Softlog Systems (2006) Ltd.

ICP Secure Programming Utility

User's Manual

IMPORTANT NOTE:

- Starting from year 2019 Softlog Systems manufactures ICP2(**G3**), ICP2-GANG(**G3**), ICP2-COMBO(**G3**) and ICP2-Portable(**G3**) programmers instead of legacy ICP2, ICP2-GANG, ICP2-COMBO and ICP2-Portable
- Due to nearly full compatibility all of them are referred below as ICP2, ICP2-GANG, ICP2-COMBO and ICP2-Portable respectively. If difference is applied then they are referred as "G3 products" and "non-G3 products"
- ICP2-ISO(G3) and ICP2-LAN(G3) products are also referred as ICP2-ISO and ICP2-LAN

1   Host Computer Requirements

- IBM PC compatible
- Windows-7/8/10/11. Contact Softlog Systems for operation with Win-95/98/NT/2000/XP/Vista/
- Display resolution: 1600x900 or higher
- Free USB port (all programmers excluding ICP2-LAN), free RS-232 port (all programmers excluding ICP2-Portable) or free LAN connection (ICP2-COMBO or ICP2-LAN)

2   Installation

2.1   Software Installation

2.1.1   Software
- Visit our site and get the latest software: https://softlog.com/downloads/

2.1.2   ICP Family Standard Software
The manual assumes that the ICP Family Windows software "ICP for Windows" is installed

2.1.3   Secure Programming Utility Installation
- Run "IcpSecureProgADMIN_setup_XXX.exe"

2.2   Hardware Installation

2.2.1   Activated Options
The following options in ICP programmer should be activated to allow operation with the secure programming software:

- DLL/Command Line Activation (D)
- Security Activation (S)

    Example: ICP2-DS, ICP2GANG(G3)-DS

2.2.2   Follow ICP Family User's Manual for hardware installation

3   Glossary

Definition	File Extension	Description
Programmer Unit	-	ICP2, ICP2-GANG/ICP2-COMBO, ICP2-Portable, ICP2-ISO or ICP2-LAN programmer
ADMIN	-	The person keeping the vital information: - Password - HEX file / environment - Secure buffer
USER	-	The end user with limited access at a remote location
Security ID file	*.SID	File created and maintained by ADMIN containing: Security ID, Password, Batch Number, Secure buffer (optional), Secure buffer properties (optional)
Security ID	-	ICP programmer friendly name, 16 characters max: not protected, used for convenient visual identification
Password	-	Password
Batch Number	-	Batch to be programmed. Used to avoid multiple update of the non-volatile counter by the same secure environment file
Counter	-	Non-volatile down-count counter of programmed units
Secure Buffer	-	Buffer inside ICP that contains vital data which will override PM (flash) or DM (EEPROM)
Standard Environment	*.PJ2	Standard ICP2 environment file containing HEX file and device (MCU) properties (device database, voltages, etc.)
Secure Environment	*.SEN	Encrypted environment containing a standard ICP environment, properties of the Security ID file (security ID name, password, batch number) and a value for non-volatile counter. Prepared by ADMIN to be sent to USER to update the environment and/or counter NOTE: secure environment should be deleted to operate a standard one - see chapter 12

4   Files and Directories

4.1   Application Directory (with EXE file)

- IcpSec.exe   - secure programming utility software EXE file
- IcpSec.def   - file defining ADMIN or USER mode
- IcpDll.dll   - ICP family DLL
- Products.ini   - product(s) information
- IcpSec.ini   - application INI file
- Last_num.txt   - last used product (created automatically)

4.2   Files in a Product Directory (Example for product named "Prod1")

- Prod1.cfg   - ICP configuration file
- Prod1.opt   - secure programming utility option file
- Prod1_xxx.sen   - secure environment files
- Prod1.sum   - summary file of the **latest** secure environment(s) to be sent to ICP programmer
- Prod1.log   - log file for Prod1
- Prod1.ser   - ICP serialization file (optional)
- *.num   - ICP serialization file with numbers (optional)

5   Menu Commands

ADMIN Menu (Alt-A)

Product Manager	Create a new product to be programmed
Create Security ID File	Create Security ID File
Send Security ID File To Programmer	Send Security ID File to ICP programmer
Create Secure Environment(s)	Create Secure Environment(s)

Product Menu (Alt-D)

Select Product	Select product to be operated
Close Product	Close active product

Communication/Environment (Alt-C)

Select COM	Select and save desired COM port
Transfer Secure Environment to Programmer	Transfer Secure Environment(s) to programmer
Direct Secure Environment File (SEN) Transfer	Transfer Secure Environment directly (no product selected)

Program Menu (Alt-P)

Program	Open dialog to execute programming

Help Menu (Alt-H)

User's Manual	Open this User's Manual
About	Display software versions

6   High-Level Flowchart
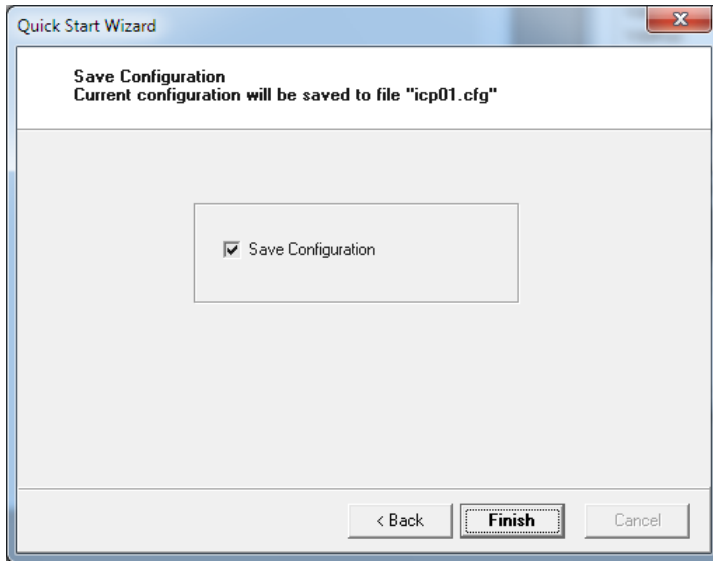
7 Quick Start (ADMIN: One-Time Operation)

7.1 ADMIN – Preparations: Prepare ICP Configuration File

- Run standard ICP family software "**ICP for Windows**"

- Run "Programmer → Quick Start Wizard" and follow on-screen instructions. Press "Finish" or "Next" when "Save Configuration" screen appears and exit the Wizard

Configuration file "icp01.cfg" is saved in the default directory: C:\Softlog\IcpWin

- Exit "ICP for Windows"

### 7.2 ADMIN – Step 1: Create New Product

- Create a directory for all security products: "**C:\Softlog\SecurityProducts**"

  NOTE: Softlog Systems strongly recommends to use this directory path/name for future compatibility with secure programming Wizard (under development)

- Run "ICP Secure Programming Utility (ADMIN)"

- Select "ADMIN/Product Manager"

- Enter new product name, for example **"Prod1"**

- Select product directory "C:\Softlog\SecurityProducts"

- Select ICP configuration file "C:\Softlog\IcpWin\Icp01.cfg"

- NOTE: since the latest ICP software/firmware supports fully standalone serialization we don't recommend to enter ICP serialization and number files here

- Press OK. The following files have been created:
  C:\SecurityProducts\Prod1\Prod1.cfg
 C:\SecurityProducts\Prod1\Prod1.opt
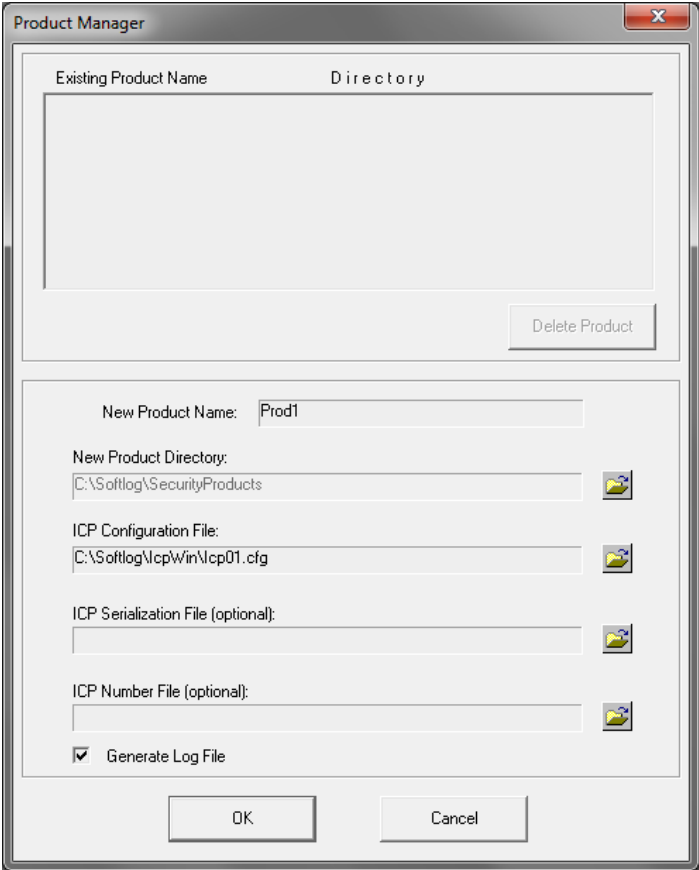
7.3 ADMIN – Step 2: Create Security ID File

- Create a separate directory, for example "C:\IcpAdminFiles"
  IMPORTANT: Keep Security ID file(s) in a safe place **unreachable** to the USER

- Run "ADMIN → Create Security ID File"
- Enter Security ID name, for example "**ICP-SEC1**"
- Enter and repeat password (6-16 characters)
- Enter batch number, for example 1
- Leave "Use Secure Buffer" unchecked. NOTE: see chapter 10 for using Secure Buffer
- Select filename to be saved, for example "C:\IcpAdminFiles\Icp-Sec1.sid"

NOTE: Base Security ID file may be used (if already exists). If it is, then select and press "Preload"

- Press OK

NOTE: Base Security ID file may be used (if already exists). If it is, then select and press "Preload"
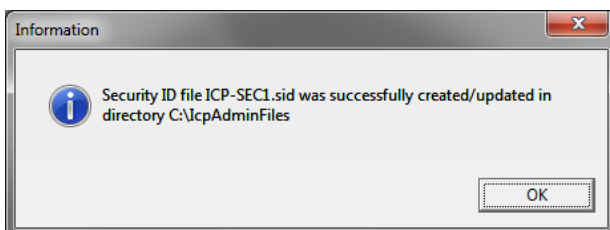
7.4   ADMIN – Step 3: Send Security ID File to Programmer

- Connect Programmer Unit to the PC
  NOTE: "ICP for Windows" should be kept closed
- Run "Communication/Environment → Select COM" and select the COM. Follow and confirm on-screen instructions
- Select "ADMIN → Send Security ID File to Programmer"
- Select Security ID File, for example "C:\IcpAdminFiles\ICP-SEC1.sid"
- Press "Apply" to validate that Security ID name is OK
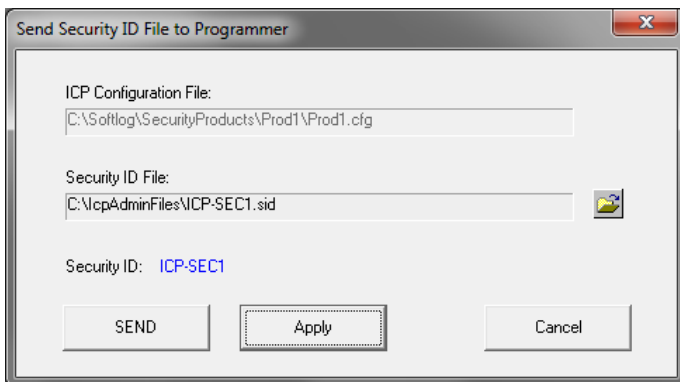
- Press "SEND". The Security ID File has been transferred and saved in programmer non-volatile memory
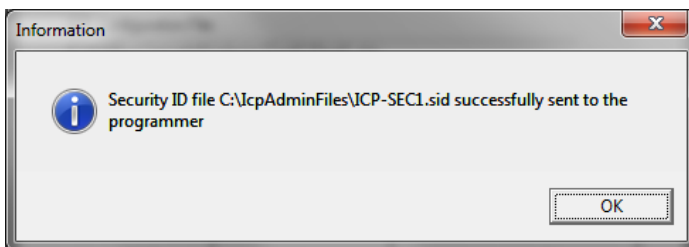
7.5   ADMIN (Optional): Create Secure Environment and Transfer to Programmer

See chapter 8 (not required at this stage but may be done)

7.6   ADMIN – Step 4: Deliver the Programmer Unit to the USER

8 ADMIN: Periodical Updates

8.1 Admin – Preparations: Create Standard ICP Environment

- Run standard ICP family software **"ICP for Windows"**
- Run "Environment → Environment Wizard" and follow on-screen instructions:
  - Load your HEX file
  - Save environment
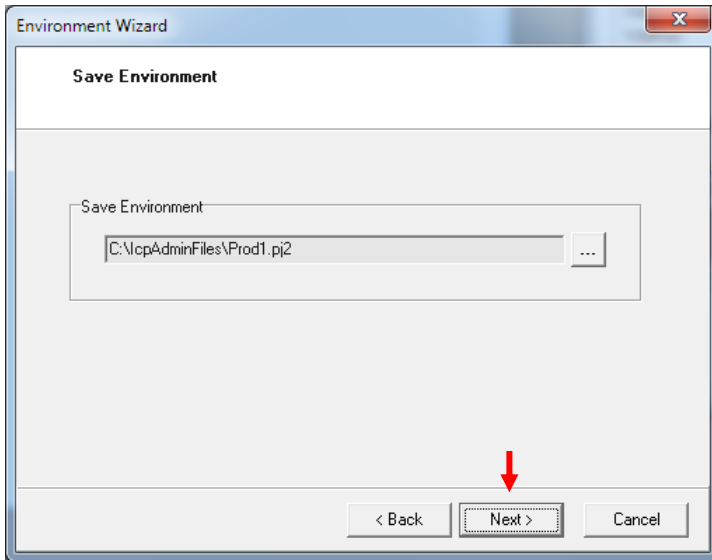
- Press Next

- Press Cancel to exit the Wizard
- Exit "ICP for Windows"

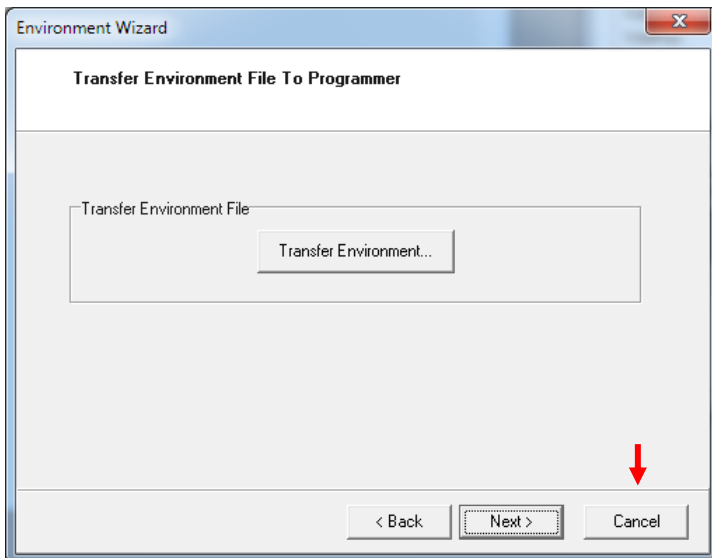## 8.2 ADMIN: Create Secure Environment

- Run "ICP Secure Programming Utility (ADMIN)"
- Run "Product → Select Product", select "Prod1" and press Select
- Run "ADMIN → Create Secure Environment"
- Select Security ID file "C:\IcpAdminFiles\Icp-Sec1.sid". **Don't** press "Apply"
- Enter total number of devices to be programmed, for example 1000
  NOTE: the following options are also available:
  - "Don't update": counter value inside the programmer unit will be kept
  - "Unlimited"
- Mark "Environment" check box
  NOTE: "Environment" check box can be unmarked if only counter should be updated
- Press "Apply"
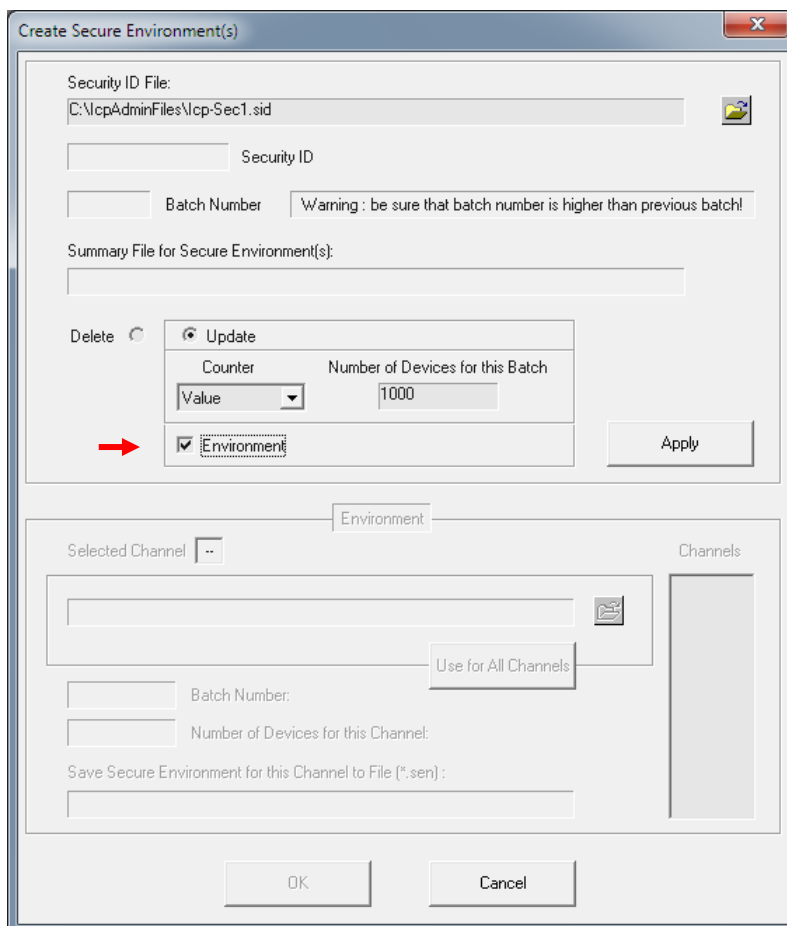
- Open file "C:\IcpAdminFiles\Prod1.pj2"
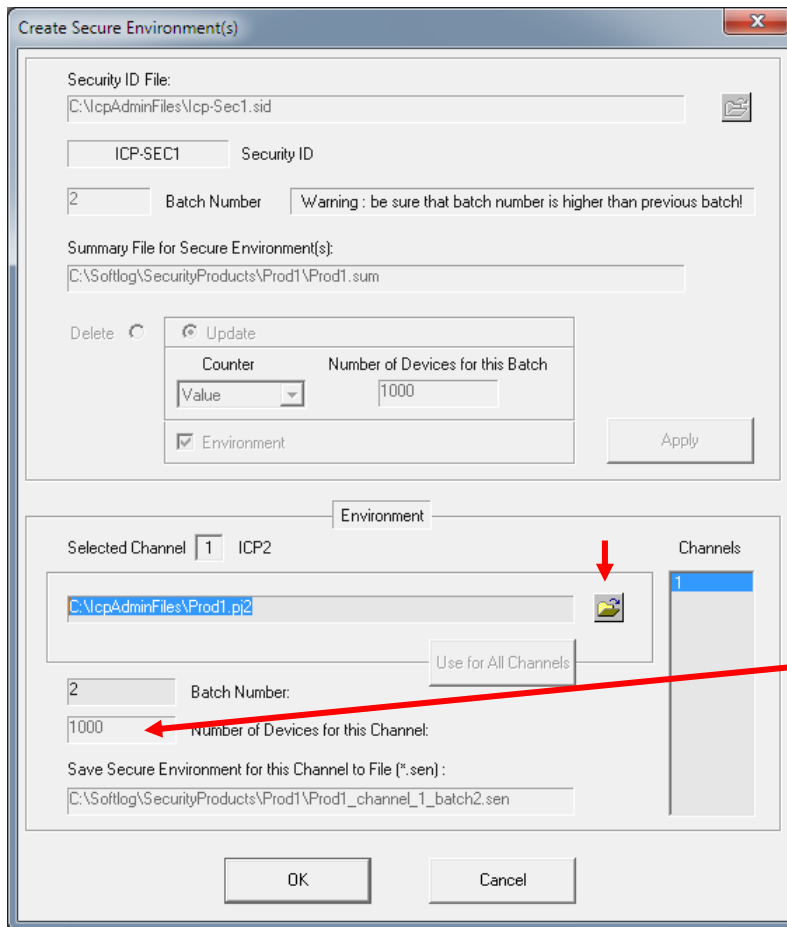
Starting from version 1.3.4 number of devices per channel can be updated after "Apply" button is pressed:

- **Don't** press "Use for all channels" if you want secure environments with different PJ2 file and/or secure counter
- Enter number 16777215 for "Unlimited" (equivalent to 0xFFFFFF)

- Press OK to confirm on-screen messages
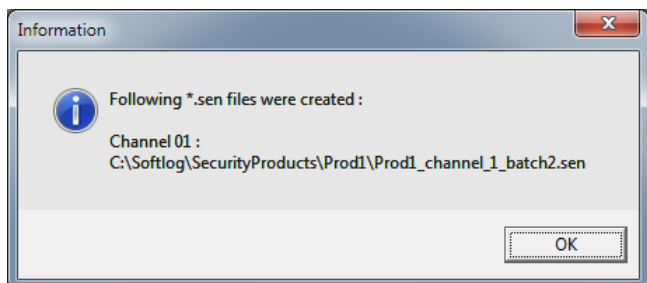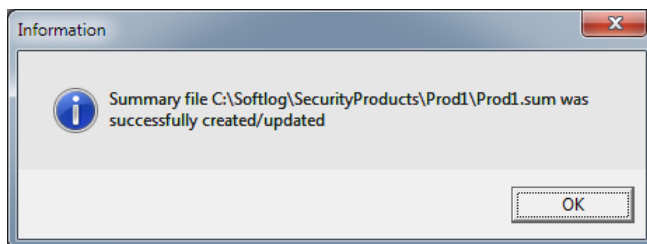
NOTE 1: the following files were created in directory "C:\Softlog\SecurityProducts\Prod1":
- Prod1.sum
- Prod1_channel_1_batch2.sen

NOTE 2: batch number in Security ID file was automatically incremented

8.3   ADMIN: Send Setup and Secure Environment Files to USER

8.3.1   The 1st time
- The following files should be sent to USER:

"IcpSecureProg**USER**setup_XXX.exe"

C:\Softlog\IcpSecurity(ADMIN)**Products.ini**
C:\Softlog\IcpSecurity(ADMIN)**IcpSec.ini**

C:\Softlog\SecurityProducts\Prod1**<All files>**

8.3.2   Updates Only
- The following files should be sent to USER:

C:\Softlog\SecurityProducts\Prod1**Prod1.sum**
C:\Softlog\SecurityProducts\Prod1**<all or last>.sen**

9   USER

9.1   USER: Software installation

- Double-click "IcpSecureProg**USER**setup_XXX.exe" and follow the on-screen instructions

- Copy files received from ADMIN as follows:
  C:\Softlog\IcpSecurity(USER)**Products.ini**
  C:\Softlog\IcpSecurity(USER)**IcpSec.ini**

 C:\Softlog\SecurityProducts\Prod1**<All files>**

9.2   USER: Hardware installation

- Connect the supplied programmer unit to the PC
- Follow "USB Driver Installation" or "USB Driver (FTDI) Installation" manual to install USB driver. This operation is not required for RS-232 (COM) connection
- Run "ICP Secure Programming Utility (USER)"
- Select "Prod1" (as prompted or "Product → Select Product")
- Exit "Program" dialog (if appears)
- Run "Communication/Environment → Select COM" and select the COM. Follow and confirm on-screen instructions
- Exit "ICP Secure Programming Utility (USER)"

9.3   USER: Transfer Secure Environment to Programmer Unit

NOTE: This operation can be done by both ADMIN and USER
- Run "ICP Secure Programming Utility (USER)"
- Select "Prod1" (as prompted or "Product → Select Product")
- Exit "Program" dialog (if appears)
- Run "Communication/Environment → Transfer Secure Environment to Programmer"
- Select suggested "C:\SecurityProducts\Prod1\Prod1.sum" file
- Press "Preload"
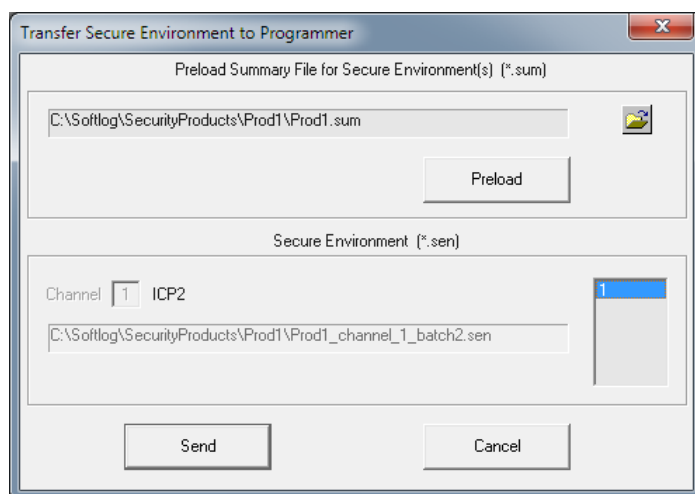
- Press "Send"

Programmer is ready for operation

- Exit "ICP Secure Programming Utility (USER)"

9.4   USER: Program Target Device
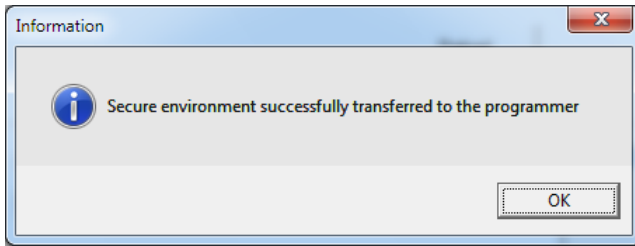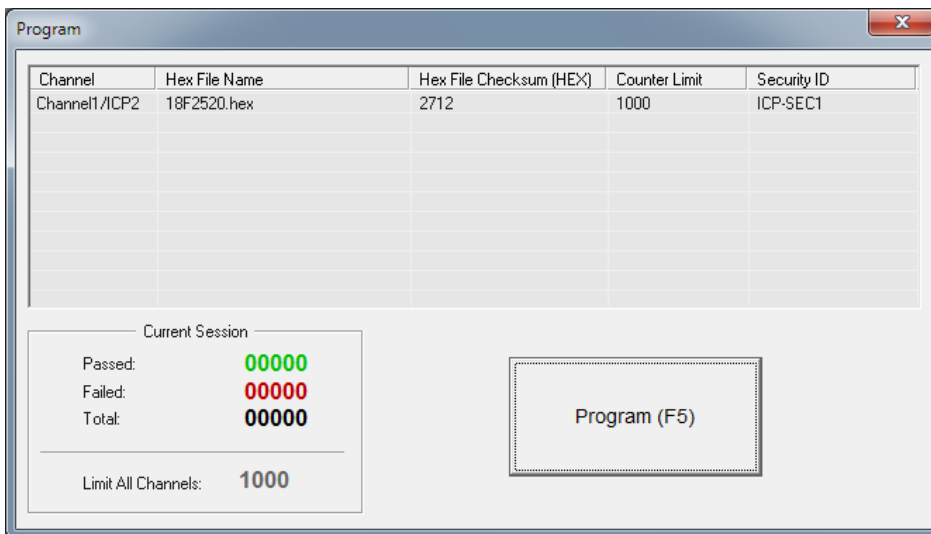
9.4.1   Programming with PC

NOTE: This operation can be done by both ADMIN and USER

- Run "ICP Secure Programming Utility (USER)"
- Select "Prod1" (as prompted or "Product → Select Product")
- Run "Program → Program" if "Program" dialog does not appear
- Connect the target device

- Press "Program(F5)"
- Repeat programming with new target devices
- Exit "ICP Secure Programming Utility (USER)"

9.4.2   Programming without PC
- The programmer is ready for standalone operation by a push-button "GO" to be connected between pins "GO" and "GND" of the programmer connector

10 Direct Secure Environment File (SEN) Transfer

Direct secure environment file (SEN) transfer allows transfer SEN file to a programmer w/o product mechanism. All settings are done in a single window
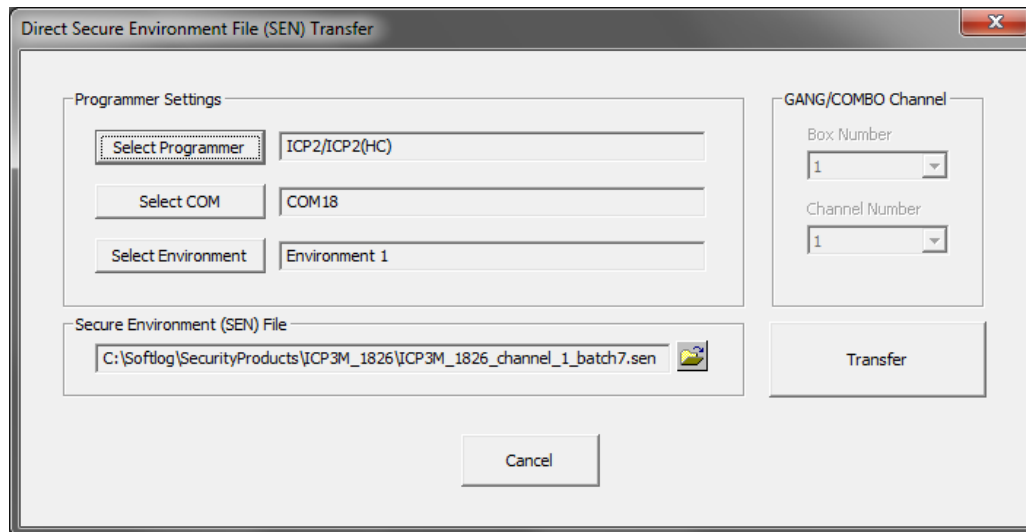
11 Appendix A: Secure Buffer and Scripts

Secure buffer provides additional protection for your IP. Contact Softlog Systems for more information

11.1 Limitations

11.1.1 Script 0 (standard): no limitations

11.1.2 Script 1 (optimized for secure buffer)

- Maximum 64-byte page size is supported
- Entire flash or EEPROM write page should be selected as a secure buffer – see datasheet and programming specification for your device or contact Softlog Systems

11.2 Example: Script 1, PIC18F2520

Task: use minimum secure buffer in flash starting from address 0x120

Solution: write buffer of PIC18F2520 is 32 bytes. It means that Secure Buffer size should be 32 (shown below) or 64 and start address in PIC should be multiple of 32 (0x20)

- Run "ADMIN → Create Security ID File" and follow paragraph 7.3

- Mark "Use Secure Buffer"

- Fill-in the first 32 bytes of the secure buffer with values taken from the original HEX files starting from address 0x120

- Select "Secure Buffer Length": 32

- Select "Secure Buffer Destination": Flash

- Select "Secure Buffer Start Address in MCU: 0x120 (in fact, byte offset)

- Select "Script": 1 - optimized for secure buffer

- Save SID file and transfer to the programmer

- Programmer initialized with security ID file above will operate as follows:

  - Program flash excluding addresses 0x120-0x13E
  - Program EEPROM and User ID
  - Verify flash, EEPROM and User ID
  - Program and verify secure buffer (flash addresses 0x120-0x13E)
  - Program and verify configuration bits

12 Appendix B: Deleting Secure Environment from Programmer Unit

There are several ways to delete Secure Environment inside the programmer:

- ADMIN only: enter "ADMIN → Send Security ID File to Programmer" and send a *.SID file to the programmer

  NOTE for ICP2-Portable: only selected environment will be physically deleted, other environments will be open for standard environment operation

- ADMIN or USER: create new secure environment valid for a designated programmer unit with parameter "Delete" (by ADMIN, ADMIN → Create Secure Environment, see attached PDF) and transfer to the programmer
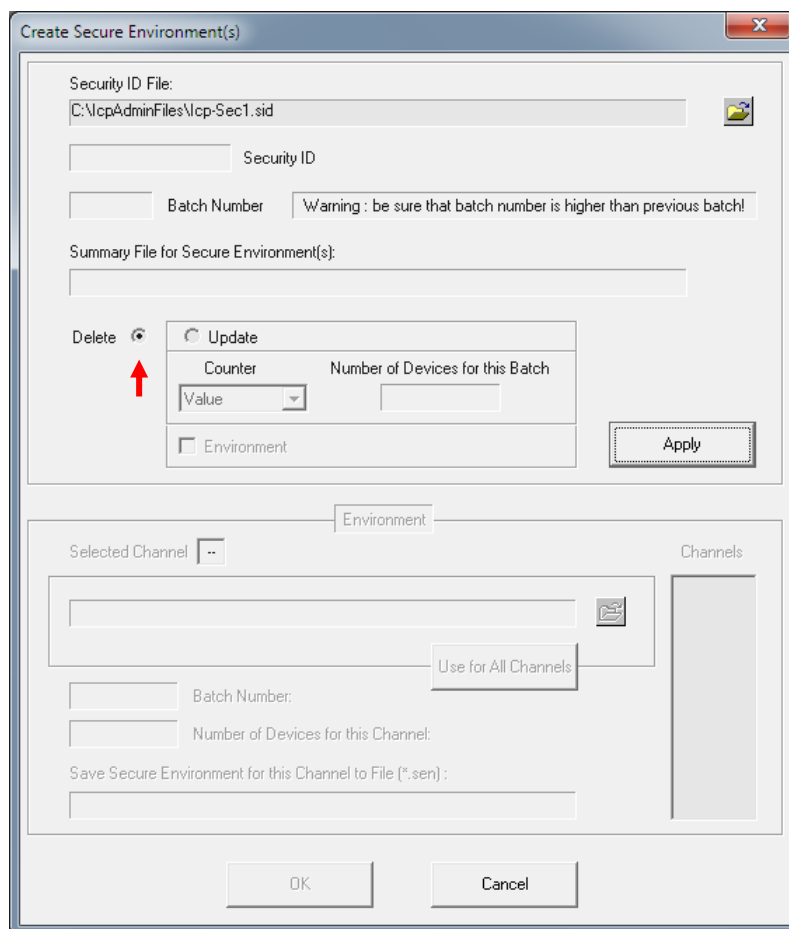
13 Appendix C: Viewing Environment inside Programmer Unit

- Run standard ICP family software "**ICP for Windows**"
- Switch "Control Center" to "Standalone Mode"
- Click "Step1: Get Environment Info"
- Double-click desired channel
- Review environment info
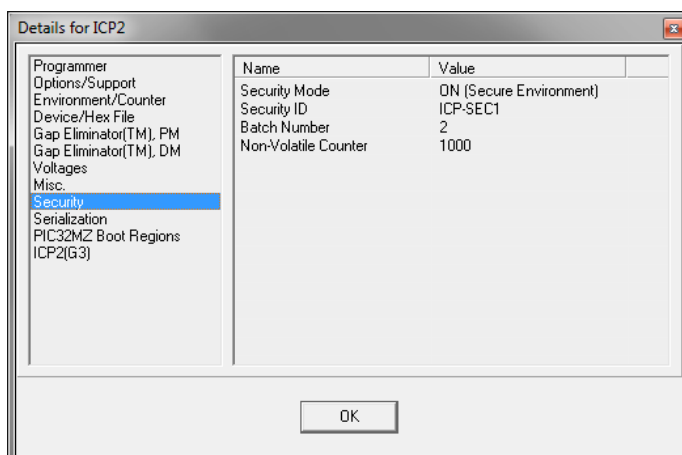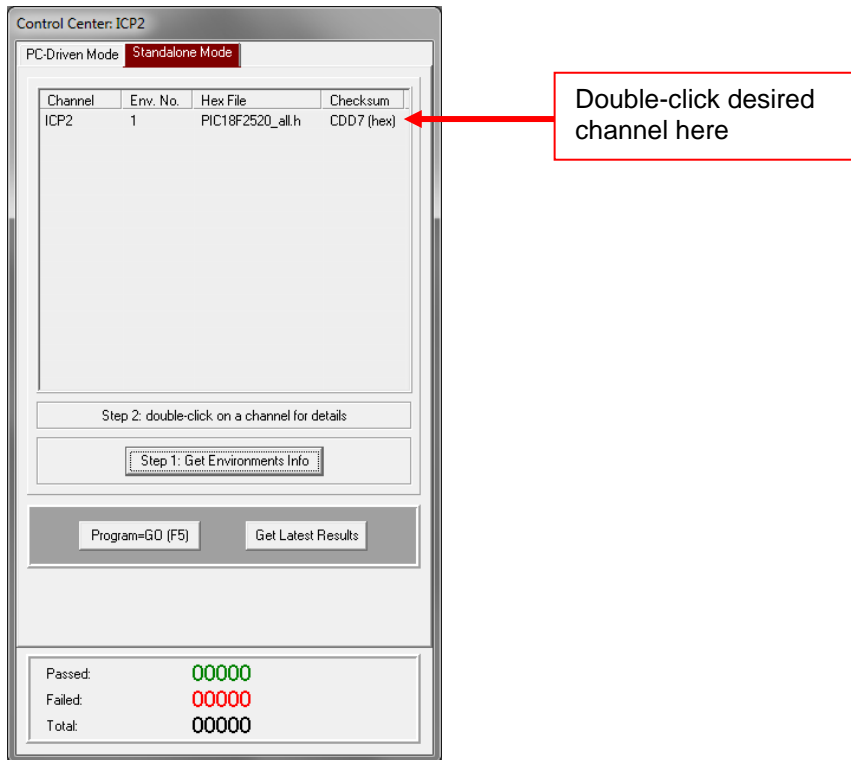
14 Appendix D: Non-Volatile Counter and Environment

Parameter	ICP2, ICP2-ISO, ICP2-LAN	ICP2-GANG	ICP2-COMBO	ICP2-Portable
Number of environments per channel	6	6	6	6
Counter type	Non-volatile, down count			
Endurance (counter defined as "unlimited")	Unlimited			
Data retention	40 years			
Individual counter per environment	No	No	No	Yes
Endurance, minimum (any value excluding "unlimited")	800,000	800,000 per channel	800,000 per channel	100,000 per environment
Endurance, typical (any value excluding "unlimited")	8,000,000	8,000,000 per channel	8,000,000 per channel	1,000,000 per environment
Maximum counter value for single environment (limited by software)	999,999	Total 999,999 for all channels	Total 999,999 for all channels	9,999

15 Appendix E: Study Case - Using and Disabling Batch Mechanism

Issue
- *There are 2 products to be programmed by ICP*
- *When we generate a new batch and it is set on the ICP, it works fine in production*
- *After that we change to different product and it also works as expected*
- *Now, if we get back to the first product, "incorrect batch" error message appears*

Solution
This is not an issue; secure programming works this way to prevent repeated use of the same SEN file with active non-volatile counter
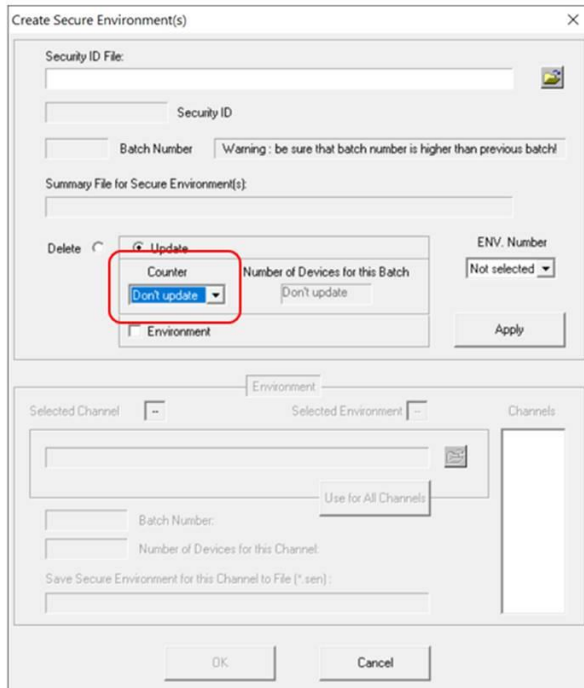
You can workaround the issue as follows:

Option 1: create and transfer environment again

Option 2: use 2 environment destinations and just switch between them (no new transfer is required)
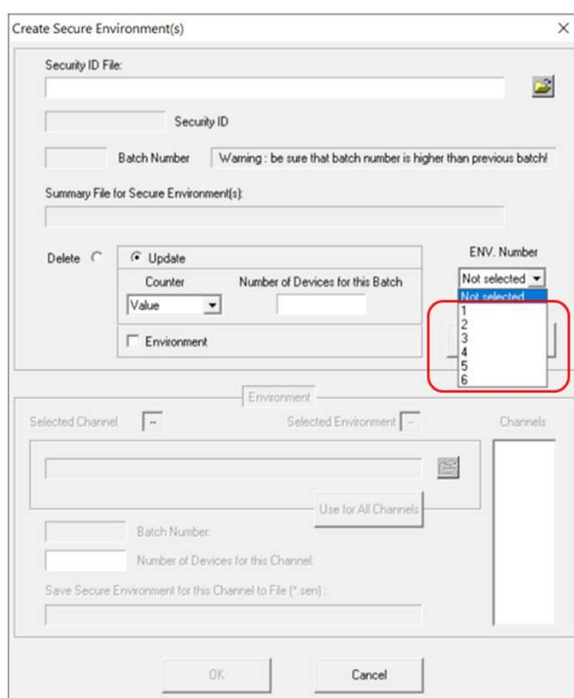
Option 3: don't use counter, it should be defined as "Don't update". In this case the batch control is disabled

16 Revision History

- Revision 2.1.1 (Feb-22):
  - added support for ICP2-ISO(G3) and ICP2-LAN(G3) programmers in single-channel and multi-channel mode
  - removed reference to ICP2(HC)
  - done support for multi-channel programmers with partly disabled channels
  - updated table "Non-Volatile Counter and Environment"
- Revision 1.3.6 (Jan-22):
  - allowed 6 environments for all programmers
  - firmware 33.12 (Oct-20) and higher: fixed counter limit issue for ICP2-Portable
    (new: counter is not affected if "Don't update, old: "Don't update" forced "Unlimited")
  - added paragraph "Study Case - Using and Disabling Batch Mechanism
- Revision 1.3.5 (Jan-20): minor document corrections, no software changes
- Revision 1.3.5 (Mar-19)
  - maximum batch number = 65,535 (old: 32,767)
  - added "Direct Secure Environment File (SEN) Transfer"
- Revision 1.3.4 (Jul-18):
  - number of COMs increased to 256
  - different counter value can be set – see 8.2
  - the program window can be resized
  - status bar is visible under Win-10
- Revision 1.3.1 (Apr-17): improved user interface, added environment selection for ICP2-COMBO
- Revision 1.2.5 (Jan-16): bug fix: "Select COM" does not crash on PCs with Bluetooth COMs
- Revision 1.2.4 (Aug-13): bug fix: "Select COM" does not crash for COM numbers > 63

17 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.

Softlog Systems emphasizes that Secure Programming software is intended to reduce a risk but can't completely prevent unauthorized reconstruction of your HEX file or/and unauthorized breach of limitation of devices to be programmed. In no event shall Softlog Systems be liable to you for any loss due to reconstruction of the HEX file or breaching limitation of the programmed devices

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.

18 Contact

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