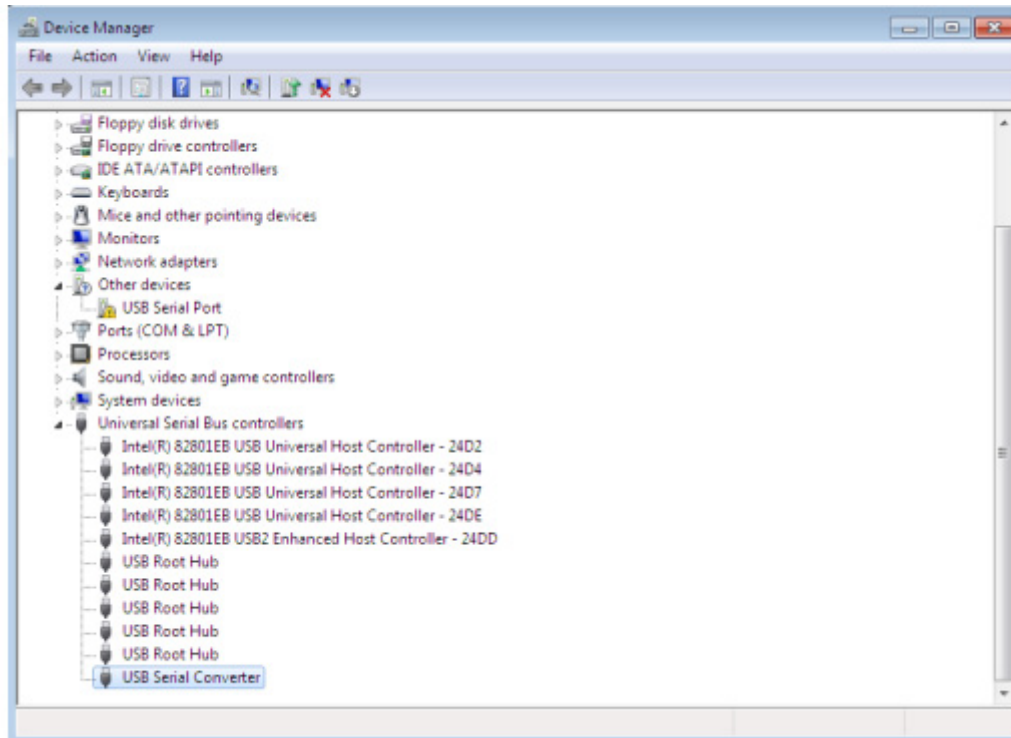


Figure 6-24

The Device Manager will still show a device under Other Devices but in addition to this there is a new entry under Universal Serial Bus Controllers indicated in the screenshot above as the USB Serial Converter. This indicates the bus layer of the driver is installed. Installing the Virtual Com Port layer of the driver is almost a repeat of the last few steps.

- Right click on the other device (TTL232R in this example) to bring up a menu as shown below.

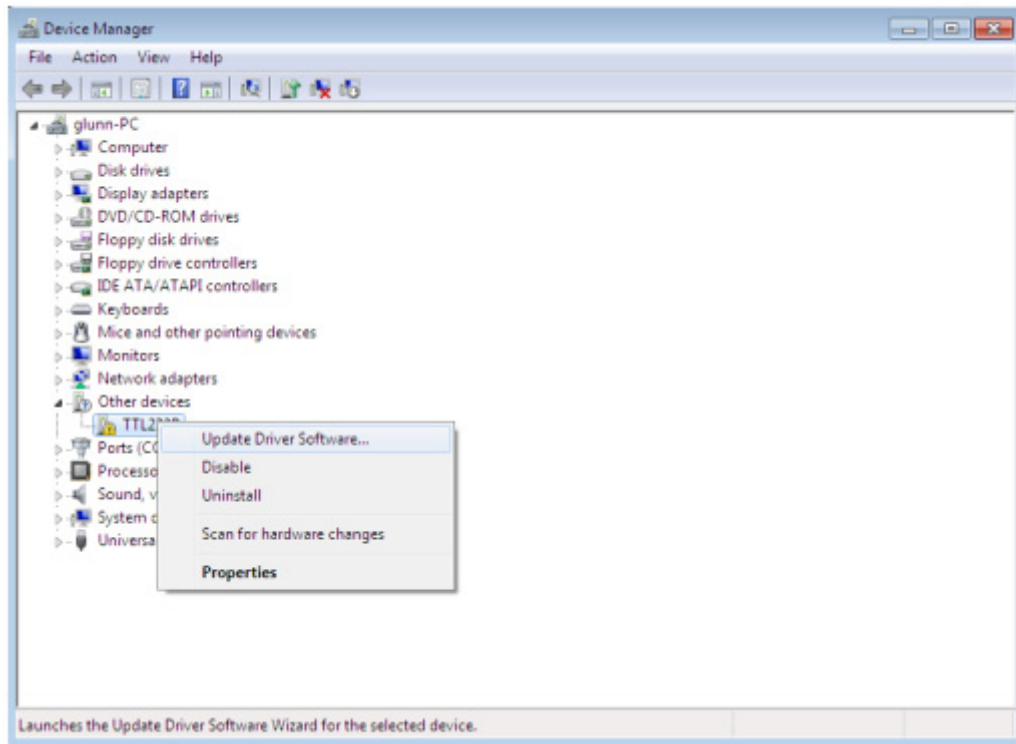


Figure 6-25

- From the displayed menu select "Update Driver Software..." This then displays the option for an automatic search or a manual search.

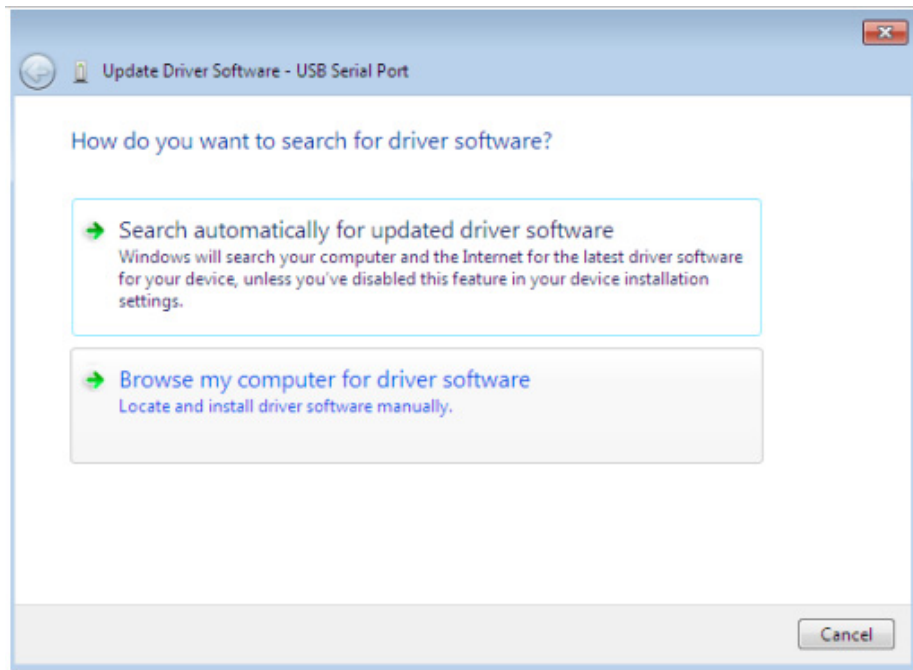


Figure 6-26

- Select the second option to browse manually.

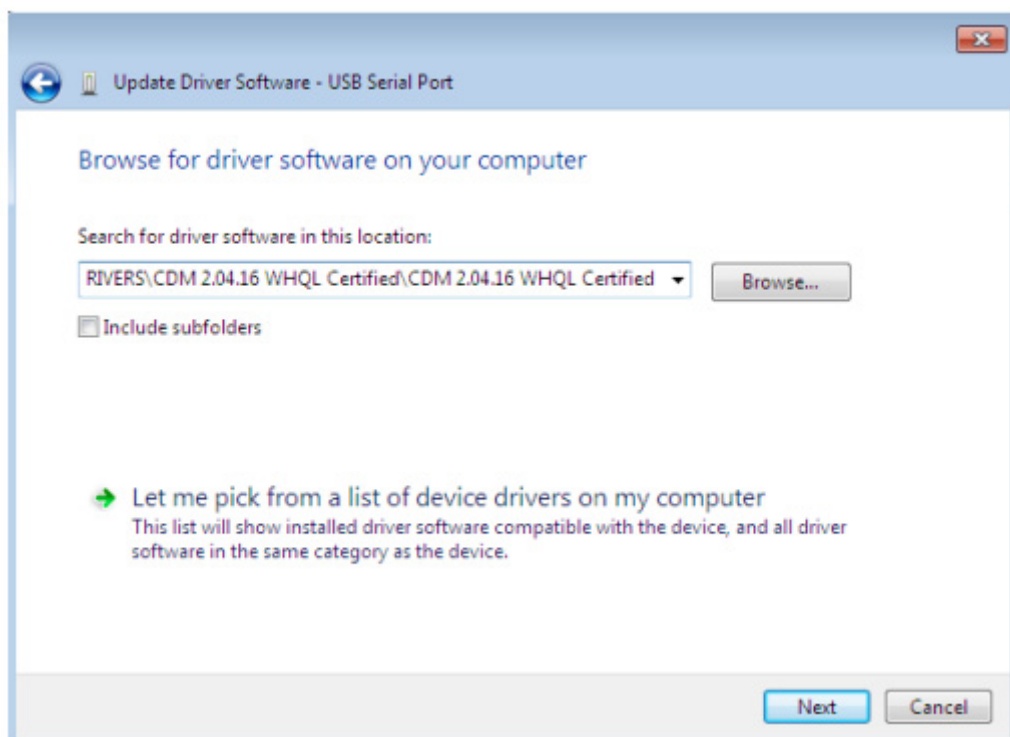


Figure 6-27

In the address box put the exact location where the drivers have been saved to. This may be on a CD or in a folder on the PC. It is not necessarily the exact same location as shown in the screenshot. The drivers could have been saved anywhere of the users choosing.

- After entering the address select “NEXT” to start the installation.

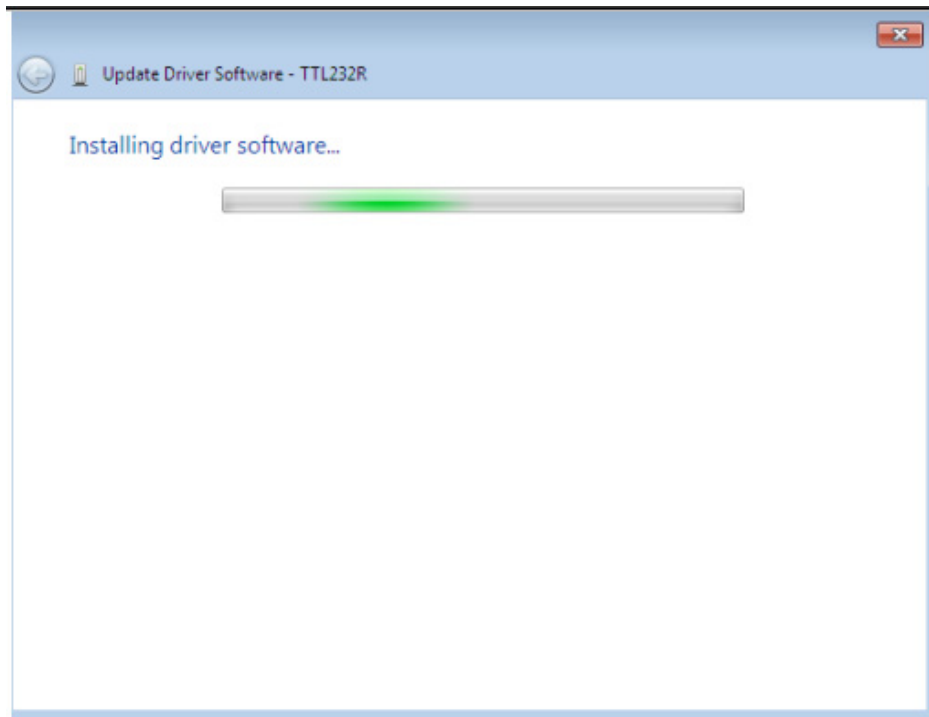


Figure 6-28

- When the installation is finished a completion screen is displayed.

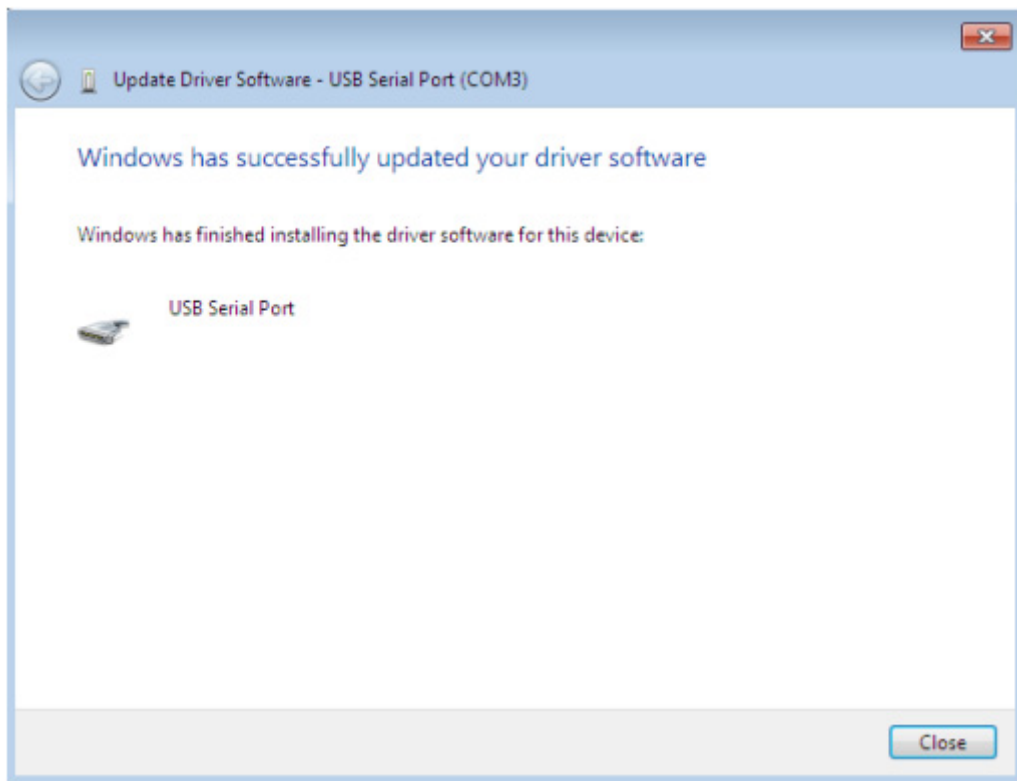


Figure 6-29

- Note this screen also displays the COM port assigned to the device. Press Close button to close this window and go back to the Device Manager Window.

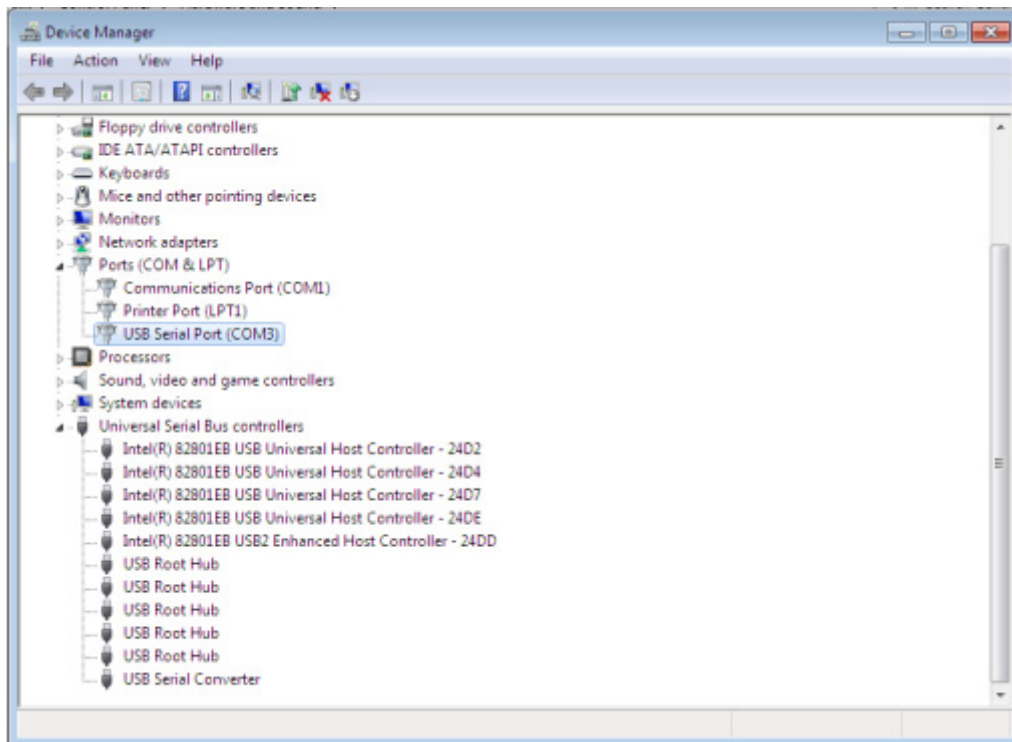


Figure 6-30

This time the Device Manager does not have a TTL232R entry under Other Devices but does show entries under Universal Serial Bus Controllers and Ports (COM & LPT). The above screen shot displays a correct installation. The device is now ready to use on COM3. NOTE: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

## 6.2 Motor parameter item

Table 6-1: motor parameter

Motor parameter name	Unit	Init Value
compressor model	-	DA89
pole pairs	Pole pairs	2
Ld	mh	8.8
Lq	mh	14.4
target rotational speed	Hz	30
target Speed	RPM	1800
KP for Id (KD)	-	0.8
KI for Id (ID)	-	0.01
KP for Iq (KQ)	-	0.8
KI for Iq (IQ)	-	0.01
KP for $\Omega$ (KS)	-	1.2
KI for $\Omega$ (IS)	-	0.02
minimum rotational speed	RPM	1200
maximum rotational speed	RPM	6000
d PI max output	-	
q PI max output	-	
speed PI max output	-	
d PI min output	-	
q PI min output	-	
speed PI min output	-	

- End -