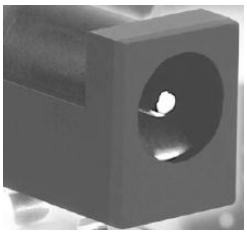
Softlog Systems (2006) Ltd.

ICP Family Programmers

User's Manual

1 Connectors

1.1 "Power" Connector (Power Jack, Center Pin 2.1mm)



Pin No.	*Pin Name (ICP2-GANG)*	*Pin Name (ICP2, ICP2(HC), ICP2-Portable)*	*Voltage Range*
1/center	POWER (+)	POWER (+/-)	12V to 15V (9V to 15V for ICP2-Portable)
2	POWER (-)	POWER (+/-)	

1.2 "USB" Connector (Type-B Female)

1.3 "RS-232 IN" Connector (D-type 9 Female)

Note: not available on ICP2-Portable

Pin No.	*Pin Name*	*Voltage Range*	*Pin Type*	*Description*
1	-	-	-	Not connected
2	PC_RXD	RS-232 level	RS-232 output	TxD output to PC
3	PC_TXD	RS-232 level	RS-232 input	RxD input from PC
4	PC_DTR	-15V to +15V	Power	**ICP2-GANG**: Not connected **ICP2/ICP2(HC)**: Additional power supply input
5	GND	-	GND	Ground connection
6	12V_OUT	11-14VDC	Power	**ICP2-GANG**: power supply output **ICP2/ICP2(HC)**: Not connected
7,8,9	-	-	-	Not connected

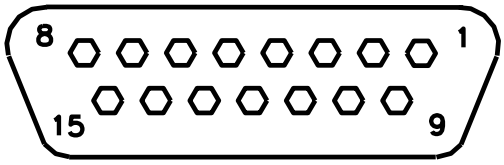
1.4 "RS-232 OUT" Connector (D-type 9 Male)

Note: available on ICP2-GANG only

Pin No.	*Pin Name*	*Voltage Range*	*Pin Type*	*Description*
1	-	-	-	Not connected
2	CHAIN_232_RXD	RS-232 level	RS-232 input	RxD input from next ICP2-GANG
3	CHAIN_232_TXD	RS-232 level	RS-232 output	TxD output to next ICP2-GANG
4	-	-	-	Not connected
5	GND	-	GND	Ground connection
6,7,8,9	-	-	-	Not connected

1.5 "TARGET" Connector (D-type 15 Female)

Note: ICP2-GANG - 4 Identical Channels
ICP2/ICP2(HC)/ICP2-Portable - 1 channel



Pin No.	*Pin Name*	*Voltage Range*	*Pin Type*	*Description*
1	T_VDD	2.0V to 5.5V	Output or input with weak pull-down and programmable strong pull-down	Target VDD supply voltage
2	GND	-	-	Ground connection
3	T_SCK	2.0V to 5.5V	CMOS output or input with weak pull-down	Target clock
4	T_MOSI	2.0V to 5.5V	CMOS output or input with weak pull-down	Target data
5	T_MISO	2.0V to 5.5V	CMOS output or input with weak pull-down	Target data, internally connected to T_MOSI
6	T_VPP	2.0V to 13.5V	Output or input with weak pull-down	Target VPP supply voltage
7	T_TARG **(2)**	5.0V	CMOS output	Optional general purpose output
8	T_VTEST	2.0V to 13.5V	Output	Target VTEST signal for PIC17Cxxx family
9	T_DIO_0	2.0V to 5.5V	CMOS output or input with weak pull-down	Target VPP output for LVP or FOSC signal for PIC17Cxxx family
10	T_DIO_1	2.0V to 5.5V	CMOS output or input with weak pull-down	Target PGM output for LVP
11	GND	-	-	Optional ground connection
12	GND **(1)**	-	-	Optional ground connection
13	GO **(1)**	0-1.0V or N/C	CMOS input with pull-up 10K	Input for programming activation in standalone mode
14	PASS_OUT**(1)**	5.0V	CMOS output	Output for pass/fail/busy indication
15	FAIL_OUT **(1)**	5.0V	CMOS output	Output for pass/fail/busy indication

Notes:
(1) Dedicated for standalone operation without PC
(2) Not available on ICP2-Portable

1.6 Typical Connection to "TARGET" Connector

Pin No.	*Pin Name*	*Standard (5-pin) Programming PIC10/12/16/18/24 dsPIC®/PIC32*	*LVP (6-pin) Programming PIC10/12/16/18*	*PIC17*	*I2C*	*Keeloq®*
1	T_VDD	VDD	VDD	VDD	VDD	VDD
2	GND	GND	GND	GND	GND	GND
3	T_SCK	CLOCK (PGC)	CLOCK (PGC)	CLOCK (PGC)	SCL	CLOCK
4	T_MOSI	DATA (PGD)	DATA (PGD)	DATA (PGD)	SDA	DATA
5	T_MISO	-	-	-	-	-
6	T_VPP	VPP	VPP	VPP	-	-
7	T_TARG	-	-	-	-	-
8	T_VTEST	-	-	VTEST	-	-
9	T_DIO_0	-	-	FOSC	-	-
10	T_DIO_1	-	PGM	-	-	S1

2 PC-Driven and Standalone Modes

ICP family programmers can be operated in PC-driven and/or standalone mode

Programmer	*PC-Driven*	*Standalone*
ICP2/ICP2(HC)	Yes	Yes
ICP2-GANG	Yes (single channel only)	Yes
ICP2-Portable	Yes	Yes
ICP-01	Yes	No

PC-driven mode means that all programming parameters and data are set in **PC** and the PC executes required sequences (programming, verification, blank check, etc)

Standalone mode means that all programming parameters and HEX file data ("Environment") are saved in **programmer's** non-volatile flash memory. See paragraph 12 "Preparing Environment and Transferring Environment to Programmer".

Standalone programming can be activated by 2 ways:
- from PC
- by GO input on the programmer unit (NOTE: optional on ICP2-Portable)

Simultaneous multi-channel programming can be done in standalone mode only

3 PASS/FAIL LEDs and Outputs

###	*Conditions*	*PASS LED*	*FAIL LED*	*PASS Output*	*FAIL Output*
1.	Power-up	2 sec ON		2 sec ON	
2.	Operation in-progress (busy)	ON		ON	
3.	Programming done: **PASS**	ON	OFF	ON	OFF
4.	Programming done: **FAIL** (verification error)	OFF	ON	OFF	ON
5.	UUT problem during operation: - Vdd overload - Vpp overload - I2C communication error	OFF	Blink	OFF	ON
6.	Non-UUT problem during standalone operation: - database error - device not supported - no Keeloq® support - no dsPIC® support - etc.	OFF	Blink	OFF	OFF
7.	No firmware presents (bootloader only)	Slow blink	OFF	OFF (not supported)	
8.	Firmware upgrade in-progress	Fast blink	OFF	OFF (not supported)	

4 Other LEDs (ICP2-Portable)

See ***"ICP2-Portable Quick Start.pdf"***

5 Standalone Operation without PC

- Prepare an environment and transfer to programmer – see paragraph 12 for details
  NOTE: once the environment is saved in **non-volatile** memory it's automatically ready for programming
- Short pin GO (:13) of the target connector to GND (:12) for at least 100ms to start programming
- Observe PASS/FAIL LEDs or/and pins PASS (:14) and FAIL(:15) – see paragraph 3 for details

6 Host Computer Requirements

- Pentium-4 or greater IBM PC compatible
- Resolution 1024x768 or higher
- 64MBytes of RAM
- Windows-XP/Vista/7. Contact Softlog Systems for operation with Win-95/98/NT/2000
- At least 50MBytes of hard disk space
- CD-ROM drive
- Free RS-232 or USB port

7 Installation

7.1 Preliminary Installation

7.1.1 Software Installation

To install the software supplied, follow the steps below:

- Insert ICP family CD in the CD-ROM drive. An opening screen appears
- Click "Install ICP for Windows" and follow the on-screen instructions

If the opening screen does not appear:
- Double-click on the "My Computer" icon
- Double-click the icon for your CD-ROM drive
- Double-click "IcpSetupWithDll.exe"

7.1.2 Preliminary Hardware Installation

- Connect the programmer to its power supply (not required for ICP2-Portable)
- Connect RS-232 or USB cable between PC and the programmer
- Install USB driver according to ***"ICP2 USB Driver Installation"*** manual
  NOTE: USB driver installation is not required for operation with RS-232 port

7.2 ICP2-GANG Setup

- Install ICP2-GANG according to ***"ICP2-GANG Quick Start"*** manual

7.3 ICP2-Portable Setup

- Install ICP2-Portable according to ***"ICP2-Portable Quick Start"*** manual

7.4 ICP2/ICP2(HC) Software Setup

7.4.1 Run "ICP_Win.exe" Program

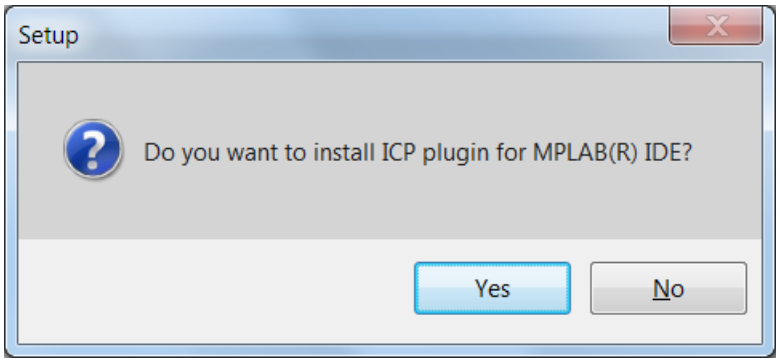
- Double-click "ICP_Win" icon
- Press "Yes" if message "Newer firmware is available. Upgrade now?" appears

7.4.2 Run "Programmer/Quick Start Wizard" and follow the Wizard

8 Plug-in to MPLAB® IDE

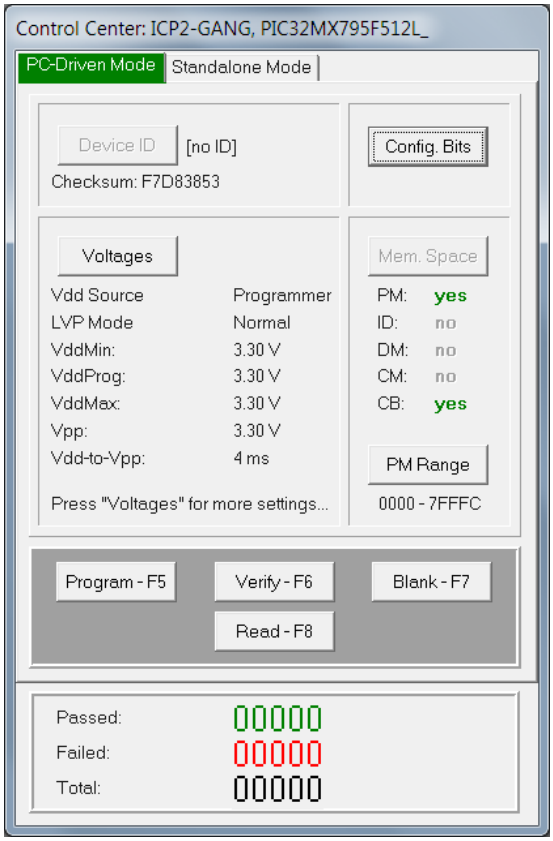
- ICP2-GANG and ICP2/ICP2(HC) programmers are integrated into Microchip MPLAB® IDE.

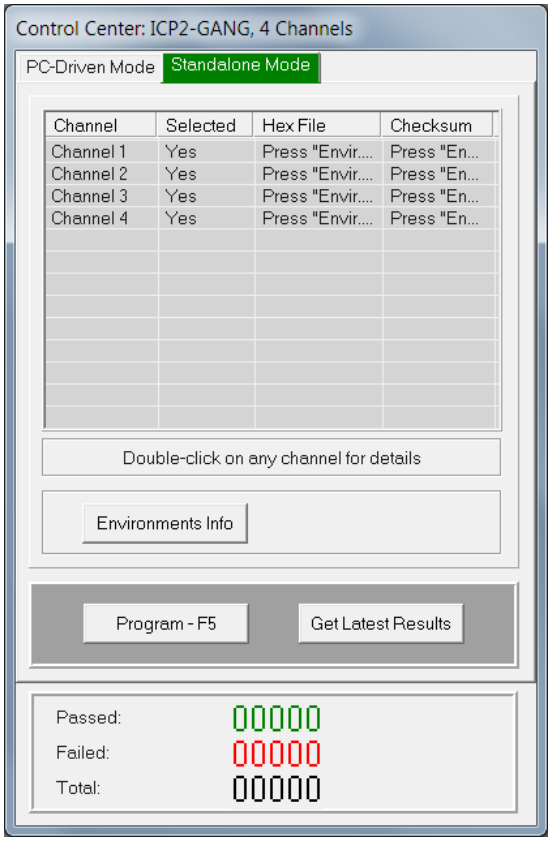
  Press "Yes" during software installation after the following message appears "Do you want to install ICP Plug-in for MPLAB?"



9 Control Center

Control Center has 2 operation modes: PC-driven and Standalone





9.1 Control Center in PC-Driven Mode

Control Center in PC-driven mode allows the following operations:

- Edit device ID
- Edit configuration bits of the device
- Select memory space
- Set PM range
- Programming, Verification, Blank Check and Read

9.2 Control Center in Standalone Mode

Control Center in standalone mode allows the following operations:

- Get environment information for all channels (button Environment Info)
- View environment details of selected channel (double-click on selected channel)
- Programming
- Get latest results

10 Menu Commands

10.1 File Menu (Alt-F)

Open (Import)...	Open a HEX file from disk and load it into buffer memory area
Save	Save the currently loaded file
Save As (Export)...	Save the buffer to a HEX file on disk

Save Configuration	Save all current settings
Exit	Exit the software

10.2 Edit Menu (Alt-E)

Edit/Fill Program Memory	Fill an area of the Program Memory with a specified value
Edit/Fill Data Memory	Fill an area of the Data Memory (EEPROM) with a specified value
Read-only Editors	Enable/disable edit of Program and Data Memory buffers

10.3 Environment (Alt-P)

Save Environment As…	Save current setup and buffers in environment format (*.pj2)
Transfer Environment to Programmer…	Transfer Environment (*.pj2) to programmer
Environment Wizard…	

10.4 Serialization Menu (Alt-S)

Disable	Disable serialization
Load File	Load serialization file
Create File	Create serialization file

10.5 Device Menu (Alt-D)

Select a type of device to be programmed

10.6 Programmer Menu (Alt-G)

Select Programmer	Select programmer (ICP2/ICP2(HC) or ICP2-GANG)
GANG Configuration	Select active GANG channels (64 max)
Assign Address to GANG Box	Assign address to currently connected programmer (1-16). See ***"ICP2-GANG Quick Start"*** for details
Quick Start Wizard	

10.7 Run Menu (Alt-R)

Program	PC-driven mode: program data in the buffer(s) into the device Standalone mode: activate standalone programming
Verify	Verify the data in the device against the data in the buffer(s)
Blank Check	Check the data in the device for the blank state
Read	Read the device and store the data in the buffers
Program Only	Open a window for repeated programming

10.8 Communication Menu (Alt-C)

RS-232/USB/Bluetooth COM	Select the desired COM port
Connect	Connect to the programmer

10.9 Options Menu (Alt-O)

Voltage	Set desired voltages
Clock/Data/MCLR(Advanced)	Set desired Clock/Data/MCLR parameters
Preferences	Select options for programming
Firmware Upgrade	Execute firmware upgrade
Activation of Options	Execute activation of optional components: - DLL/Command Line Support (D) - dsPIC®/PIC24 Support (P) - Keeloq® Support (K) - Secure Programming Support (S) - PIC32 Support (X) Note: **Contact Softlog Systems for activation details**

10.10 Help Menu (Alt-H)

Read me	Display "Readme_w.txt" file
About	Connect with the programmer and display software and firmware versions

11 Shortcuts

Save	Ctrl-S
Open...	Ctrl-O
Program	F5
Verify	F6
Blank Check	F7
Read	F8
Programming Only	F9
Menu	F10
Close Window	Ctrl-F4
Exit	Alt-F4

12 Preparing Environment and Transferring Environment to Programmer

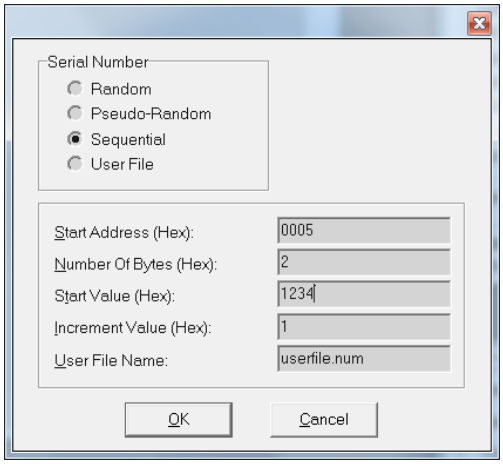
- Run "Environment/Environment Wizard" and follow the Wizard
- Select programmer and press "Next"
- ICP2-GANG only: select GANG channels and press "Next"
  ICP2-Portable only: select environment number and press "Next"
- Select Device
  From the "Device" list select a device to be programmed and press "Next"
- Set Voltages and press "Next"
- Load (open) a HEX file.
  NOTE: The programmer software is able to read ID information, data memory (EEPROM) contents and configuration bits from the HEX file
- Save Environment
  - Press on "…" button
  - Type in environment name, 16 characters max
  - Press "Save"
  - Press "Next"
- Transfer Environment to Programmer
  - Press on "Transfer Environment" button, select your environment and press "Open"
  - Wait until environment is transferred to all channels
  - Press "Next"
- Switch to Standalone Mode
  - Press on "Standalone Mode" button
  - Press "Finish"
- Your system is ready for standalone programming

13 Serialization

13.1 Create Serialization File

- Select "Serialization/Create File" to generate a serialization file

- Enter the following data:
  - Serial Number (serialization scheme): random, pseudo-random, sequential and user file
  - Start Address. The address should be valid for the device
  - Number of Words. Enter the number of words (1 to 8) for your serial number.
  - Start Value. Enter the start value (1 to 16 hex digits). If the start value is greater than the maximum value for the number of words selected the most significant digits will be truncated. The start value must differ from zero for pseudo-random scheme.
  - Increment Value. Valid for the sequential scheme only
  - User File Name. Valid for "user file" scheme only



- Press OK to save a serialization file

NOTES:
- A currently selected serialization file will be updated after any successful programming for single-channel programming and after any programming attempt for ICP2-GANG
- The "retlw" opcode will be automatically generated for a selected type of devices, i.e.:
  - 08(Hex) for low-end microcontrollers (12C5xx, etc)
  - 34(Hex) for mid-range microcontrollers (16C/Fxxx)
  - b6(Hex) for high-end microcontrollers (17C7xx)
  - 0c(Hex) for enhanced microcontrollers (18Fxxx)
  - 054(Hex) for 16-bit devices (pattern: 0000_0101_0100_kkkk_kkkk_dddd)
  - no retlw is generated for PIC32

13.2 Serialization File Example 1

SerializationScheme = 2 (0-Random, 1-Pseudo-Random, 2-Sequential, 3-User File)
StartAddress = 0005 (Hex)
NumberOfWords = 2 (Hex)
CurrentValue = 0000000000001234 (Hex)
IncrementValue = 1 (Hex)
UserFile = userfile.num

The following program memory locations will be updated as follows:

- PIC16xxx
  0005: 3434
  0006: 3412

- PIC12C5xx
  0005: 0834
  0006: 0812

13.3 Serialization File Example 2 (User File Scheme)

SerializationScheme = 3 (0-Random, 1-Pseudo-Random, 2-Sequential, 3-User File)
StartAddress = 0005 (Hex)
NumberOfWords = 2 (Hex)
CurrentValue = 0000000000001234 (Hex)
IncrementValue = 1 (Hex)
UserFile = File1.num

User file should contain serial numbers in HEX radix, for example:
1111
2222
3333
4444
5FC1

The user file will be updated by placing semicolon (;) at very beginning of the string, for example:
; 1111
; 2222
3333
4444
5FC1

If your numbers start from very beginning of the string the 1-st digit will be replaced by semicolon:
;111
;222
3333
4444
5FC1

13.4 Enable Serialization

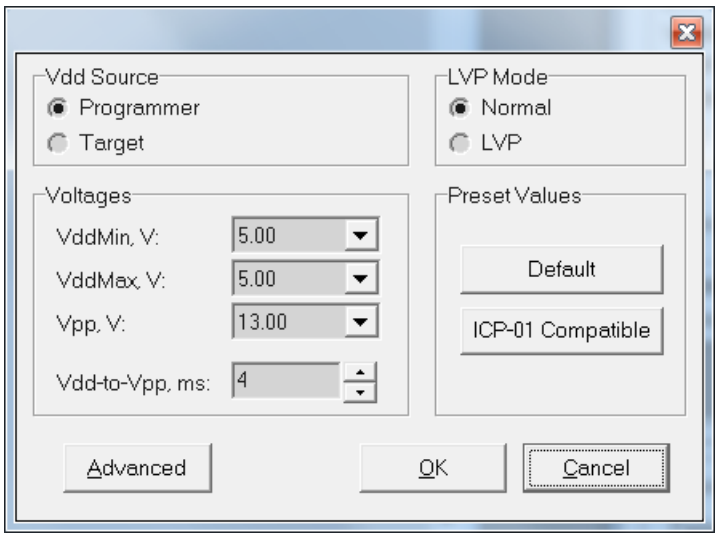
Select "Serialization/Load File" to activate serialization

13.5 Disable Serialization

The serialization will be disabled in the following cases:
- "File/Open..." command is executed
- "Serialization/Disable" command is executed
- "Edit/Read-only Editors" is set to edit mode
- "Run/Read" command is executed
- a new device is selected
- user's serialization file is empty
- Control Center switches between PC-driven and standalone modes

14 Voltages

14.1 Menu: Options → Voltage



14.2 Vdd Source and LVP Mode

The programmer executes operations at the following Vdd voltages

###	***Vdd Source***	***LVP Mode***	***Vdd during Programming***	***Vdd during Verify***	***Vdd during Blank Check***	***Vdd during Read***
1.	Programmer	Normal	Database	VddMin, VddMax ***(Note 2)***	VddMin	Database
2.	Programmer	LVP	VddMax ***(Note 1)***	VddMax	VddMax	VddMax
3.	Target	Normal	Target	Target	Target	Target

Notes:
1) Use LVP mode if you want to change default programming voltage
2) Set VddMin=VddMax to disable the 2-nd verification pass

14.3 Vpp Voltage

The Vpp voltage is the same for all the operations

14.4 Vdd-to-Vpp Delay

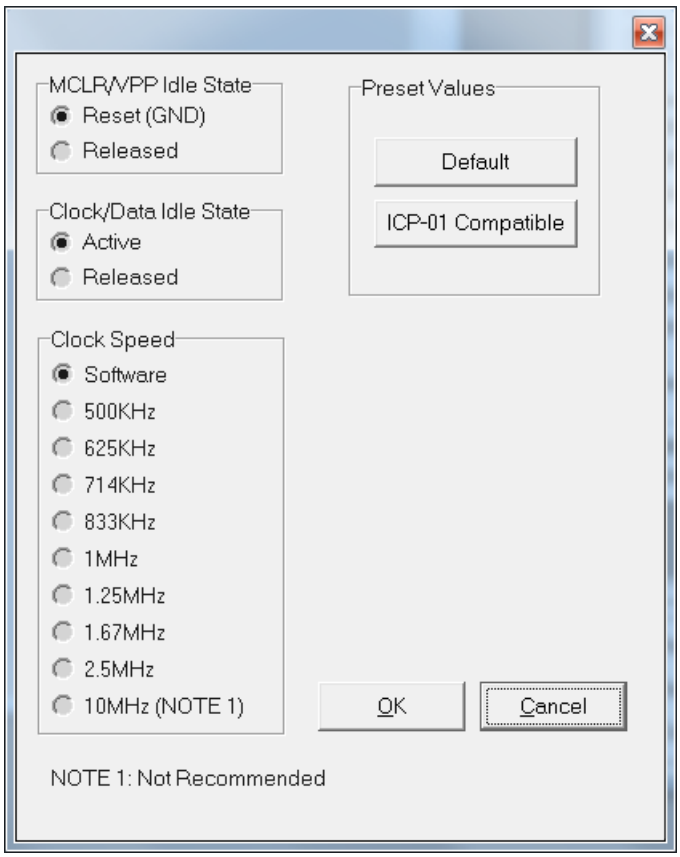
Delay between Vdd and Vpp can be in range 0.1...250ms. It is recommended to use default delay of 4ms to correctly enter the programming mode. Longer delays may be useful if the Vdd line has high capacitance (more than 200uF) which causes the Vdd to rise slowly

14.5 ICP-01 Compatibility

Press on "ICP-01 compatible" button forces the following settings:
- Vdd Source: Programmer
- LVP Mode: Normal
- Voltages: Database values

15 Clock, Data and MCLR/VPP

15.1 Menu: Options → Clock/Data/MCLR(Advanced)



15.2 MCLR/VPP Idle State

Reset (GND): Programmer permanently keeps MCLR in reset state (GND) when no operation
Released: Programmer releases MCLR with weak pull-down of about 160KΩ

15.3 Clock/Data Idle State

Active: Programmer configures data/clock pins as outputs when no operation
Released: Programmer releases data/clock with weak pull-downs of about 300KΩ

15.4 Clock Speed

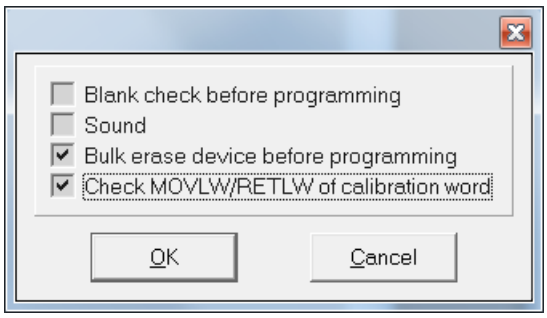
Clock speed can be selected for enhanced microcontrollers (PIC18F) and 16-bit devices (PIC24, dsPIC30 and dsPIC33). It's recommended to use high clock speed (2.5MHz) for devices with memory size bigger than 32K and dsPICs. **NOTE:** 10MHz is not recommended

15.5 ICP-01 Compatibility

Press on "ICP-01 compatible" button forces the following settings:
- MCLR/VPP Idle State: Reset (GND)
- Clock/Data Idle State: Active
- Clock Speed: Software (100-500KHz, depends on device family)

16 Preferences

16.1 Menu: Options → Preferences



16.2 Blank check before programming [ ]

Enables/disables blank check operation before device programming. This option is not useful for flash devices

16.3 Bulk erase device before programming [x]

When the option is ON the device will be automatically erased by bulk erase mechanism

IMPORTANT:
- this option must be set to ON for proper operation with most of devices
- it's the only option to erase code protected device

16.4 Row erase device before programming [ ]

When the option is ON the device will be automatically erased by the row erase mechanism

IMPORTANT:
- row erase can't erase a code protected device
- available for dsPIC30 family only, may be useful for operation at low voltages

16.5 Exclude DM (EEPROM) from row erase [ ]

When the option is ON the DM (EEPROM) is excluded from row erase procedure

NOTE: available for dsPIC30 family only, may be useful to preserve EEPROM

16.6 Check MOVLW/RETLW of calibration word [ ]

When the option is ON an opcode of the calibration memory is tested during programming

NOTE: available for devices which have a calibration word with movlw/retlw opcode (PIC12F519, PIC12F675, etc.)

17 Configuration File

The ICP setup is saved in a configuration file named "icp01.cfg".

IMPORTANT: the program reads a configuration file that is located in a directory which specified in "Start in" property. This approach allows creation of unlimited configurations on the same PC

Normally, a configuration file should **not** be modified by a text editor.

18 Command Line Parameters (GUI)

Some parameters can be loaded from the command line:

<Hex file> - hex file to be loaded

/c<Configuration file> - configuration file to be loaded, overwrites local "icp01.cfg"
/s<Serialization file> - serialization file to be loaded
/p - production mode (one-touch operation)

Examples:

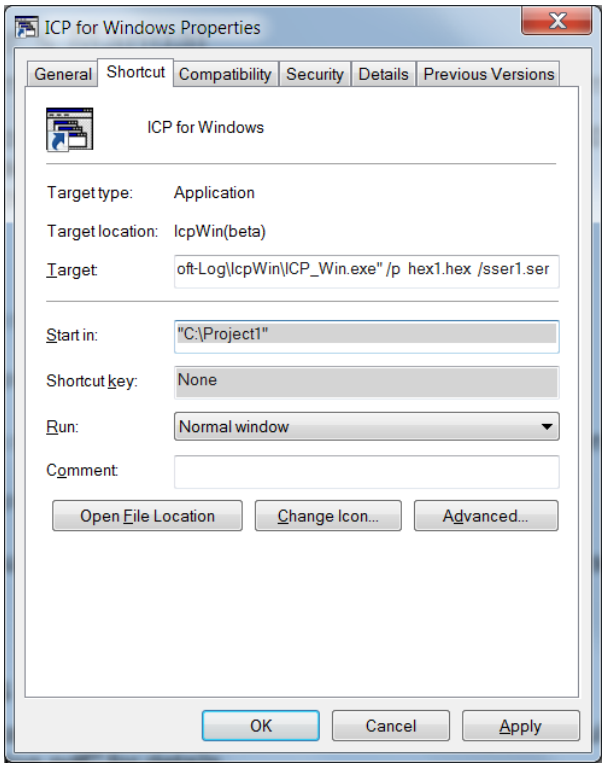
- Start in the production mode and load file "hex1.hex":

  <path to ICP_Win.exe> /p hex1.hex

- Start in the production mode and load hex file "hex1.hex" and serialization file "ser1.ser":

  <path to ICP_Win.exe> /p hex1.hex /sser1.ser

  "Start in" property should specify a directory where "hex1.hex" and "ser1.ser" are located



19 DLL Functions

ICP family programmers can be run from the user's application using powerful set of DLL functions. See document ***"DLL Description.pdf"*** for details

20 Command Line Interface (non-GUI)

ICP family programmers can be run from the user's application using full-featured command line interface. See document ***"ICP Command Line.pdf"*** for details

21 Secure Programming

Your hex files contain business-critical intellectual property that could be compromised during the contract manufacturing process. Utilizing patent pending technology, our Secure Programming feature provides several layers of protection that dramatically reduce the risk of unauthorized reconstruction of hex data. See document ***"Secure Programming Utility User's Manual.PDF"*** for more details

22 Manual Production Mode (One-Touch Operation)

The production mode is a powerful option for volume programming

The following steps should be done to correctly prepare the software for programming in the production mode:

- Create a subdirectory (C:\FILE_HEX)
- Copy your CFG, HEX and SERIALIZATION files to FILE_HEX subdirectory (for example: "hex1.hex" and "ser1.ser")
  NOTE: serialization file is optional
- Change ICP_Win shortcut property "Start in" to C:\FILE_HEX
- Change ICP_Win shortcut property "Target" to C:\...\ICP_Win.exe hex1.hex /sser1.ser /p
- Double-click ICP_Win icon for programming

The program will be terminated in the following cases:
- Communication error
- Hex file error
- Serialization file should be loaded (/s appears) but loading is failed

23 In-Circuit Programming

Standard in-circuit programming is done through 5 wires (VDD, GND, CLOCK, DATA and VPP)

23.1 Vdd

- Maximum Vdd current consumption by the application circuit :
  - ICP2/ICP2-GANG: 250mA
  - ICP2(HC): 1000mA
  - ICP2-Portable: 50mA

- Maximum Vdd capacitance: 1000-10000uF. For ICP2/ICP2-GANG, increase Vdd-to-Vpp delay by about 20ms for every 1000uF

NOTE: If your circuit has low current consumption (less than 10mA) in conjunction with high capacitance (more than 100uF), the load resistor (100-510 Ohm) must be connected between Vdd and GND pins of the programmer for faster discharge of Vdd capacitor

23.2 Vpp

Vpp recommended load (ICP2/ICP2GANG/ICP2-Portable): > 1KOhm, < 33nF
Vpp recommended load (ICP2(HC)): > 100 Ohm, <100nF

23.3 CLOCK and DATA

CLOCK and DATA recommended load(ICP2/ICP2GANG/ICP2-Portable): > 3.3KOhm, < 33pF
CLOCK and DATA recommended load(ICP2(HC)): > 50 Ohm, < TBD nF

23.4 Delay between Vdd and Vpp

This delay should be as short as possible (4ms is recommended)

NOTE: for more details contact Softlog Systems to obtain ***"ICP2-GANG Specification"***, ***"ICP2 Specification", "ICP2(HC) Specification" and "ICP2-Portable Specification"***

24 Appendix A: Power Supply

The ICP system (excluding ICP2-Portable) is shipped with its own power supply. If the user wishes to connect his/her own power, make sure the following specifications are met:

Programmer	*Output Voltage*	*Output Current*	*Center Terminal, 2.1mm*
ICP2-GANG	12VDC	1.5A	"+"
ICP2	12VDC	0.5A	"-" or "+"
ICP2(HC)	12VDC	1.5A	"-" or "+"
ICP2-Portable	9-15VDC	0.5A	"-" or "+"

25 Technical Assistance

You may contact Softlog Systems for technical assistance by calling, sending a fax or e-mail. To help us give you quick and accurate assistance, please provide the following information:

- Software version number, firmware version number and product serial number (if available). This information is displayed at the program start
- Detailed description of the problem you are experiencing
- Error messages (if any)
- Microcontroller part number (if device-related)
- Send us your "icp01.cfg" file

26 Warranty

Softlog Systems (2006) Ltd. warrants this product against defects in materials and workmanship for a period of 1 (one) year. This warranty will not cover programmers that, in the opinion of Softlog Systems, have been damaged due to abuse, improper use, disassembly, replacement of parts or attempted repair by anyone other than an authorized Softlog Systems service technician.

This product must be returned to the supplier for warranty service within the stated period. The buyer shall pay all shipping costs and other charges or assessments for the product by the supplier.

Softlog Systems shall not be liable for any indirect, incidental, or consequential damages, regardless of whether liability is based upon breach of warranty, negligence, strict liability in tort, or any other theory, Softlog Systems will never be liable in an amount greater than the purchase price of the products described by this express warranty. No agent, distributor, salesperson, or wholesale or retail dealer has the authority to bind Softlog Systems to any other affirmation, representation, or warranty concerning these goods.

27 Contact

Softlog Systems (2006) Ltd.

Rojanski 18 St. Rishon-Letzion 75070 Israel

Phone: 972-3-9515359
Fax: 972-3-9527520
Web: www.softlog.com
E-mail: sales@softlog.com, support@softlog.com

28 Copyright Notice

Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331