

## How to Program Standard ISP Code in LDROM with A Universal Programmer

Application Note for 8-bit 8051-based Microcontroller

Rev. 1.10 — Apr. 30, 2015

### Document Information

<b>Abstract</b>	This document introduces how to program standard ISP code in LDROM of Nuvoton 8-bit microcontroller (MCU) with a Universal Programmer while keeping the standard ISP functionality provided by Nuvoton.
<b>Apply to</b>	W78E516D/058D/054D/052D, N78E517A/059A/055A/366A.

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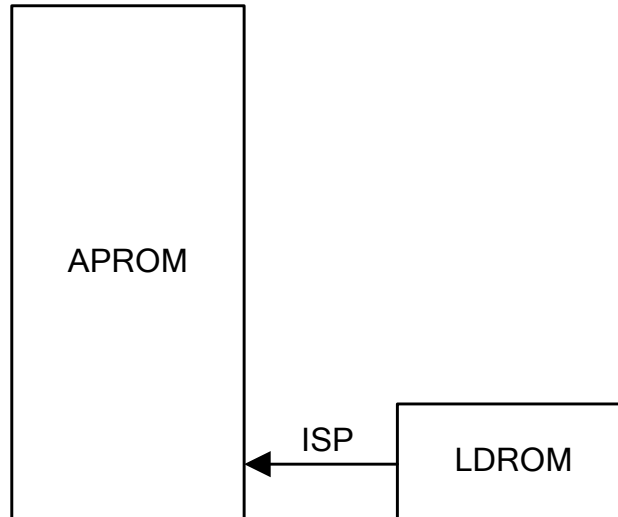
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## 1 Introduction

The Nuvoton 8-bit microcontrollers W78E516D/058D/054D/052D and N78E517A/059A/055A/366A all provide two internal program memory blocks, APROM and LDROM. APROM usually stores user code, and LDROM generally stores boot code of In-System-Programming (ISP). A general operating procedure is: LDROM program receives user code and then updates user code into APROM through software register control to achieve the In-System-Programming (ISP) function.



For the convenience of programming user code into APROM, the Nuvoton 8-bit microcontroller mentioned above is pre-programmed with the standard ISP code in LDROM before shipping from factory. User can directly program APROM through ISP in a friendly way. However, if a user chooses to use a Universal Programmer for program APROM, but still wants to keep the ISP functionality, please see the following instructions to avoid ISP abnormal operation after soldering.

## 2 Operation Procedure

### 2.1 ISP Methodology

Nuvoton ISP needs to boot the microcontroller from LDROM. The Nuvoton standard ISP boot code is also required to be included in LDROM. However, all Universal Programmers, including Hi-Lo, Xeltek, ZLG, or others, **may always execute the whole chip erase action regardless of any settings when programming. The erase range includes LDROM content and CONFIG setting.** Therefore, if user still wants to use ISP function after programming, two steps must be followed:

1. Make sure to load the Nuvoton standard ISP code into LDROM during the setting of the Universal Programmer.
2. CONFIG must be set as "boot from LDROM". CONFIG bit CBS should be 0.  
(The CONFIG setting is not required for W78E516D/058D.)

The following sections illustrate how to program N78E517A with Hi-Lo ALL-100A, Xeltek SUPERPRO 5000E, and ZLG SmartPRO 5000U.

### 2.2 Loading ISP Code into LDROM

The Nuvoton standard ISP code is available on Nuvoton's official website. Please visit the <http://www.nuvoton.com/hq/products/microcontrollers/8bit-8051-mcus/Software> to download "Nuvoton ISP-ICP Programmer vx.xx".

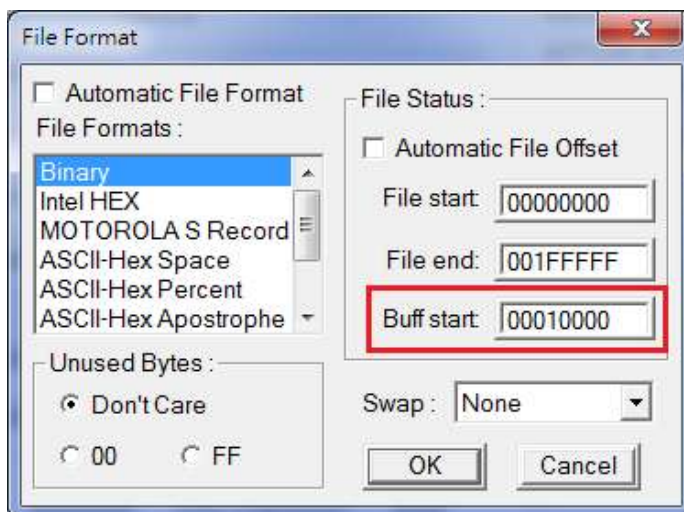
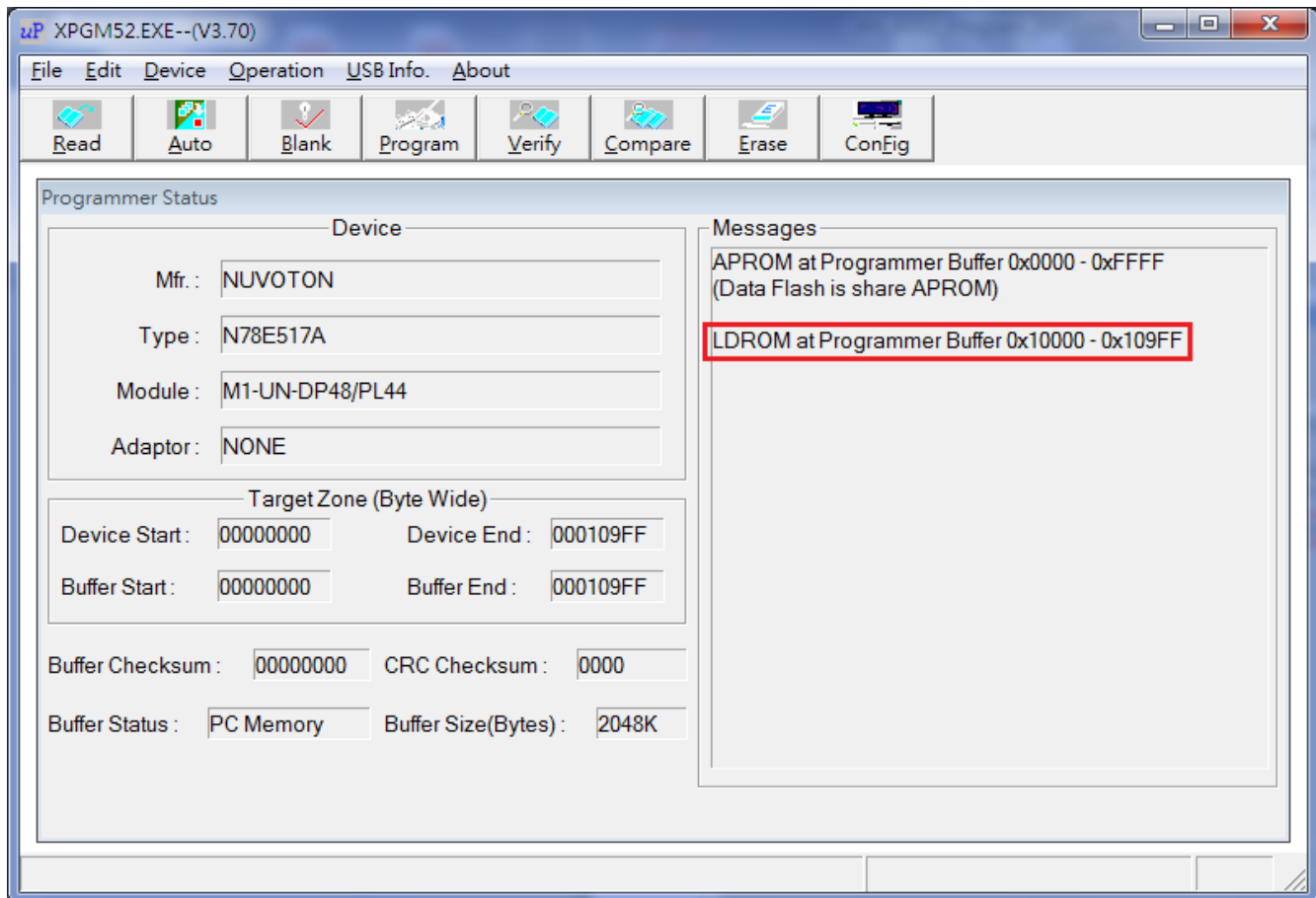
下載	版本	更新
 N79E82x Demo Code	1.0.5	2011/12/25
 N79E84x Sample Code	1.0.8	2014/01/30
 N79E85x Sample Code	1.0.8	2014/01/30
 Nuvoton 8051 ISP-ICP Programmer V7.10	7.10	2014/01/30
 Nuvoton_8051_Keil_uVision_Driver	1.04	2012/04/18
 W79E2051_4051 Sample Code	1.0.2	2014/01/30

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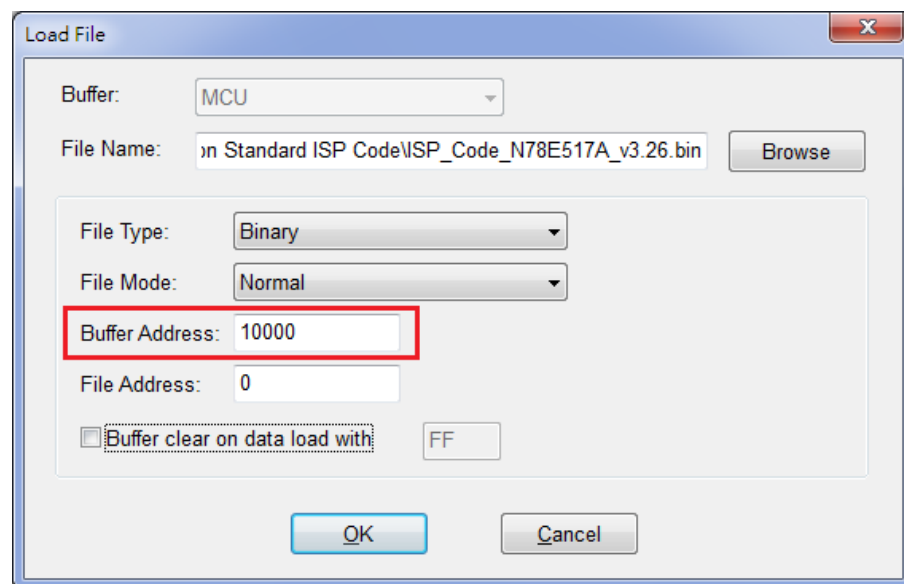
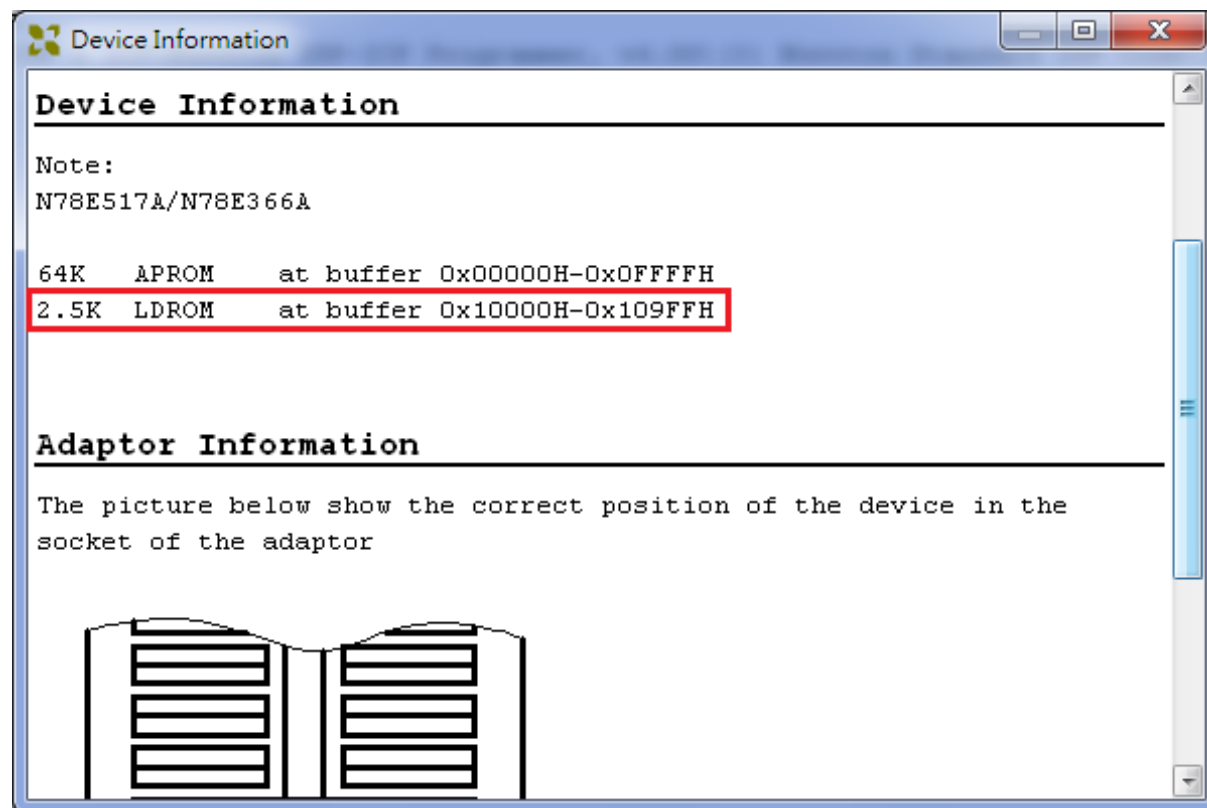
After a file is unzipped, user can find the "ISP\_Code\_N78E517A\_vx.xx.bin" file in the folder "(3) Nuvoton Standard ISP Code" and load this file into the LDROM block or the buffer address specified by the Universal Programmer.

1. Check the User Manual of the Universal Programmer, confirm the buffer start address corresponding to LDROM, and set up properly before loading a file.

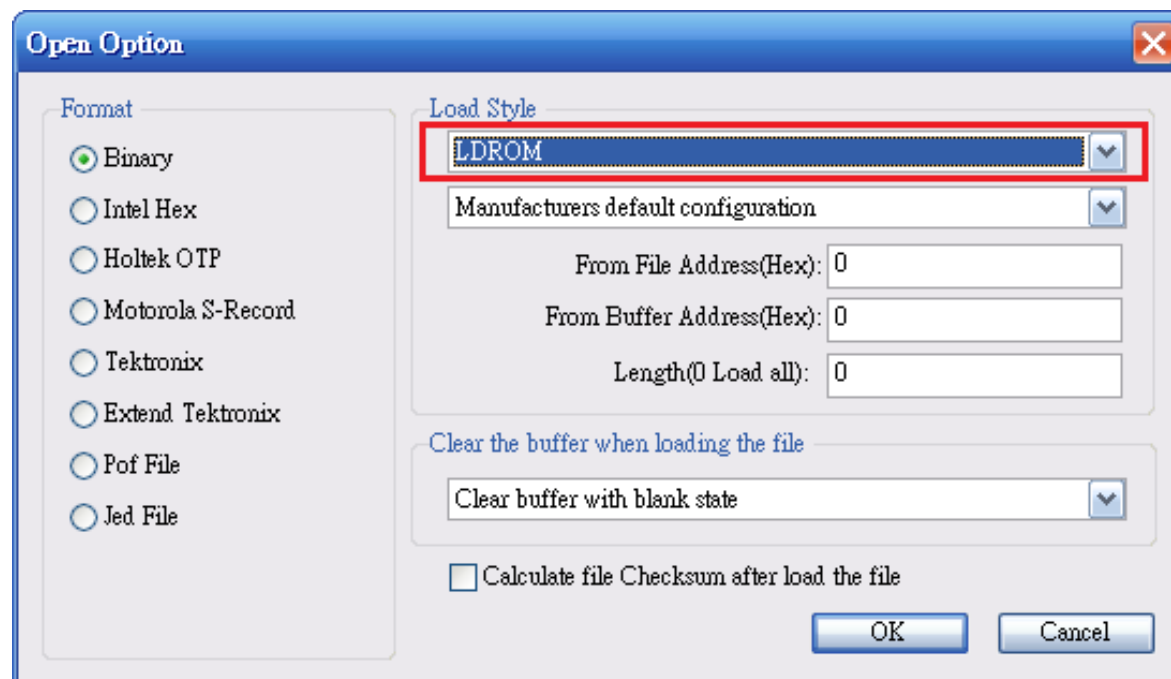
Hi-Lo ALL-100A:



Xeltek SUPERPRO 5000E:

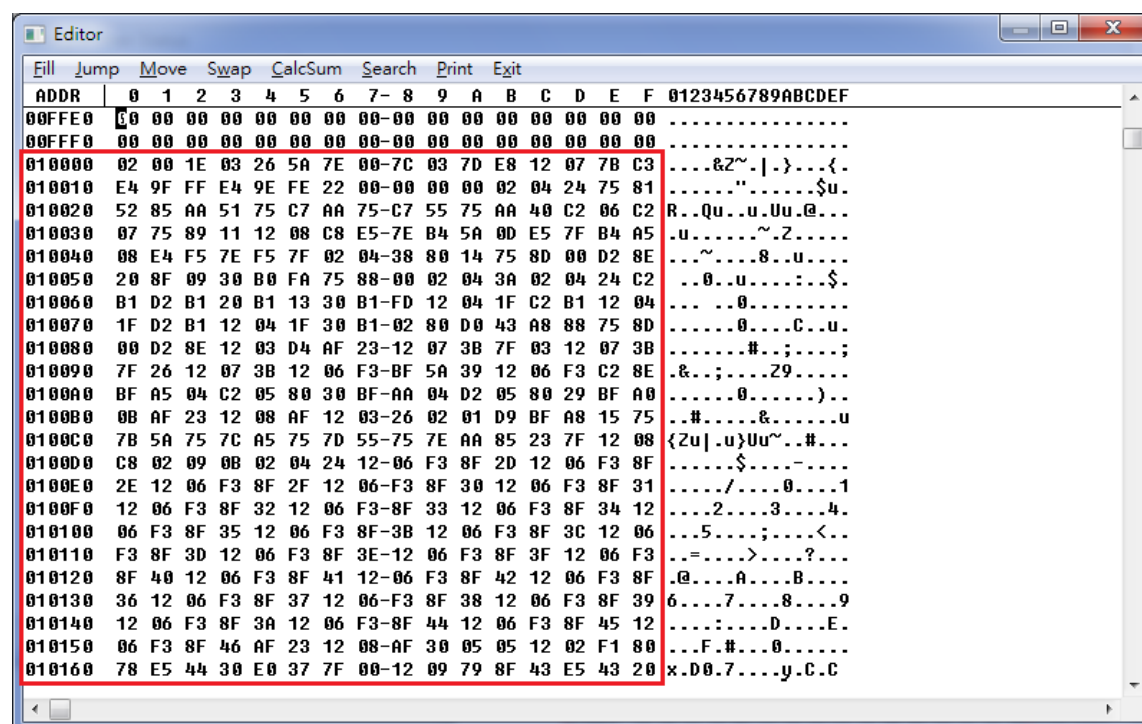


## ZLG SmartPRO 5000U:

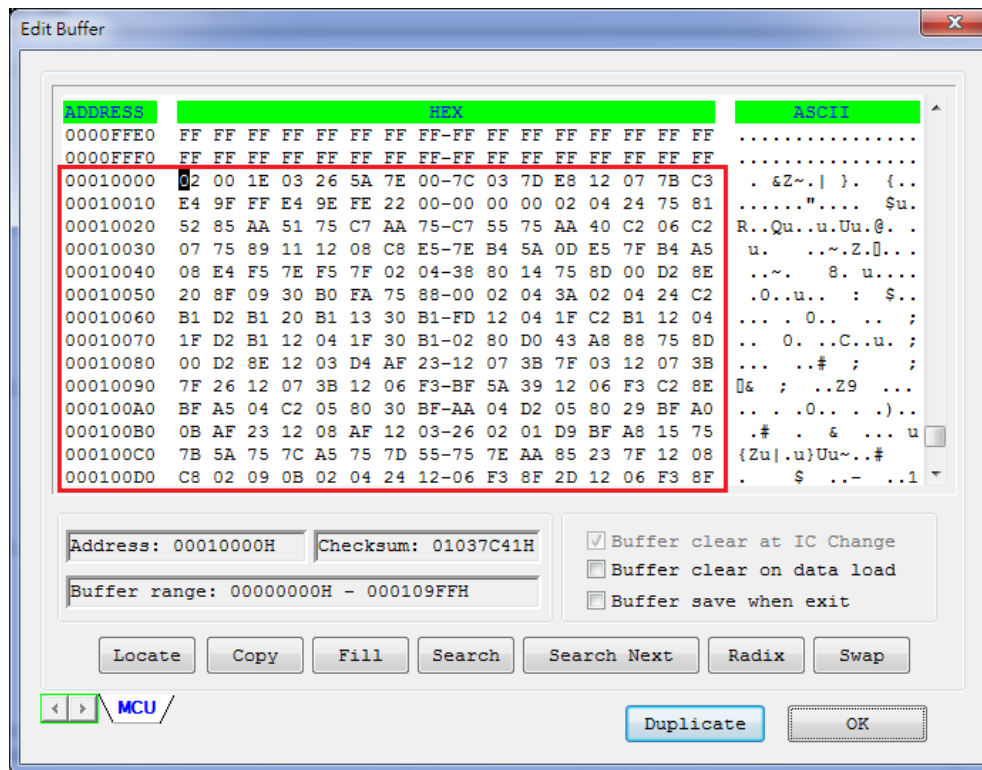


2. Check if the ISP code is properly loaded into LDROM through the buffer window of the Universal Programmer.

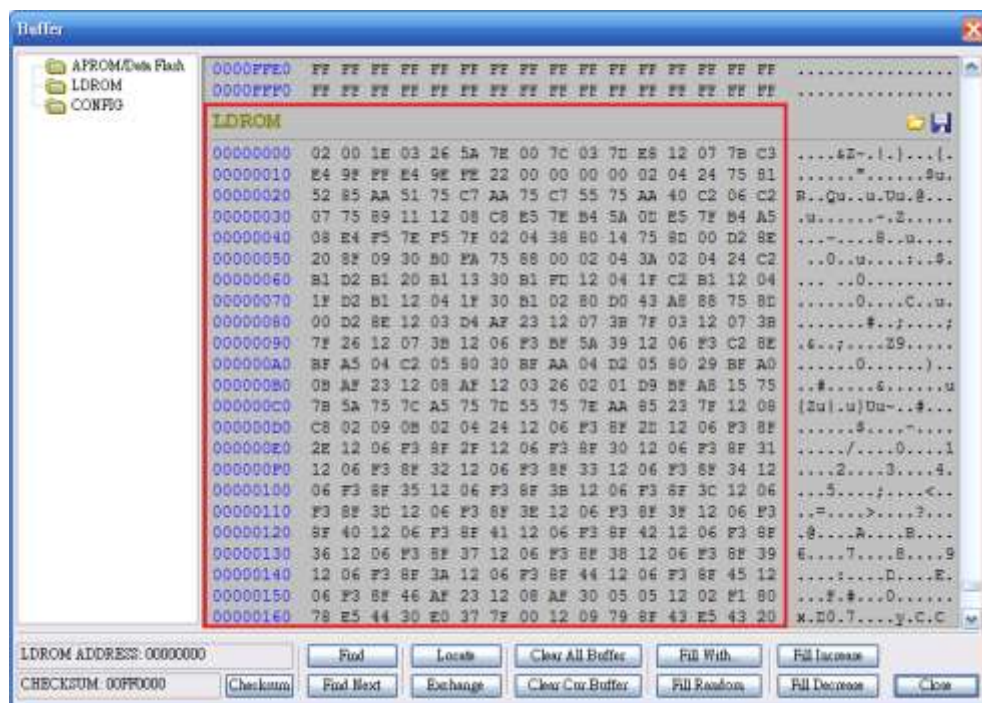
Hi-Lo ALL-100A:



Xeltek SUPERPRO 5000E:



ZLG SmartPRO 5000U:





## 2.3 CONFIG Setting

After the ISP code is loaded, open the CONFIG Setting window and select "MCU will boot from LDROM". (There CONFIG setting is not required for W78E516D/058D.)

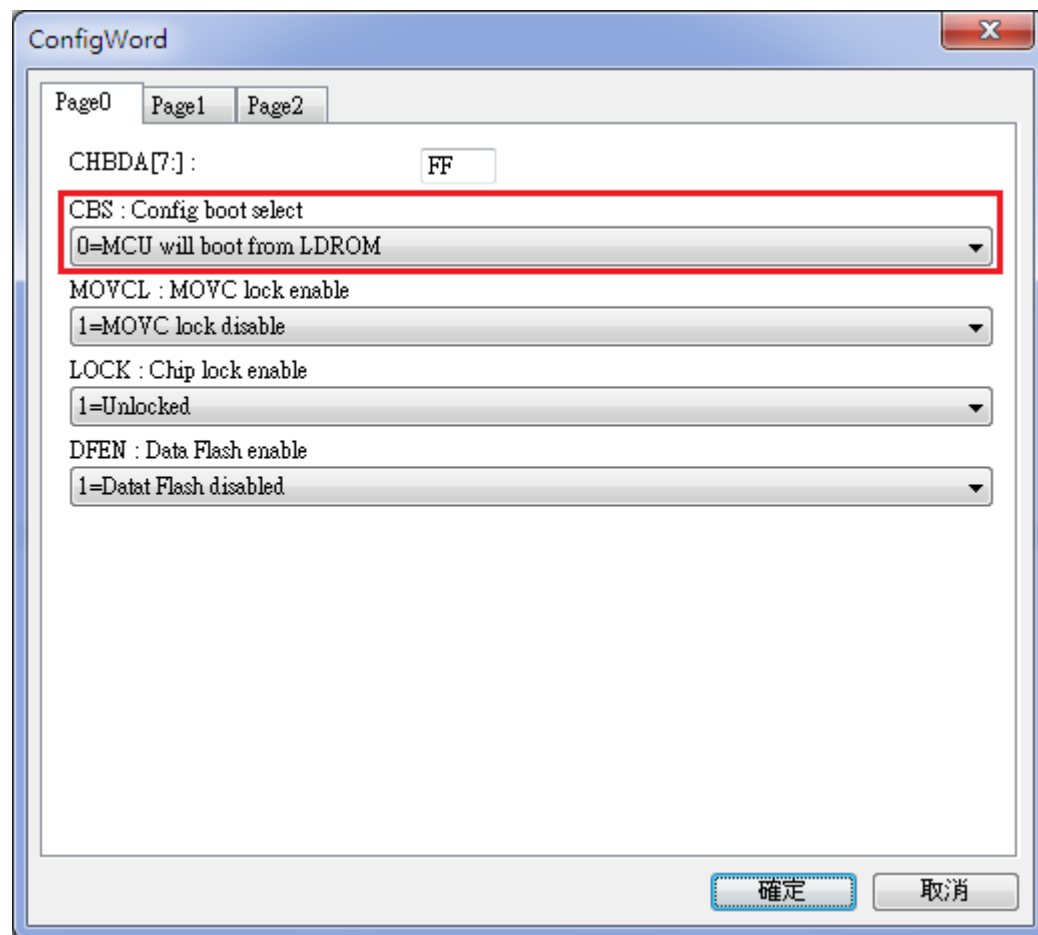
Hi-Lo ALL-100A:

The screenshot shows the 'Config Setting' window with the following settings:

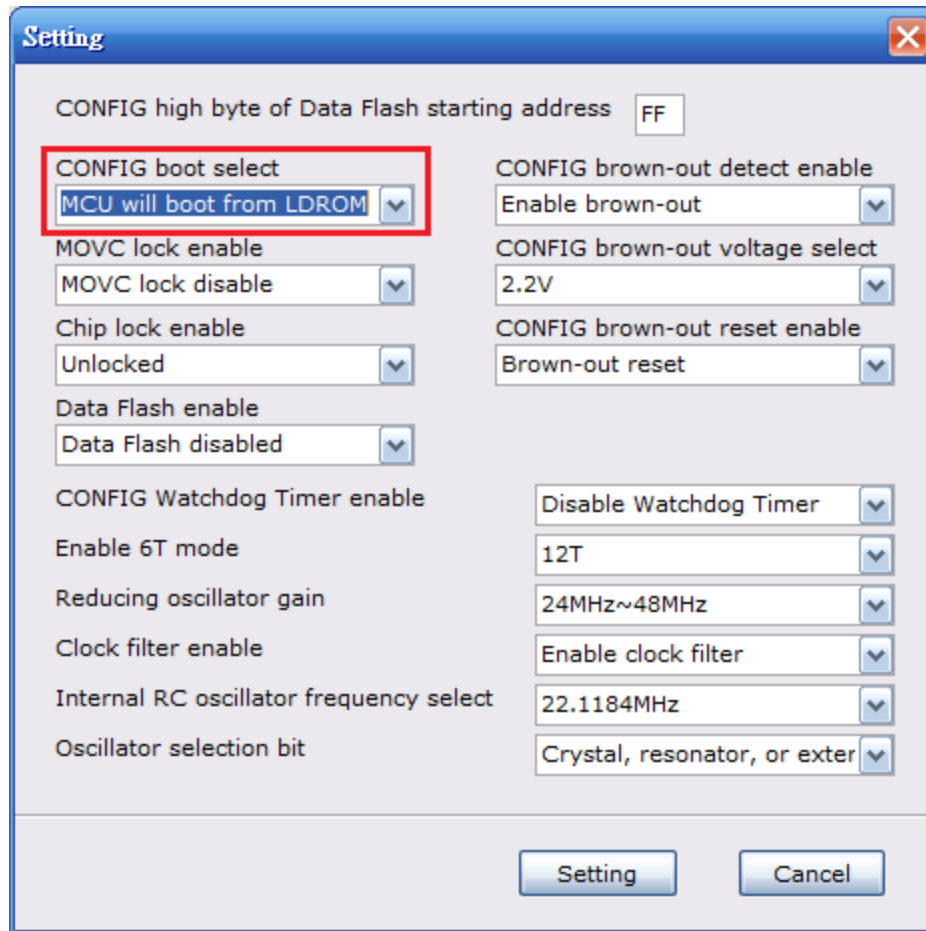
- Messages :**
  - Config0**
    - Data Flash enable : 1: Data Flash disabled.
    - Chip lock enable : 1: Unlock.
    - MOVC lock enable : 1: MOVC lock disable.
    - CONFIG boot select : 0: MCU will boot from LDROM.**
  - Config1**
    - CONFIG high byte of Data Flash starting address : FF
  - Config2**
    - CONFIG brown-out reset enable : 1: Brown-out reset.
    - CONFIG brown-out voltage select : 11: Brownout voltage is 2.2V
    - CONFIG brown-out detect enable : 1: Enable brown-out.
  - Config3**
    - CONFIG oscillator selection bit : 1: Crystal, resonator, or external clock input.
    - Internal RC oscillator frequency select : 1: 22.1184MHz
    - Clock filter enable : 1: Enable clock filter.
    - Reducing oscillator gain : 1: 24MHz~48MHz.
    - Enable 6T mode : 1: 12T.
    - CONFIG Watchdog Timer enable : 1: Disable Watchdog Timer.

At the bottom, there are checkboxes for ☒ ID Check and ☒ Insertion Test, and buttons for Read, OK, and Close.

Xeltek SUPERPRO 5000E:



ZLG SmartPRO 5000U:



## 2.4 Executing Programming

User can load their own user code in APROM or leave it blank. After the completion of the above steps, user can execute the entire programming. User will be able to use ISP function through Nuvoton ISP tool after programming is finished.

## 2.5 Other Notices

Each Universal Programmer supplier has different ways to load code and set CONFIG. This Application Note cannot enumerate the examples. If any operation question, please check the User Manual for each Universal Programmer manufacturer.

## Revision History

Revision	Date	Description
1.00	Jan. 13, 2014	Initially issued.
1.10	Apr. 30, 2015	Update the hyperlink for Nuvoton ISP-ICP Programmer vx.xx.

## Important Notice

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