

# AN10337

## Adding ISP firmware to an LPC900 software project

Rev. 02 — 21 April 2009

Application note

### Document information

Info	Content
<b>Keywords</b>	LPC900, ISP
<b>Abstract</b>	This application note describes how to add In-System Programming (ISP) firmware into a Keil $\mu$ Vision 3 software project.

**Revision history**

Rev	Date	Description
02	20090421	Brought <a href="#">Table 1</a> up to date with current devices.
01	20041213	Initial version.

**Contact information**

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## 1. Introduction

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The P89LPC900 family of microcontrollers has In-System Programming (ISP) capability on some of its family members, which allows the microcontroller to be programmed when it is soldered on the printed circuit board. ISP code is programmed into the microcontroller as factory default.

The ISP code is programmed in the upper half of the highest sector on the LPC900 devices.

This application note will show how to add NXP ISP code to a software project to have it included in the code with the  $\mu$ Vision 3 IDE from Keil.

The ISP source code will be provided in assembly language with this application note and can be added to any code project in C or assembly.

## 2. Benefits of adding ISP in a project

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The benefits of adding the ISP code to the software project are:

- The global CRC and the sector CRCs of the device will match the hex file, and therefore the complete code can be verified with a parallel programmer including the ISP section of the Flash memory.
- If ISP gets erased by accident it can be reprogrammed with a parallel programmer.
- Another benefit is that the compiler will produce errors and/or warnings if there are any conflicts between the usercode and ISP code.

### 3. ISP version and sizes

Currently there are four versions of ISP and four memory sizes.

Make sure you use the correct version and code size of ISP with the following devices. When using an incorrect version the ISP will not function correctly.

[Table 1](#) shows the different part numbers with the ISP version number and memory size.

**Table 1. ISP files used by LPC900 parts**

Part number	ISP version	ISP sector location	Memory size	File name
P89LPC920	Version 2	Upper half of sector 1	2 kB	LPC_ISP_2K_V02.a51
P89LPC9201	Version 4	Upper half of sector 1	2 kB	LPC_ISP_2K_V04.a51
P89LPC921	Version 2	Upper half of sector 3	4 kB	LPC_ISP_4K_V02.a51
P89LPC9211	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC922	Version 2	Upper half of sector 7	8 kB	LPC_ISP_8K_V02.a51
P89LPC9221	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC922A1	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC924	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC9241	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC925	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9251	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC930	Version 2	Upper half of sector 3	4 kB	LPC_ISP_4K_V02.a51
P89LPC9301	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC931	Version 2	Upper half of sector 7	8 kB	LPC_ISP_8K_V02.a51
P89LPC931A1	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC932A1	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9321	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC933	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC9331	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC934	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9341	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC935	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9351	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC936	Version 4	Upper quarter of sector 7	16 kB	LPC_ISP_16K_V04.a51
P89LPC938	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9381	Version 4	Upper half of sector 3	4 kB	LPC_ISP_4K_V04.a51
P89LPC9401	Version 2	Upper half of sector 7	8 kB	LPC_ISP_8K_V02.a51
P89LPC9402	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC9408	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC952	Version 4	Upper half of sector 7	8 kB	LPC_ISP_8K_V04.a51
P89LPC954	Version 4	Upper half of sector 15	16 kB	LPC_ISP_16K_V04.a51

[Table 2](#) shows the changes between the different ISP versions.

**Table 2. ISP changes**

ISP version	ISP changes
Version 1	Initial version
Version 2	Added security key and updated bootvector
Version 3	Added high speed communications
Version 4	Added control of hardware security for UCFG1

The added security key is not visible when using ISP, but make sure when you are using IAP that the correct key is passed to IAP, please see the appropriate users manual for more details.

High speed communications allow ISP to load a higher baudrate when using ISP making programming a lot shorter.

Hardware security for UCFG1 allows the UCFG1 configuration byte to be protected by hardware and cannot be altered by ISP anymore when protected.

## 4. Adding ISP in a $\mu$ Vision3 project

To add the ISP code you simply have to add the LPC\_ISP\_xK\_Vxx.a51 file to the project file in the Keil  $\mu$ Vision3 compiler.

[Table 1](#) shows the different file names for the ISP files.

To do this first you can copy the ISP assembly file in the same folder as the project you are working on. In  $\mu$ Vision3 you can right click the project and select add files.

Then the next time the project is compiled the ISP file will be added into the hex file that can be programmed in the Flash memory of the microcontroller.

[Figure 1](#) shows how to add the ISP file to a  $\mu$ Vision3 project.

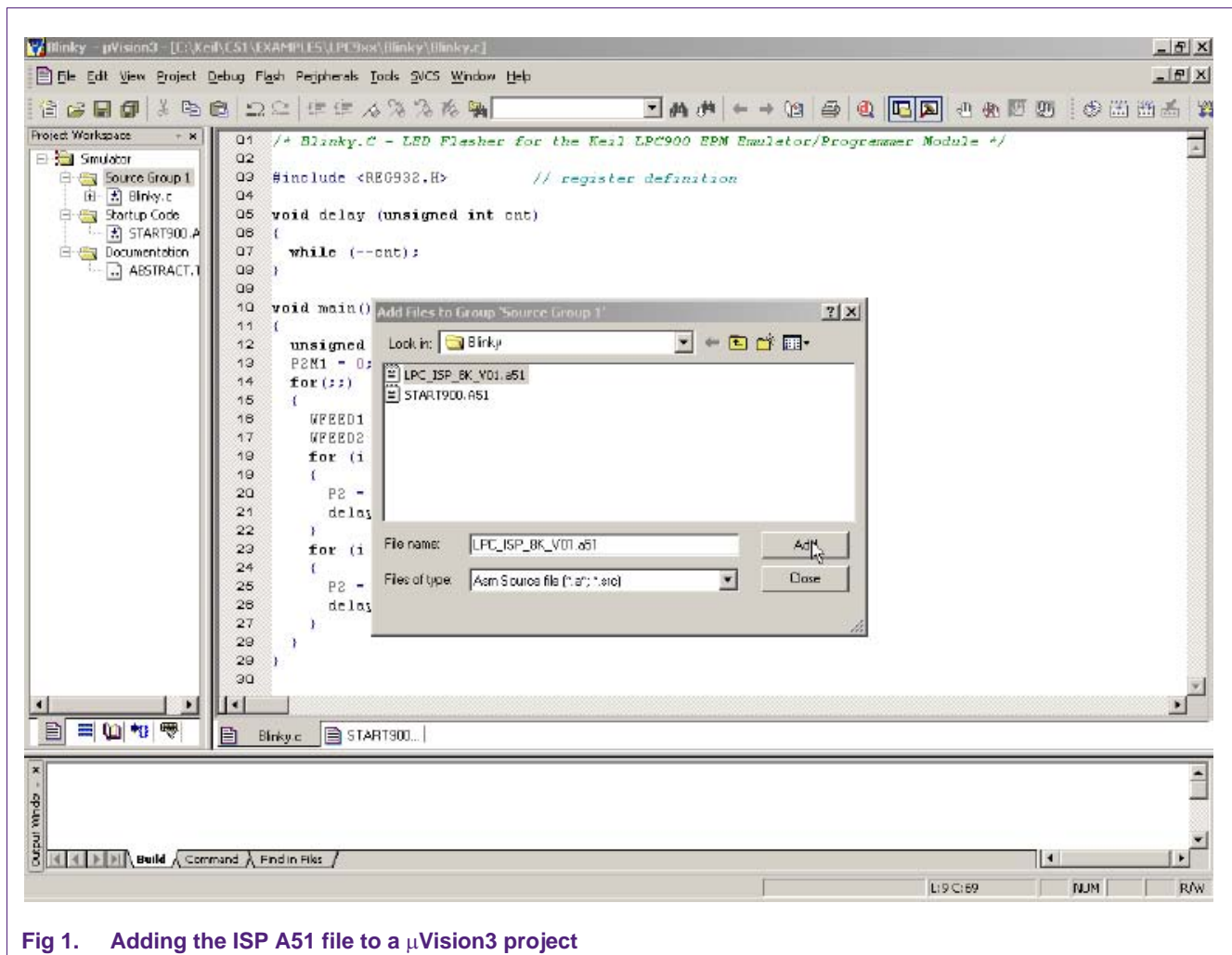


Fig 1. Adding the ISP A51 file to a  $\mu$ Vision3 project

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