PEM-1X

User Manual

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Contents

Introduction

PEM-1X

Mini-PCIe Hot Swap Extender allow user to plug mini type of PCIe card into PC motherboard for testing. It suitable to be applied to any PC compatible to the 3rd generation PCI Express Bus. The excellent protection circuit can isolate any power and signals between PCIe motherboard and Device Under Test (DUT) and facilitate the hard-swap verifications and function tests.

Isolation Function can be performed by the built-in power switch for manual control or by software for remote control.

Hot Swap Function can relieve engineers or testing people from turning off PC power and operation system, or repeatedly rebooting PC during the test or verification. By using this product and software provided, it allows engineering or testing people to perform hot-swap under system-on status, which will save the PC reboot time needed for card swapping, as a result, it will effectively shorten test time, increase production capacity and speed up the test. Applying the product's auto-switch and insertion-to-auto-test-initiation function can simplify the test, and further more speed up the test as well as reduce human negligence, thus will meet the auto-test requirement.

Production Function can provide protection against short-circuits or over voltage (over-current). When user test PCI interface card that is the under unclear status or is malfunctioning, this product will monitor test by supplying accurate DC power (+3.3V, +1.5V, +3.3VAUX) to ensure that the Mini-PCIe test specimen is working normally. Once there is a short circuit or abnormal voltage/current occurs, PEM-1X will immediately cut off power supplied to the slot to protect your PC and test specimen from being burnt.

Audio function provides the built-in beeper and audio control program to inform operator by audio sound when test is completed or error occurred. Testers can then know whether the test is passed or a failure.

New Function

Current Measuring Function converts current consumption values of DUT at both +3.3V and +1.5V power rail into digital output. User can use software (Utility or DLL) to read directly the precise voltage & current values of DUT at +3.3V & +1.5V respectively through PCIe Bus, and timely monitor DUT current consumption without any external instrument being engaged; it thus can remarkably reduce the expense on equipment and maintenance.

New Function

Cable-less Control Function Previously a cable was needed to send control command if software control was applied. Now the PEM-1X makes it possible by the "Cable Less Control" function to control the device driver and the power of the DUT without any physical connection, making the installation easier on production floor.

Products

Standard Parts: PEM-1X Hot Swap Extender card ---------- 1 piece

Installation CD ---------- 1 piece

Optional Parts:

PEM-1CRL: Long-size Slot Riser

To accommodate the heavy load of mass production that would cause the wear-out of the slot, this long-size slot riser provides protection for the slot of PEM-1X card from wear-out and extend its duration. Use it together with the mass-production type DUT latch frame.

PEM-1CRS: Short-size Slot Riser

Applying the short-size design to works with the auto DUT loading equipment in the production line.

PEM-1LC: Mini-PCIe 500mm high-speed extended slot cable set

Extending the PCIe-mini Bus for 500mm long by flex cable. It in particular is suitable for the mass production test of wireless network cards that need to extend DUT into RF shielding box for test.

Mass-production-type DUT Latch Frame

Use this frame to meet the fast card-swap requirement in mass-production test. Operators can effortlessly insert the card with one hand. Press to secure the card and then release (withdraw) it.

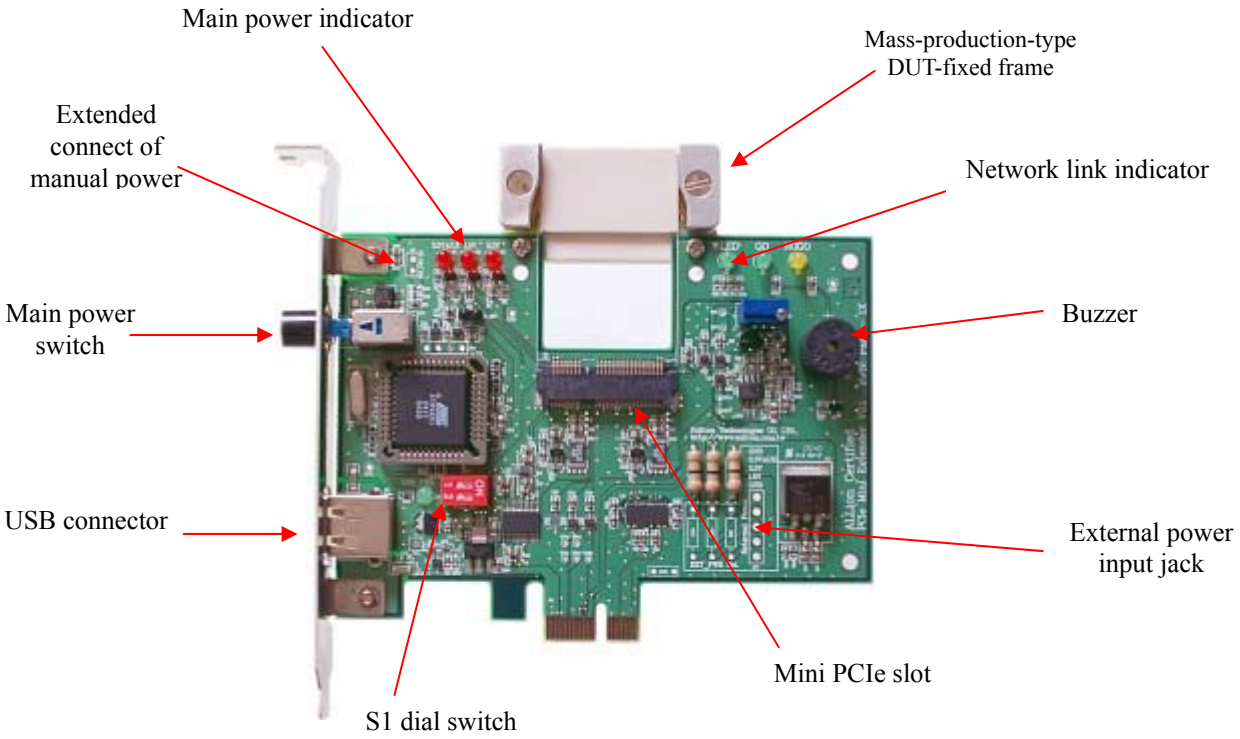
CD Content

The CD index is described as below:

PEM1X

- WinNT Windows 2K/XP Install program
- Document User Manual
- Catalog PEM-1X catalog
- Example Code Index of sample programs
  - VC Visual C++ sample program
  - VB Visual Basic sample program
  - BCB Borland C++ Builder sample program
  - Net .Net sample program

Hardware



PEM-1X PCB Figure

System Functions

■ Windows2000/XP Support:

Support Windows 2000/XP Operating System.

■ Multi-Card Testing:

Allow 1~4 PEM-1X cards applied concurrently at the same testing PC to test Mini PCIe products.

■ DUT Card Enable/Disable:

Execute Driver Enable/Disable function directly on Mini PCIe DUT.

■ Remote software control DUT power on/off:

Use software to remotely control the power and signal switch of PEM-1X.

■ On-board LED indicators:

Provide LED indication of slot power and Go/No-Go state LED indication of the specimen at DUT end, making it easy for operators to judge the test result.

■ Short-circuit & Over-current protection:

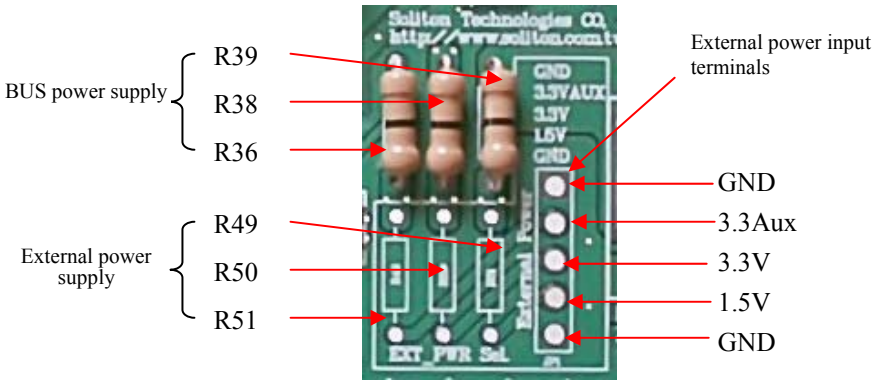
Provide short-circuit & over-voltage protection that will protect the motherboard and DUT from being burnt out.

■ On-board Current & Voltage Measurement:

Provide current and voltage measurement, user can read the DUT power consumption rate directly by software utility or DLL.

■External Power Connector:

Provide external power supply input to DUT. Allow user to switch power to external power supply at 3.3Aux, 3.3V or 1.5V for supplementary power. Just move the bus-powered 0ohm resistors (R36, R38, and R39) to external power-supply resistors R51, R50 & R49.



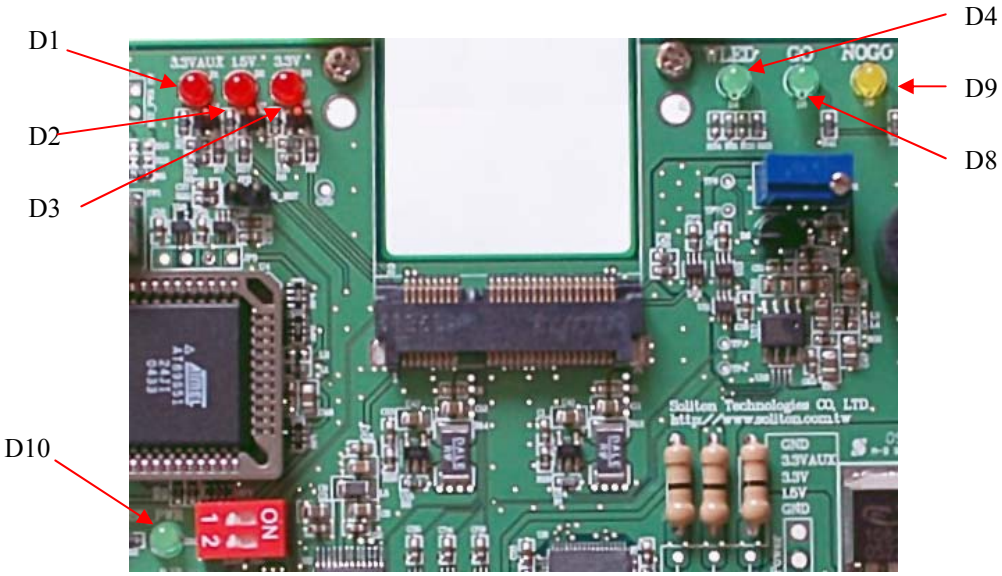
Hardware Setting

Terminal Points and Wire-jumps:

Terminal	Type	Function	Descriptions
R39	+1.5V Selection	DUT power from motherboard	R39 Close, R51 Open: Set PEM-1X 1.5V power source from motherboard PCIe BUS Slot (default)
R38	+3.3V Selection	DUT power from motherboard	R38 Close, R50 Open: Set PEM-1X 3.3V power source from motherboard PCIe BUS Slot (default)
R36	+3.3VAux Selection	DUT power from motherboard	R36 Close, R49 Open: Set PEM-1X 1.5VAux power source from motherboard PCIe BUS Slot (default).
R51	+1.5V Selection	DUT power from external	R51 Close, R39 Open: Set to external supply of 1.5V power from JP1 power input terminal.
R50	+3.3V Selection	DUT power from external	R50 Close, R38 Open: Set to external supply of 3.3V power from JP1 power input terminal.
R49	+3.3VAux Selection	DUT power from external	R49 Close, R36 Open: Set to external supply of 3.3VAux power from JP1 power input terminal.
SW1	Input	Power control switch	Manually turns on/off the power of DUT Slot (default).
S4	Input	Power control switch	Extends manual power switch to turn on/off power at DUT Slot. +5V R65=0(ohm)、R64=0(ohm) +12V R64=1.2K(ohm) +24V R64=24K(ohm)
S1	Input	Multi-card control	Works with hardware/software to perform multi-card operations (default: S1=11) S1=00 Set control address as 1st Extender S1=01 Set control address as 2nd Extender S1=10 Set control address as 3rd Extender S1=11 Set control address as 4th Extender
JP2	Input	RESET	Close to Reset PEM-1X
JP3	Input	JTAG	Not supplied
P3	Output / input	USB Port	Use an external USB cable to connect with PC motherboard USB port for DUT USB function.

LED Indicators

PEM-1X has six LED indicators, see detail description in the following table.

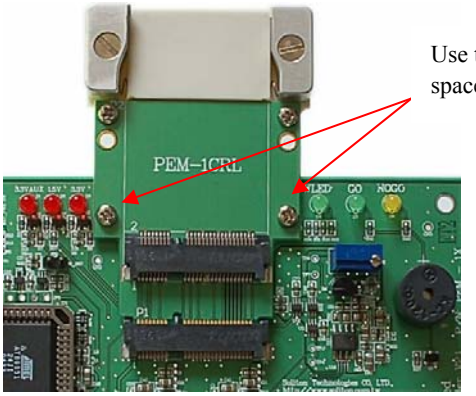


LED	Mark	Description
D1	+3.3VAux	Indicate the +3.3Vaux power status at DUT slot. ON: +3.3Vaux power is under supply already. OFF: no +3.3Vaux power supplied to DUT slot or short circuit occurs.
D2	+1.5V	Indicate the +1.5V power status at DUT slot. ON: +1.5V power is under supply already. OFF: no +1.5V power supplied to DUT slot or short circuit occurs.
D3	+3.3V	Indicate the +3.3V power status at DUT slot. ON: +3.3V power is under supply already. OFF: no +3.3V power supplied to DUT slot or short circuit occurs.
D4	WWLAN	3 kinds of network status are provided. User can follow the jump-wired 0603 SMD resistor to select one among them. 1. WLAN: connect R31 to indicate WLAN (default) 2. WWAN: connect R33 to indicate WWAN status 3. WPAN: connect R34 to indicate WPAN status
D8	Go	Use program to control LED ON (light up) to indicate the DUT test result is PASS.
D9	NoGo	Use program to control LED ON (light up) to indicate the DUT test result is FAIL.
D10	USB	Indicate the connection status of PC USB port. ON: means that PC USB port is attached. OFF: means that PC USB port not attached, USB function not support for DUT.

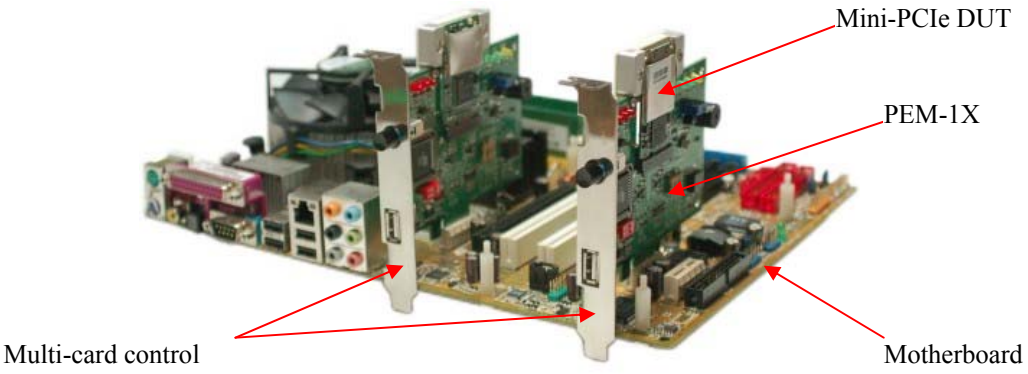
Hardware Installation

Before installing PEM-1X, please turn off PC and unplug the AC power cable and perform the following installation step by step.

1. Install the PEM-1CRL or 1CRS riser onto Extender Mini slot as shown in the figure.



2. Open the PC box cover.
3. Take out the PEM-1X Extender from the anti-static-electricity bag and insert it into any PCI Express x1 or 16 slot on motherboard.
4. Use screws to secure the card to the PC box after the PEM-1X Extender is plugged in place.



5. Insert the Mini PCIe DUT to the PEM-1X
6. Plug the AC power cable to plug seat and turn on PC.
7. PC system will automatically detect the Mini PCIe DUT and install DUT driver.
8. Ensure that DUT works normally; now the hardware installation is complete.

Operation modes

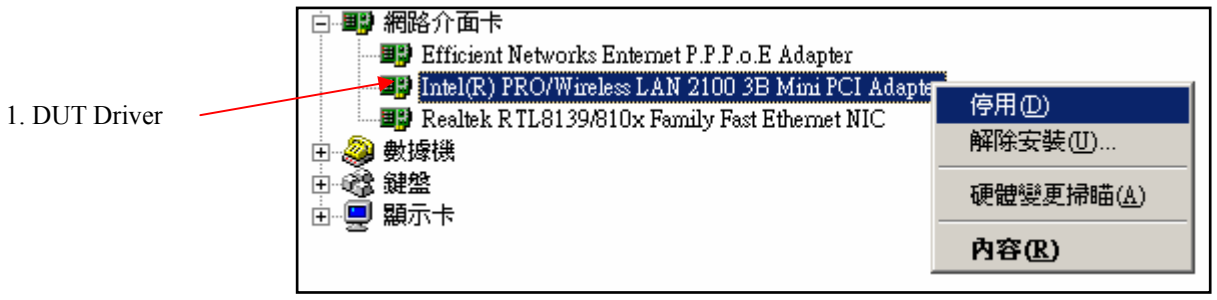
PEM-1X is very powerful which provides many modes for selection as described below.

1. Standard Control Mode

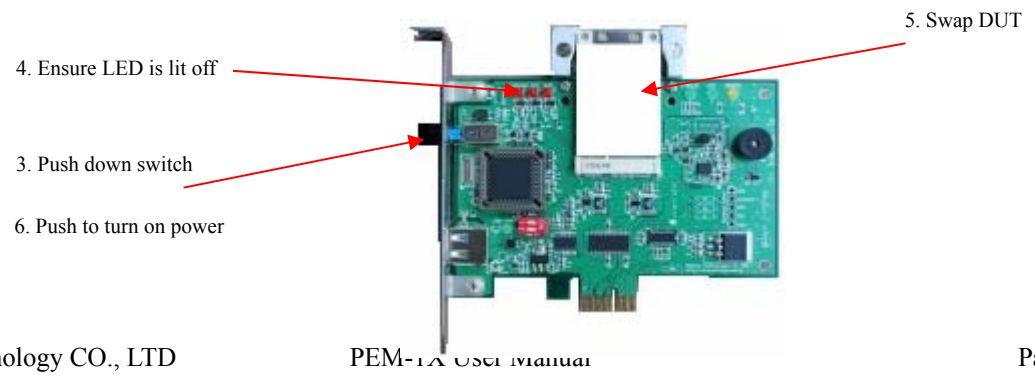
In this mode, no PEM-1X software or driver is install required, users just use and control the PEM-1X manually. We recommend user to use this mode to test first, after it works then move to control software installation. The operation procedures are described below.

a) After the hardware is installed, click to open Windows Device Manager to verify that the DUT driver works properly.

b) Use DUT test program to verify the card; when finished, go to the Device Manger and manually disable the DUT driver. Illustration below shows a network card applied as the DUT, users should select the actual DUT driver of their own and disable it.



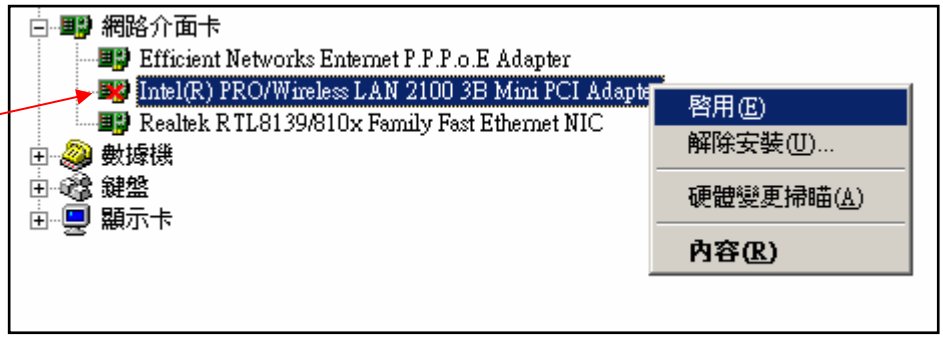
c) When a red cross-mark appears on the DUT icon, it means the DUT driver is disabled. Push the PEMm-1X main power switch to turn off the DUT power. Ensure that the power indicator on PEM-1X card is off and then swap another DUT without turning off PC.



d) After DUT is exchanged, push the switch again to turn on the PEM-1X main power to activate the DUT power, power indicator at the PEM-1X card should light on to indicate the DUT is powered. If the DUT is not powered, the DUT might be short-circuited or over current occurred, please fix the problem before performing next step.

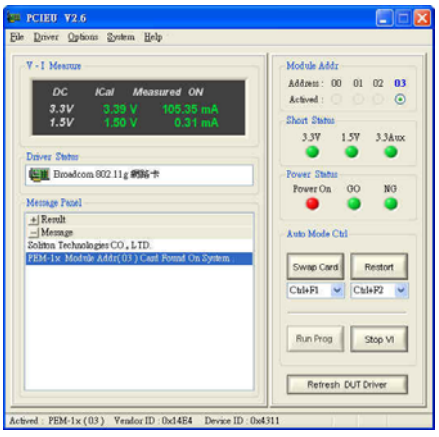
e) When power is activated normally, go to Device Manager and enable the DUT driver. If the DUT works normally, the red cross-mark on the icon should disappear; system is now restored to the initial DUT status.

7. Activate driver



2. Software control mode

Use PEM-1X software utility to perform the above basic operation/control functions and advanced DUT voltage /current measurement. The simple and diverse interface facilitates the operation for both engineers and operators. For details, please refer to next chapter for software installation and operation.



3. Program control mode

If users want to integrate PEM-1X's control functions into their production test program, just used dynamic linking library (DLL). The source code of sample program is provided in CD_ROM. To develop the production test programs under VC, VB or Builder C++ environment, please refer to the following documents:

Document\DLL_Manual\PEM-1X COM Dll v1.0.pdf

Document\DLL_Manual\ PEM-1X Dll v1.0.pdf

Note:

Before installing PEM-1X software, please ensure that the DUT device driver has been installed properly and works normally.

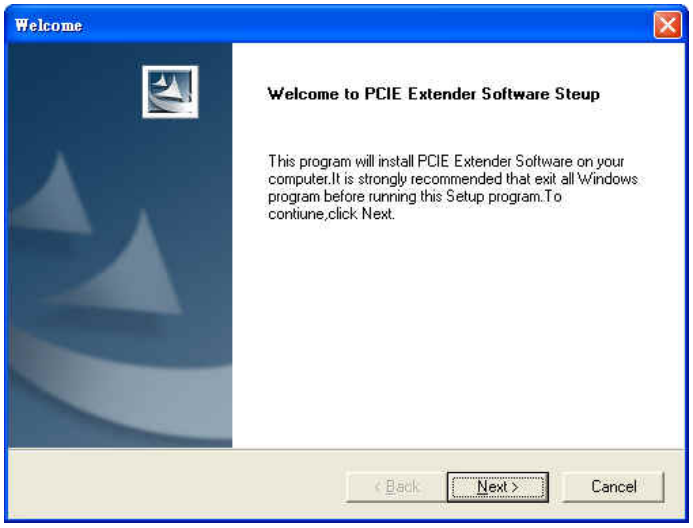
Currently Soliton PCIe series hot swap extender has 2 versions of firmware, which is V1.x and V2.x. Please find the version label on the top of MCU. Different version of firmware has to use correct version of utility software, below is the table list. If incorrect version of utility is used will caused system crashed or extender not working properly.

Item	Firmware Version	Software Utility Version	DLL Library Version
1	V1.x	PCIEU.exe V1.x	PEMDLL.dll V1.x
2	V2.x	PCIEU.exe V2.x	PEMDLL.dll V2.x

Installation (Windows version):

Perform the following step by step to install the PEM-1X control utility.

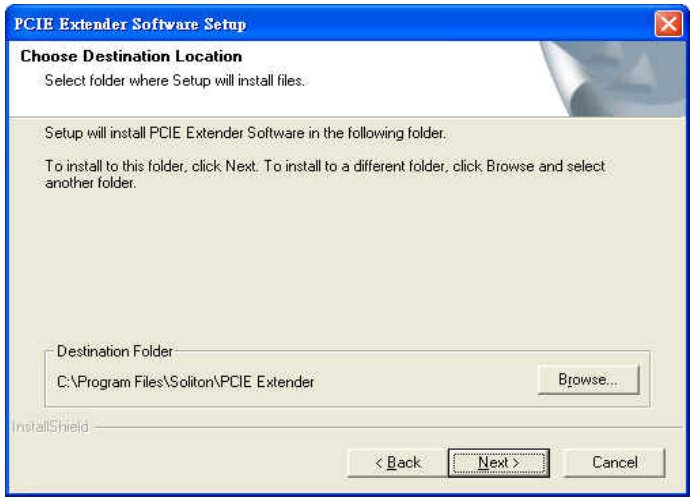
1. Insert the PEM-1X CD to the CD drive, and go to PEM-1X\WinNT\Utility directory.
2. For Win2K/XP /Vista system please select PCIE NT Vx.x.exe and double click to execute the install program. The Welcome screen will appear..



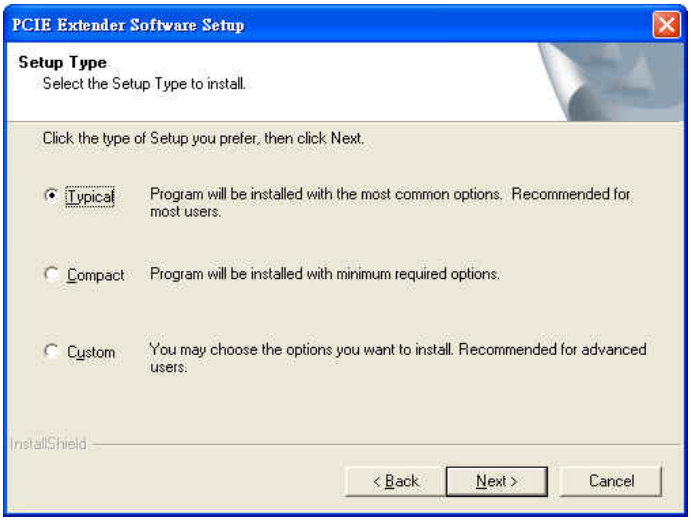
3. Click Next to start installation, or Cancel to abort.

4. Again, ensure that the PEM-1X Card has been installed in PC correctly. On the other hand, if the DUT isn't properly and correctly installed, system will not be able to find the related hardware during the installation and would be unable to setup and allocate the correct configuration data, consequently it causes failure to install the program. If the hardware isn't properly installed, cancel the installation first. After correct hardware status is confirmed, resume the installation.

5. When prompted the path that program is to be installed, click Next (※do not change the path location).



6. Select "Typical", and click Next.

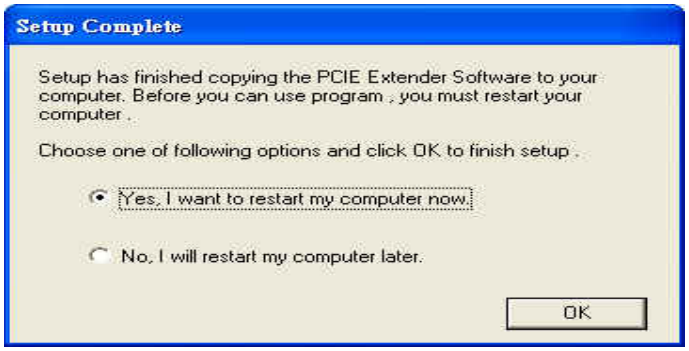


7. When the following dialog box appears; click “OK” to go to next step.

8. When the following error message dialog box appears, ignore it by clicking “OK”.

9. When the following dialog box appears to indicate that the device driver has been successfully installed, click “OK”.

10. When the dialog box shown as below, it means the installation is completed, click “OK” to reboot PC.



11. After the program is installed, system will create a shortcut of PCIEU application program icon on desktop.
12. To execute the PEM-1X utility program, click the shortcut icon on your PC desktop, or go to the default path (C:\Program Files\Soliton\PCIE Extender\Utility\PCIEU.exe). Click to run PCIEU.exe.

Folder and Files

After the hardware and software both are installed, system will create following folder into your hard drive. The actual path will vary according to the user's setting. Default installation path is illustrated in this manual as below.

The default installation path is:
C:\Program Files\Soliton\PCIE Extender\
Document Folder: User Manual
Debug Tool Folder: Debug Tool Program
Utility Folder: Windows version of control software

Note: To integrate the PEM-1X control functions into production test program, user can call the dynamic linking Library (DLL). The source code of sample program is provided in CD-ROM. Test programs can be developing under VC, VB or Builder C++ environment. Please refer to the following documents for more details of DLL.

Document\DLL_Manual\PEM-1X COM Dll v1.2.pdf

Document\DLL_Manual\PEM-1X Dll v1.0.pdf

Install the control program sample software:

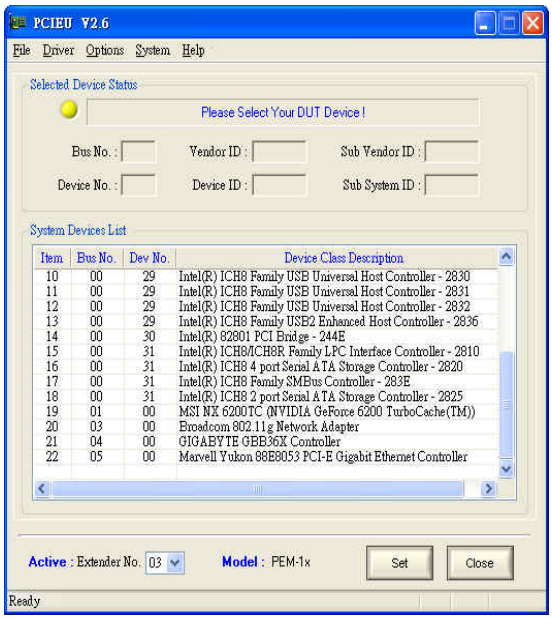
1. Insert the PEM-1X CD into your CD drive and change folder to PEM-1X\Sample_Code directory.
2. Directly copy the sample program folder in the CD into your hard drive. Before modifying the program, make sure program developing software, such as VC, VB or BCB has been installed properly. Then, open the Project which just copy to hard drive of the sample's source codes, re-compile and link the source code to generate the execution file.

Important Message

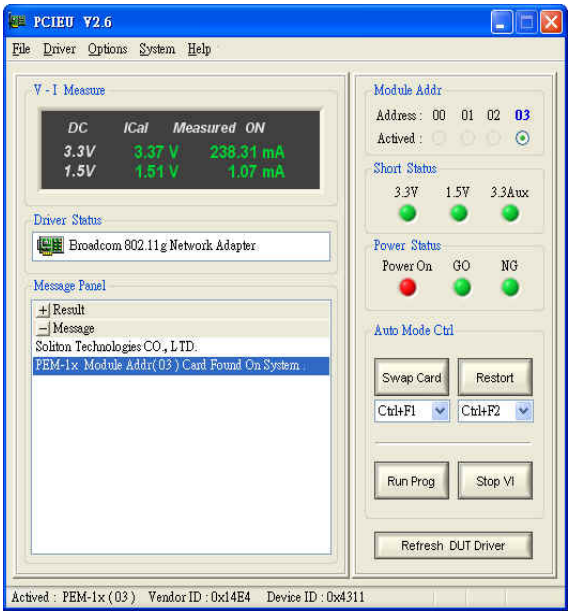
Windows version:

Make sure the Golden Unit is plugged for the first time of software installed or every time you reboot PC, also make sure all the DUT functions are working normally.

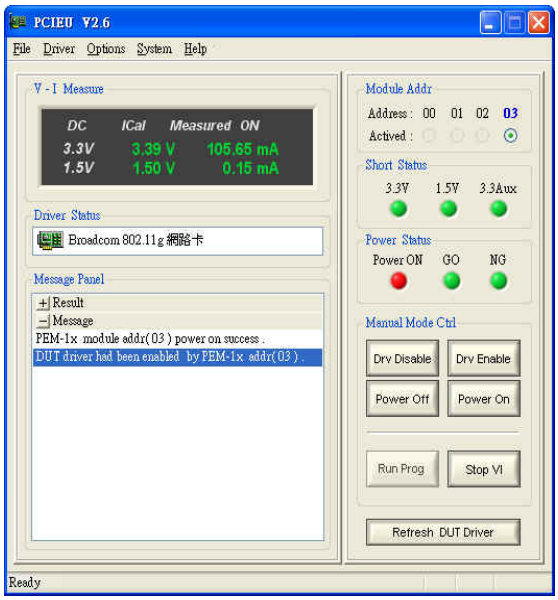
The PEM1X control software not only provides engineering mode, it also provides mass production mode; various operation and setting windows are illustrated as below:



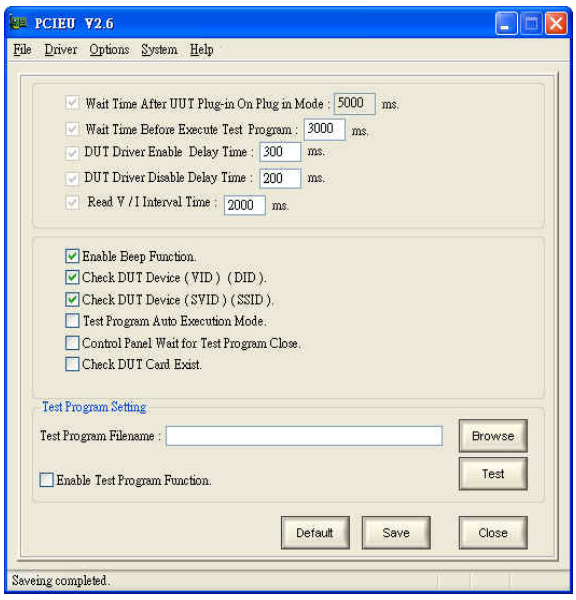
Select device under test



Main OP. Window and Mass production Auto Mode



Engineering Manual Mode



Configuration & Inspecting unit

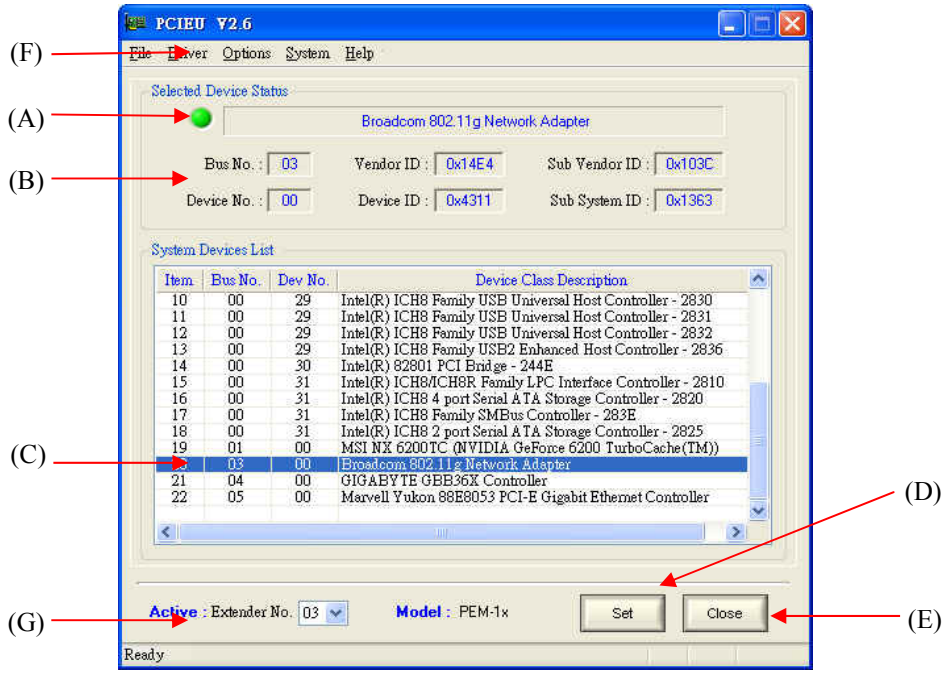
1. INITATE PEM1X

After the application software is installed properly, system will create a shortcut icon on desktop, click to open the control program. If no such icon can be found on desktop, please launch the program at the path defined below:

C:\Program Files\Soliton\PCIE Extender\Utility\PCIEU.exe

2. DUT SELECT PANEL

When execute the PCIEU.exe for the first time, or applying it to different types of DUT, Fig 1 as below will appear. The main purpose of the interface is to list all interface devices in system for users to select corresponding DUT inserted on the PEM-1X. Be sure to select match DUT, otherwise it might cause software malfunction or PC crash. After setting is completed, main operation window dialog will be loaded automatically.



(Fig 1)

2-1 User Interface Introduction:

(A) **LED display**: Indicate the DUT configuration status. If configuration is not set yet or is incorrect, the respective indicator will flash yellow and message prompts “Please Select Your Device”. If the setting is correct, the indicator will turn to green and message prompts “PEM-1x Addr [XX] has setting success!”.

(B) **Device information**: Displays the information of selected DUT, it includes DUT vendor ID, sub vendor ID, Device ID, bus number, device number and sub system ID for identify the DUT.

(C) **Interface device table**: displays the interface information of all devices installed on the motherboard, applied for user to select DUT. Device being clicked will show the related information on (b) edit box for user’s check.

(D) **Set** button: After confirmed the DUT select on the PEM-1X, press **SET** button to save current configuration data into system, then it can work with the PEM-1X application program to perform hot swapping or DUT debugging.

(E) **Close** button**:** closes this device selection window and enter the main control window of the PEM-1X application software.

(F) **Reselect DUT Device:** To reselect DUT device please select the menu bar of Options → Reselect DUT Device.

(G) **PEM1xAddr**: displays and selects activate PEM-1X address setting. When multi-card control is used, each of PEM-1x has to set unique address (00~03) by change S1 dial switch.

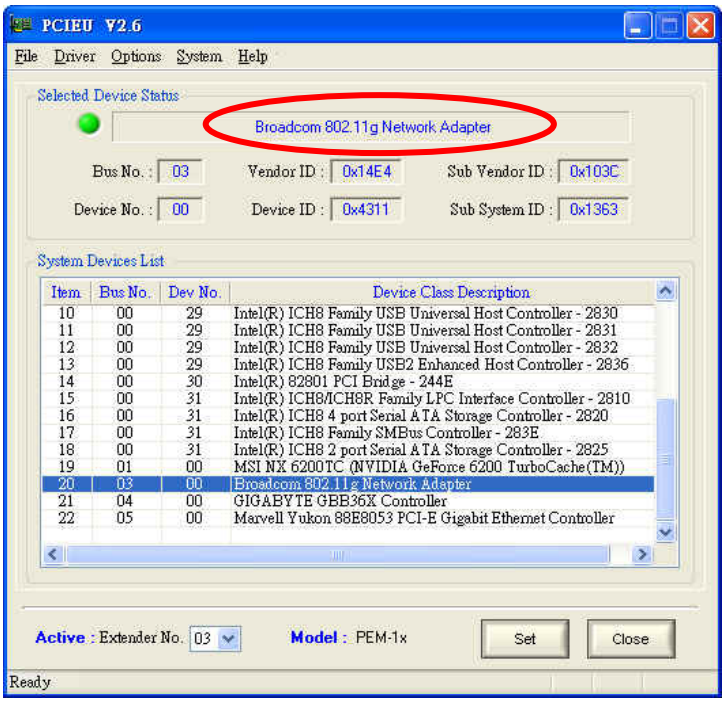
2-2 Setting Procedures:

(1) Select the DUT inserted on PEM-1X from the interface device list in Fig 2, the selected device will be highlighted.

(2) Confirm the data correctness of the selected device, for example, the information of Vendor ID and Device ID.

(3) Click [Set] to complete the setting and save it, shown in Fig 2.

(4) Click [Close] to finish the setting and enter the main control window.



(Fig 2)

2-3 Notes:

Before click [Set] button, please double confirm the setting information of selected DUT. If it is incorrect, click to select and make setting on it once again, otherwise the DUT and PEM-1X card won't be controlled by the software as they should be, which will result in the software malfunction and system crash.

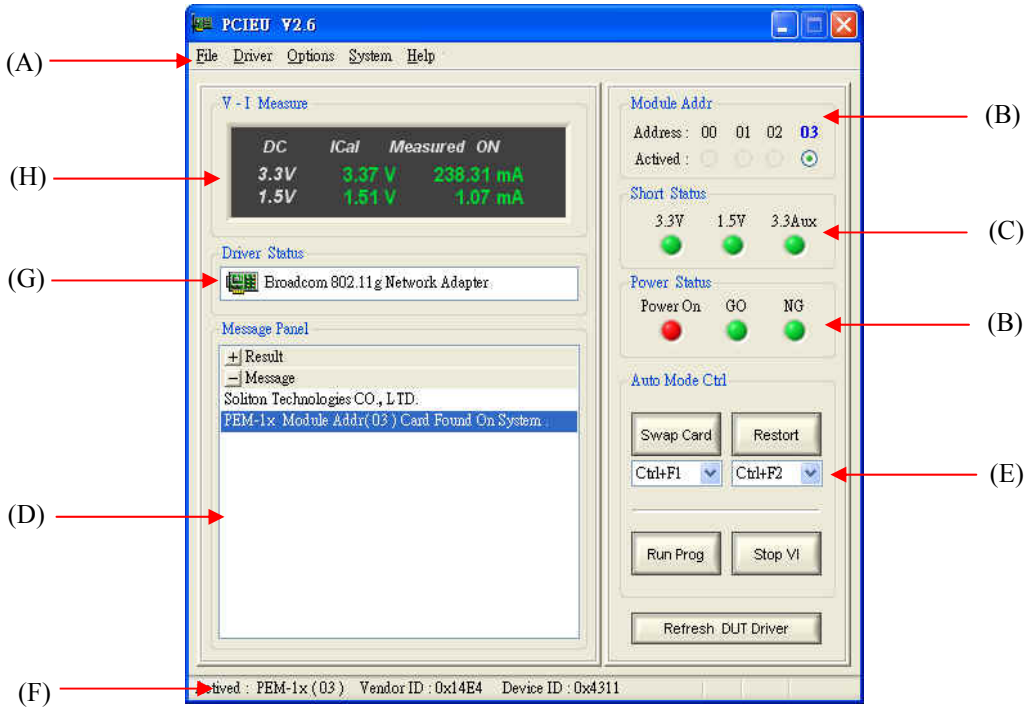
If the device selection window can not be closed after clicking Close button, this means the software already detected certain errors on the setting; please check following items.

(1) Is DUT power of PEM-1x card at on state?

(2) Is DUT inserted into PEM-1x card slot?

3. MAIN OPERATION WINDOW

As displayed in Fig 3, the main operation dialog box provides the control of card hot swapping, debugging and the status information.



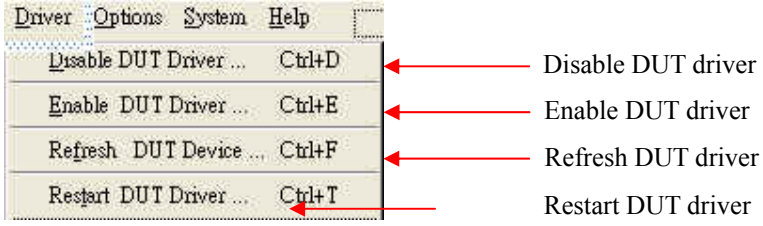
(Fig 3)

3-1 Operation Window Introduction

(A) MENU BAR

(I) Driver pull-down menu

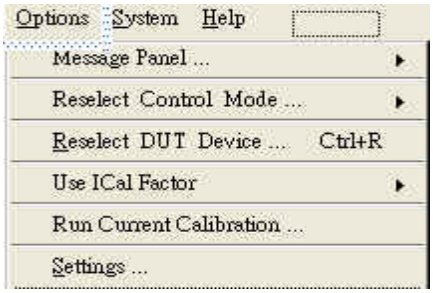
Click the "Driver" from main dialog box menu bar for control DUT device driver Enable, Disable, Refresh and Restart.



(Fig 4)

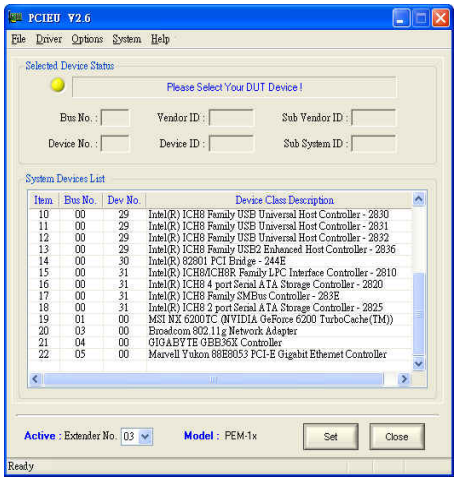
(Ⅱ) Options pull-down menu

Options pull-down menu provides many functions allow users to set detail control tasks. The options menu is shown in Fig 5.



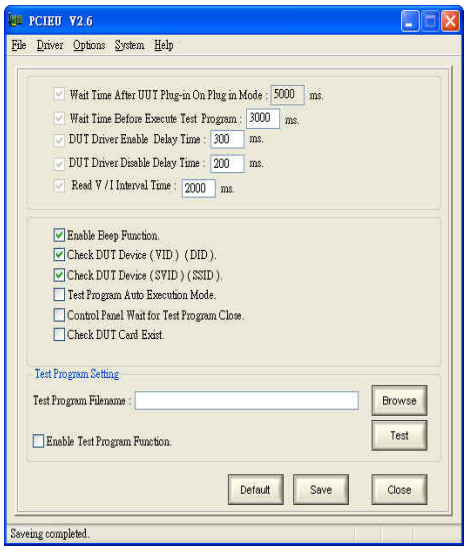
(Fig 5)

Reselect DUT Device: Opens the DUT device selection window as shown in Fig 6.



(Fig 6)

Settings: Opens the PEM-1X setting window as shown in Fig 7.



(Fig 7)

Run Current Calibration：Apply to calibrate the PEM-1X measurement function, please refer to the appendix for detail.

Reselect Control Mode： **Manual Mode** and **Auto Mode** are available for users' selection, illustrated as below. Users can switch manual mode for engineering or auto mode for mass-production.

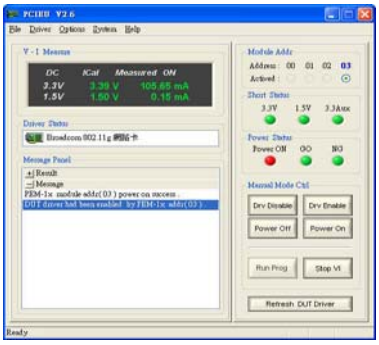
Manual Mode： Open the engineering manual control mode.

Auto Mode： Open the auto mass-production control mode.

Mass-production control mode

(Fig 8)

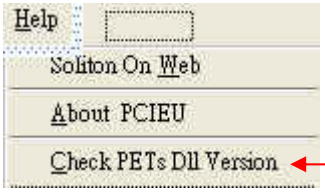
Manual control mode



(Fig 9)

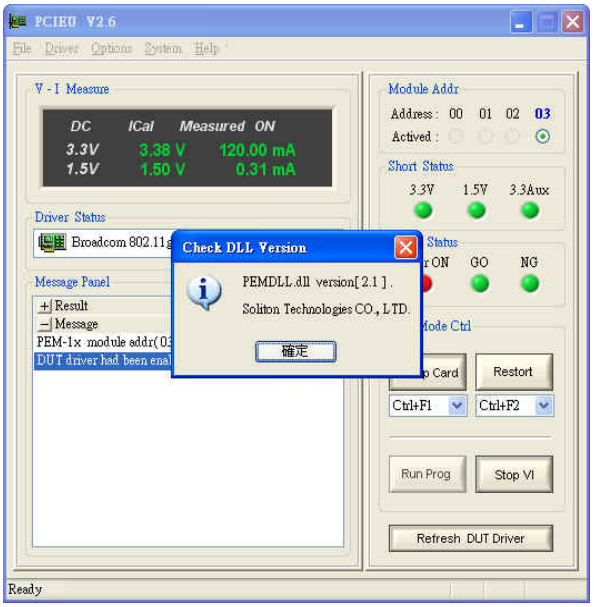
(Ⅲ) Help pull-down menu

For check current software utility and DLL library version at Help menu.



(Fig 10)

Check PETs(PEMDLL.dll) version



(Fig 11)

(B) ADDRESS/POWER STATUS DISPLAY AREA

Address: Display and activate which PEM-1X card is under control.

Shows which PEM-1X card being selected or in use, ADDR in the operation window will display (00 ~ 03).

Power xx: Displays the power status of PEM-1X card

- ■ Indicator in red means the DUT slot power is on.
- ■ Indicator in gray means the DUT slot power is off.

GO : Displays the result of DUT card hot swapping.

- ■ If the result of card swapping is normal, green indicator will light up.
- ■ If the result of card swapping procedure is abnormal, indicator will grey.

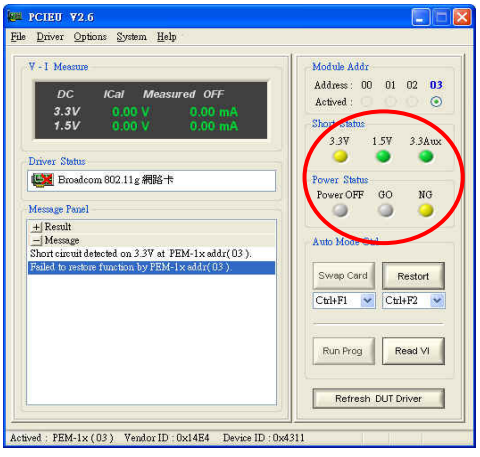
NG : Displays the result of DUT card hot swapping.

- ■ If result of card swapping is abnormal, yellow indicator will light up.
- ■ If the result of card swapping procedure is normal, grey indicator will grow.

(C) SHORT-CIRCUIT STATUS DISPLAY AREA

In normal operation, the Short Status displays in black text, whereas the 1.5V, 3.3V or 3.3Vaux LED indicators are in green status.

When DUT short-circuit is occurred, the Short Status will show in red text, and LED indicator will flashes in yellow, this means the respective power circuit is short-circuited or over-current. In this case, change another DUT and test again. Figure 12 is an example of 3.3V shot-circuit.



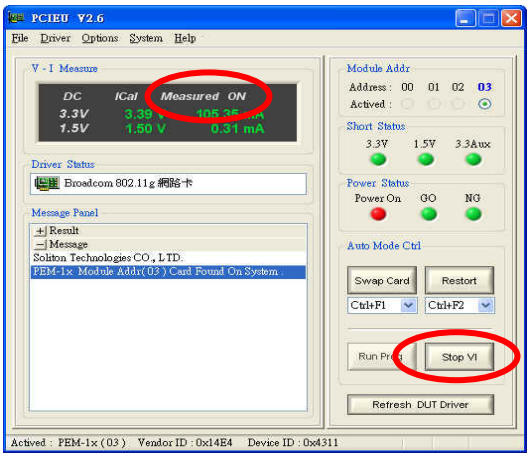
(Fig 12)

(D) TEXT MESSAGE DISPLAY AREA

System will shows all the control, error and activity messages in this area.

(E) CONTROL BUTTON AREA

- Actived It can switch and display which PEM-1X card is under control.
- Swap Card While under auto mode, whenever clicking this button software will execute the following actions in sequence to swap another DUT.
  Driver Disable → Power off
  Hot key: (Ctrl + F1)
- Restore While in auto mass-production mode, whenever clicking the "Restore" button, software will execute the following actions in sequence. After DUT is being swapped, click restore for DUT back to initial state.
  Power On → Driver Enable
  Hot key: (Ctrl + F2)
- Read VI Read V_I measurement values
  While clicking this button, screen will auto open and display the V_I measurement window as shown in Fig 15, displayed data will be read and updated every 2 seconds.
  To disable the V_I measurement function, click the "Stop VI" button.
  To enable the V_I measurement function, click the "Read VI" button.



(Fig 15)

- Driver Disable Disable the DUT (driver) device (available in manual mode).
- Driver Enable Enable the DUT (driver) device (available in manual mode).
- Power Off Turn off PEM-1X card slot power (available in manual mode).
- Power On Turn on PEM-1X card slot power (available in manual mode).
- Run Prog While in auto mode, click the "Run Prog" button to launch the test program which user been set in system setting dialog box.
- Refresh DUT Driver Refresh DUT Driver.

(F) STATUS BAR

Display the PEM-1X card being initiated and its address (0~3), also the information of DUT Vendor ID and Device ID.

If the Vendor ID or Device ID does not match with DUT, users can click Options from menu bar and select Reselect DUT Device to list all system devices information for re-select DUT.

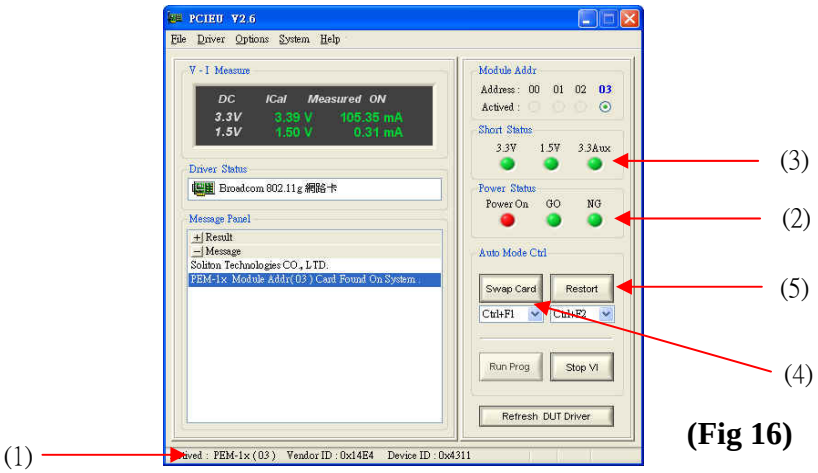
(G) DUT DEVICE DRIVER STATUS

While the DUT swapping users can monitor the DUT device driver status in this bar. If the DUT icon with red cross-mark means device driver is disable. Normally PEM-1X software will auto enable DUT driver after DUT swapped in production mode. Be note the DUT driver should be enable before running the function test. In some cases exclamation mark (!) might be occurred on driver icon, please check the connection between DUT and slot or DUT hardware may not works.

(H) VOLTAGE / CURRENT DISPLAY AREA

Shows the DUT +3.3V and +1.5V two power rails of voltage & current reading that measured from PEM-1X. It is very useful to check the current reading after DUT power on, since any hardware problems will caused abnormal current reading. The refresh rate of reading is 2 seconds.

3-2 Operation procedures of mass-production mode:



(Fig 16)

After setting is complete, run PCIEU.exe and screen will appear as shown in Fig 16. Software will detect all the PEM-1X cards on the PC motherboard, and indicates the readiness by (red) POWER indicator and (green) GO indicator. System can control 4 PEM-1X cards at most concurrently for test or application. When multiple PEM-X cards are applied, each card should set in unique address by S1 dial-switch, S1 dial-switch address range are 00, 01, 10 to 11.

Once you enter the main operation window, verify the following items:

(1) The DUT data such as Vendor ID and Device ID.

(2) The power LED indicator in red means that the slot power is ON. And if the Driver LED indicator is in red, it means the DUT Device Driver is in ready status.

(3) If 1.5V, 3.3V & 3.3Vaux short-circuit indicator is in green, it means that power supply is normal. And if all displays are normal, use the following buttons to control DUT.

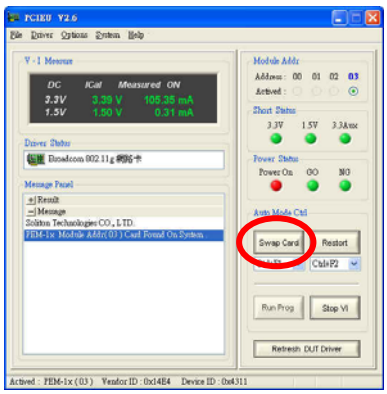
(4) Click **Swap Card** button to swap DUT. The software will close the DUT driver and turn off the power. After the Power LED indicator from on goes off, operator then can remove DUT and replace with a new one. Operator also can use hot key to operate it by keyboard.
Hot-key: (Ctrl + F1)

(5) When the DUT is replaced, click the **Restore** button to turn on the power and enable the DUT driver. If all indicators are normal, perform the DUT test program. Otherwise, the DUT might be defective; change it by another new card.
Restore Hot key: (Ctrl + F2)

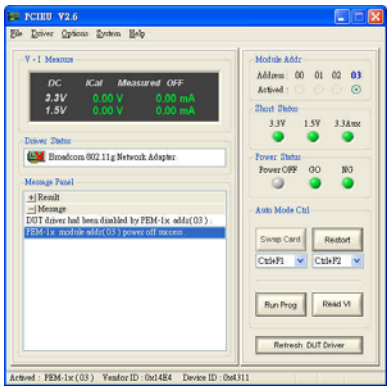
(6) PEM-1X will shows the messages at text display area for current activity status. Any normal or abnormal messages will be displayed in this area.

Swap Card → Replace DUT → **Restore** → Verify DUT Functions→ Test Completed

Status display of engineering operation mode:

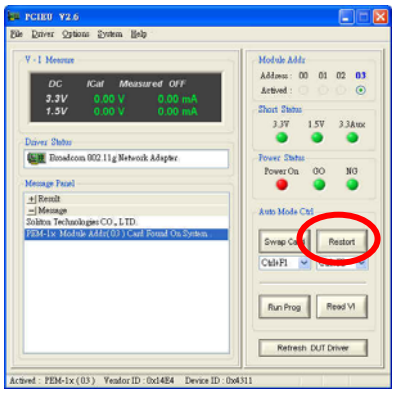


(a) State before swapping Card

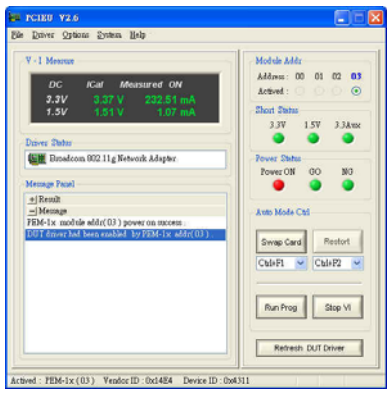


(b) After Swap Card button clicked

Replace New DUT

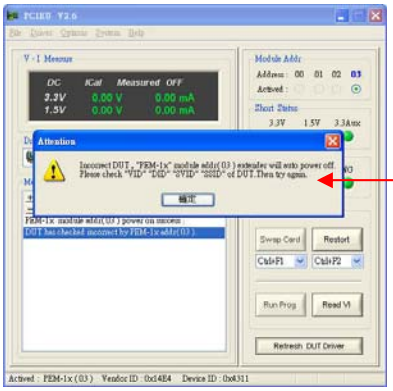


(c) After DUT replaced, click Restore



(d) Card-swapping successful, start testing

Errors that might occur after card is changed**:**



(Fig 17)

If an error message shown in above figure 17 after card is replaced, it means the card swapping has error. The PEM-1x software has DUT verify capability, therefore it will bring error message to the text message area. Please correct the error and click the [Restore] button once again, window will be restored to the screen that card being successfully swapped. The related error messages are described below.

1. **PEM-1x[xx] No DUT Card Plug in**
   No DUT is plug in PEM-1x, probably DUT isn't inserted please re-insert it.
2. **"Check DUT Device VID DID Error By PEM-1x [xx] !"**
   The new DUT does not match the VID, DID data originally saved.
   Probably DUT isn't inserted or is malfunctioning, re-insert or replace it.
3. **"Check DUT Device SVID SID Error By PEM-1x [xx] !"**
   The replaced DUT does not match the originally saved SVID, SDID data.
   Probably DUT isn't inserted properly or is malfunctioning; re-insert or replace it.
4. **"Failed To PEM-1x [xx] Power On !"**
   The power-on function of the PEM-1X is abnormal.
5. **"Failed To PEM-1x [xx] Power Off !"**
   The power off function of the PEM-1X is abnormal.
6. **"Failed To Disable DUT Device Driver By PEM-1x [xx]"!**
   Error detected while the PEM-1X disable the DUT driver.
7. **"Failed To Enable DUT Device Driver By PEM-1x [xx]"**
   Error detected while the PEM-1X enable the DUT driver.

3-3 Operation procedures of engineering mode:

To apply multiple PEM-1X cards, it is necessary to set up each card to different dial switch S1, the order is from 00, 01, 10 to 11.

After entering the operation window normally, check the following items

(a) DUT data, such as Vendor ID and Dgvice ID.

(b) If the Power LED indicator in red, it means the slot power is ON.

(c) If the Driver LED indicator in red, it means the driver is enabled already.

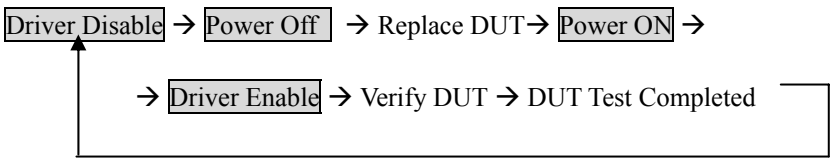
(d) Check if the 1.5V, 3.3V & 3.3Vaux short-circuit indicators are all in green at software panel, which represents all power rails are in normal state.

(e) Driver Disable Disable the DUT device driver.

(f) Driver Enable Enable the DUT device driver.

(g) Power Off Turn off the DUT slot power at PEM-1X card.

(h) Power On Turn on the DUT slot power at PEM-1X card.

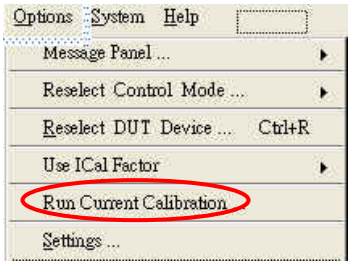


Current Calibration

To read the DUT current consumption more precisely, user can perform the current calibration described below. Before doing so, remove DUT and the extended cable on the PEM-1x slot card, it is because the calibration program should be performed in non-loaded mode.

. ***Operation procedures of current calibration:***

(a) Click the "Run Current Calibration" from menu bar.

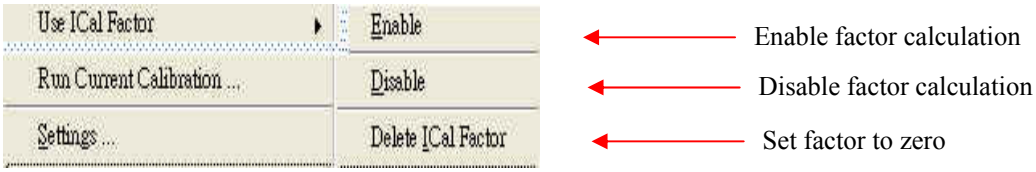


(b) When the dialog box shown as below, please remove DUT from PEM-1X and press "OK".

(c) Program now starts to calibrate current. When finished, the dialog box shown as below.

Options for current calibration:

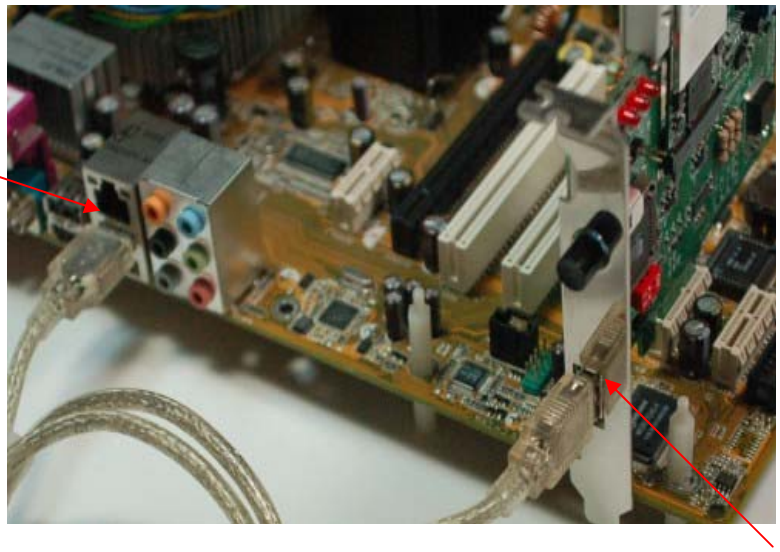
After calibration system will store calibration factor into hard drive, users can determine to use this factor or not by select Enable / Disable of "Use IcalFactor" in menu bar. Also this factor can be deleted by click "Delete IcalFactor".



USB Function

In order to support USB 2.0 for DUT USB function test, PEM-1X has one USB 2.0 port. Users should use a type-A male-to-male USB cable (see the picture below) to link with motherboard USB 2.0 port.

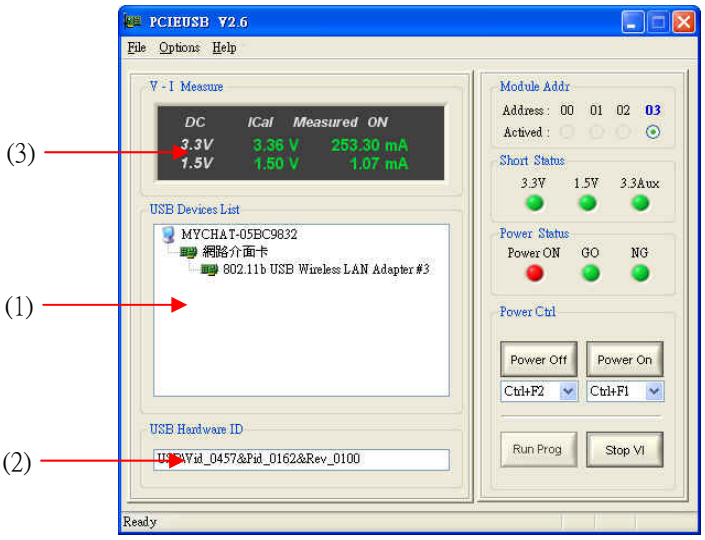
The way of using card's hot swap is identical to that described in the previous chapter. If the PCIe Mini DUT only has USB function, then there will be no need to control DUT driver (Driver Enable/Disable), all you need to do is to control the power switch since USB itself has hot swap capability.



USB Operation

For some DUTs which use USB bus only, PEM-1x provides PCIEUSB utility for DUT power control. After the application software is installed properly, click Windows Start Menu / Programs / Soliton / PCIEUSB to open the control program or execute the program at the path defined below:

C:\Program Files\Soliton\PCIE Extender\Utility\PCIEUSB.exe



(1) Shows USB device driver status

(2) Shows USB device hardware information

(3) Display Voltage/current measuring

■ Power Off Turn off PEM-1X card slot power .

■ Power On Turn on PEM-1X card slot power .

■ Run Prog While in auto mode, click the Run Prog button to launch the DUT test program which has been set in system setting dialog box.

■ Read VI Read V_I measurement values

While clicking “Read VI” button, screen will auto open and display the V_I measurement window as shown in (3), displayed data will be read and updated every 2 seconds.

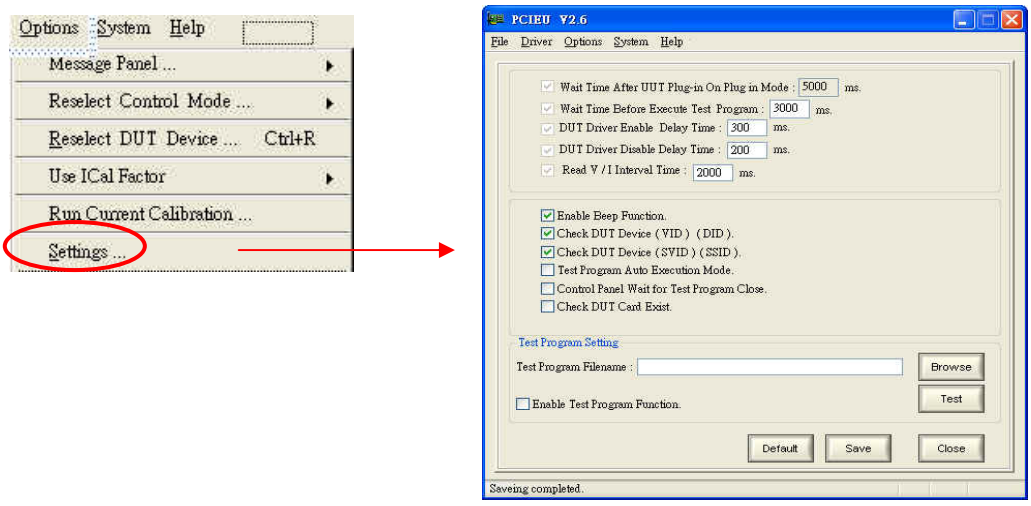
To disable the V_I measurement function, click the “Stop VI” button.

To enable the V_I measurement function, click the “Read VI” button.

SETTING DIALOG (configuration setting of PEM-1X card):

Click **Options** from menu bar and select Setting, the Setting Dialog shown below will appear. It displays the saved configuration register of PCI DUT for review, comparison and selection for the test method and the process of DUT. After the main program is proformed, it will automatically detect the configuration setting to make related application and verification test.

This dialog box also allows users to set the DUT test program setting; if there is no test software, no data input will be required, just keep it blank.



- **Enable Beep Function:**
  Check to enable the alarm function, or leave it blank to disable beep function.
  One long beep sound indicates the PEM-1X is abnormal.
  Two short beep sound indicates the PEM-1X is normal.

- **Test Program Auto Execution Mode:**
  If selected, system is set to auto control mode, which means system will auto run the DUT test program whenever the card-swap procedure is complete. Leave it unchecked to disable the test program link control function.

- **Check Device VID DID:**
  If selected, it means every time when the card is swapped, program will auto check if the saved settings of PCI configuration match that of the replaced card. This will greatly help to screen the DUT at beginning of testing, the production capability can then be boosted.
  (System default is set to on. It is recommended to use this function.)

- **Check Device SVID SID:**
  If selected, it means every time when the card is swapped, program will auto check if the saved settings of PCI configuration is match with the replaced card. This will greatly help to screen the DUT at beginning of testing, the production capability can then be boosted.
  (System default is set to on. It is recommended to use this function.)

- **Wait Time After DUT Plug-in**
  After activating the auto card-insertion trigger function, to avoid error users can set certain period of time for waiting so that the main power of the PEM-1X will be automatically turned on after the card-insertion is fully performed and stabilized.
  Note: Before adjust this parameter, select the "Enable Card Plug Function For Auto_Mode" option first (system default is: 3000 ms).

- **Wait Time Before Test Program Execution**
  This parameter allows users to set a certain period of time for waiting after the DUT driver has been successfully initiated and before the test program is activated. Waiting time is necessary because after the DUT driver is activated, it needs some time to execute the test program. Condition for setting up this waiting time is no error occurs during the test program is being performed and no system crash occurs. Waiting time should be as short as possible.

  Note: Before adjust this parameter, select the "Auto Test Program Running Mode" option first (system default is: 1000 ms).

- **DUT Driver Enable Delay Time**
  This parameter allows users to set a certain period of time for delay after the DUT driver is successfully initiated. Delay time is necessary for ensuring the DUT is fully enabled for some DUTs need longer time to initiate.
- **DUT Driver Disable Delay Time**
  This parameter allows users to set a certain period of time for delay after the DUT driver is fully disabled for some DUTs need longer time to stop.

- **Test Program Filename:**
  It displays the folder, path location and name of the DUT test program being set.

- **Brows:**
  Set the folder, path location and name of the DUT test program by browse.

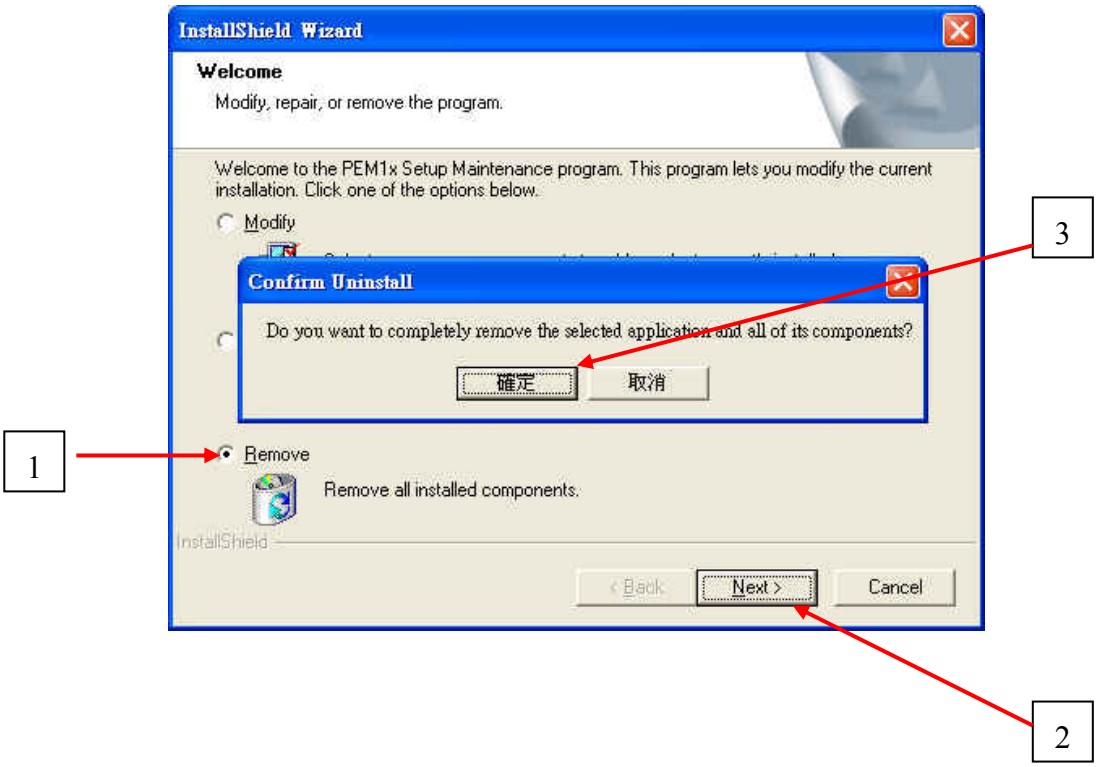
- **Enable Test Function:**
  Select this option to activate the connection capability of the DUT test program. If

it is unchecked, system will clear the folder path and name of the DUT test program.

- **Test:**
  Perform the DUT test program been linked.
- **Save :**
  Save the parameter data been set or modified on the Setting Dialog, and close the Setting Dialog configuration window.
- **Close:**
  Close the Setting Dialog configuration window without saving. .
- **Default:**
  Reset all values to factory default.

Uninstall Software

To uninstall the PEM-1X application software, please open Control Panel→ Add/Remove Program to run PCIEU; windows shown below will appear. Click “Remove” and “Next”, and click “**YES**” to start the uninstall process. When finished, **reboot your PC**.



Notes and Troubleshooting

■ **Notes:**

1. Before installing the application program, ensure that the PEM-1X card is properly installed in your PC already. If the PEM-1X is not properly installed, system won't be able to set up configuration data properly during the installation. It is because no related hardware can be found, and that would cause malfunction of the program. If this occurs, use the uninstall software to remove the application program. Make sure the hardware is installed properly, then re-install the application program.

2. If the Driver Disable or Driver Enable buttons are used during the test process, do not perform next step until all related actions are completed, otherwise, it would cause PC crash.

3. (Windows) software wise, when multiple PEM-1X cards are used concurrently in one PC, to shift the software control from one PEM-1X card to anther, make sure that the controlled PEM-1X card is at Power On status, and the PCI driver on the card is under normal and ready status.

4. While inserting DUT to the PEM-1X card, if beeper on the PEM-1X makes three consecutive long beeps for warning and the power indicator is off, it means that short-circuit is detected and the PEM-1X card has performed auto power-shutdown protection. In this case, change another card to continue to use the PEM-1X.

5. Currently Soliton PCIe series hot swap extender has 2 versions of firmware, which is V1.x and V2.x. Please find the version label on the top of MCU. Different version of firmware has to use correct version of utility software, below is the table list. If incorrect version of utility is used will caused extender not working properly.

Item	Firmware Version	Software Utility Version	DLL Library Version
1	V1.x	PCIEU.exe V1.x	PEMDLL.dll V1.x
2	V2.x	PCIEU.exe V2.x	PEMDLL.dll V2.x

■ **Troubleshooting:**

1. If the error message "**No PCIE Extender Card Found on System!**" shows up when launch PCIEU.exe, please check below status.
   a. Is PEM-1X extender card installed in PC?
   b. Is the motherboard chipset support by PEM-1X firmware? Check the updated information on our web site.
2. If message "**No Card Found on System**" appears after running the PCIEU.exe and buttons on the operation window are disable, this means that the hardware/software of the PEM-1X card isn't installed and set up properly, do the following:

   (1) Make sure the Mini PCIe DUT is inserted properly on the PEM-1X card and the driver is installed correctly.

   (2) When using multi-card control mode, make sure the address of S1 DIP switch on all PEM-1X cards is unique.
3. If DUT is unable to function after PC is booted or system is rebooted, go to Control Panel→System Device Manager→System Devices to check if the DUT driver is disabled. If it is disabled, manually enable it.
4. If normal operation dialog box cannot be displayed after PEM1X.exe is executed, close resident programs such as antivirus or other software temporarily.

Technical Support

For any technical problem regarding the PEM-1X, please visit our website first.
http://www.soliton.com.tw.

For further information, please reach us at:
Phone：+886(0)3-656-6996
Fax　：+886(0)3-656-6883
Email : tech@soliton.com.tw