

LPC900icp User Manual

LPC900 Microcontroller Family ICP & ISP Programmer

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Revisions

Revision 1.0: Date: April 11, 2005 – First

Revision 1.1: Date: July 7, 2005 – Flat 16pin cable; RS-232 speed 38400baud;

Revision 1.2: Date: July 26, 2005 – RS-232 speed 9600/57600baud;

Revision 1.3: Date: March 19, 2007 – Windows command line software, LPC900 derivatives;

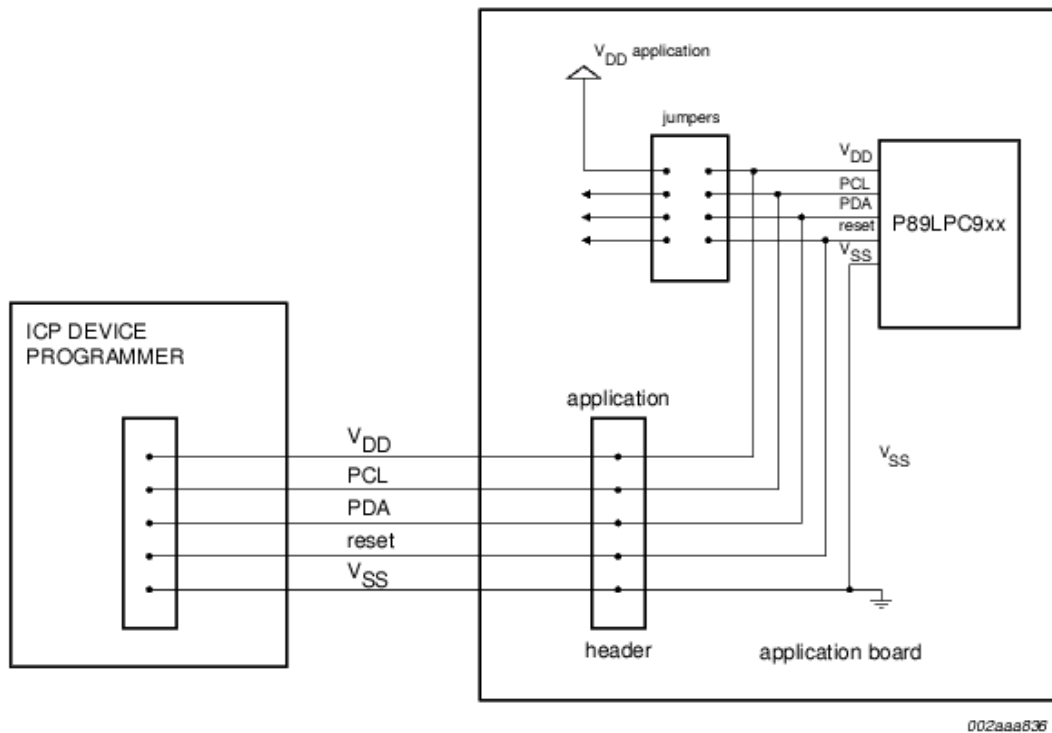
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Main Features

The **PRECMA LPC900icp** is a hardware/software kit that allows you to easily and conveniently program any Philips LPC900 Family Microcontroller derivate.

- Low cost
- USB Interface - no addictional power needed
- In Circuit Programming (ICP, no bootloader needed)
- In System Programming optionally (ISP, with original Philips bootloader)
- Open commands protocol and software clients software
- Works also with Esacademy *FlashMagic* (standard Philips client software)
- Software available for Windows and Linux
- USB VCP (Virtual COM Port) drivers available for Windows, Linux and Mac
- Up to 1,5KB/sec. programming speed



Connections and LEDs

- USB Connector: used to connect with your PC trough an USB A-B cable
- 16pin flat cable connector: used to connect with the device to be programmed

| Pin | Signal | Type | Usually to be connected to |
|------------|---------------|-------------|-----------------------------------|
| 3 | ISP RXD | IN | μC TxD = P1.0 |
| 5 | ISP TXD | OUT | μC RxD = P1.1 |
| 7 | ICP PDA | I/O | μC PDA = P0.4 |
| 9 | VPP (+3.3V) | OUT power | μC VCC |
| 11 | /RESET | OUT | μC RESET = P1.5 |
| 13 | GND | OUT power | μC GND |
| 15 | ICP PCL | I/O | μC PCL = P0.5 |

All the other connector pins are not used (not connected).

- Yellow LEDs: show USB communications
- Green LED: ON when connected and blinking when executing commands (ICP mode)
- Red LED: ON when the device to be programmed is powered and in programming mode

Software Interface

LPC900icp commands protocol is OPEN and described in this document, so that you can develop your own programming software if you need.

PRECMA offers two **open-source** software interfaces (distributed under the GNU General Public License) that you can use with Windows or Linux, or as a base for your software interface developing.

Installation

LPC900icp is an USB based peripheral; under Linux you won't have to install any driver: all the necessary drivers are currently included in the kernel.

Under Windows you will have to install the VCP (Virtual Com Port) Drivers for PRECMA LPC900icp Programmer that you will find on the <<http://www.precma.com/>> website.

The PRECMA LPC900icp Programmer USB interface is based on the FTDI FT232BM chip, so if you want to know deeper how it works you can go directly on the FTDI website <<http://www.ftdichip.com/>>

Windows

After installing the driver and connecting the LPC900icp board to your computer, a new COM port appears.

PRECMA LPC900icp Programmer for Windows is a VisualBasic 6 sample program that manage the LPC900icp. You can download it for free from PRECMA S.r.l. website.

There is also available a DOS Window **command-line** program, very useful for production line use (you can easily create a BATCH file and use always the same command). The command line program manages all the LPC900icp Programmer features, while the VBasic sample with GUI may not.

PRECMA LPC900icp can also work with the **Esacademy FlashMagic** software that you can download for free from Esacademy website <<http://www.esacademy.com/>>.

Software commands to power/unpower the device to be programmed in ICP mode are not managed by FlashMagic software: you must use the S1 pushbutton.

Linux

PRECMA LPC900icp Programmer for Linux (lpc900icp.pl) is a command line PERL program that manages all the LPC900icp features. You can download it for free from PRECMA S.r.l. website.

If your PERL installation has not the Device::SerialPort module installed, you will have to download and install it from <<http://sendpage.org/device-serialport/>>

After connecting the LPC900icp board to your computer, a new "tty" port appears, usually /dev/ttyUSB0.

When using `lpc900icp.pl` the first time, you will be asked for using the `--port` option.

After the first successful using of the `--port` option, `lpc900icp.pl` writes its configuration in a hidden file named `.lpc900.cgf` in your home dir.

Usually the port to be used is /dev/ttyUSB0 or something like this (be sure to have the rights to access the port!). Check which new port you find after connecting the PRECMA LPC900icp Programmer the first time. Type "`lpc900icp.pl --help`" to show all the options.

Usage

Before programming an LPC900 derivate, you must put it in *Programming Mode*; the LPC device to be programmed can be forced in *Programming Mode* using the S1 pushbutton on the LPC900icp board: pushing once the S1 pushbutton makes the green LED blink and the red LED light: when the red LED is ON, the device to be programmed is powered and in *Programming Mode*.

Pushing once again the S1 pushbutton makes the green LED blink and the red LED switch off: when the red LED is OFF, the device to be programmed is unpowered and NOT in *Programming Mode*.

You must connect the device to be programmed to the LPC900icp board when it is unpowered; then you can push the S1 pushbutton to force it in the *Programming Mode*, you can program it and push again the S1 pushbutton to unpower it and disconnect.

LPC900icp can work in two modes: **ICP Mode** and **ISP Mode**.

ICP Mode

ICP Mode allows to program all the LPC900 Family Microcontroller derivates (*except P89LPC932 first releases*). In order to use the PRECMA LPC900icp in ICP mode, the board jumper **JP1** must be NOT inserted (default status).

Using ICP Mode, the device to be programmed can be powered/unpowered also by software commands (see protocol specifications and software interfaces description).

Using ICP mode, all the flash ROM can be programmed and there is no need to protect the Philips original bootloader sector (unless you want to use it later).

The communication speed in ICP mode is selectable using **JP2**:

- Jumper JP2 inserted: 9600baud
- Jumper JP2 NOT inserted (default): 57600baud

The programming speed at 57600baud is about 1,5Kb/sec. in standard mode and about 3Kb/sec. in ICP QuickMode (LPC900icp exclusive fast programming mode).

The PRECMA LPC900icp writes only the really used pages in the flash ROM, so the programming time depends on the real binary file dimension.

ISP Mode

ISP Mode allows to program ONLY the LPC900 Family Microcontroller derivates that have an original Philips BootLoader firmware on-chip (see derivates specifications). In order to use the PRECMA LPC900icp in ISP mode, the board jumper **JP1** must be inserted.

Using ISP mode, the only way to enter/exit programming mode is using the S1 pushbutton.

The communication speed in ISP mode depends on the bootloader: usually 9600baud works good. In ISP mode, you must be careful and do not write/erase the sector containing the Philips original bootloader.

Programming Protocol

LPC900icp accepts commands in *Intel HEX* record format using the following record types (for the "Record Type" field in the Intel HEX record):

| | |
|-------------------|---|
| 0 = PROGRAM: | program user code |
| 1 = READ_VERSION: | read IAP/ISP version |
| 2 = MISC_WRITE: | misc. write functions |
| 3 = MISC_READ: | misc. read functions |
| 4 = ERASE: | erase sector/page |
| 5 = SECTOR_CRC: | read sector CRC |
| 6 = GLOBAL_CRC: | read global CRC |
| 7 = LOAD_BAUD: | not documented by Philips - not implemented yet |
| 8 = CHIP_ERASE: | full chip erase |

Please note that the READ_VERSION record type has the same code than the Intel HEX EOF (END OF FILE) record.

For detailed informations on the Intel HEX format please see the "Hexadecimal File Format Specification" from Intel; for detailed informations on the special record types fields accepted by the Philips ISP (ICP) protocol, please see the "ISP to ICP Bridge Description" from Philips; you can download both these documents from PRECMA website (intelhex.pdf and ISP_ICP_bridge_v10.pdf).

Note to the Record Type 0 = PROGRAM

Philips LPC derivatives DO NOT ACCEPT any Intel HEX record with type field 0: records with type field 0 must have a **fixed lenght**, which may be 16bytes or 64bytes, depending on the device to be programmed.

Addictional Commands

PRECMA LPC900icp accepts a few further single-character commands:

- 'P' = Power ON the device to be programmed and enter programming mode
- 'S' = Power OFF the device to be programmed

Responses

PRECMA LPC900icp reply to the commands with the command echo, plus:

- '.' = ACK
- 'X' = checksum NACK
- 'R' = Programming execution NACK

If the reception/transmission of one single command exceeds the timeout limit (1,3 ~ 5.6 sec.), the LPC900icp reset.

Important note on P89LPC932 microcontroller

P89LPC932 does not support ICP mode (ISP mode only). Moreover, P89LPC932 was the first μ C of the LPC900 family and its first versions had some hardware bugs:

- P89LPC932 labeled "ISP K1.0" or with revision up to "Revision C" do not support hardware ISP activation, therefor are not supported by PRECMA LPC900icp.
- P89LPC932 revision "E" or later are supported by PRECMA LPC900icp, in ISP mode only.

Appendix 1

Supported LPC900 Microcontroller Derivates

The following LPC900 family microcontroller derivates are supported:

| | | |
|------------|------------|-------------|
| P89LPC901 | P89LPC914 | P89LPC931 |
| P89LPC902 | P89LPC915 | P89LPC9311 |
| P89LPC903 | P89LPC916 | P89LPC932A1 |
| P89LPC904 | P89LPC917 | P89LPC933 |
| P89LPC906 | P89LPC918 | P89LPC934 |
| P89LPC907 | P89LPC920 | P89LPC935 |
| P89LPC908 | P89LPC921 | P89LPC936 |
| P89LPC9102 | P89LPC922 | P89LPC938 |
| P89LPC9103 | P89LPC9221 | P89LPC9401 |
| P89LPC9107 | P89LPC924 | P89LPC9408 |
| P89LPC912 | P89LPC925 | P89LPC952 |
| P89LPC913 | P89LPC930 | |
