Nuvoton

8051 ICP Programmer

User Manual

Revision 7.15, 2015/Apr/15

Contents

Revision History

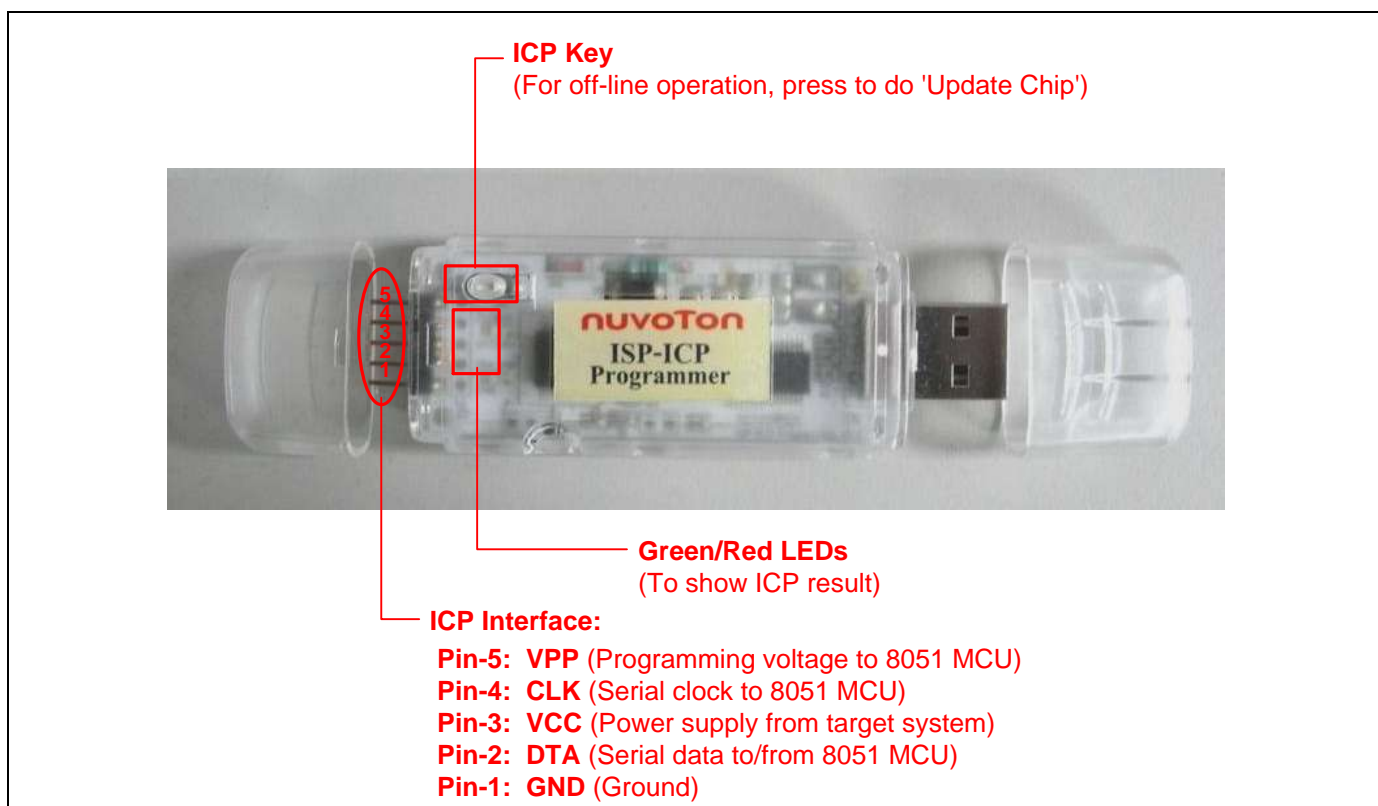| Revision	Description	Date
v3.00	The first formal released version.	2010/02/10
v4.00	(1) Added new parts: N79E234(R)/235(R) and N79E822A/823A/824A/825A. (2) Corrected some GUI errors. (3) Updated the document version to v4.00.	2010/04/01
v5.00	(1) Updated the Hardware Connection. (Section 2.1) (2) Updated the PC-site AP to v5.00. (The GUI display for "CONFIG Setting" becomes more user-friendly.)	2010/08/13
v5.02	Fixed the HEX-to-BIN conversion error when the hex input file has a binary code size more than 64K. (The application program is updated to v5.02.)	2010/11/15
v5.05	(1) Supported Tool Project (TPJ) file for GUI setting management. (2) Released 'FS0' bit in CONFIG1 for W79E8213.	2011/01/18
v5.31	Fixed some software bugs.	2011/04/08
v5.50	(1) Supported N79E855/4/3, N79E845/4/3 and N79E815/4/3. (2) Supported N79E375/374 and N79A903/902. (3) Supported an advanced function: Limited Usage Times. (4) Updated the PC-site AP version to v5.50.	2011/06/15
v5.51	Fixed minor bugs in the PC-site AP of v5.50.	2011/07/26
v5.52	(1) Fixed ICP programming problem of N79E855/4/3, N79E845/4/3 and N79E815/4/3 when V_{DD}=3.3V. (2) Changed the maximum 'Limited Usage Times' from 9,999 to 60,000. (3) Supported to save the 'Limited Usage Times' setting in the TPJ file.	2011/09/28
v5.60	Supported N79E8432 and N79E8132.	2011/10/20
v5.70	Supported N79A8211A.	2011/11/07
v6.00	Supported chip counter for successfully programmed chips. (cf. Section 7.2)	2011/12/20
v6.02	Fixed some minor software bugs.	2012/02/01
v6.03	Updated the document version to v6.03.	2012/02/13
v6.04	Fixed ICP programming problem in the following parts: N79E855/4, N79E845/4, N79E815/4, N79E8432 and N79E8132.	2012/02/29
v6.10	Supported the 'serial number programming' function. (cf. Section 7.2)	2012/03/26
v6.12	Fixed a software bug that makes "Auto Synchronization of Buffer Data" failed. (cf. Section 3.4)	2012/04/26
v7.10	(1) Enhanced ICP programmer in the following parts: N79E855/4, N79E845/4, N79E815/4, N79E8432, N79E8132. (2) Added ISP_ICP key de-bounce. (3) Replaced 10 kΩ with 2 kΩ on R13/R14. (4) Removed support for N79A901, N79A902, N79A903, N79E374, N79E375, N79E813, N79E843, N79E853, N79E234, N79E234R, N79E235, N79E235R and N79A8211A. (5) Supported the 'serial number *off-line* programming' function. (cf. Section 7.2.1)	2014/01/15
v7.13	Supported N79E715/N76E885.	2015/01/09
v7.14	Fixed some minor software bugs.	2015/01/16
v7.15	Supported N76E616	2015/04/15

1 Introduction

ICP is the acronym of **I**n-**C**ircuit **P**rogramming, which makes it possible that the user can update the MCU's program memory under hardware control without removing the mounted MCU chip from the actual end product. The USB-stick-like tool "8051 ICP Programmer", as shown in the following picture, is used to perform the ICP function. It uses a serial interface with only five pins for programming, not like the universal programmer, which usually uses a parallel interface. In addition, since this tool can save the programming data downloaded from the host, it is able to perform the off-line operation. This feature is especially useful in the field without a host.

Note:
The difference between ICP (In-Circuit Programming) and ISP (In-System Programming) is that ICP is implemented by hardware control while ISP is implemented by software control of MCU itself. So, before updating the MCU chip, ISP needs a software code (the ISP-code) pre-programmed in LDROM of the MCU to function as software control while ICP does not need any software code pre-programmed.

Picture of the "8051 ICP Programmer"

ICP Key
(For off-line operation, press to do 'Update Chip')

Green/Red LEDs
(To show ICP result)

ICP Interface:
Pin-5: VPP (Programming voltage to 8051 MCU)
Pin-4: CLK (Serial clock to 8051 MCU)
Pin-3: VCC (Power supply from target system)
Pin-2: DTA (Serial data to/from 8051 MCU)
Pin-1: GND (Ground)

The ICP Interface

VPP: Programming voltage to the 8051 MCU. This voltage may be up to +11V for some MCU parts.

CLK: Serial clock to the 8051 MCU.

**VCC**: Power supply from the target system. In off-line operation, the programmer is powered by the target system.

DTA: Serial data to/from the 8051 MCU.

GND: Ground.

2   Hardware

2.1   Hardware Connection

The following diagram shows the hardware connection. The DIP-switch is recommended to isolate the ICP interface signals from the application circuit during ICP programming. Before starting ICP programming, the user should switch the DIP-switch to OFF state. Note the DTA and CLK signals are always kept at TTL level while the VPP signal may rise up to +11V for some parts. For the parts with VPP up to +11V, the isolation is especially necessary to protect the application circuit from being damaged. After ICP programming is finished, disconnect the ICP Programmer and switch the DIP-switch to ON state for normal operation.
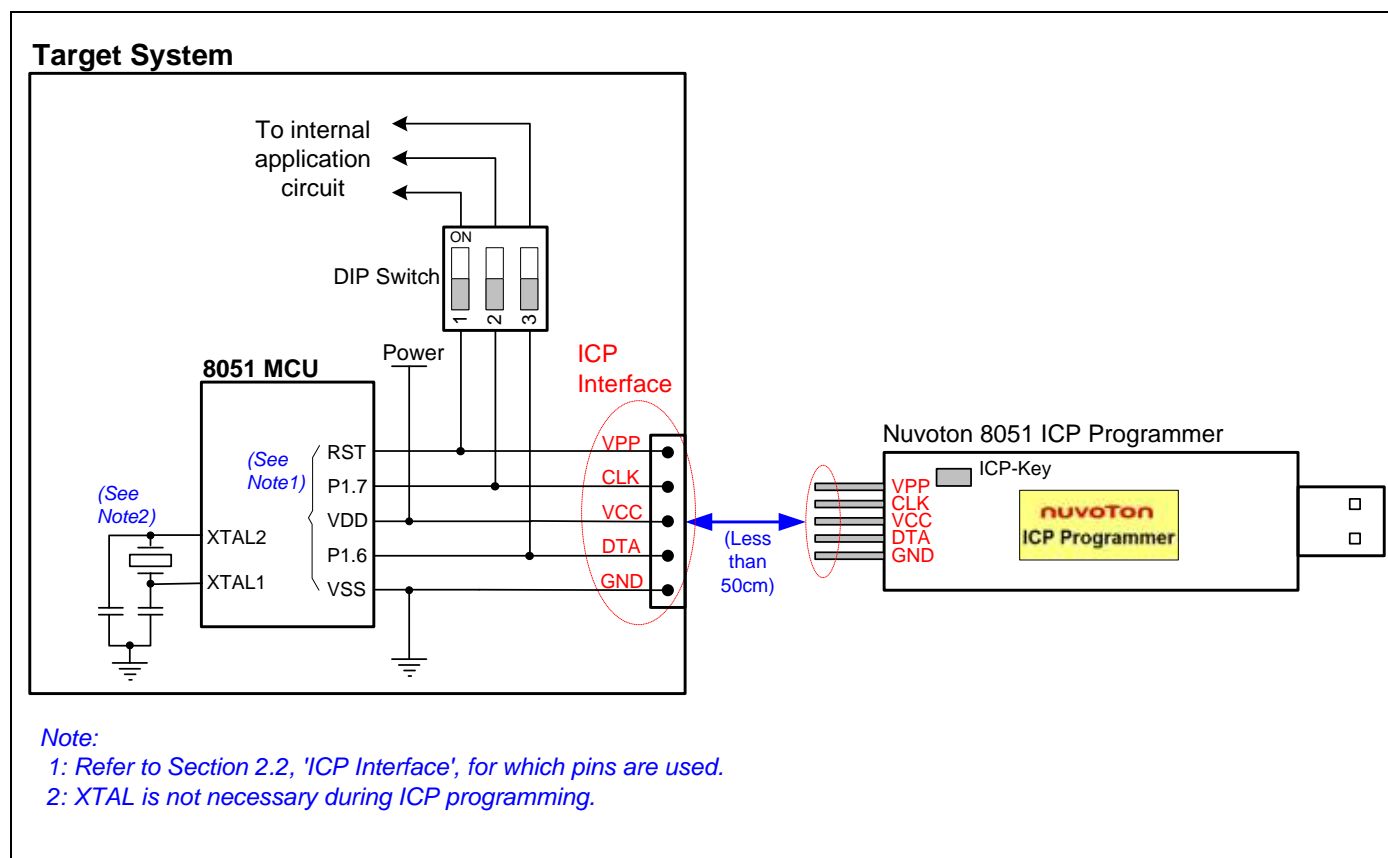
2.2   ICP Interface

See the following table for the pins used as the ICP interface.

Part No.	Pins Used as the ICP Interface			+11V for VPP
	DTA	CLK	VPP	
W79E2051A	P1.6	P1.7	RST	NO
W79E2051RA	P1.6	P1.7	RST	NO
W79E4051A	P1.6	P1.7	RST	NO
W79E4051RA	P1.6	P1.7	RST	NO
W79E8213	P0.4	P0.5	P1.5	YES
W79E8213R	P0.4	P0.5	P1.5	YES
N79E342	P0.4	P0.5	P1.5	YES
N79E342R	P0.4	P0.5	P1.5	YES
N79E352	P1.6	P1.7	RST	NO
N79E352R	P1.6	P1.7	RST	NO
N79E875	P0.4	P0.5	P1.4	YES
N79E875R	P0.4	P0.5	P1.4	YES
N79E822A	P0.4	P0.5	P1.5	YES
N79E823A	P0.4	P0.5	P1.5	YES
N79E824A	P0.4	P0.5	P1.5	YES
N79E825A	P0.4	P0.5	P1.5	YES
N79E814A	P1.6	P1.7	/RST	NO
N79E815A	P1.6	P1.7	/RST	NO
N79E844A	P1.6	P1.7	/RST	NO
N79E845A	P1.6	P1.7	/RST	NO
N79E854A	P1.6	P1.7	/RST	NO
N79E855A	P1.6	P1.7	/RST	NO
N79E8132A	P1.6	P1.7	/RST	NO
N79E8432A	P1.6	P1.7	/RST	NO
N79E374A	ICPDA	ICPCK	RST	NO
N79E375A	ICPDA	ICPCK	RST	NO
N79E715	P1.6	P1.7	/RST	NO
N76E885	P0.0	P0.1	P1.2	NO
N76E616	P3.4	P3.5	P3.6	NO

3   Software

3.1   Installing the Driver

This ICP Programmer has the USB-to-Serial bridge chip (PL-2303) built inside. When connected to host, it will appear as a *USB-to-Serial COM port* in the System\Hardware\Device Manager. Before starting to use this programmer, the user has to install the driver if the PL-2303 driver has never been installed in this host. The user can also find this driver in the folder [(1) Driver].

Note: Don't plug the ICP Programmer to the host before the driver is installed.

3.2   Installing the Application Program

The application program setup file is stored in the folder [(2) Application Program]. Using the default installation setting, you will find the item *"Nuvoton Tools \ Nuvoton ISP-ICP Utility, v?.??"* appears in the Windows START-menu after the application program is successfully installed.

*Note: **ISP-ICP** means this application program is designed for both the **ISP Programmer** and the **ICP Programmer**.*

3.3   Introduction to the GUI

3.4   Auto Synchronization of Buffer Data

The buffer contents will be automatically synchronized with the physical file in the hard disk when the function buttons 'Download Programmer', 'Update Chip' or 'Verify Chip' is clicked, as shown below. Thus, the user does not need to manually reload the files for APROM buffer and DataFlash buffer when the physical files are updated externally.
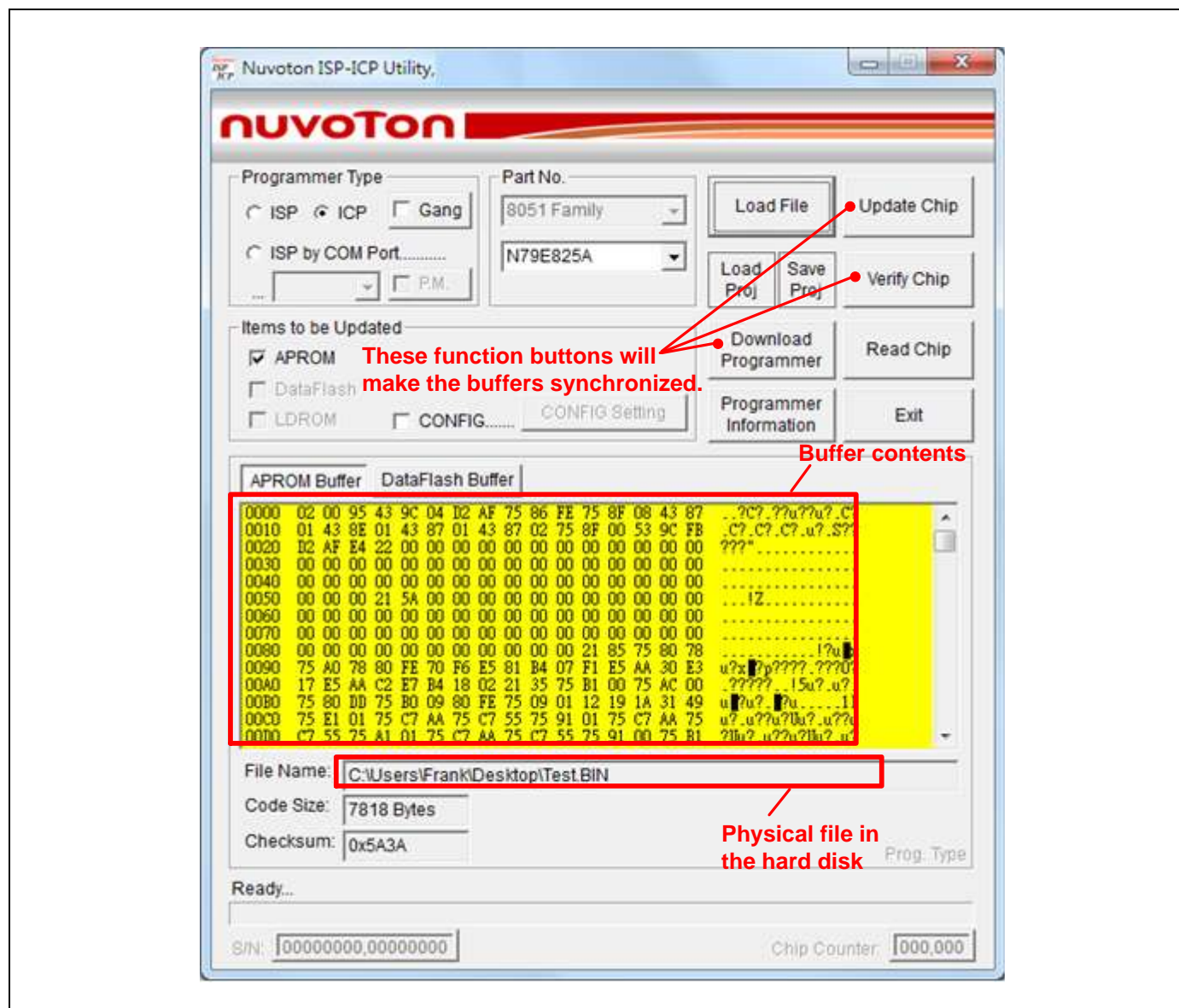
4 Operation Modes

4.1 On-line Mode

The system diagram for **On-line Mode** is shown below. In this mode, both the host and MCU chip are connected. The user may directly update the MCU chip or download the programming data into the programmer for use in Off-line Mode. After updating the MCU chip, the user may disconnect the programmer and send a reset signal to the MCU chip to make it re-start to run the new application code.
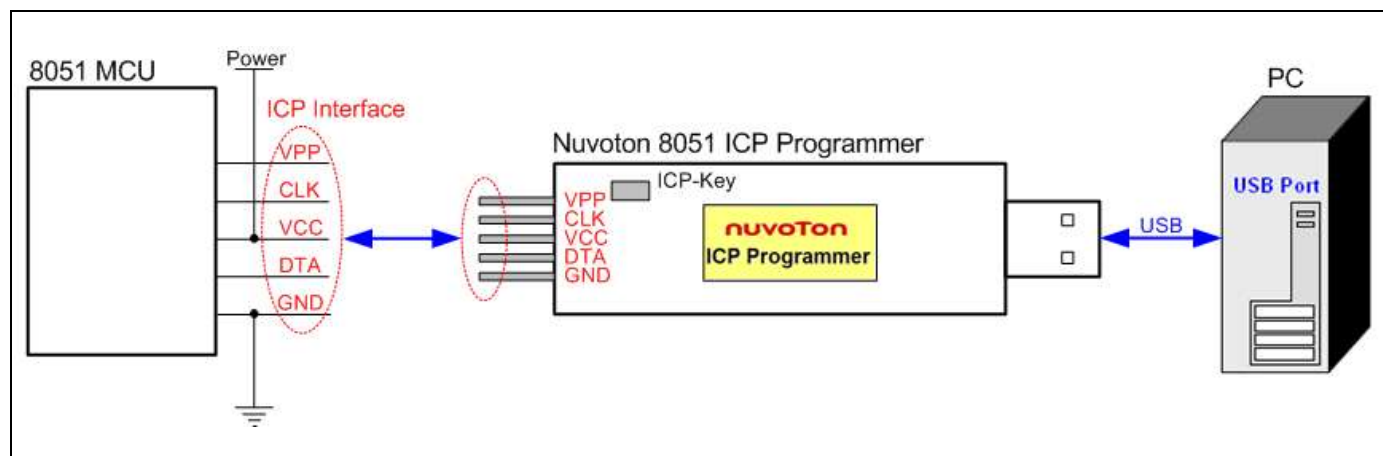

4.2 Download Programmer Mode

The system diagram for **Download Programmer Mode** is shown below. In this mode, only the host is connected. The user may download the programming data into the programmer for use in Off-line Mode.

8051 ICP Programmer
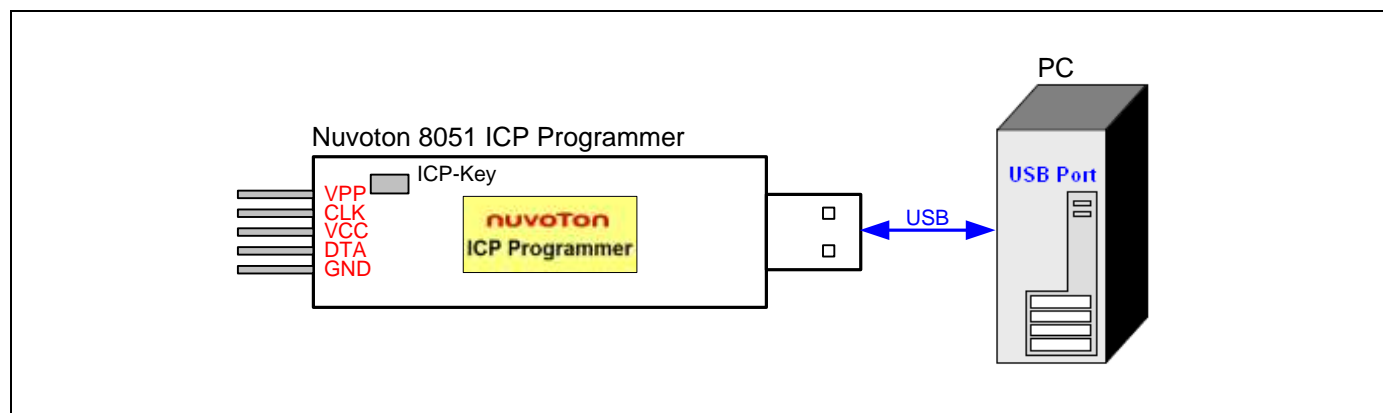
4.3   Off-line Mode

The system diagram for **Off-line Mode** is shown below. In this mode, only the MCU chip is connected. This mode is especially useful in the field without a PC. After the programmer has been downloaded, it can perform the off-line operation. Press the ICP-Key to start an ICP operation to update the MCU chip. After updating the MCU chip, the user may disconnect the programmer and send a reset signal to the MCU chip to make it run the new application code.
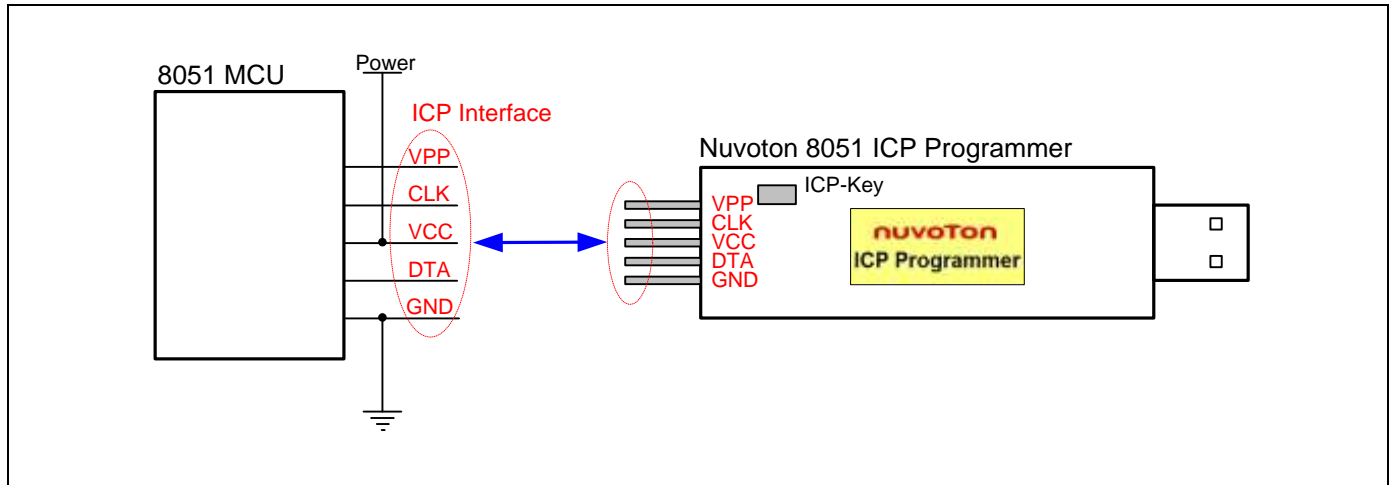
5   Tool Project File (TPJ)

The user may save all the GUI settings to the Tool Project (TPJ) file, and retrieve the GUI setting by loading the TPJ file previously saved. It is much helpful to the user to manage a variety of programming data by the 'project' type.

The GUI settings or the contents of the TPJ file include:

(1) Programmer type
(2) Part number
(3) Items to be updated
(4) APROM buffer data if APROM is one of the updated items
(5) Data Flash buffer data if DataFlash is one of the updated items
(6) LDROM buffer data if LDROM is one of the updated items
(7) CONFIG settings if CONFIG is one of the updated items
(8) Advanced functions setting
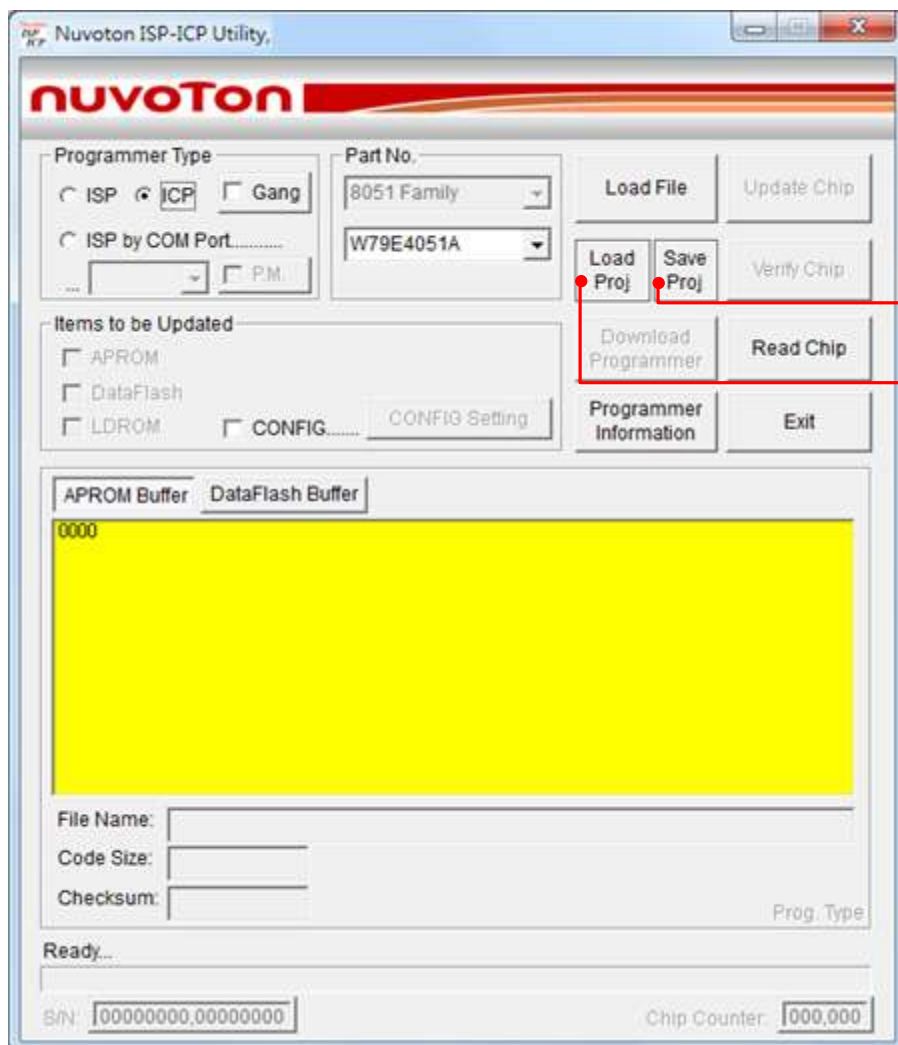
Save GUI setting to a TPJ file

Restore GUI setting from a TPJ file

8051 ICP Programmer

6   Programmer Information

To check the programming data downloaded in the programmer, click the 'Programmer Information' button when the programmer is connected to PC. Note the 'CONFIG Setting' dialog box appears only when the CONFIG bits are to be updated.

The programming data saved in the programmer.
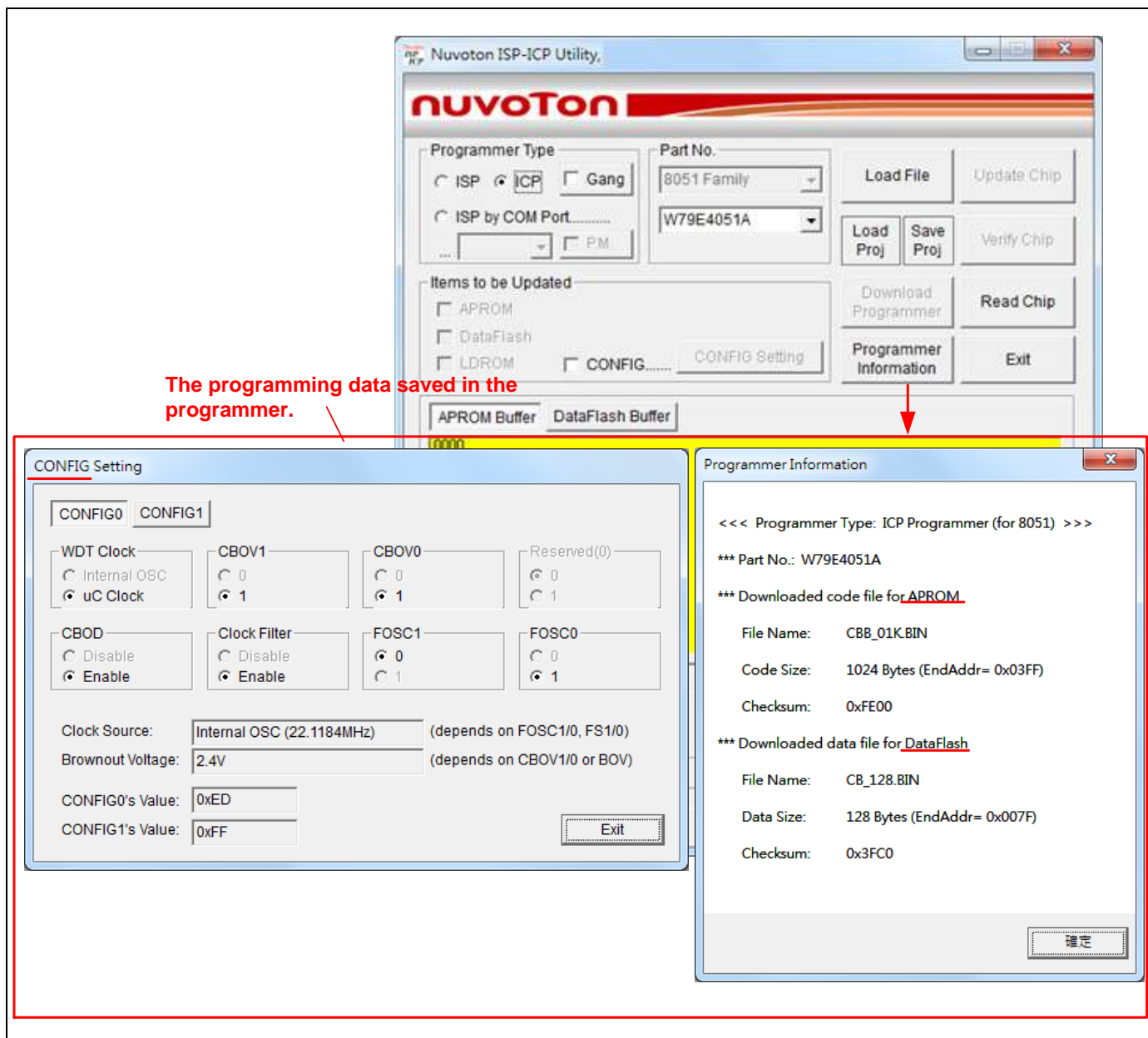
7   Advanced Functions

7.1   Limited Usage Times

An advanced function, *Limited Usage Times*, is supported for the customer who wants to limit the usage times of the ICP Programmer. Once this function is enabled and the wanted times value is filled, as shown below, the usage times of this programmer will be limited after finishing 'Download Programmer'. Provided that 100 is filled, then the programmer will be no longer available when reaching 100 times of successful programming. That is to say, only 100 times of successful programming are available.

Check the Left Available Times

To check the left available times of the programmer, which was previously downloaded with *Limit Usage Times* enabled, click the 'Programmer Information' button when the programmer is connected to PC, as shown below.
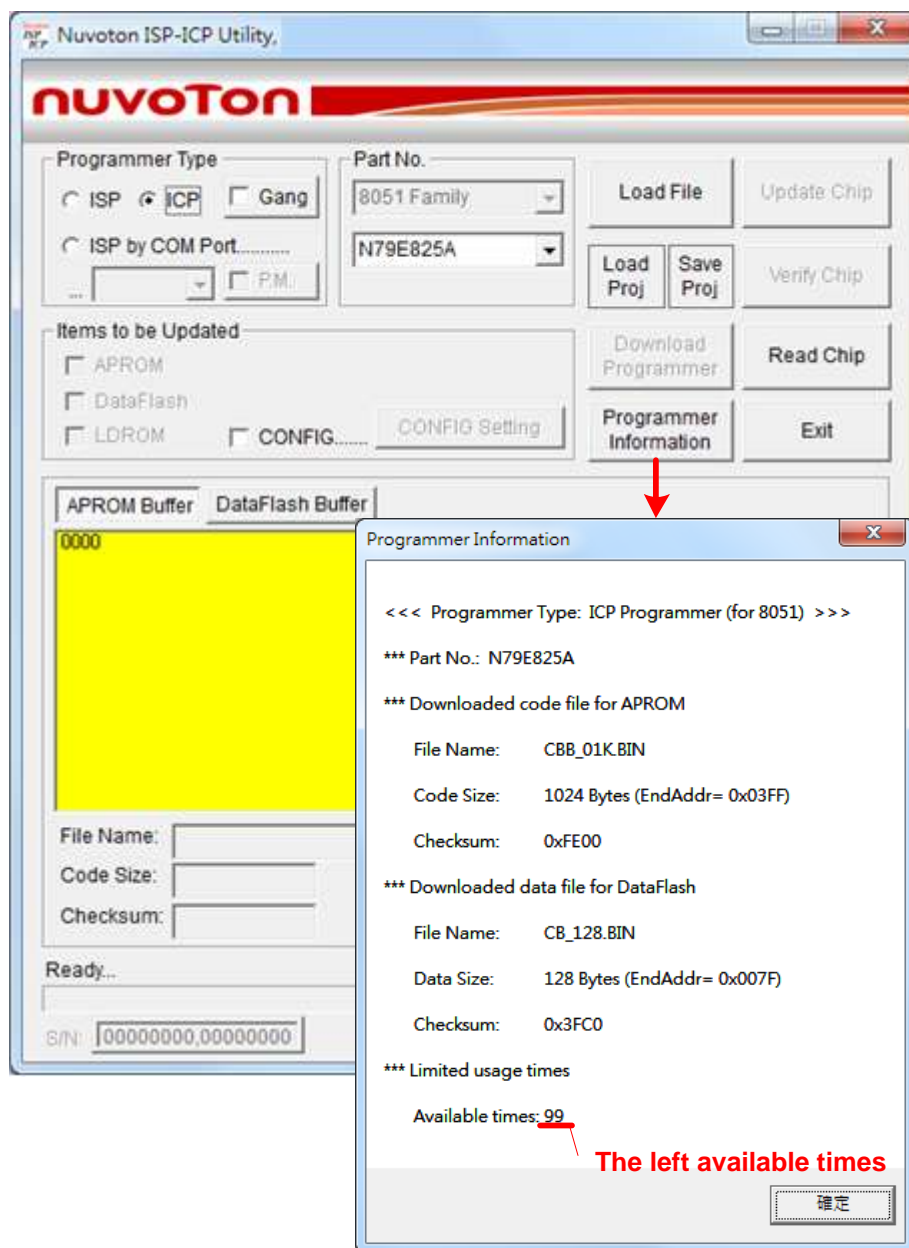
7.2 Serial Number Programming

The serial number programming is supported when the programmer operates in On-line mode. The serial number is BCD coded and 8 bytes long, which supports 16 decimal digits. Only APROM area can be programmed with the serial number. The following figure shows how to open the configuration dialog box for serial number programming.
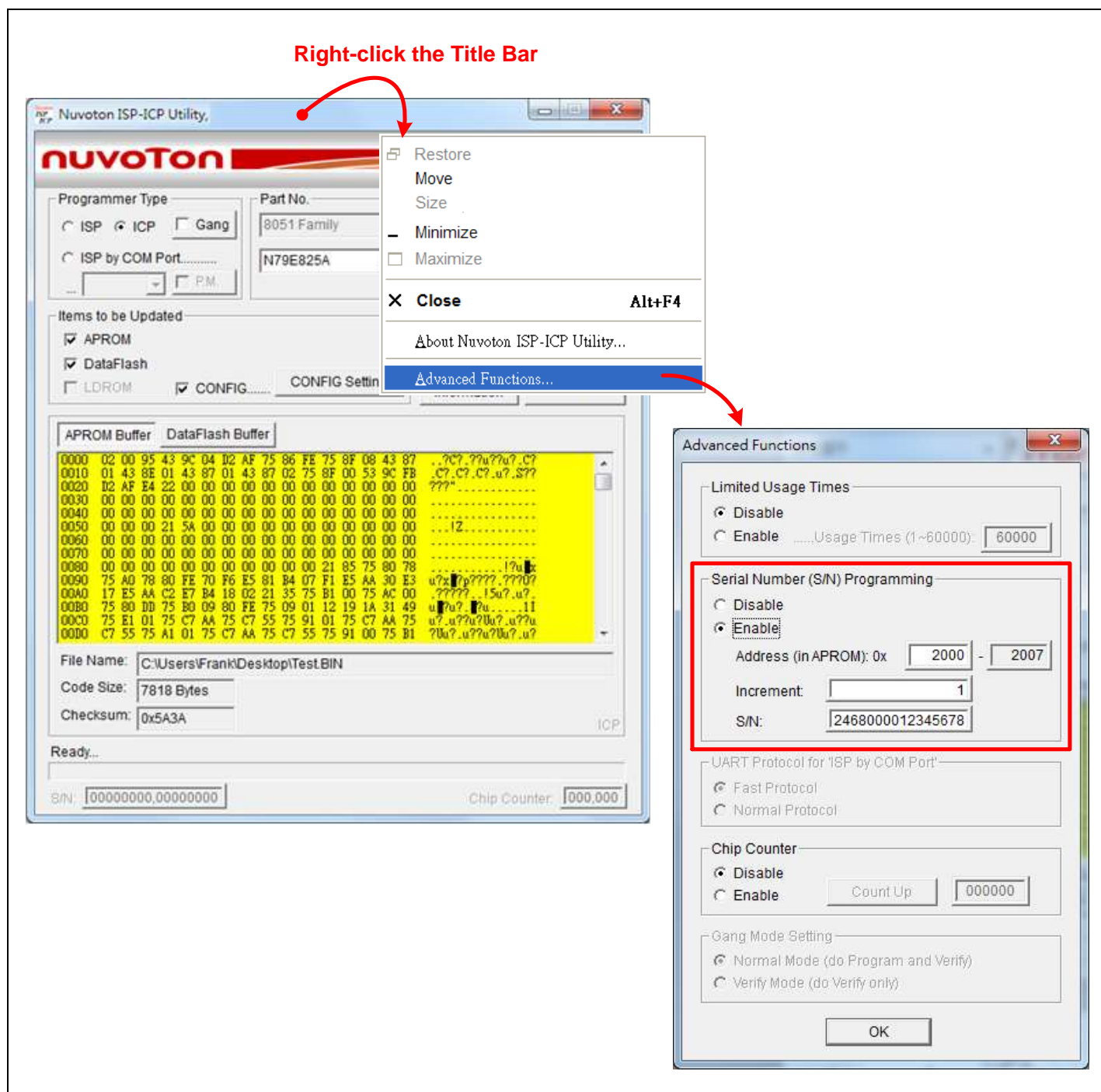
As shown in the above figure, '2468000012345678' is to be programmed at address 0x3FF8 in APROM area. The BCD-coded serial number programmed in the chip has a '*what you see is what you get*' format, as shown below.

7.2.1 Off-line Serial Number Programming

The serial number programming is also supported when the programmer operates in Off-line mode. Before using the off-line serial number programming, do the same setting described in Section 7.2, and then click the 'Download Programmer' button to download all the programming data including the serial number setting to the programmer.

How to check the serial number stored in the programmer? Click the 'Programmer Information' button when the programmer is connected to PC, as shown below.
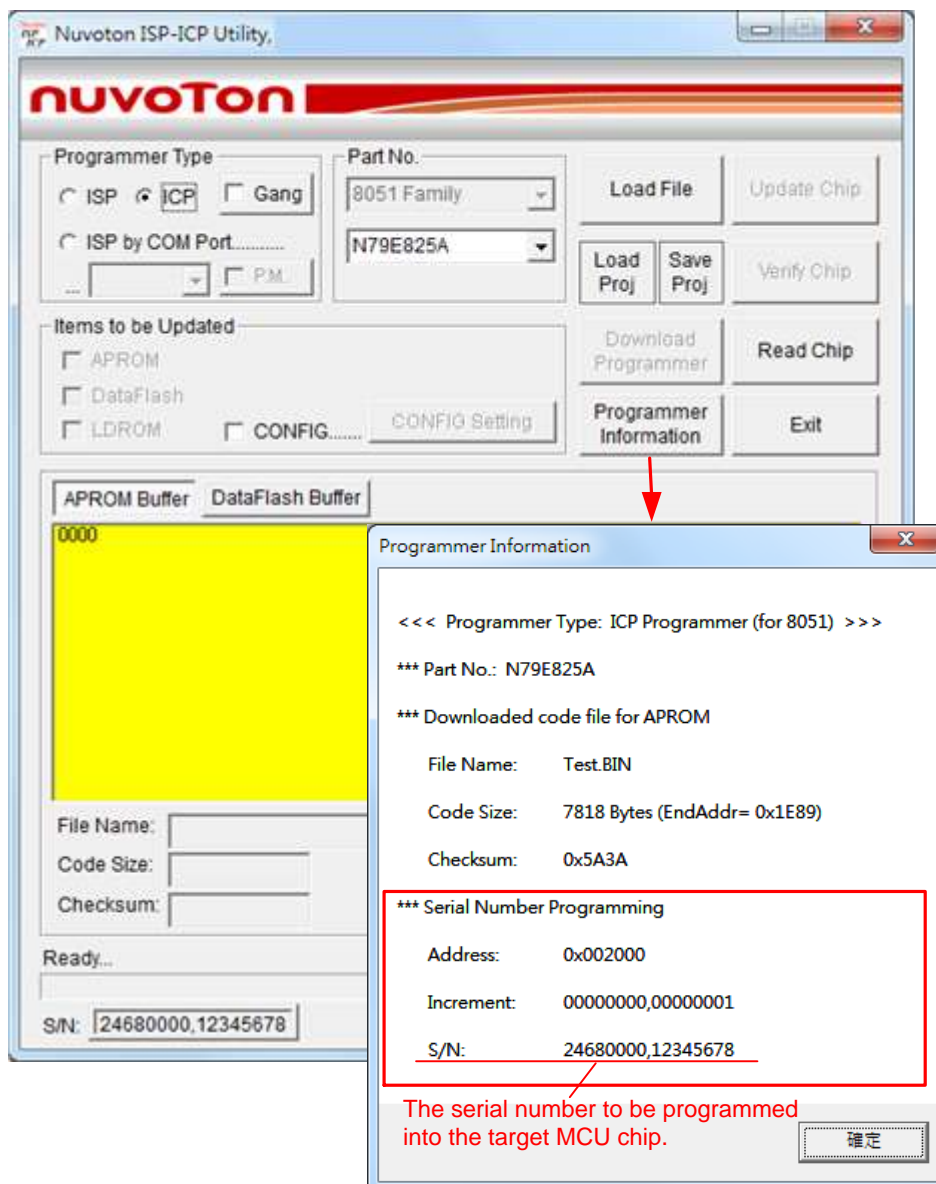
7.3   Chip Counter

The chip counter is used to calculate the successfully programmed chips. The user may configure the counter as up counter or down counter, and set the initial counter value. The following figure shows how to enable the chip counter and its various configurations.