1. Registers description

5.1.3.1 Censorship password registers (NVPWD0 and NVPWD1)

The two private password registers combine to form a 64-bit password that should be programmed to a value known only by you. After factory test these registers are programmed as shown below:

- NVPWD0 = 0xFEED_FACE
- NVPWD1 = 0xCAFE_BEEF

This means that even if censorship was inadvertently enabled by writing to the censorship control registers, there is an opportunity to get back into the microcontroller using the default private password of 0xFEED_FACE_CAFE_BEEF.

When configuring the private password, each half word (16-bit) must contain at least one "1" and one "0". Some examples of legal and illegal passwords are shown in Table 5-3:

Table 5-3. Examples of legal and illegal passwords

Legal (valid) passwords	Illegal (invalid) passwords
0x0001_0001_0001_0001 0xFFFE_FFFE_FFFE_FFFE 0x1XXX_X2XX_XX4X_XXX8	0x0000_XXXX_XXXX_XXXX 0xFFFF_XXXX_XXXX_XXXX

In uncensored devices it is possible to download code via LINFlex or FlexCAN (Serial Boot Mode) into internal SRAM even if the 64-bit private password stored in the flash and provided during the boot sequence is a password that does not conform to the password rules.

5.1.3.2 Nonvolatile System Censorship Control registers (NVSCC0 and NVSCC1)

These registers are used together to define the censorship configuration. After factory test these registers are programmed as shown below which disables censorship:

- NVSCC0 = 0x55AA_55AA
- NVSCC1 = 0x55AA_55AA

Each 32-bit register is split into an upper and lower 16-bit field. The upper 16 bits (the SC field) are used to control serial boot mode censorship. The lower 16 bits (the CW field) are used to control flash memory boot censorship.

If the contents of the shadow flash memory are erased and the NVSCC0,1 registers are not re-programmed to a valid value, the microcontroller will be permanently censored with no way for you to regain access. A microcontroller in this state cannot be debugged or re-flashed.

5.1.3.3   Censorship configuration

The steps to configuring censorship are:

1. Define a valid 64-bit password that conforms to the password rules.
2. Using the table and flow charts below, decide what level of censorship you require and configure the NVSCC0,1 values.
3. Re-program the shadow flash memory and NVPWD0,1 and NVSCC0,1 registers with your new values. A POR is required before these will take effect.

If
   (NVSCC0 and NVSCC1 do not match)
or
   (Either NVSCC0 or NVSCC1 is not set to 0x55AA)
then the microcontroller will be permanently censored with no way to get back in.

Table 5-4 shows all the possible modes of censorship. The red shaded areas are to be avoided as these show the configuration for a device that is permanently locked out. If you wish to enable censorship with a private password there is only one valid configuration — to modify the CW field in both NVSCC0,1 registers so they match but do not equal 0x55AA. This will allow you to enter the private password in both serial and flash boot modes.

2. Censorship configuration

Table 5-4. Censorship configuration and truth table

Boot configuration		Serial censorship control word (NVSCCn[SC])	Censorship control word (NVSCCn[CW])	Internal flash memory state	Nexus state	Serial password	JTAG password
FAB pin state	Control options						
0 (flash memory boot)	Uncensored	0xXXXX AND NVSCC0 == NVSCC1	0x55AA AND NVSCC0 == NVSCC1	Enabled	Enabled		N/A
	Private flash memory password and censored	0x55AA AND NVSCC0 == NVSCC1	!0x55AA AND NVSCC0 == NVSCC1	Enabled	Enabled with password		NVPWD1,0 (SSCM reads flash memory[1])
	Censored with no password access (lockout)	!0x55AA OR NVSCC0 != NVSCC1	!0X55AA	Enabled	Disabled		N/A
1 (serial boot)	Private flash memory password and uncensored	0x55AA AND NVSCC0 == NVSCC1		Enabled	Enabled	NVPWD0,1 (BAM reads flash memory[1])	
	Private flash memory password and censored	0x55AA AND NVSCC0 == NVSCC1	!0x55AA AND NVSCC0 == NVSCC1	Enabled	Disabled	NVPWD1,0 (SSCM reads flash memory[1])	
	Public password and uncensored	!0x55AA AND NVSCC0 != NVSCC1	0X55AA AND NVSCC0 != NVSCC1	Enabled	Enabled	Public (0xFEED_FACE_CAFE_BEEF)	
	Public password and censored (lockout)	!0x55AA OR NVSCC0 != NVSCC1		Disabled	Disabled	Public (0xFEED_FACE_CAFE_BEEF)	

	= Microcontroller permanently locked out
	= Not applicable

[1] When the SSCM reads the passwords from flash memory, the NVPWD0 and NVPWD1 password order is swapped, so you have to submit the 64-bit password as {NVPWD1, NVPWD0}.

3. Censorship control in flash memory boot mode, "censored with private password over JTAG" was marked with red ellipse.

Note: Don't configure it in the mode marked with red bar, otherwise it can't be unlocked forever.
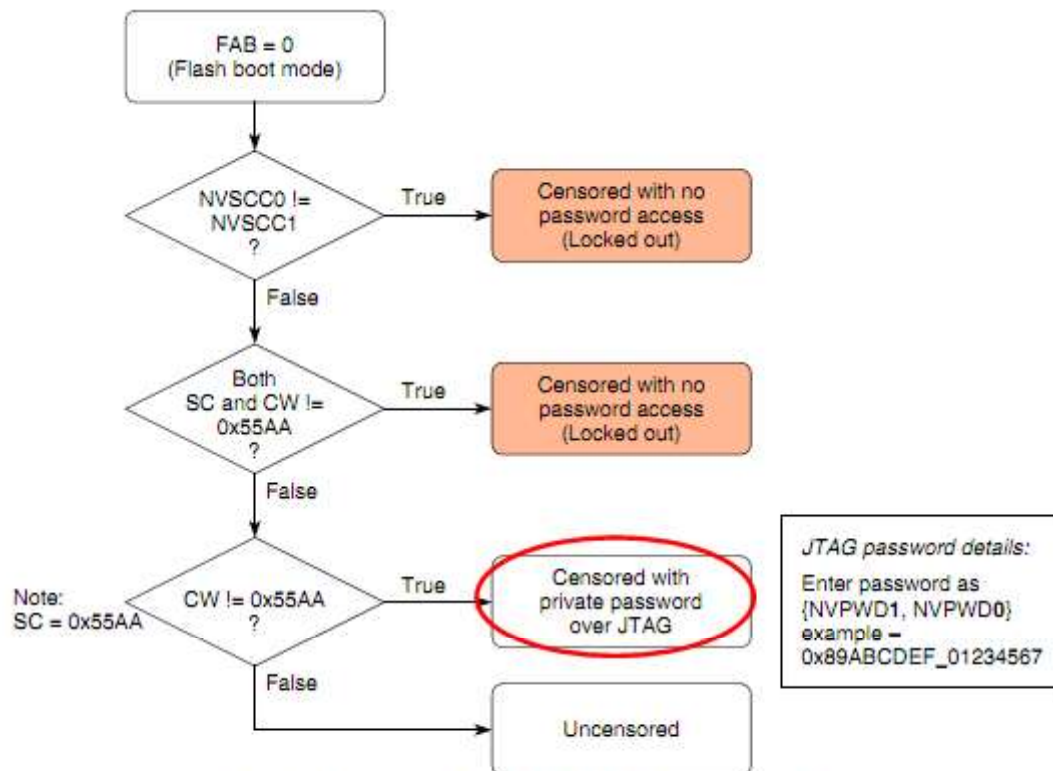
Figure 5-4. Censorship control in flash memory boot mode

Note: Do not regard "NVPWD1","NVPWD2","NVSCC3","NVSCC4" that showed below, they are just used for full fill the whole line in .s19 so it can calculate the line checksum correctly.

Open the code below in "main.c", change "NVPWD3" and "NVPWD4" (the password needed), then compile the project.

```
#if 1
#pragma push /* Save the current state */
#pragma force_active on

#pragma section sconst_type ".NVPWD_Data"
extern const dword NVPWD1 = 0xFFFFFFFF;
extern const dword NVPWD2 = 0xFFFFFFFF;
extern const dword NVPWD3 = 0x12345678;
extern const dword NVPWD4 = 0x89ABCDEF;

#pragma section sconst_type ".NVSCC_Data"
extern const dword NVSCC1 = 0x55AA1122;
extern const dword NVSCC2 = 0x55AA1122;
extern const dword NVSCC3 = 0xFFFFFFFF;
extern const dword NVSCC4 = 0xFFFFFFFF;

#pragma force_active off
#pragma pop
#endif
```

Open the hex generated, fine these two lines which will be used to change the shadow buffer.
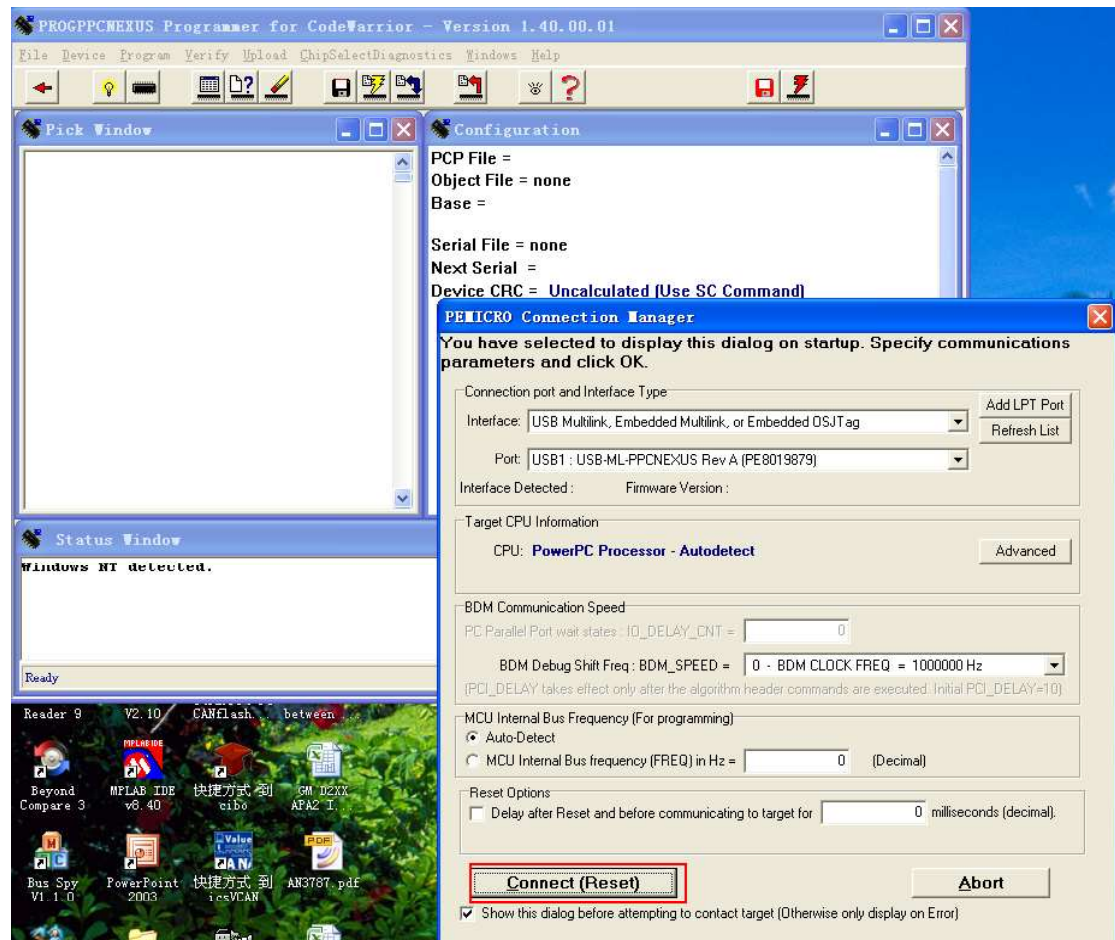
S31500203DD0FFFFFFFFFFFFFFFF1234567889ABCDEFC1
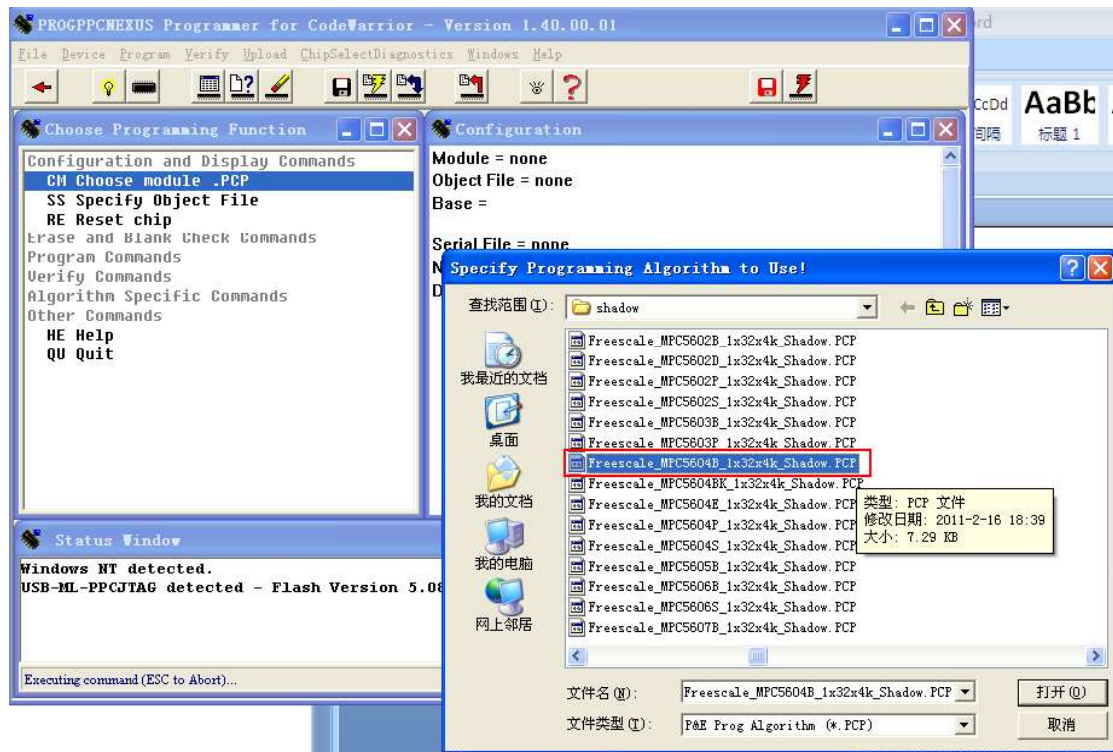
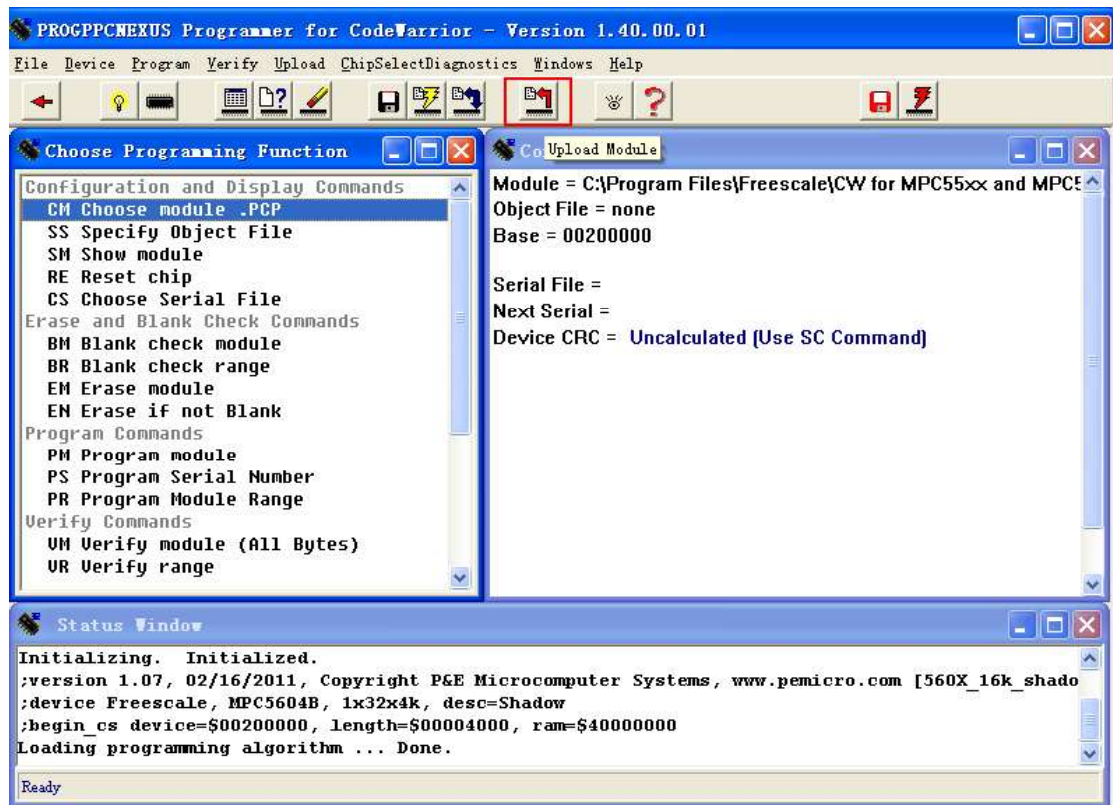S31500203DE055AA112255AA1122FFFFFFFFFFFFFFFF51
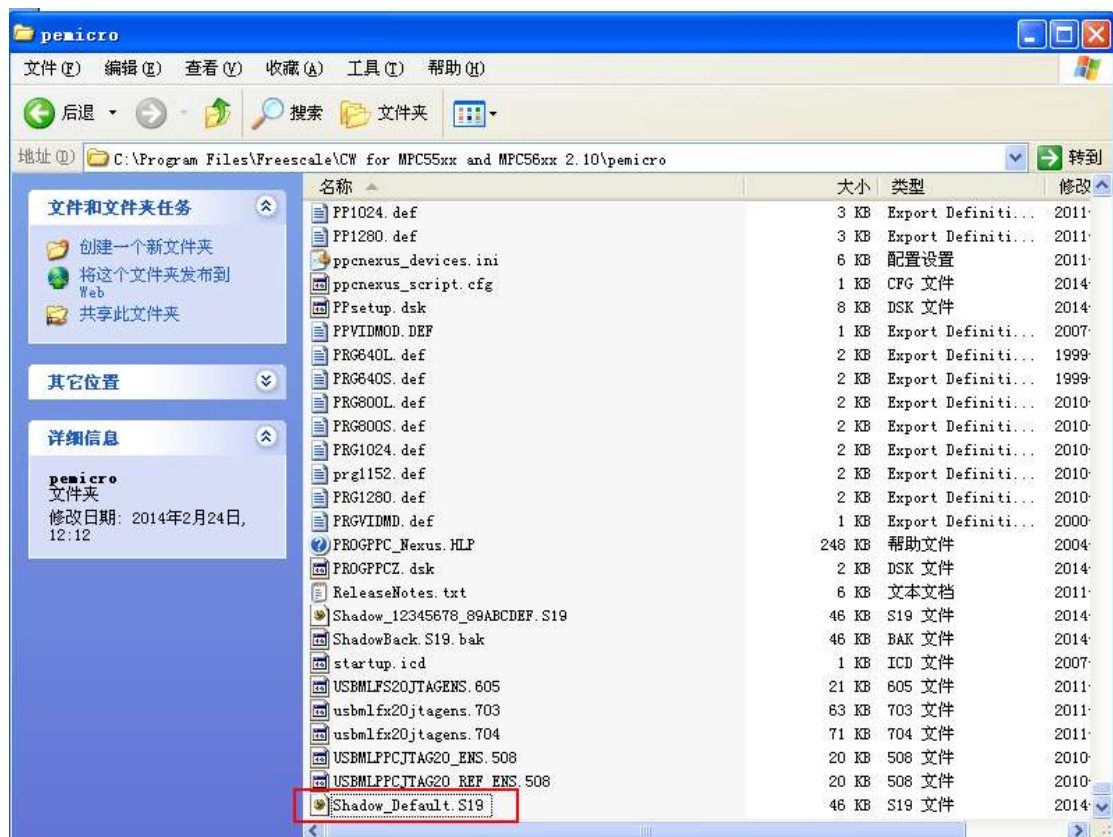
Open "cw_progppcnexus.exe"

Connect to device.

Load the shadow flash driver.

Upload and backup the shadow flash data from the MCU.
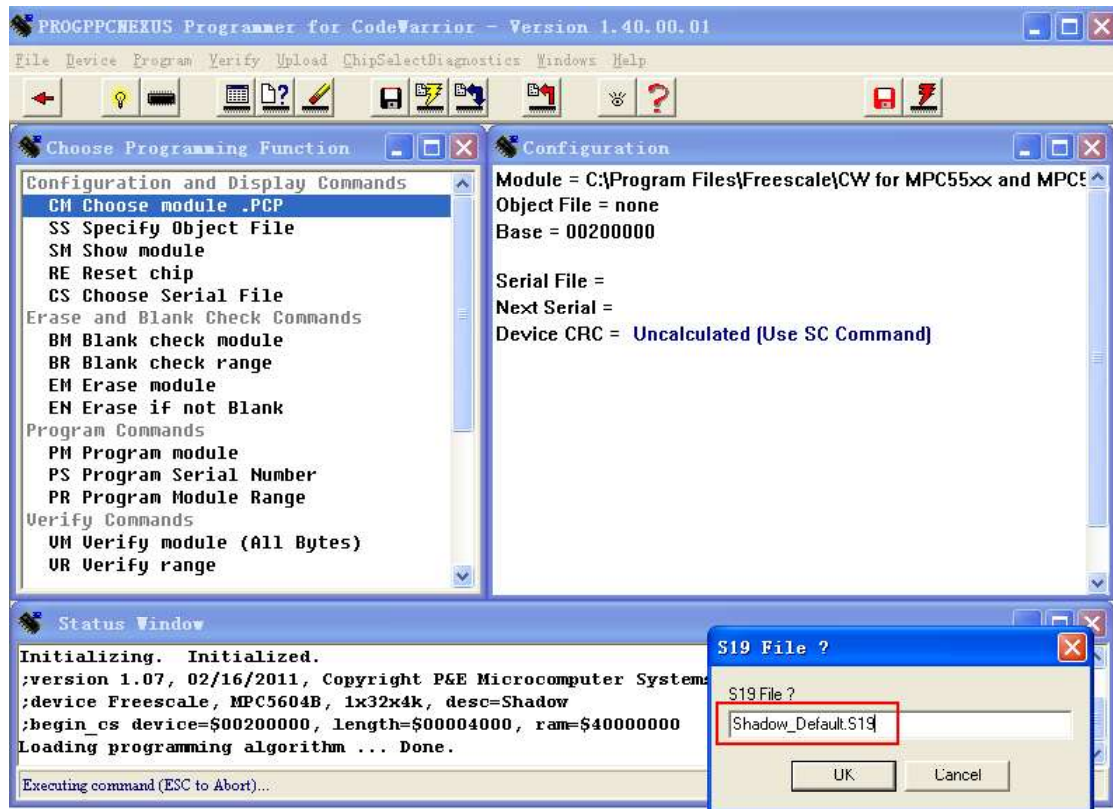
The following descriptions are to censor the MCU with password "1234567889ABCDEF".

Open the file "Shadow_Default.S19" that was upload and backup before.

Change the following two line:

S214203DD0FFFFFFFFFFFFFFFFFFEEDFACECAFEBEEF9E

S214203DE055AA55AA55AA55AAFFFFFFFFFFFFFFFFBA

To:

S214203DD0FFFFFFFFFFFFFFFFFF1234567889ABCDEFC2

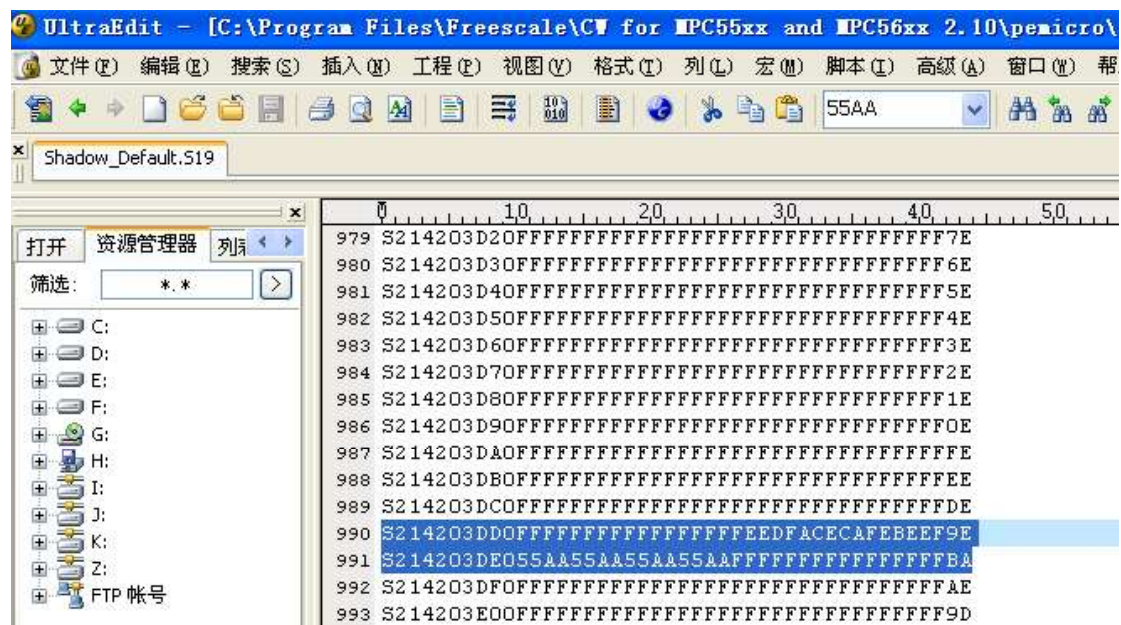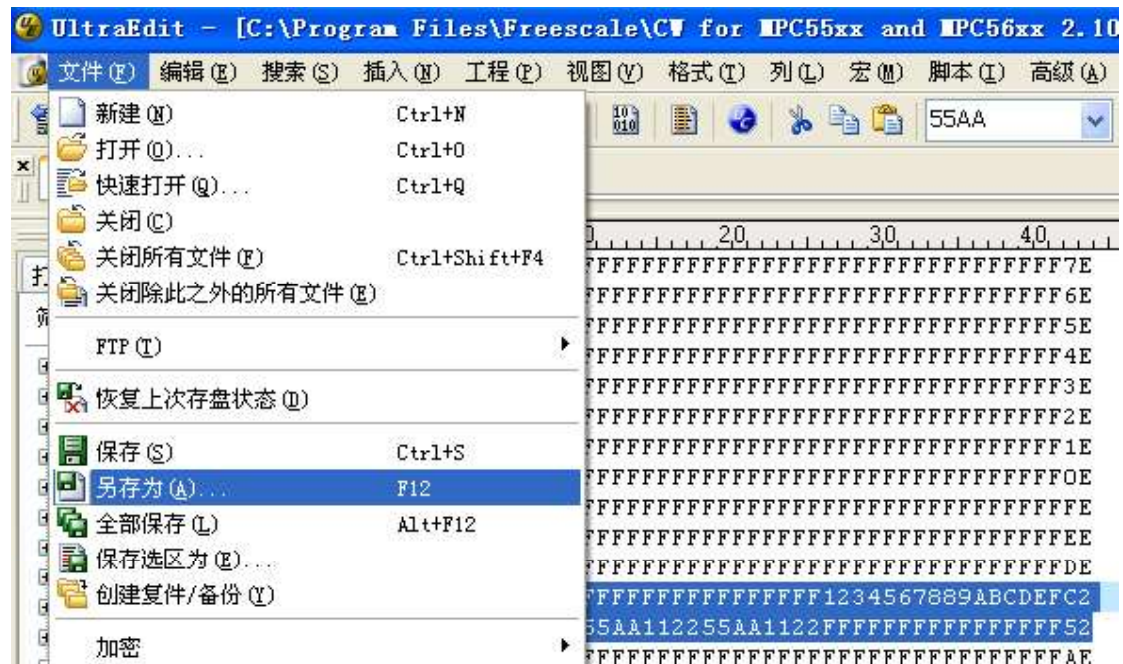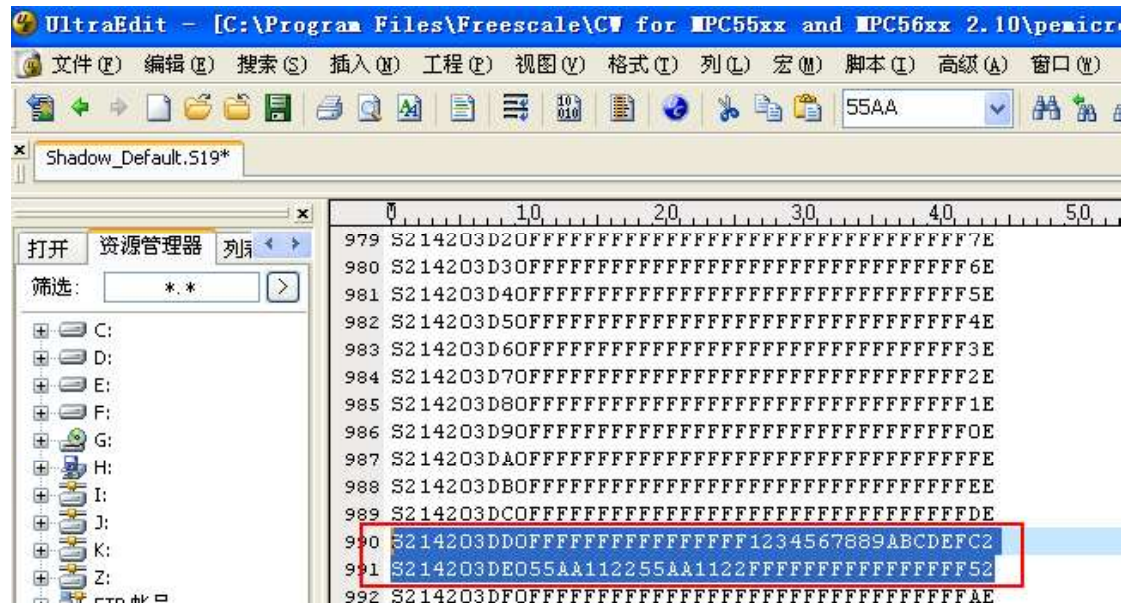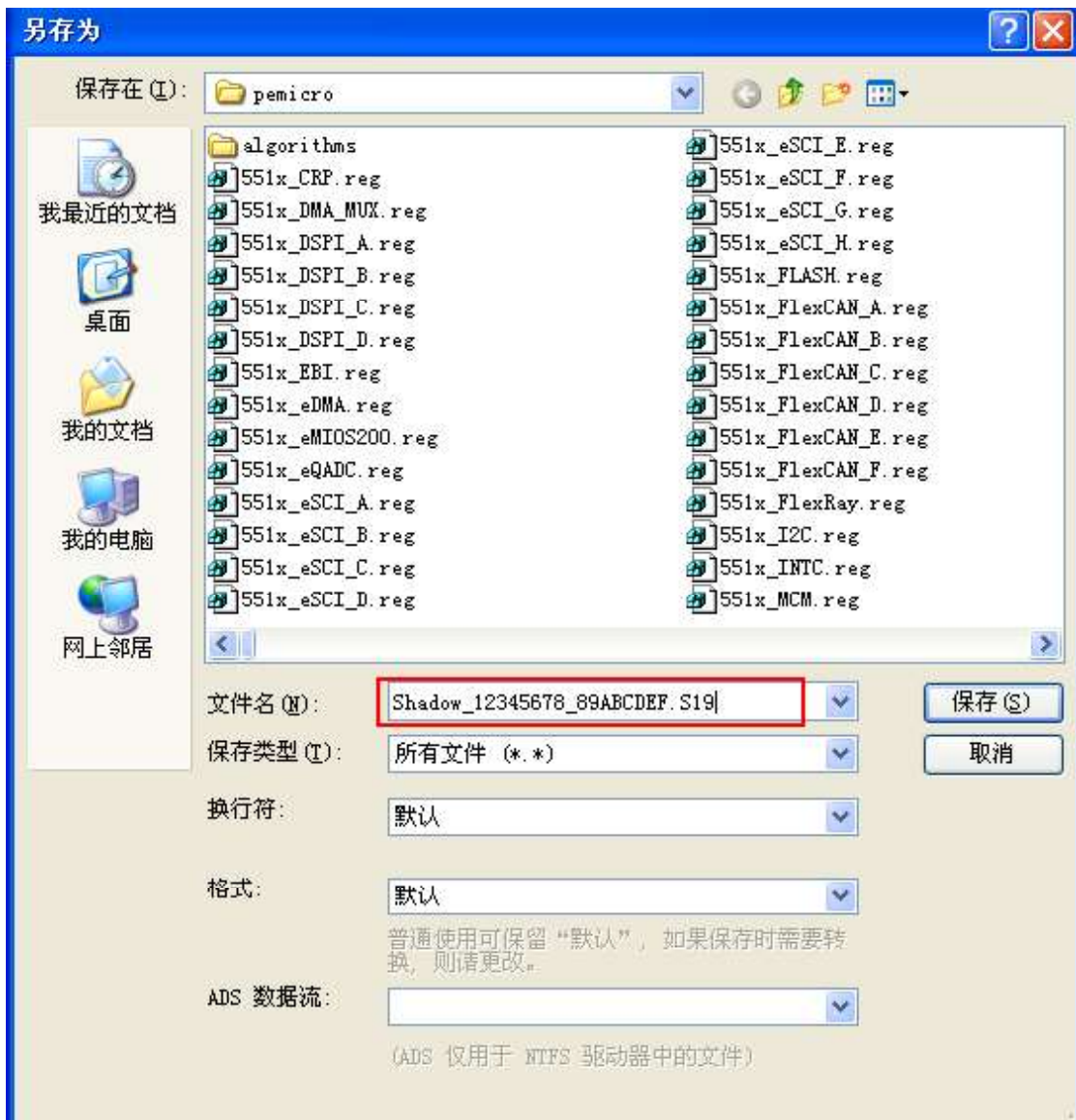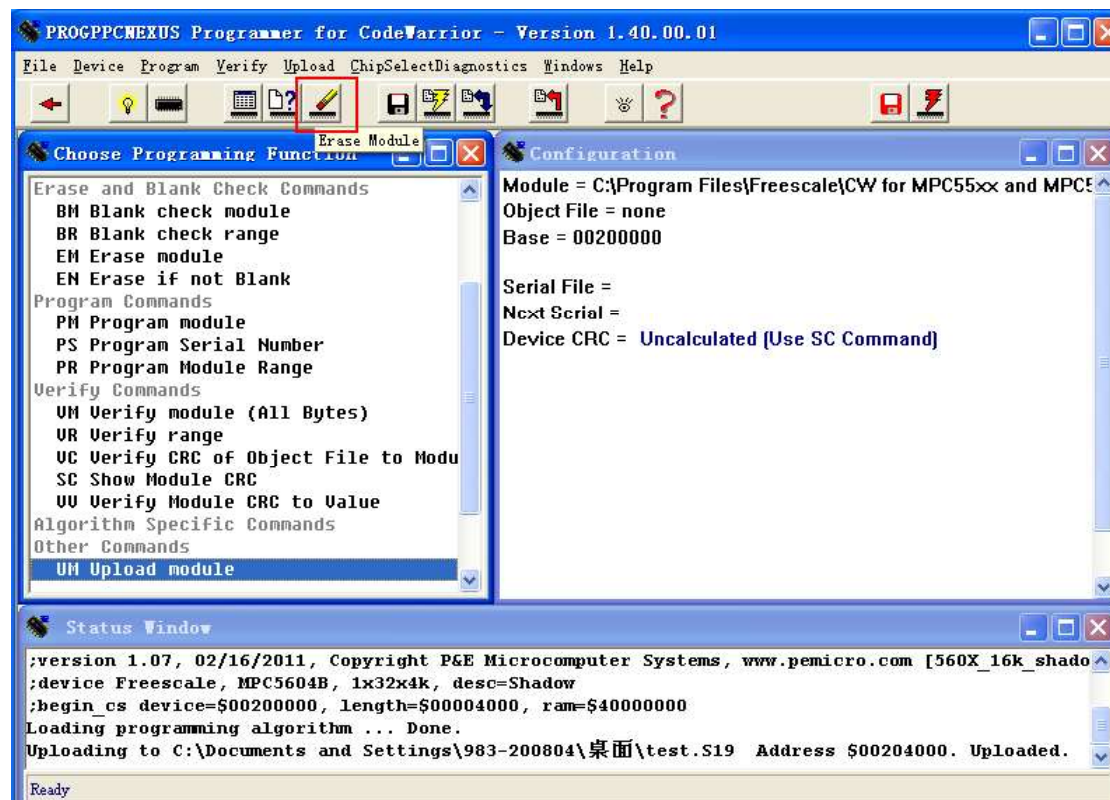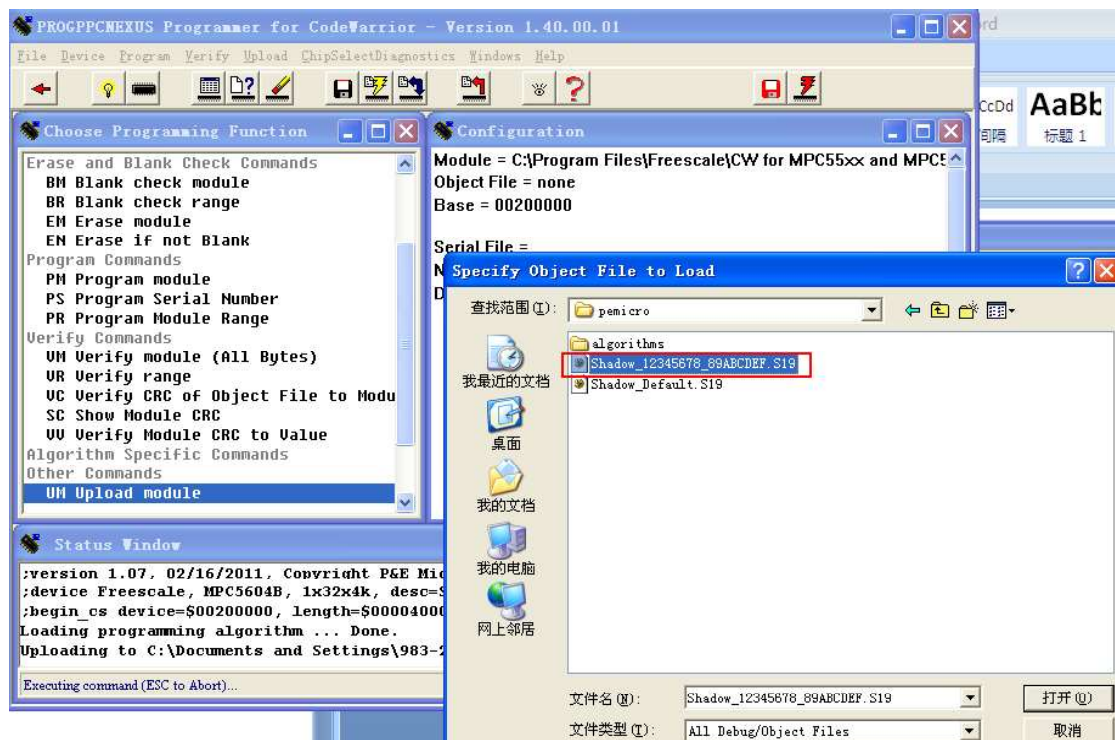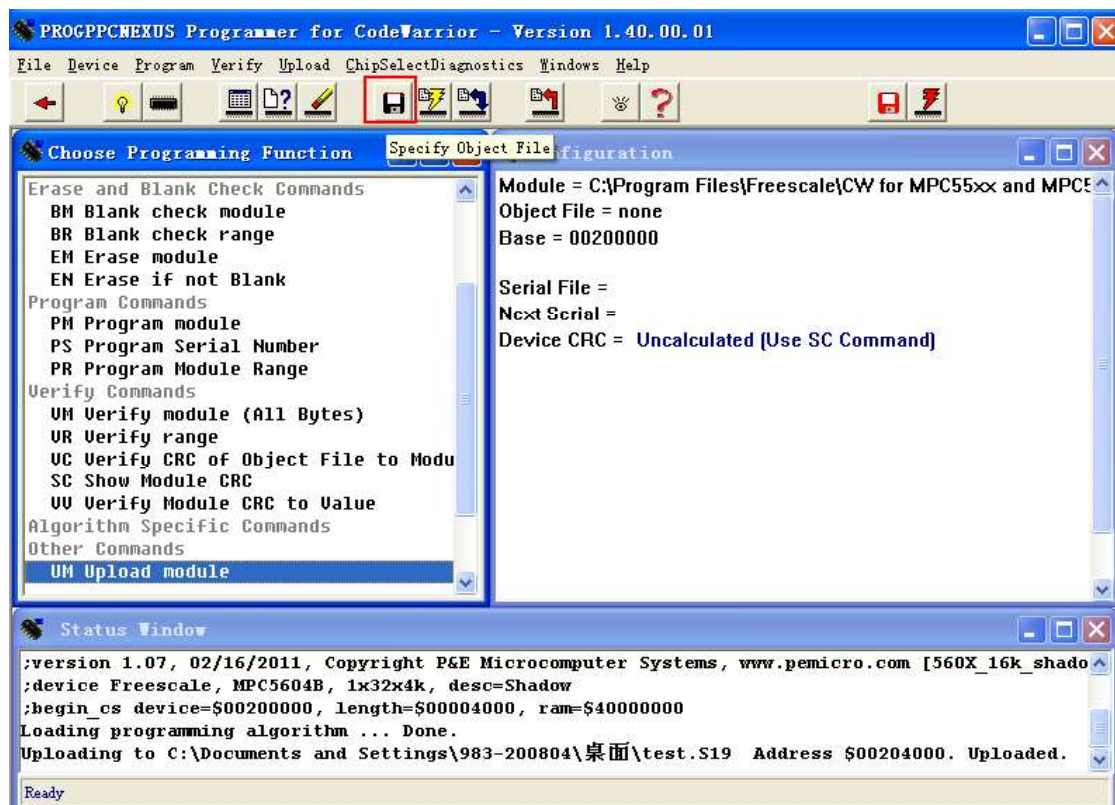S214203DE055AA112255AA1122FFFFFFFFFFFFFFFF52

PROGPPCNEXUS Programmer for CodeWarrior — Version 1.40.00.01

File Device Program Verify Upload ChipSelectDiagnostics Windows Help

Choose Programming Function

SS Specify Object File
SM Show module
RE Reset chip
CS Choose Serial File
Erase and Blank Check Commands
BM Blank check module
BR Blank check range
EM Erase module
EN Erase if not Blank
Program Commands
PM Program module
PS Program Serial Number
PR Program Module Range
Verify Commands
VM Verify module (All Bytes)
VR Verify range
VC Verify CRC of Object File to Modu
SC Show Module CRC

Program Module

Configuration

Module = C:\Program Files\Freescale\CW for MPC55xx and MPC5
Object File = C:\Program Files\Freescale\CW for MPC55xx and MI
Base = 00200000

Serial File =
Next Serial =
Device CRC = Uncalculated (Use SC Command)

Status Window

;version 1.07, 02/16/2011, Copyright P&E Microcomputer Systems, www.pemicro.com [560X_16k_shado
;device Freescale, MPC5604B, 1x32x4k, desc=Shadow
;begin_cs device=$00200000, length=$00004000, ram=$40000000
Loading programming algorithm ... Done.
Uploading to C:\Documents and Settings\983-200804\桌面\test.S19 Address $00204000. Uploaded.

Ready

PROGPPCNEXUS Programmer for CodeWarrior — Version 1.40.00.01

File Device Program Verify Upload ChipSelectDiagnostics Windows Help

Choose Programming Function

SS Specify Object File
SM Show module
RE Reset chip
CS Choose Serial File
Erase and Blank Check Commands
BM Blank check module
BR Blank check range
EM Erase module
EN Erase if not Blank
Program Commands
PM Program module
PS Program Serial Number
PR Program Module Range
Verify Commands
VM Verify module (All Bytes)
VR Verify range
VC Verify CRC of Object File to Modu
SC Show Module CRC

Verify Module

Configuration

Module = C:\Program Files\Freescale\CW for MPC55xx and MPC5
Object File = C:\Program Files\Freescale\CW for MPC55xx and MI
Base = 00200000

Serial File =
Next Serial =
Device CRC = Uncalculated (Use SC Command)

Status Window

;version 1.07, 02/16/2011, Copyright P&E Microcomputer Systems, www.pemicro.com [560X_16k_shado
;device Freescale, MPC5604B, 1x32x4k, desc=Shadow
;begin_cs device=$00200000, length=$00004000, ram=$40000000
Loading programming algorithm ... Done.
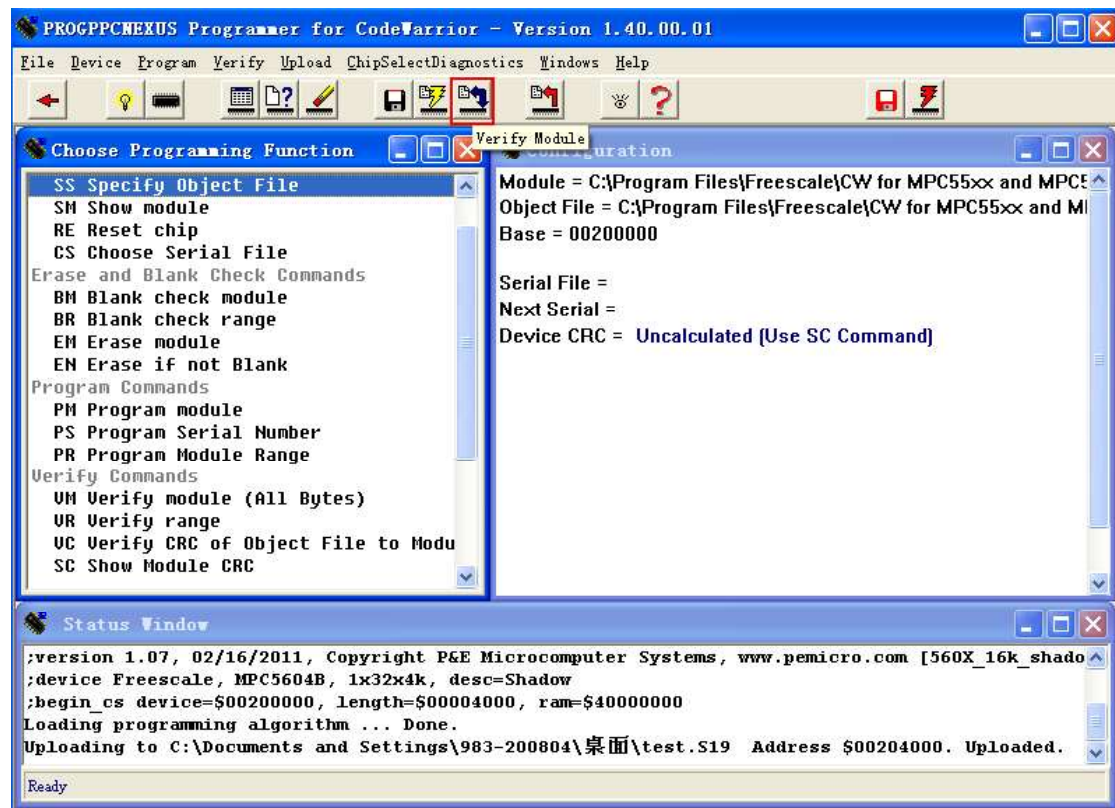Uploading to C:\Documents and Settings\983-200804\桌面\test.S19 Address $00204000. Uploaded.

Ready

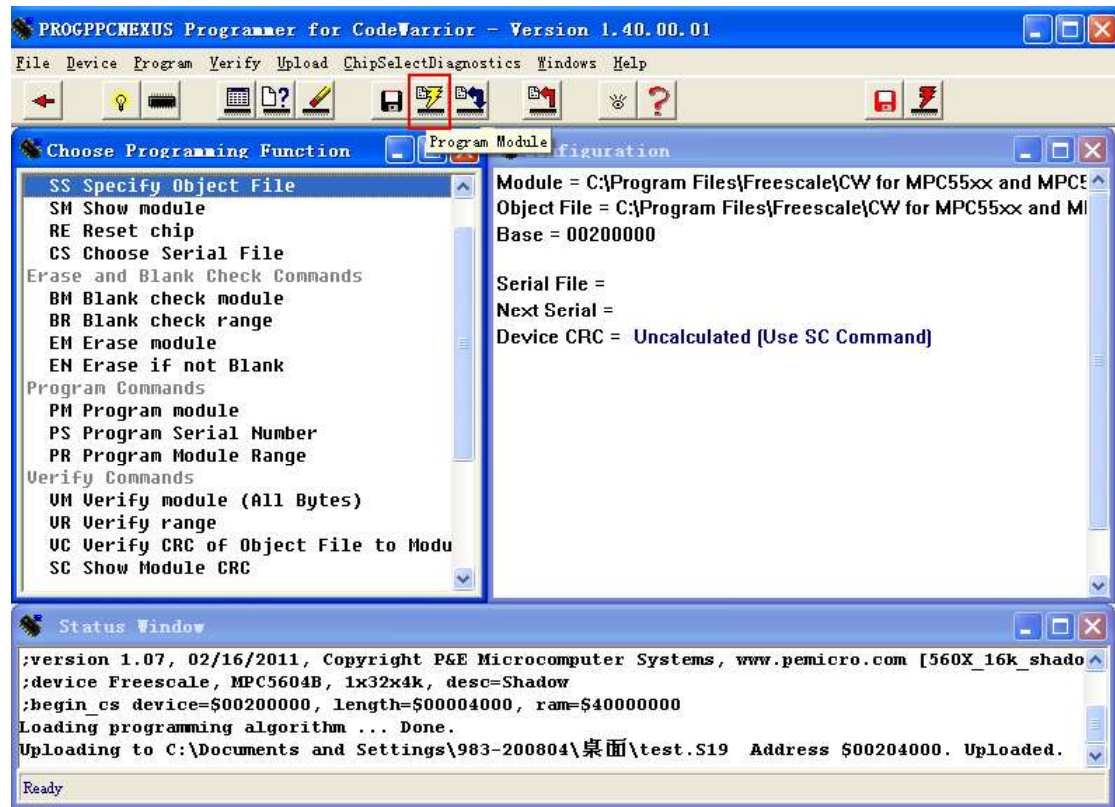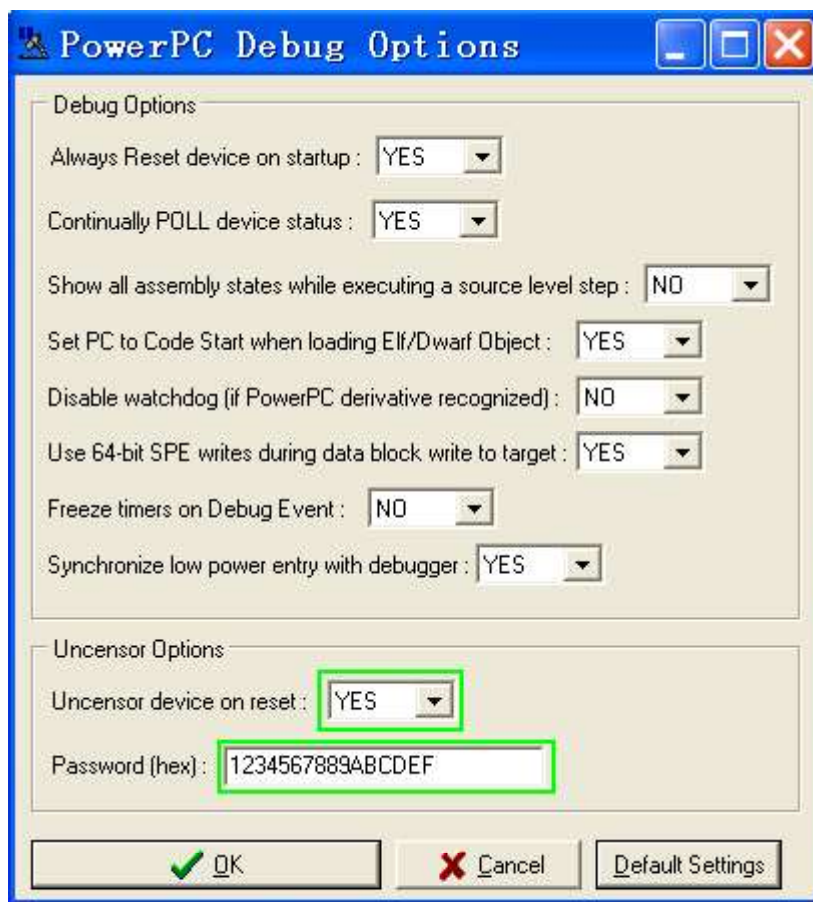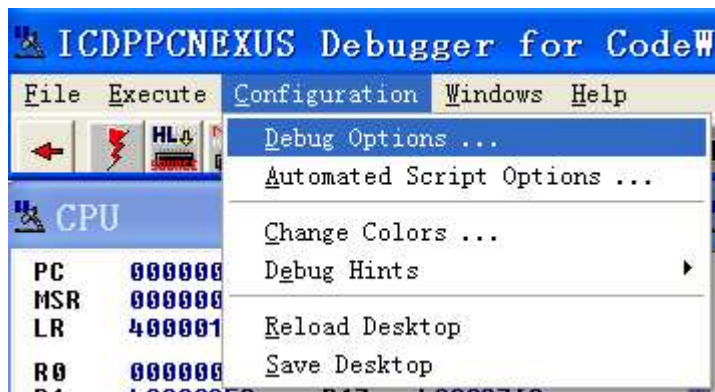## 5. Enter debug mode when the MCU is censored with password

6. Recover the defult setting for Censorship (uncensored)

Make a power reset

Open "cw_progppcnexus.exe" again

The following descriptions are to recover the default setting for Censorship (uncensored).

Just download "Shadow_Default.S19" that upload and backup before.