
ICP Family Programmers

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	Connectors	4
1.1	“Power” Connector (Power Jack, Center Pin 2.1mm)	4
1.2	“USB” Connector	4
1.3	“LAN” Connector: Standard RJ-45	4
1.4	“RS-232 IN” Connector (Standard D-type 9 Female)	4
1.5	“RS-232 OUT” Connector (Standard D-type 9 Male)	4
1.6	“Control Interface” Connector (DIN-64 A, B Male)	5
1.7	“TARGET” Connector D-type 15 Female: all programmers excluding ICP2-COMBO	6
1.8	ICP2-COMBO only: “TARGET” Connector (DIN-48, A,B,C, male); 1, 2 or 3 Identical Connectors	7
1.9	“RS-232, CONTROL” Connector (Header-16 Male, ICP2-ISO: 2.54mm, ICP2-LAN: 2mm)	7
1.10	Typical Connection to “TARGET” Connector	8
2	PC-Driven and Standalone Modes	8
2.1	Modes	8
2.2	Standalone Programming	9
3	Chain Connection (ICP2-GANG, ICP2-COMBO, ICP2-ISO and ICP2-LAN)	9
4	PASS/FAIL LEDs and Outputs	9
5	Other LEDs (ICP2-Portable)	10
6	Standalone Operation without PC	10
6.1	Standalone Programming using GO/PASS/FAIL Interface	10
6.2	Standalone Programming using High-Level RS-232 Communication	10
7	Host Computer Requirements	10
8	Installation	10
8.1	Important Note	10
8.2	Preliminary Installation	11
8.2.1	Software Installation	11
8.2.2	Preliminary Hardware Installation	11
8.3	ICP2-GANG Setup	11
8.4	ICP2-COMBO Setup	11
8.5	ICP2-Portable Setup	11
8.6	ICP2 Software Setup	11
8.7	FTDI Driver Latency	11
9	Family-based Activation System	11
10	Checksum Calculation and Programming Buffers	12
11	Control Center	13
11.1	Control Center in PC-Driven Mode	13
11.2	Control Center in Standalone Mode	13
12	Menu Commands	14
12.1	File Menu (Alt-F)	14
12.2	Edit Menu (Alt-E)	14
12.3	Environment (Alt-N)	14
12.4	Serialization Menu (Alt-S)	14
12.5	Device Menu (Alt-D)	14

ICP Family User's Manual

12.6	Programmer Menu (Alt-P).....	14
12.7	Run Menu (Alt-R).....	15
12.8	Communication Menu (Alt-C)	15
12.9	Options Menu (Alt-O).....	15
12.10	Speed Optimization Menu (Alt-T)	15
12.11	Help Menu (Alt-H)	15
13	Shortcuts.....	15
14	Preparing and Transferring Environment to Programmer	16
14.1	Sub-Environment Mechanism.....	16
14.2	Prepare and Transfer Environment with Wizard.....	16
14.3	Prepare and Transfer Environment Manually.....	16
14.4	ICP2-GANG and ICP2-COMBO: Transfer Different Environments to Different Channels.....	17
14.4.1	Option 1: Multiple channel mode, single operation.....	17
14.4.2	Option 2: Single channel mode, multiple operations	17
15	Viewing Environment.....	18
16	Serialization	19
16.1	Create Serialization File.....	19
16.2	Serialization File Example 1	19
16.3	Serialization File Example 2 (User File Scheme)	20
16.4	Enable Serialization	20
16.5	Disable Serialization	20
16.6	Standalone Serialization	20
16.7	PC-Driven Serialization in Standalone Mode	21
17	Options → Voltages.....	21
17.1	Vdd Source and VddProg Mode	21
17.2	Vpp Voltage	21
17.3	Vdd-to-Vpp Delay	22
18	Options → Clock/Data/MCLR(Advanced)	22
18.1	MCLR/VPP Idle State	22
18.2	Clock/Data Idle State	22
18.3	Clock Speed	22
18.4	VddOff Delay	22
18.5	RESET Pulse after Operation.....	22
19	Options → Preferences	23
19.1	Blank check before programming [].....	23
19.2	Bulk erase device before programming [v].....	23
19.3	Row/block erase before/during programming [].....	23
19.4	Exclude DM (EEPROM) from row erase []	24
19.5	Check MOVLW/RETLW of calibration word [v].....	24
19.6	Enhanced ICSP™ Programming or Flashloader [v].....	24
19.7	Gap Eliminator™ for PM (flash) [v].....	24
19.8	Gap Eliminator™ for DM (EEPROM) [v]	24
19.9	COMBO: disconnect opto after action []	24
19.10	Smart hard. erase/unlock, factory reset [].....	24
19.11	12V UPDI/TPI programming entry []	24
19.12	MOSI pull-down 2.2K (G3 only) []	24
19.13	Atmel SPI / CYBLE / ESP32 faster programming [v]	25
19.14	Calculate fuse CRC or CS of inter. vectors []	25
19.15	STM32 parallelism 8 bit []	25
19.16	Allow programming of pre-programmed device [].....	25
19.17	Connect under reset []	25
19.18	Check Device ID [x]	25
19.19	Force DM (EEPROM) erase []	25
19.20	Alternative access port []	25
19.21	Use calibration value from mailbox [].....	25
19.22	CRC/MD5 verification []	25
19.23	Swap clock/data pins (SBW) []	25
19.24	Power cycle entry (●) Auto () Vdd ≤ 3.6 V () Vdd > 3.6V.....	25
19.25	Don't program protected devices [].....	25
19.26	Reduce synchronization frequency []	25
19.27	Read info area during programming [].....	25
20	Gap Eliminator™	26

ICP Family User's Manual

20.1	Overview	26
20.2	How It Works	26
20.3	Example of HEX File with Gaps	26
21	Speed Optimization Utility	27
22	Configuration File	27
23	ICP for Windows: Limited Command Line Parameters	27
24	DLL Functions	28
25	Command Line Interface (non-GUI)	28
26	Secure Programming	28
27	Standard LAN Configuration	28
27.1	LAN Configuration	29
27.2	COM Port Redirection	30
28	Manual Production Mode (One-Touch Operation)	31
29	In-Circuit Programming (Electrical Parameter Summary)	32
29.1	VDD	32
29.2	VPP	32
29.3	T_MOSI, T_MISO, T_DIO_0/1/2	32
29.4	Delay between VDD and VPP	32
30	Target Cable	32
31	Appendix A: Power Supply	32
32	Appendix B: Return Values (Errorcodes)	33
33	Appendix C: DEBUG and COE Bits	33
34	Appendix D: System Debug Procedure	33
35	Appendix E: Recommendations for Low Pin Count Devices	33
36	Appendix F: Emergency Bootloader Mode	34
37	Appendix I: Special Code Protection Settings	34
37.1	Security Bit	34
37.2	CMPA Lock	34
38	Appendix J: Oscillator Frequency Calibration	35
39	Revision History	35
40	Technical Assistance	36
41	Warranty	37
42	Contact	37
43	Copyright Notice	37

ICP Family User's Manual

1 Connectors

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

Pin No.	Pin Name (ICP2-GANG, ICP2-COMBO, ICP2-ISO, ICP2-LAN)	Pin Name (ICP2, ICP2-Portable)	Voltage Range
1/center	POWER (+)	POWER (+/-)	12V to 15V 
2	POWER (-)	POWER (+/-)	

1.2 "USB" Connector

- ICP2-Portable(G3) only: Mini-USB
- Other programmers: USB Type-B

Note: galvanically isolated on ICP2-COMBO and ICP2-ISO

1.3 "LAN" Connector: Standard RJ-45

Note: available on ICP2-COMBO and ICP2-LAN

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

Notes:

- not available on ICP2-Portable
- galvanically isolated on ICP2-COMBO

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	+12 to +15V	Power	ICP2-GANG, ICP2-COMBO: not connected ICP2: additional power supply input
5	GND	-	GND	Ground connection
6	12V_OUT	+11...14V	Power	ICP2-GANG: power output ICP2/ICP2-COMBO: not connected
7,8,9	-	-	-	Not connected

1.5 "RS-232 OUT" Connector (Standard 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

ICP Family User's Manual

1.6 “Control Interface” Connector (DIN-64 A, B Male)

Notes:

- available on ICP2-COMBO only
- all voltages are referenced to isolated GND (GND_ISO)

Mating connector: 09022646421 (Harting) - DIN41612, 2 rows, 64 pins, female, B style, receptacle, straight

Pin No.	Pin Name	Pin Type	Description																																				
A1	-																																						
B1	5V_ISO	5V reference source	Isolated 5V with in-series fuse 50mA, can be used to control ENV_SEL_A/B/C_ISO lines																																				
A2	GND_ISO	-	Isolated GND																																				
B2	GND_ISO	-	Isolated GND																																				
A3	PC_RXD_ISO	Standard RS-232 output	RS-232 output to PC																																				
B3	PC_TXD_ISO	Standard RS-232 input	RS-232 input from PC																																				
A4	CHAIN_232_RXD_ISO	Standard RS-232 input	RS-232 input from chained ICP2-COMBO																																				
B4	CHAIN_232_TXD_ISO	Standard RS-232 output	RS-232 output to chained ICP2-COMBO																																				
A5	GND_ISO	-	Isolated GND																																				
B5	GND_ISO	-	Isolated GND																																				
A6	ENV_SEL_A_ISO	CMOS input (0/5V) with weak pull-down	Environment selection: <table><tr><th>...C...</th><th>...B...</th><th>...A...</th><th>Result</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Env. 1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Env. 2</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Env. 3</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Env. 4</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Env. 5</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Env. 6</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Reserved</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Reserved</td></tr></table>	...C...	...B...	...A...	Result	0	0	0	Env. 1	0	0	1	Env. 2	0	1	0	Env. 3	0	1	1	Env. 4	1	0	0	Env. 5	1	0	1	Env. 6	1	1	0	Reserved	1	1	1	Reserved
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0	0	0		Env. 1																																			
0	0	1		Env. 2																																			
0	1	0	Env. 3																																				
0	1	1	Env. 4																																				
1	0	0	Env. 5																																				
1	0	1	Env. 6																																				
1	1	0	Reserved																																				
1	1	1	Reserved																																				
B6	ENV_SEL_B_ISO	CMOS input (0/5V) with weak pull-down																																					
A7	ENV_SEL_C_ISO	CMOS input (0/5V) with weak pull-down																																					
			Reserved combination selects Env. 1																																				
B7	-	-	-																																				
A8	-	-	-																																				
B8	GND_ISO	-	Isolated GND																																				
A9	GO_ISO_1	CMOS input (0/Z) with weak pull-up	Ch. 1: programming start (active low)																																				
B9	GO_ISO_2	CMOS input (0/Z) with weak pull-up	Ch. 2: programming start (active low)																																				
A10	GO_ISO_3	CMOS input (0/Z) with weak pull-up	Ch. 3: programming start (active low)																																				
B10	GO_ISO_4	CMOS input (0/Z) with weak pull-up	Ch. 4: programming start (active low)																																				
A11	GO_ISO_5	CMOS input (0/Z) with weak pull-up	Ch. 5: programming start (active low)																																				
B11	GO_ISO_6	CMOS input (0/Z) with weak pull-up	Ch. 6: programming start (active low)																																				
A12	GO_ISO_7	CMOS input (0/Z) with weak pull-up	Ch. 7: programming start (active low)																																				
B12	GO_ISO_8	CMOS input (0/Z) with weak pull-up	Ch. 8: programming start (active low)																																				
A13	GO_ISO_9	CMOS input (0/Z) with weak pull-up	Ch. 9: programming start (active low)																																				
B13	GO_ISO_10	CMOS input (0/Z) with weak pull-up	Ch. 10: programming start (active low)																																				
A14	GO_ISO_11	CMOS input (0/Z) with weak pull-up	Ch. 11: programming start (active low)																																				
B14	GO_ISO_12	CMOS input (0/Z) with weak pull-up	Ch. 12: programming start (active low)																																				
A15	-	-	-																																				
B15	-	-	-																																				
A16	-	-	-																																				
B16	-	-	-																																				
A17	PASS_ISO_1	CMOS output with in-series R=330Ω	Ch. 1: pass/busy indication																																				
B17	PASS_ISO_2	CMOS output with in-series R=330Ω	Ch. 2: pass/busy indication																																				
A18	PASS_ISO_3	CMOS output with in-series R=330Ω	Ch. 3: pass/busy indication																																				
B18	PASS_ISO_4	CMOS output with in-series R=330Ω	Ch. 4: pass/busy indication																																				
A19	PASS_ISO_5	CMOS output with in-series R=330Ω	Ch. 5: pass/busy indication																																				
B19	PASS_ISO_6	CMOS output with in-series R=330Ω	Ch. 6: pass/busy indication																																				
A20	PASS_ISO_7	CMOS output with in-series R=330Ω	Ch. 7: pass/busy indication																																				
B20	PASS_ISO_8	CMOS output with in-series R=330Ω	Ch. 8: pass/busy indication																																				
A21	PASS_ISO_9	CMOS output with in-series R=330Ω	Ch. 9: pass/busy indication																																				
B21	PASS_ISO_10	CMOS output with in-series R=330Ω	Ch. 10: pass/busy indication																																				
A22	PASS_ISO_11	CMOS output with in-series R=330Ω	Ch. 11: pass/busy indication																																				
B22	PASS_ISO_12	CMOS output with in-series R=330Ω	Ch. 12: pass/busy indication																																				
A23	-	-	-																																				
B23	-	-	-																																				
A24	-	-	-																																				
B24	-	-	-																																				

ICP Family User's Manual

Pin No.	Pin Name	Pin Type	Description
A25	FAIL_ISO_1	CMOS output with in-series R=330Ω	Ch. 1: fail/busy indication
B25	FAIL_ISO_2	CMOS output with in-series R=330Ω	Ch. 2: fail/busy indication
A26	FAIL_ISO_3	CMOS output with in-series R=330Ω	Ch. 3: fail/busy indication
B26	FAIL_ISO_4	CMOS output with in-series R=330Ω	Ch. 4: fail/busy indication
A27	FAIL_ISO_5	CMOS output with in-series R=330Ω	Ch. 5: fail/busy indication
B27	FAIL_ISO_6	CMOS output with in-series R=330Ω	Ch. 6: fail/busy indication
A28	FAIL_ISO_7	CMOS output with in-series R=330Ω	Ch. 7: fail/busy indication
B28	FAIL_ISO_8	CMOS output with in-series R=330Ω	Ch. 8: fail/busy indication
A29	FAIL_ISO_9	CMOS output with in-series R=330Ω	Ch. 9: fail/busy indication
B29	FAIL_ISO_10	CMOS output with in-series R=330Ω	Ch. 10: fail/busy indication
A30	FAIL_ISO_11	CMOS output with in-series R=330Ω	Ch. 11: fail/busy indication
B30	FAIL_ISO_12	CMOS output with in-series R=330Ω	Ch. 12: fail/busy indication
A31	-	-	-
B31	-	-	-
A32	-	-	-
B32	-	-	-

1.7 “TARGET” Connector D-type 15 Female: all programmers excluding ICP2-COMBO

Notes: ICP2-GANG - 4 identical channels
ICP2/ICP2-Portable/ICP2-ISO/ICP2-LAN - 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 (4)	2.0V to 5.5V	CMOS output or input with weak pull-down	Target clock
4	T_MOSI (4)	2.0V to 5.5V	CMOS output or input with weak pull-down	Target data (out, in/out)
5	T_MISO (4)	2.0V to 5.5V	CMOS output or input with weak pull-down	Target data (in)
6	T_VPP/MCLR	2.0V to 13.5V	Output or input with weak pull-down	Target VPP supply voltage
7	T_TARG (2)	5.0V	CMOS output	General purpose output
8	T_VTEST (non-G3 products)	2.0V to 13.5V	Output	Target VTEST signal for PIC17Cxxx family
	T_DIO_2 (G3 products)	2.0V to 5.5V	Output or input with weak pull-down	Target I/O number 2
9	T_DIO_0	2.0V to 5.5V	CMOS output or input with weak pull-down	Target I/O number 0 Non-G3 products: FOSC signal for PIC17Cxxx family
10	T_DIO_1	2.0V to 5.5V	CMOS output or input with weak pull-down	Target I/O number 1
11	GND	-	-	Optional ground connection
12	GND (1)	-	-	Optional ground connection
13	GO (1,3)	0-1.0V or N/C	CMOS input with pull-up 10K	Input for programming start in standalone mode
14	PASS_OUT(1,3)	5.0V	CMOS output	Output for pass/fail/busy indication
15	FAIL_OUT (1,3)	5.0V	CMOS output	Output for pass/fail/busy indication

Notes:

- (1) Dedicated for standalone operation without PC
- (2) Not available on ICP2-Portable (non-G3)
- (3) Optional for ICP2-Portable, contact Softlog Systems for details
- (4) G3 products additionally contain strong (2.2K) programmable pull-up and pull-down resistors

ICP Family User's Manual

1.8 ICP2-COMBO only: "TARGET" Connector (DIN-48, A,B,C, male); 1, 2 or 3 Identical Connectors

Mating connector: 86093488314755V1LF (FCI) - DIN41612, 3 rows, 48 pins, female, C/2 style, straight

Pin Number				Pin Name	Opto-relay barrier	Pin Type	Description
CH. 1 CH. 5 CH. 9	CH. 2 CH. 6 CH. 10	CH. 3 CH. 7 CH. 11	CH. 4 CH. 8 CH. 12				
A1	A5	A9	A13	T_VPP/ MCLR	Yes	Power output or input with weak pull-down	Target VPP/MCLR supply voltage
A2	A6	A10	A14	T_SCK (4)	Yes	CMOS output or input with weak pull-down	Target clock
A3	A7	A11	A15	T_MOSI (4)	Yes	CMOS output or input with weak pull-down	Target data (out, in/out)
A4	A8	A12	A16	T_DIO_0	Yes	CMOS output or input with weak pull-down	Target I/O number 0 Non-G3 products: FOSC signal for PIC17Cxxx family
B1	B5	B9	B13	T_DIO_1	Yes	CMOS output or input with weak pull-down	Target I/O number 1
B2	B6	B10	B14	T_MISO (4)	Yes	CMOS output or input with weak pull-down	Target data (in)
B3	B7	B11	B15	T_VTEST (non-G3 products)	Yes	Output	Target VTEST signal for PIC17Cxxx family
				T_DIO_2 (G3 products)		CMOS output or input with weak pull-down	Target I/O number 2
B4	B8	B12	B16	T_VDD	Yes	Power output or input with weak pull-down and programmable strong pull-down	Target VDD supply voltage
C1	C5	C9	C13	GND_SW	Yes	-	Ground connection via opto-relay barrier. Not recommended
C2, C3	C6, C7	C10, C11	C14, C15	GND	-	-	Ground connection (permanent)
C4	C8	C12	C16	T_TARG	-	CMOS output	General purpose output

Notes:

(4) G3 products additionally contain strong (2.2K) programmable pull-up and pull-down resistors

1.9 "RS-232, CONTROL" Connector (Header-16 Male, ICP2-ISO: 2.54mm, ICP2-LAN: 2mm)

NOTE: all voltages are referred to **isolated** GND (GND_ISO)

ICP2-ISO mating connector: HIF3FB-16DA-2.54DSA(71) (Hirose), header 16 pin, 2.54mm, female, with key (polarized)

ICP2-LAN mating connector: 79107-7007 (Molex), header 16 pin, 2mm, female

Pin No.	Pin Name	Pin Type	Description
1	PC_RXD_ISO	Standard RS-232 output	RS-232 output to PC
2	GND_ISO	-	Isolated GND
3	PC_TXD_ISO	Standard RS-232 input	RS-232 input from PC
4	GND_ISO	-	Isolated GND
5	CHAIN_232_TXD_ISO	Standard RS-232 output	RS-232 output to chained ICP2-ISO
6	GND_ISO	-	Isolated GND
7	CHAIN_232_RXD_ISO	Standard RS-232 input	RS-232 input from chained ICP2-ISO

ICP Family User's Manual

Pin No.	Pin Name	Pin Type	Description																																				
8	GND_ISO	-	Isolated GND																																				
9	GO_ISO	CMOS input (0/Z) with weak pull-up	Programming activation (active low)																																				
10	PASS_ISO	CMOS output with in-series R=330Ω	Pass/busy indication																																				
11	FAIL_ISO	CMOS output with in-series R=330Ω	Fail/busy indication																																				
12	5V_ISO	5V reference source	Isolated 5V with in-series fuse 50mA, can be used to control ENV_SEL_A/B/C_ISO lines																																				
13	ENV_SEL_A_ISO	CMOS input (0/5V) with weak pull-down	Environment selection: <table><tr><th>...C...</th><th>...B...</th><th>...A...</th><th>Result</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Env. 1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Env. 2</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Env. 3</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Env. 4</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Env. 5</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Env. 6</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Reserved</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Reserved</td></tr></table> Reserved combination selects Env. 1	...C...	...B...	...A...	Result	0	0	0	Env. 1	0	0	1	Env. 2	0	1	0	Env. 3	0	1	1	Env. 4	1	0	0	Env. 5	1	0	1	Env. 6	1	1	0	Reserved	1	1	1	Reserved
...C...	...B...	...A...		Result																																			
0	0	0		Env. 1																																			
0	0	1		Env. 2																																			
0	1	0		Env. 3																																			
0	1	1		Env. 4																																			
1	0	0		Env. 5																																			
1	0	1		Env. 6																																			
1	1	0	Reserved																																				
1	1	1	Reserved																																				
14	ENV_SEL_B_ISO	CMOS input (0/5V) with weak pull-down																																					
15	ENV_SEL_C_ISO	CMOS input (0/5V) with weak pull-down																																					
16	Reserved	CMOS input (0/5V) with weak pull-down	Future use																																				

1.10 Typical Connection to "TARGET" Connector

- See separate document "ICP2(G3) Connection Table.pdf" for the latest table

2 PC-Driven and Standalone Modes

2.1 Modes

ICP family programmers can be operated in full PC-driven, standalone mode (PC-controlled) and full standalone mode (w/o PC)

Programmer	Full PC-Driven	Standalone (PC-controlled)	Full Standalone (w/o PC)
ICP2	Yes	Yes	Yes
ICP2-GANG, single channel	Yes	Yes	Yes
ICP2-GANG, multi-channel	-	Yes	Yes
ICP2-COMBO, single channel	Yes	Yes	Yes
ICP2-COMBO, multi-channel	-	Yes	Yes
ICP2-Portable	Yes	Yes	Yes
ICP2-ISO, single channel	Yes	Yes	Yes
ICP2-LAN, single channel	Yes	Yes	Yes
ICP2-ISO, multi-channel	-	Yes	Yes
ICP2-LAN, multi-channel	-	Yes	Yes

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.).a

Standalone mode means that all programming parameters and HEX file data ("Environment", "PJ2 file") are saved in **programmer's** non-volatile flash memory. See paragraph 14 "Preparing Environment and Transferring Environment to Programmer"

ICP Family User's Manual

2.2 Standalone Programming

True parallel multi-channel programming can be done in standalone mode only. The standalone programming can be done in 3 ways:

- From PC:
 - ICP for Windows
 - ICP DLL
 - ICP Command Line / Advanced Command Line
 - ICP Secure Programming
- GO input on the programmer unit (optional on ICP2-Portable) by GO/PASS/FAIL wired interface
- RS-232 high-level communication (DLL/Command Line support should be activated)

3 Chain Connection (ICP2-GANG, ICP2-COMBO, ICP2-ISO and ICP2-LAN)

Number of channels can be increased up to 64 by daisy chain connection between ICP2-GANG or ICP2-COMBO units

Number of channels can be increased up to 16 by daisy chain connection between ICP2-ISO or/and ICP2-LAN units (they can be mixed)

ICP2-GANG: see "ICP2-GANG Quick Start" manual for details

ICP2-COMBO: see "ICP2-COMBO-12 - Assign Address to Programmer" and "ICP2-COMBO-8 - Assign Address to Programmer" for details

IMPORTANT:

- all programmer units should have the **same** (all=yes or all=no) "DLL/Command Line Support" option
- all programmer units should be of the same generation: G3 or non-G3
- using short RS-232 cables is recommended, 3 wires only (TxD, RxD and GND)

4 PASS/FAIL LEDs and Outputs

##	Conditions	PASS LED	FAIL LED	PASS Output	FAIL Output
1.	Power-up	2 sec ON (see Notes)		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 family activation - etc.	OFF	Blink	OFF	OFF
7.	Operation is canceled	OFF	OFF	OFF	OFF
8.	No firmware presents (bootloader only)	Slow blink	OFF	OFF (not supported)	
9.	Firmware upgrade in-progress	Fast blink	OFF	OFF (not supported)	

Notes:

- ICP2-ISO and ICP2-LAN PASS/FAIL LEDs provide additional blinks on power-up as follows:
 - 1 blink: configured as "Channel ≠ 2" (i.e. non-default channel 2)
 - 2 blinks: configured as "Use RS-232 interface only"

5 Other LEDs (ICP2-Portable)

##	LED Name	Color	LED Behavior
1.	POWER	Blue	ON
2.	LOW BATTERY	Red	- Battery is normal: OFF - Battery is low: ON "GO" button is pressed & battery is very low: no programming is allowed, blinks in parallel to FAIL LED
3.	SERIALIZATION	Green	- Serialization = OFF: OFF - Serialization = ON & S/N (serial numbers) = OK: ON - Serialization = ON & no S/N: permanent slow blink - Serialization = ON, no S/N & "GO" button is pressed: no programming is allowed, blinks in parallel to FAIL LED
4.	COUNTER < 10	Red	- Counter < 10: ON - Counter = 0: permanent slow blink - Counter = 0 & "GO" button is pressed: no programming is allowed, blinks in parallel to FAIL LED
5.	Environment (1 of 6 LEDs)	Green	- Environment is selected & OK: ON - Environment is selected & invalid: permanent slow blink - Environment is invalid & "GO" button is pressed: no programming is allowed, blinks in parallel to FAIL LED
6.	PASS	Green	See above
7.	FAIL	Red	

6 Standalone Operation without PC

6.1 Standalone Programming using GO/PASS/FAIL Interface

- Prepare environments and transfer to programmer – see paragraph 14 for details
NOTE: programmer is automatically ready for programming once the environments are saved in **non-volatile** memory
- Short pin GO to GND for at least 100ms to start programming
- Observe PASS/FAIL LEDs or/and pins PASS_OUT and FAIL_OUT – see paragraph 4 for details

6.2 Standalone Programming using High-Level RS-232 Communication

- Prepare environments and transfer to programmer – see paragraph 14 for details
NOTE: programmer is automatically ready for programming once the environments are saved in **non-volatile** memory
- Follow document **"High-Level RS-232 Communication.pdf"**

7 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)

8 Installation

8.1 Important Note

- In the past the default directory was specified as "C:\Program Files\Soft-Log\..."
- Starting from Jan-2015 ICP family software will be installed to a default directory C:\Softlog\ which allows to avoid virtual storage of CFG and INI files

ICP Family User's Manual

8.2 Preliminary Installation

8.2.1 Software Installation

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

8.2.2 Preliminary Hardware Installation

NOTE: USB driver installation is not required for operation with RS-232 port

- Install USB driver according to “**USB Driver Installation.pdf**” and “**USB Driver (FTDI) Installation.pdf**” instructions.
IMPORTANT:
 - disconnect ICP2 from USB
 - install the driver
 - connect ICP2 to USB
- Connect the programmer to its power supply (not required for ICP2-Portable, ICP2 and ICP2-ISO)
- Connect RS-232 or USB cable between PC and the programmer

8.3 ICP2-GANG Setup

- Install ICP2-GANG according to “**ICP2-GANG Quick Start**” document

8.4 ICP2-COMBO Setup

- Install ICP2-COMBO according to “**ICP2-COMBO Quick Start**” document
- Ventilation (fan) is **strongly** recommended if ICP2-COMBO is placed into a closed equipment

8.5 ICP2-Portable Setup

- Install ICP2-Portable according to “**ICP2-Portable Quick Start**” document

8.6 ICP2 Software Setup

- Run "ICP_Win.exe" Program
 - Double-click "ICP_Win" icon
 - Press “Yes” if message “Newer firmware is available. Upgrade now?” appears
- Run “Programmer/Quick Start Wizard” and follow the Wizard

8.7 FTDI Driver Latency

ICP2-Portable(**G3**) and ICP2-ISO(**G3**) programmers operate with FTDI USB driver. Default latency of the driver is set to 16ms which slows down the programmer operation. ICP for Windows automatically tries to set the latency to 2ms, but it may not work. In this case change the latency as follows:

- Option 1 - run ICP for Windows as Administrator (click and hold right mouse button)
 - Option 2 - change latency manually:
 - enter Control Panel → System → Device Manager → Ports (COM & LPT)
 - select USB Serial Port (COMx) → Port Settings → Advanced
 - change Latency Timer to 2ms (recommended).
- Notes:
- 1ms is not recommended due to possible communication problems on several computers
 - set to 4ms if communication problems arise with 2ms (rare cases)
 - press OK
 - restart your PC if it was prompted

9 Family-based Activation System

- Starting from July-2021 ICP2 G3 family programmers are activated by device/microcontroller family/algorithm
- Installed new software without activation will not work with non-Microchip/Atmel devices (for example STM, NXP, Nordic, etc.)
- Microchip/Atmel devices and serial EEPROM/flash memories will function without change
- You can always downgrade your existing ICP2 G3 programmers and use previous software/firmware
- Temporary activation is available for test purposes

- Contact us for more info: sales@softlog.com

10 Checksum Calculation and Programming Buffers

ICP family software calculates HEX file checksum (CS) as follows (referred as “Checksum” or “ICP2 General Checksum”):

- Microchip®: Unprotected CS is calculated according to Microchip programming specifications (as MPLAB or MPLAB X)
- Other vendors or Microchip protected devices: in contrary to the programming specifications, **protected** CS is calculated as unprotected one. MPLAB/MPLAB X calculates it according to the specifications that makes the result CS nearly unusable (flash CS is not calculated at all)

Starting from software 8.1.1 (Mar-2017) ICP for Windows displays “CP=OFF Checksum” and “Checksum” as they are expected to appear in MPLAB® IPE

Note that ICP software intentionally **doesn't** clear programming buffers automatically by default (it allows to merge partial HEX files), therefore CS may change if you load one HEX file after another. You can clear the buffers before loading by using Edit - Clear All Memory Buffers or marking “Clear all memory buffers before loading” in “Open (Import)” dialog

11 Control Center

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

Control Center: ICP2-GANG/COMBO, ATtiny1616

PC-Driven Mode Standalone Mode

Memory Model
Not Applicable

Select Partition
▼

User ID/Row

ICP2 General Checksum: 3FC000
CP=OFF Checksum: N/A
Checksum: N/A

Config. Bits

Regions

Voltages

Vdd Source: Programmer
VddProg Mode: As VddMax
VddMin: 3.30 V
VddProg: 3.30 V
VddMax: 3.30 V
Vpp: 11.50 V
Vio: As Vdd
Vdd-to-Vpp: 4 ms

Press "Voltages" for more settings...

Interface: N/A

Mem. Space

PM: **yes**
ID: **yes**
DM: **yes**
CM: **no**
CB: **yes**
BM: **no**
OTP: **no**

Mem. Ranges

PM: Automatic
DM: Automatic

Program - F5

Verify - F6

Blank Check

Read - F8

Passed: 00000

Failed: 00000

Total: 00000

Control Center: ICP2-GANG/COMBO, 12 Channels

PC-Driven Mode Standalone Mode

Channel	Env. No.	Hex File	Checksum
Channel 1	1	1616_rand_1.hex	B3E7 (hex)
Channel 2	1	1616_rand_1.hex	B3E7 (hex)
Channel 3	1	1616_rand_1.hex	B3E7 (hex)
Channel 4	1	1616_rand_1.hex	B3E7 (hex)
Channel 5	1	1616_rand_1.hex	B3E7 (hex)
Channel 6	1	1616_rand_1.hex	B3E7 (hex)
Channel 7	1	1616_rand_1.hex	B3E7 (hex)
Channel 8	1	1616_rand_1.hex	B3E7 (hex)
Channel 9	1	1616_rand_1.hex	B3E7 (hex)
Channel 10	1	1616_rand_1.hex	B3E7 (hex)
Channel 11	1	1616_rand_1.hex	B3E7 (hex)
Channel 12	1	1616_rand_1.hex	B3E7 (hex)

Step 2: double-click on a channel for details

Step 1: Get Environments Info

Program=GO (F5)

Get Latest Results

Passed: 00000

Failed: 00000

Total: 00000

11.1 Control Center in PC-Driven Mode

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

- Select Memory Model and Partition if applicable for selected device
- Edit User ID/Row
- Edit Configuration Bits
- Set Regions or Security Bit if applicable for selected device
- Set voltages
- Select programming interface (for devices with dual interface, for example SWD or JTAG)
- Select memory spaces
- Set PM and DM ranges
- Programming, Verification, Blank Check and Read

11.2 Control Center in Standalone Mode

Control Center in standalone mode allows the following operations:

- Get environment information for all channels (button "Step 1: Get Environments Info")
- View environment details of selected channel (double-click on selected channel)
- Programming
- Get latest results

12 Menu Commands

12.1 File Menu (Alt-F)

Open (Import)...	Open a data file from disk and load it into buffer memory area
Save	Save the currently loaded file in HEX format
Save As (Export)...	Save the buffer to a HEX file on disk
Universal HEX Loader	Load a data file with virtual addresses (usually ATmega/ATtiny/AVR)
Load PM with zero offset	Load a data file with zero offset into PM (flash)
Load BM with zero offset	Load a data file with zero offset into BM (boot memory)
Import Data Memory	Load a data file with zero offset into DM (EEPROM)
Export Data Memory	Save DM into a HEX file with zero offset
Save Configuration	Save all current settings
Export Configuration (CFG) File...	Export and save current settings. Note: it also saves currently used icp01.cfg
Exit	Exit the software

12.2 Edit Menu (Alt-E)

Clear All Memory Buffers	Clear all memory buffers
Edit/Fill Program Memory	Fill area of Program Memory with a specified value
Edit/Fill Boot Memory	Fill area of Boot Memory with a specified value
Edit/Fill Data Memory	Fill area of Data Memory with a specified value
Edit/Fill OTP Memory	Fill area of OTP Memory with a specified value
Read-only Editors	Enable/disable edit the buffers above (disabled by default)

12.3 Environment (Alt-N)

Save Environment As...	Save current setup and buffers to an environment file (*.pj2)
Transfer Environment to Programmer...	Transfer environment (*.pj2) to programmer
Transfer Different Environments to Multi-Channel Programmer	Transfer different PJ2 files to programmer in single dialog
Allow Sub-Environments	Turn on/off sub-environment mechanism
Environment Wizard...	

12.4 Serialization Menu (Alt-S)

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

12.5 Device Menu (Alt-D)

Select by Name...	Select a type of device to be programmed
-------------------	--

12.6 Programmer Menu (Alt-P)

Select Programmer	Select programmer
GANG/COMBO Configuration	Select active ICP2-GANG/COMBO channels (64 max)
Assign Address and Baud Rate to GANG/COMBO Box	Assign box address to currently connected programmer (1-16), see "ICP2-GANG Quick Start" for details
ICP2-ISO/LAN Configuration	Select active ICP2-ISO/LAN channels (16 max)
Assign Address and Baud Rate to ICP2-ISO/LAN Unit	Assign channel address to currently connected programmer (1-16)
Quick Start Wizard	

ICP Family User's Manual

12.7 Run Menu (Alt-R)

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

12.8 Communication Menu (Alt-C)

RS-232/USB/LAN COM	Select the desired COM port and connect
Connect	Connect to the programmer
Close COM	Close COM

12.9 Options Menu (Alt-O)

Voltage	Set desired voltages
Clock/Data/MCLR(Advanced)	Set desired advanced voltage parameters
Preferences	Select programming preferences
Firmware Upgrade	Execute firmware upgrade
Create Device/Family Preliminary List for Activation (offline)	Future use
Summary of Options/Families, Collect My Firmware IDs	View summary of options/families, save Firmware IDs for activation
Activate Options/Families by HEX File	Execute activation of options/families - Families - DLL/Command Line (D) - Secure Programming Support (S) - Microchip only (K): Keeloq® - Microchip only (P): 16-bit (dsPIC®/PIC24) - Microchip only (X): 32-bit (PIC32, ATSAM) Note: Contact Softlog Systems for activation details
OEM Solutions	Enable OEM features, contact Softlog Systems for details

12.10 Speed Optimization Menu (Alt-T)

Run Speed Optimization Utility	Run a utility which automatically configures the programmer settings for the optimal speed performance
Optimization Summary	Show optimization summary

12.11 Help Menu (Alt-H)

Read me	Display "Readme_w.txt" file
<Different documents>	
About	Connect to the programmer and display software and firmware versions, programmer details and activated families

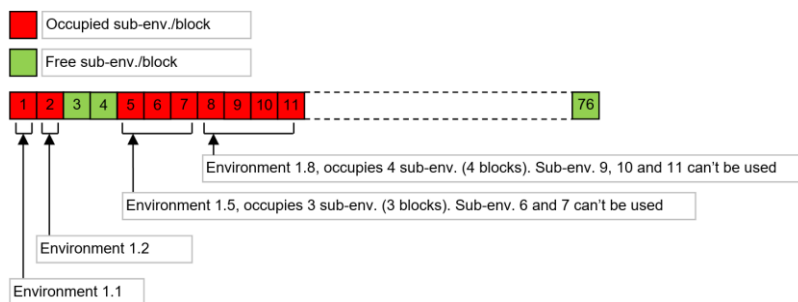
13 Shortcuts

Save	Ctrl-S
Open (Import)...	Ctrl-O
Program	F5
Verify	F6
Blank Check	F7
Read	F8
Programming Only	F9
Programming buffers: go to address	Ctrl-G

14 Preparing and Transferring Environment to Programmer

14.1 Sub-Environment Mechanism

- Starting from software 16.1.1(beta) 9-Feb-25 till 512 environments can be used.
See “**Release Notes: Sub-Environments.pdf**” for details (it’s also available by pressing “Help” on the environment “Destination” window – see a screenshot below)



14.2 Prepare and Transfer Environment with Wizard

- Run “Environment/Environment Wizard” and follow the Wizard
- Select programmer and press “Next”
- ICP2-GANG/ICP2-COMBO: select GANG channels and press “Next”
- Select environment number and press “Next”
- Select Device
Select a device to be programmed and press “Next”
- Set Voltages (and Advanced button) and press “Next”
- Set Preferences and press “Next”
- Load (open) a HEX file.
NOTE: The software can read User ID, data memory (EEPROM), OTP and configuration bits from the HEX file
- Load serialization (SER) file (if required) and press “Next”
- 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 file 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
- View the transferred environment as shown in Paragraph 15

14.3 Prepare and Transfer Environment Manually

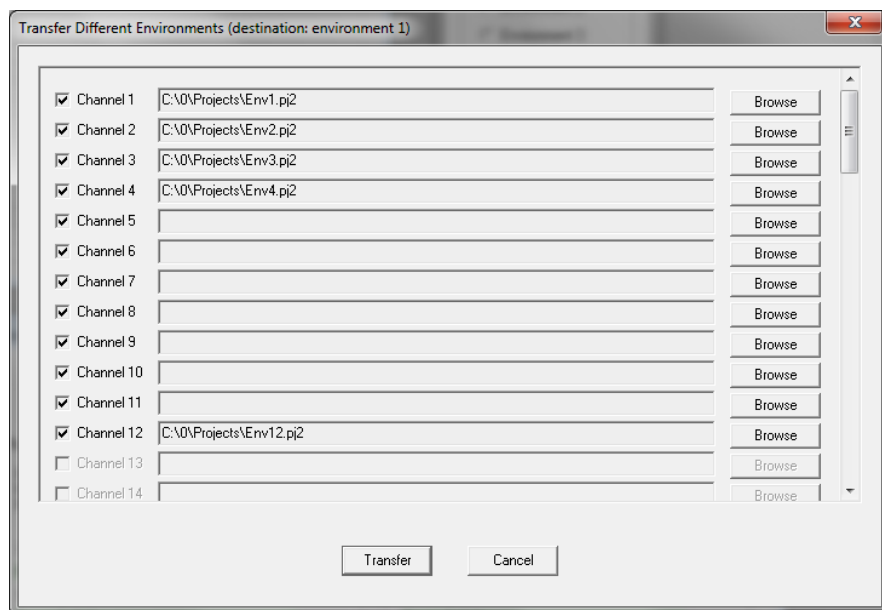
Some settings (memory areas, memory, etc.) are not available with the Environment Wizard therefore manual procedure below is recommended in several cases

- Validate that your part number (device name) is selected correctly
- Set voltages, clock frequency and other parameters if required
- Load your HEX file
- Change memory space (example): Control Center → select PM and CB only
- Load serialization file (if required): Serialization → Load File
- Save environment: Environment → Save Environment As...
- Transfer the saved environment file PJ2: Environment → Transfer Environment to Programmer...

14.4 ICP2-GANG and ICP2-COMBO: Transfer Different Environments to Different Channels

14.4.1 Option 1: Multiple channel mode, single operation

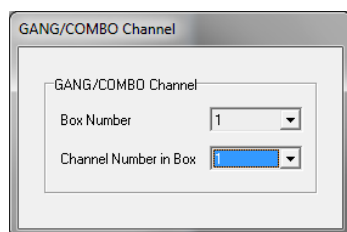
- Create different environment files *.PJ2, for example Env1.pj2, Env2.pj2, Env3.pj2, Env4.pj2, ..., Env12.pj2 as specified in 14.3 (don't transfer)
- Select Environment → Transfer Different Environments to ICP2-GANG/ICP2-COMBO and load PJ2 files (Env5.pj2...Env11.pj2 are not shown)



- Press "Transfer"

14.4.2 Option 2: Single channel mode, multiple operations

- Create different environment files *.PJ2, for example Env1.pj2, Env2.pj2, Env3.pj2, Env4.pj2, ..., Env12.pj2 as specified in 14.3 (don't transfer)
- Select single channel mode: Programmer → Select Programmer → ICP2-GANG(Single) / ICP2-COMBO(Single)
- On the pop-up window select desired channel, for example channel 1



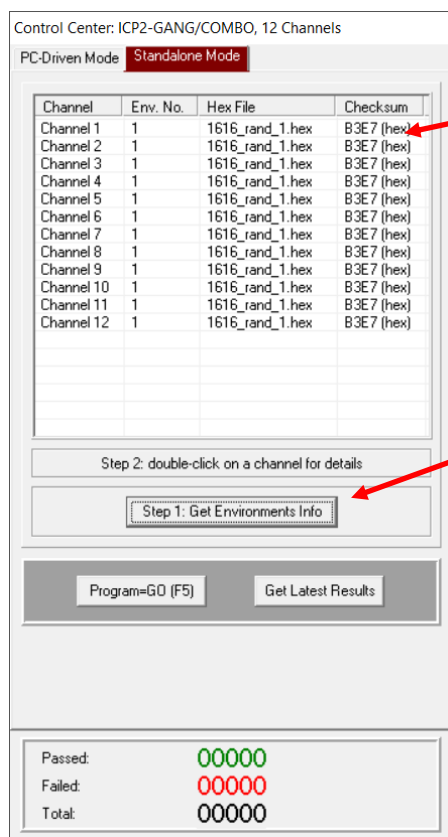
- Transfer Env1.pj2: Environment → Transfer Environment to Programmer...
- Repeat 2 steps above for channels 2, 3, 4...12 with Env2.pj2, Env3.pj2 and Env4.pj2... Env12.pj2
- Restore GANG/COMBO selection: Programmer → Select Programmer → ICP2-GANG/ICP2-COMBO

15 Viewing Environment

- Preparation: select desired environment number



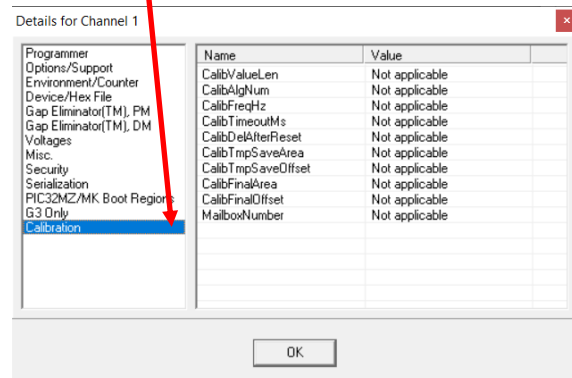
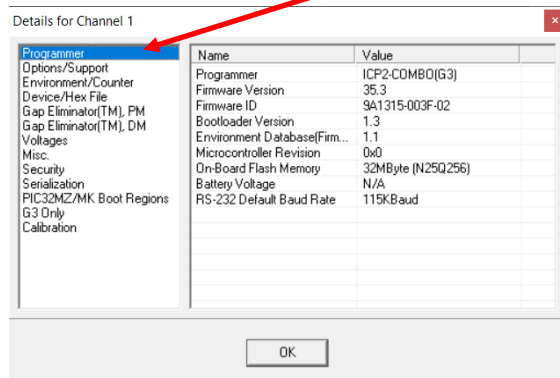
- Active environments inside the programmer can be viewed as shown below



Step 2:
Double-click

Step 1:
Click once

Step 3: Select
desired TAB



16 Serialization

16.1 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 S/N Bytes. Enter number of bytes (1 to 8) for your serial number
 - WARNING:** Total number of result **words** (addresses) depends on the device and access method
 - 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 bytes 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
 - Access Method. Select Retlw or Raw Data

Create Serialization File

Serial Number (S/N)

☐ Random

☐ Pseudo-Random

☒ Sequential

☐ User File

Access Method

☐ Retlw

☒ Raw Data

Start Address (Hex): 8200

Number of S/N Bytes (*): 1

Start Value (Hex): 1

Increment Value (Hex): 1

User File Name: userfile.num

OK Cancel

(*) Total word number depends on device and access method

- 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/ICP2-COMBO
- The "retlw" opcode ("retlw" access method) 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)

16.2 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
AccessMethod	= 0 (0-retlw, 1-raw data)

The following program memory locations will be updated as follows:

ICP Family User's Manual

- PIC16xxx
0005: 3434
0006: 3412
- PIC12C5xx
0005: 0834
0006: 0812

16.3 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
AccessMethod = 0 (0-retlw, 1-raw data)

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

16.4 Enable Serialization

Select "Serialization/Load File" to activate serialization

16.5 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

16.6 Standalone Serialization

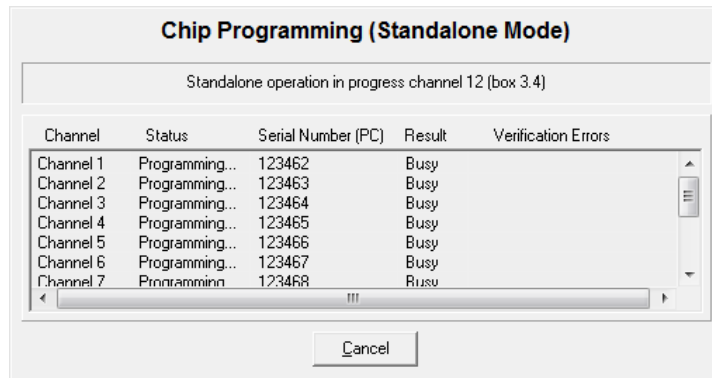
- Make all settings (select device, voltages, etc.)
- Load a HEX file
- Select "Serialization/Load File" to activate serialization
- Create an environment by "Environment/Save Environment As..."
- Transfer the environment to programmer

ICP Family User's Manual

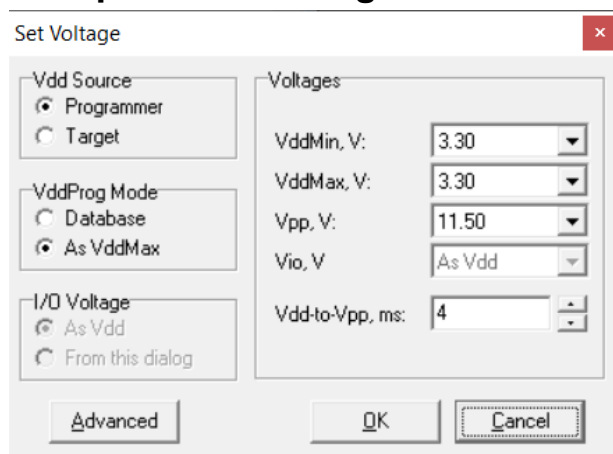
16.7 PC-Driven Serialization in Standalone Mode

PC-driven serialization in standalone mode may be required for GANG/COMBO

- Switch Control Center to Standalone mode
- Validate that all required channels are enabled – see 15
- Select "Serialization/Load File" to activate serialization
- Execute programming (F5)



17 Options → Voltages



17.1 Vdd Source and VddProg Mode

The programmer executes operations at the following Vdd voltages

##	Vdd Source	VddProg Mode	Vdd during Programming	Vdd during Verify	Vdd during Blank Check	Vdd during Read
1.	Programmer	Database	Database	VddMin, VddMax (Note 2)	VddMin	Database
2.	Programmer	As VddMax	VddMax (Note 1)	VddMax	VddMax	VddMax
3.	Target	Any	Target	Target	Target	Target

Notes:

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

17.2 Vpp Voltage

The Vpp voltage is the same for all the operations

17.3 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

18 Options → Clock/Data/MCLR(Advanced)

Clock/Data/MCLR (Advanced) ×

MCLR/VPP Idle State ☐ Reset (GND) ☒ Released	VddOff (ms) 80
Clock/Data Idle State ☐ Active ☒ Released	
Clock Speed ☒ Software ☐ 500KHz ☐ 625KHz ☐ 714KHz ☐ 833KHz ☐ 1MHz ☐ 1.25MHz ☐ 1.67MHz ☐ 2.5MHz ☐ 5MHz(G3 only) ☐ 10MHz(*)	

(*): Not Recommended

18.1 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

18.2 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

18.3 Clock Speed

10MHz is not recommended

18.4 VddOff Delay

VddOff delay is required for Vdd discharge, range 5-250ms (default 80ms)

18.5 RESET Pulse after Operation

“RESET Pulse after Operation” is not a single menu item, it's provided as a result of combined settings as follows (**all** settings **together**):

- Vdd source = **Target**
- MCLR/VPP Idle State = **Released**
- Clock/Data Idle State = **Released**

19 Options → Preferences

NOTE: some items are grayed out if they are not supported by a selected device



19.1 Blank check before programming []

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

19.2 Bulk erase device before programming [✓]

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

HIGHLY IMPORTANT:

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

19.3 Row/block erase before/during programming []

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

IMPORTANT:

- row erase usually can't erase a code protected device
- available for several devices

19.4 Exclude DM (EEPROM) from row erase []

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

NOTES:

- available for several devices, may be useful to preserve EEPROM
- DM (EEPROM) space should be **excluded** from operation (see Memory Space on Control Center)

19.5 Check MOVLW/RETLW of calibration word [V]

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.)

19.6 Enhanced ICSP™ Programming or Flashloader [V]

When the option is ON the device is programmed/verified faster using Enhanced ICSP™ method or via a flashloader

IMPORTANT: external or internal pull-down resistor is required for Enhanced ICSP™ of dsPIC33/PIC24 devices

IMPORTANT - Enhanced ICSP™ limitations (Microchip® silicon issues):

- PGEC3/PGED3 programming pair does not work on several devices – check Microchip® errata
- Enhanced ICSP™ may not work if “Windowed WDT” is enabled

19.7 Gap Eliminator™ for PM (flash) [V]

When this option is ON ICP family programmer automatically excludes **multiple** empty (blank) PM areas in the HEX file from the programming process, resulting in shortened programming time. See paragraph 20 for more details

19.8 Gap Eliminator™ for DM (EEPROM) [V]

When this option is ON ICP family programmer automatically excludes **multiple** empty (blank) DM areas in the HEX file from the programming process, resulting in shortened programming time. See paragraph 20 for more details

IMPORTANT: Due to different silicon read/write protection mechanisms the DM (EEPROM) may be not erased before programming for several devices, therefore test your device before going to production. If it is then don't enable this feature

19.9 COMBO: disconnect opto after action []

When the option is ON the ICP2-COMBO opto-relay barrier will be disconnected after programming/verification/blank check/read

19.10 Smart hard. erase/unlock, factory reset []

Applicable to devices with hardware erase pin (ATSAM3/4/7, etc.) or special unlock or factory reset (MSPM0G/L, TM4C). If the option is ON then related operation is executed

19.11 12V UPDI/TPI programming entry []

When the option is ON 12V entry method is used for devices with UPDI or TPI interface.

IMPORTANT: validate that your hardware is designed for 12V on UPDI or MCLR pin (actual voltage level is defined by Vpp setting)

19.12 MOSI pull-down 2.2K (G3 only) []

When the option is ON the internal pull-down resistor 2.2K on T_MOSI is enabled, useful for Enhanced ICSP™

19.13 Atmel SPI / CYBLE / ESP32 faster programming [V]

When the option is ON Atmel SPI devices (ATmega, ATtiny, etc.) are programmed faster by pre-programming fuse bits with maximum oscillator speed configuration. Final fuse bits are reprogrammed at the end of the operation. Higher baud rate is used for Cypress CYBLE modules, faster erase/programming mechanism for ESP32

19.14 Calculate fuse CRC or CS of inter. vectors []

Applicable to several devices only

19.15 STM32 parallelism 8 bit []

When the option is ON STM32F2xx/4xx/7xx devices are erased and programmed by 8-bit (x8) parallelism instead 32-bit one (x32). x8 algorithm is much slower but it's usually required for VDD < 2.7V. Note: 16-bit (x16) parallelism is not supported

19.16 Allow programming of pre-programmed device []

Allows programming of pre-programmed devices (applicable to Nordic nRF51)

19.17 Connect under reset []

Applicable to several devices

19.18 Check Device ID [x]

Checks Device ID before programming

19.19 Force DM (EEPROM) erase []

Forces DM erase even for devices with fuse "Preserve EEPROM". Applicable to Atmel SPI devices

19.20 Alternative access port []

Applicable to several devices

19.21 Use calibration value from mailbox []

Applicable to ATmega devices when frequency calibration is required

19.22 CRC/MD5 verification []

Applicable to devices with active flashloader for faster verification

19.23 Swap clock/data pins (SBW) []

Swap clock and data pins for devices with SBW interface

19.24 Power cycle entry

- (•) **Auto**
- () **Vdd ≤ 3.6 V**
- () **Vdd > 3.6V**

Applicable to CY8C2 devices

19.25 Don't program protected devices []

Don't program protected MCUs to avoid decrement of the non-volatile secure counter

19.26 Reduce synchronization frequency []

Reduce operation frequency by additional step after synchronization is done, applicable to Atmel MCUs with SPI interface (ATmega, ATtiny)

19.27 Read info area during programming []

Read from specified addresses and save to a special buffer in ICP firmware. Later this buffer can be accessed by a DLL function IcpMultipleBytesTxRxOem() with parameter OEM_OPER_INFO_BUF_READ or using the high-level RS-232 communication

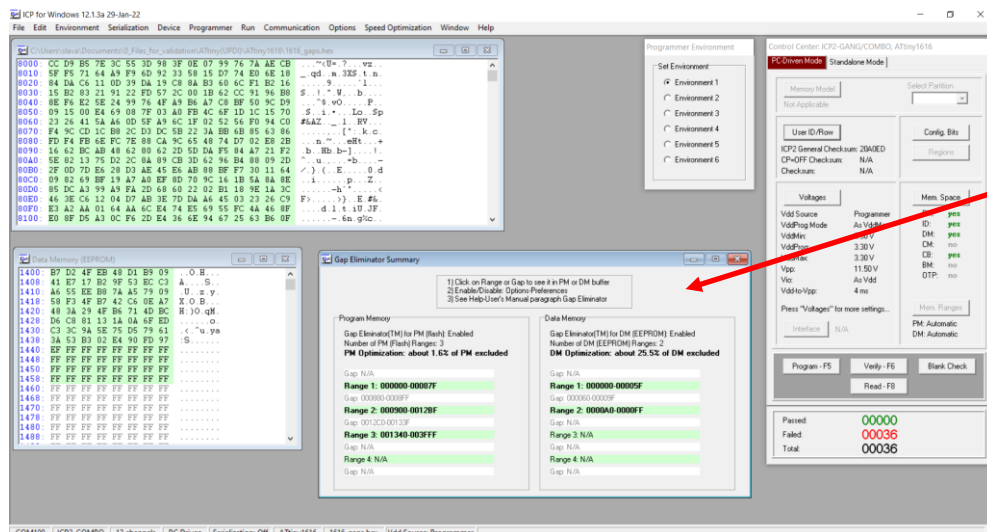
ICP Family User's Manual

20 Gap Eliminator™

20.1 Overview

The Gap Eliminator™ enables end customers to exclude empty (blank) flash and EEPROM areas in the HEX file from the programming process, resulting in shortened production cycles and reduced manufacturing costs. This powerful feature is available for all Softlog's programmers.

Starting from Jan-20 permanent “Gap Eliminator Summary” window is available:



20.2 How It Works

In addition to the critical data they carry, HEX files may also contain multiple empty areas (gaps). These gaps may come at the beginning, in the middle, or at the end of the HEX file. Thus, when programming a microcontroller, the empty bytes of a HEX file are also burned onto the microcontroller. In order to "skip" these gaps, a typical programmer usually allows the operator to define a single programming range, thus enabling two empty areas to be skipped at the beginning and end of the file. However, if the gap(s) are located between valid data areas (see example below), this is not an effective solution.

Softlog's Gap Eliminator™ feature solves this problem. Before a production run, it automatically analyzes the HEX file and effectively removes multiple gaps (up to five) from the Program Memory (flash) and Data Memory (EEPROM). This significantly reduces programming time for mass production operations.

20.3 Example of HEX File with Gaps

Memory size = 4096 bytes (address range 0x0000...0x0FFF)

Gaps are highlighted in yellow; **valid data** in green

```
Address 0x0000...0x0007: FF FF FF FF FF FF FF FF
...
Address 0x0078...0x007F: FF FF FF FF FF FF FF FF
Address 0x0080...0x0087: 01 53 A4 67 88 A5 CD 6F
Address 0x0088...0x008F: 01 23 45 67 89 AB CD EF
...
Address 0x01F8...0x01FF: 51 F3 45 F7 89 A6 CC CF
Address 0x0200...0x0207: FF FF FF FF FF FF FF FF
Address 0x0208...0x020F: FF FF FF FF FF FF FF FF
...
Address 0x07F8...0x07FF: FF FF FF FF FF FF FF FF
Address 0x0800...0x0807: 01 53 A4 67 88 A5 CD 6F
Address 0x0808...0x080F: 01 23 45 67 89 AB CD EF
...
Address 0x09F8...0x09FF: 51 F3 45 F7 89 A6 CC CF
```

ICP Family User's Manual

```
Address 0x0A00...0x0A07: FF FF FF FF FF FF FF FF
Address 0x0A08...0x0A0F: FF FF FF FF FF FF FF FF
...
Address 0x0FF0...0x0FF7: FF FF FF FF FF FF FF FF
Address 0x0FF8...0x0FFF: 01 53 A4 67 88 A5 CD 6F
```

As noted, a typical programmer allows you to define one range 0x0080...0x0FFF (3968 bytes), skipping the empty area at the beginning of the file. **This reduces the size of the HEX file by 128 bytes (3.2%).**

Using a Softlog ICP programmer with the Gap Eliminator™ feature, three programming ranges can be defined for this example:

- 0x0080...0x01FF (384 bytes)
- 0x0800...0x09FF (512 bytes)
- 0x0FF8...0x0FFF (8 bytes)

This effectively eliminates all the gaps and **reduces the size of the HEX file to be programmed by 3,192 bytes (77.9%).**

21 Speed Optimization Utility

The Speed Optimization Utility is a Wizard that guides the user through the ICP programmer configuration settings to ensure optimal speed performance. These settings include Clock/Data speed, Vdd-to-Vpp delay, VddOff delay, Gap Eliminator, Enhanced ICSP™ and more.

Enter "Speed Optimization → Run Speed Optimization Utility"

22 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 be not modified by a text editor.

23 ICP for Windows: Limited Command Line Parameters

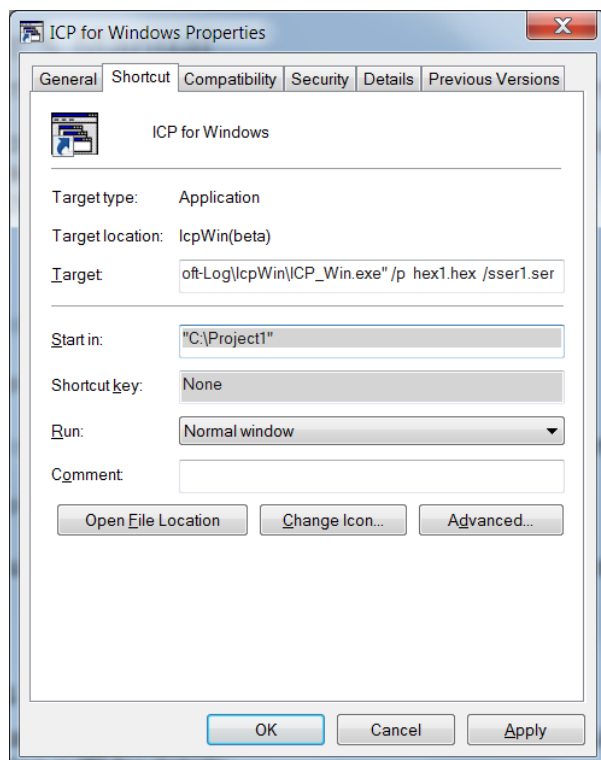
Some parameters can be loaded from the command line:

<Hex file>	- HEX/BIN/LDF 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 /s ser1.ser

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



24 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

25 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

26 Secure Programming

Your hex files contain business-critical intellectual property that could be compromised during the contract manufacturing process. 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

27 Standard LAN Configuration

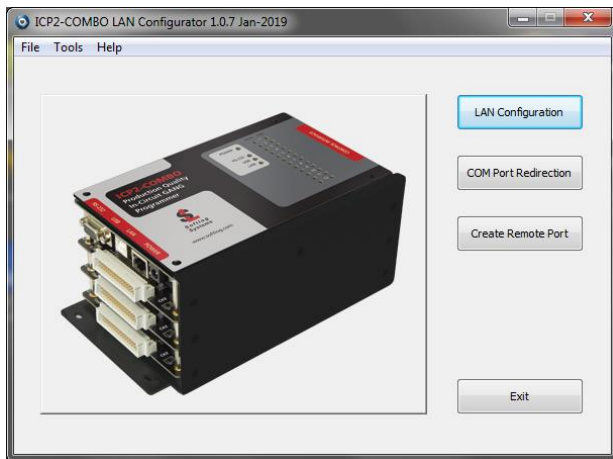
NOTES:

- See ***"ICP LAN Configurator User's Manual.pdf"*** for detailed description of all features
- Screenshots below are taken from the previous software version but they completely cover the latest version

To install and run the software supplied, follow the steps below:

- Run "IcpLan_setup_x_x_x_MMM-YYYY.exe" and follow the on-screen instructions
- Connect ICP2-COMBO or ICP2-LAN programmer to the same Ethernet network as your PC:
 - use straight cable for connection via network hub or switch
 - use crossover cable for direct connection to the PC
- Run "ICP-LAN" application that is located under C:\Softlog\IcpLan. An opening screen appears:

ICP Family User's Manual

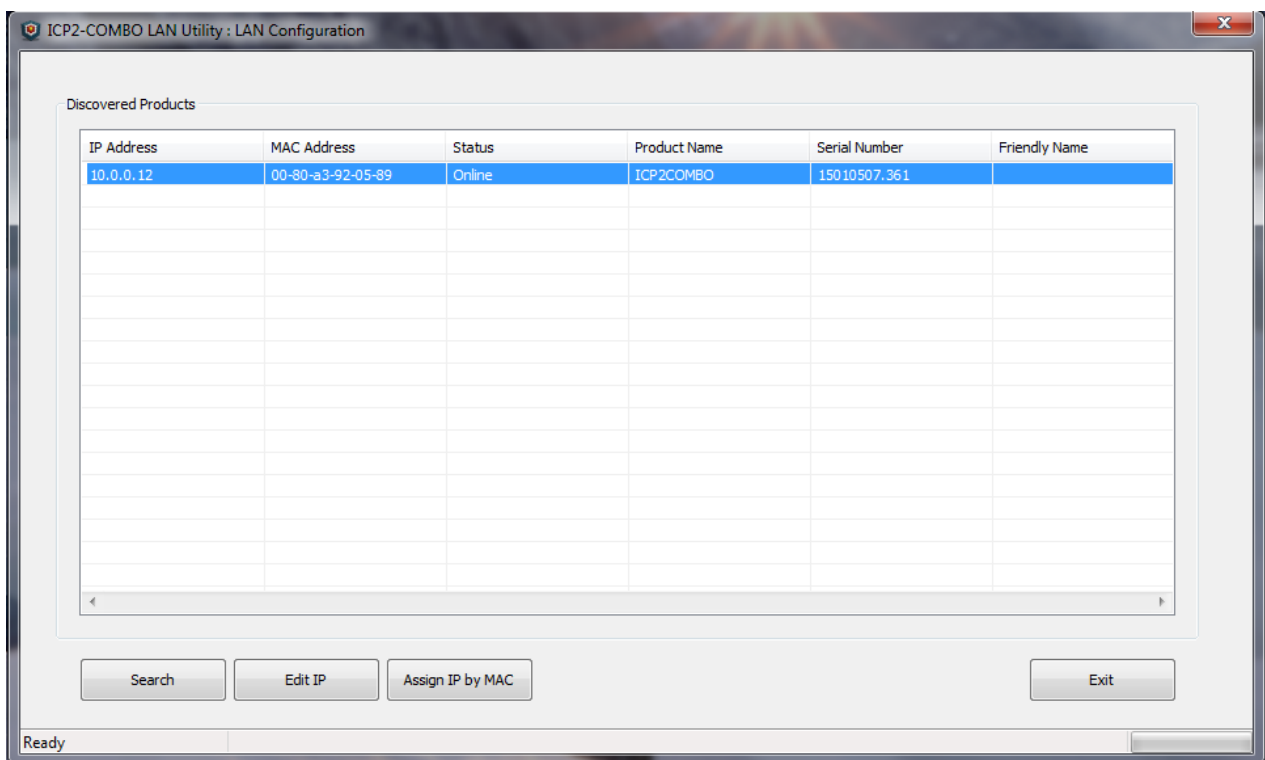


The “ICP-LAN” application provides 3 configuration features:

- “LAN Configuration” which discovers ICP2-COMBO or ICP2-LAN and changes IP network parameters
- “COM Port Redirection” which creates a virtual COM (CPR) port for ICP2-COMBO or ICP2-LAN
- “Create Remote Port” which creates remote port w/o discover procedure

27.1 LAN Configuration

- Click “LAN Configuration” button
- The application automatically starts discovering programmers. You can retry by clicking “Search” button
- The following screen appears:

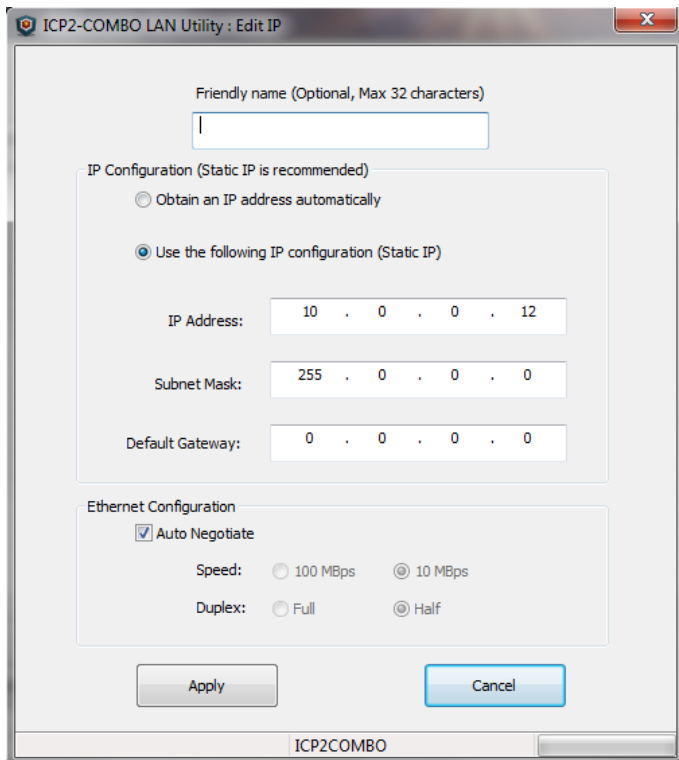


NOTES:

- verify that detected product serial number is the same as printed on the ICP2-COMBO or ICP2-LAN sticker
- if your device was not found refer to “Advanced IP Configuration”
- if status of discovered device is “Unreachable”, reconnect the power to the device and retry searching, otherwise refer to “Advanced IP Configuration”.

- Select (highlight) the discovered ICP2-COMBO programmer
- Click “Edit IP” button. The following screen appears:

ICP Family User's Manual



- Change your settings if required

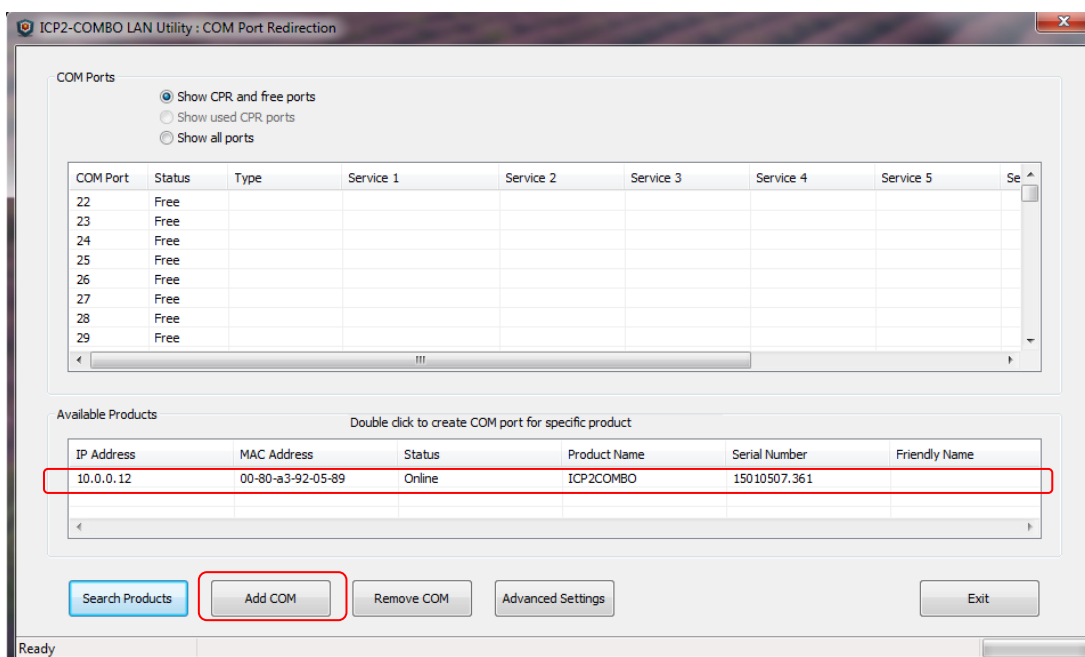
NOTES - the following settings are recommended:

- assign a friendly name to ICP2-COMBO, for example "COMBO-12 for tester 4"
- use static IP for convenient operation with a virtual CPR COM port

- Press "Apply". Wait until operation is complete (may take about 1 minute)
- Press "Exit"

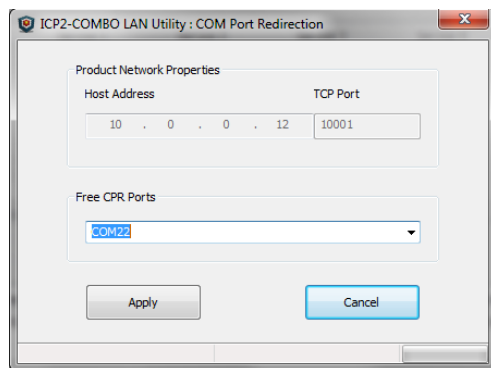
27.2 COM Port Redirection

- Click "COM Port Redirection" button (from the opening screen). The following screen appears:

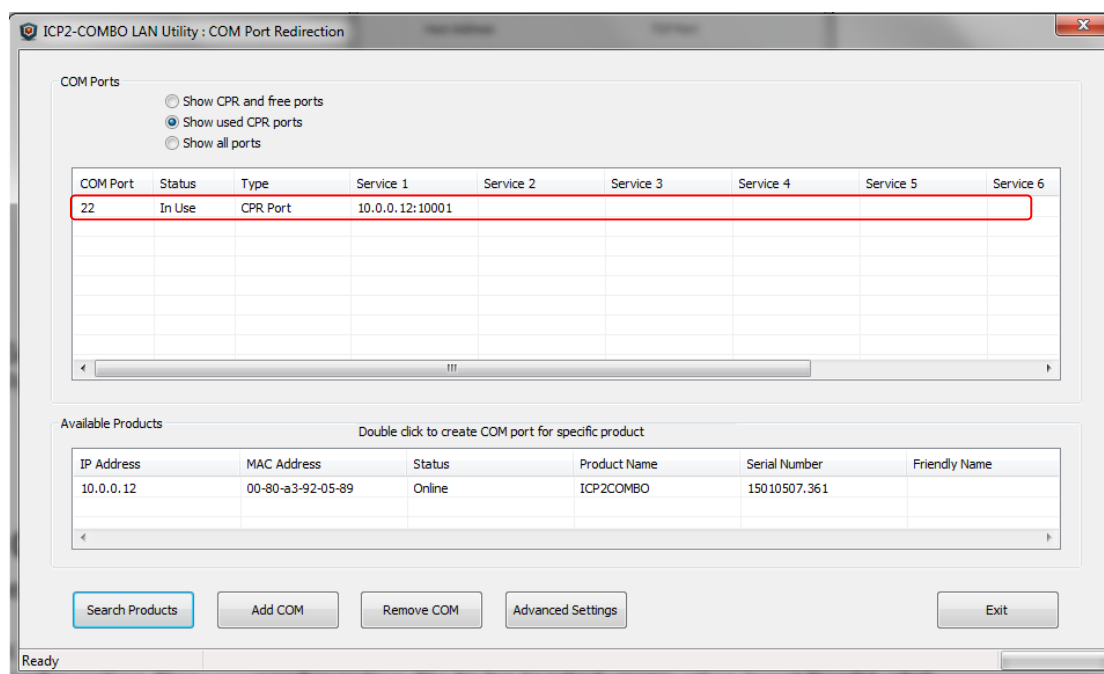


ICP Family User's Manual

- Select (highlight) the discovered ICP2-COMBO programmer on the bottom list
- Click "Add COM" button. The following screen appears:



- Select desired COM port number and press "Apply". COM Ports list on "COM Port Redirection" window will refresh automatically:



- Press "Exit"

28 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 /s ser1.ser /p
- Double-click ICP_Win icon for programming

The program will be terminated in the following cases:

- Communication error
- Hex file error

ICP Family User's Manual

- Serialization file should be loaded (/s appears) but loading is failed

29 In-Circuit Programming (Electrical Parameter Summary)

NOTE: for more details see related programmer specification:

- "ICP2(G3) Specification.pdf"
- "ICP2-GANG(G3) Specification.pdf"
- "ICP2-COMBO(G3) Specification.pdf"
- "ICP2-Portable(G3) Specification.pdf"
- "ICP2-ISO(G3) Specification.pdf"
- "ICP2-LAN(G3) Specification.pdf"

29.1 VDD

- Maximum Vdd current consumption by the application circuit:
 - ICP2/ICP2-GANG/ICP2-COMBO/ICP2-ISO/ICP2-LAN: 250mA per channel
 - ICP2-Portable: 100mA
- Maximum Vdd capacitance: 1000-10000uF. 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), a load resistor of 100-510 Ohm must be connected between Vdd and GND pins of the programmer for faster discharge of Vdd capacitor

29.2 VPP

VPP recommended load: > 1KOhm, < 22nF

WARNING: due to high VPP requirements ICP2-Portable may be not suitable for old OTP devices

29.3 T_MOSI, T_MISO, T_DIO_0/1/2

Recommended load: > 3.3KOhm, < 33pF

29.4 Delay between VDD and VPP

Default 4ms is recommended, it should be increased for big Vdd capacitors to allow full Vdd charge before Vpp rise – see 29.1

30 Target Cable

Softlog Systems recommends using the following cable between ICP family programmer and target device:

- Length: as short as possible, less than 50cm
- Structure: unshielded separate wires
- Low-pass filter: 18-33pF between CLOCK and GND **as close as possible** to the target microcontroller is recommended, especially for long cables (> 20cm).
- See "**Filter for long cables.pdf**" in folder "c:\Softlog\IcpWin\Misc Documents\"

31 Appendix A: Power Supply

ICP family programmers (excluding ICP2-Portable) are shipped with their own power supplies. 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	Recommended Power Supply
ICP2	12VDC	0.5A	"-" or "+"	GST25A12-P1J (Mean-Well)
ICP2-ISO	12VDC	0.5A	"+"	
ICP2-LAN	12VDC	0.5A	"+"	
ICP2-Portable	12VDC	0.5A	"-" or "+"	
ICP2-GANG	12VDC	1.5A	"+"	
ICP2-COMBO	12VDC	5A	"+"	GST60A12-P1J (Mean Well)

32 Appendix B: Return Values (Errorcodes)

See file "**fr_exp.h**" or ICP for Windows – Help – Errorcodes (fr_exp)

33 Appendix C: DEBUG and COE Bits

A compiler may provide incorrect settings for debug-related bits: DEBUG (Background debug) and/or COE (Clip-on emulation mode). Development tool as MPLAB® IDE manipulate these bits automatically while ICP family software loads them from a HEX file "as is".

The following procedure is strongly recommended to validate these bits:

- Run MPLAB IDE
- Compile in "Release" mode
- Export the HEX file (File → Export) under a name (for example) "1.hex"
- Import HEX file "1.hex" (File → Import)
- Write down the checksum
- Run "ICP for Windows"
- Open "1.hex"
- Compare checksums
- Inspect configuration bits. If DEBUG or COE are set to debug mode then change them to operational one
- Save updated buffers: File → Save As (Export)...

34 Appendix D: System Debug Procedure

- Validate that your programming cable is OK
 - Clock (pin 3) and Data (pin 4) are not swapped
 - VPP/MCLR comes from pin 6
 - If possible then use separate short wires (less than 20cm during debug)
- Debug the system in full PC-driven mode which provides much more info
 - Switch the Control Center to PC-driven mode
 - For ICP2-GANG/COMBO only: enter Programmer → Select Programmer → ICP2-GANG/COMBO (**Single**)
 - For ICP2-GANG/COMBO only: on the popup window select desired channel
 - Connect your target to the selected TARGET connector
 - Validate that the correct PIC is selected
 - Validate that Voltages and Preferences settings are OK
 - Load your HEX
 - Execute programming
- If the problem persists then send the following info to support@softlog.com:
 - Screenshot of entire screen including status line
 - Verification error screen
 - Electrical circuit, at least connections to VDD/MCLR/CLOCK/DATA
 - Description of the programming cable:
 - length (should be as short as possible)
 - cable type (separate unshielded wires are recommended)

35 Appendix E: Recommendations for Low Pin Count Devices

Follow recommendations below in your firmware for low pin count devices to allow correct entering to programming mode:

- enable power-up timer
- enable MCLR/VPP pin if possible
- add delay 50-200ms before configuring shared programming pins as outputs

36 Appendix F: Emergency Bootloader Mode

The following sequence can be executed to enable "emergency bootloader" mode which temporarily disables transition to the firmware

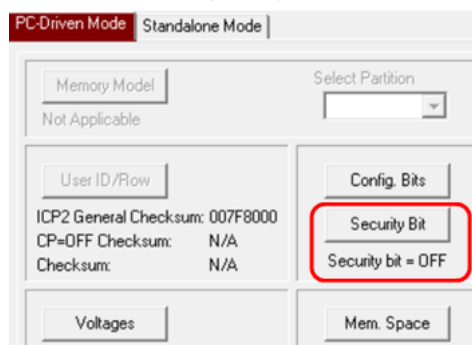
- Preparation: connect a push button (let's call it START) between pins 12 (GND) and 13 (GO) of the TARGET connector
- Preparation (CP210x only): disable power management on the USB port:
 - exit "ICP for Windows"
 - connect ICP family programmer to USB port
 - enter "Control Panel - System - Device Manager - Ports(COM &LPT) - select "Silicon Labs 210x USB..."
 - press right mouse button and select "Properties"
 - select TAB "Power Management"
 - uncheck "Allow the computer to turn off this device to save power"
 - press OK
- Disconnect ICP2 from USB and power supply (power should be off)
- Press and hold START button
- Connect ICP2 to the USB port, START button should be kept pressed
- When red LED "FAIL" goes on, immediately release START button
- Green LED "PASS" starts to blink. It means that ICP2 entered the bootloader mode
- Run "ICP for Windows"
- If no communication: enter "Connect" and select "Silicon Labs 210x USB...". Press OK
- Execute firmware upgrade when prompted or select Options - Firmware Upgrade

37 Appendix I: Special Code Protection Settings

37.1 Security Bit

- Security bit is available on devices like ATSAMC/D/L/R, for example ATSAMC20E15A
- It can be set as follows to enable code protection:
 - ICP for Windows: "Security Bit" on the Control Center

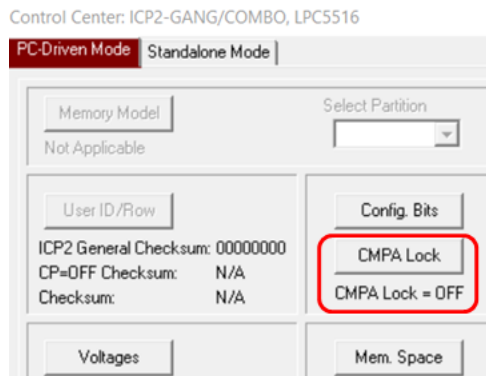
Control Center: ICP2-GANG/COMBO, ATSAMC20E15A



- ICP DLL: function IcpLoadSecurityBit()
- ICP Command Line: switch /y

37.2 CMPA Lock

- CMPA Lock bit is available on devices like LPC55xx, for example LPC5516
- It can be set as follows:
 - ICP for Windows: "CMPA Lock" on the Control Center



- ICP DLL: function IcpLoadSecurityBit()
- ICP Command Line: switch /y

38 Appendix J: Oscillator Frequency Calibration

- PC-driven and fully standalone oscillator frequency calibration is available for several Atmel SPI devices (ATmega328P, etc.). See document:
c:\Softlog\IcpWin\Release Notes\Release Notes - ATmega calibration.pdf

39 Revision History

- Revision Jul-25: minor corrections
- Revision Mar-25:
 - added fully standalone mode with high-level RS-232 communication
 - added sub-environment mechanism
- Revision Mar-24:
 - added ICP2-ISO(G3) and ICP2-LAN(G3) programmers
 - removed reference to ICP2(HC)
 - added reference to BIN and S19/S28/S37 data files
 - removed "Typical Connection to TARGET Connector": now it's referred to a separate document
 - removed "Errorcodes": now it's referred to a separate document
- Revision 12.1.3a (Jan-22):
 - updated connection table
 - "Control Interface" for ICP2-COMBO: added truth table for environment selection
 - added paragraph "Emergency Bootloader Mode"
 - added paragraph "Special Code Protection Settings"
 - added paragraph "Oscillator Frequency Calibration"
 - minor updates
- Revision 8.35.1a (Jan-20):
 - updated connection table in paragraph
 - removed references to ICP-01 (obsolete product since year 2007)
 - added new menu items, see paragraph 12
 - expanded [ICP2-GANG and ICP2-COMBO: Transfer Different Environments to Different Channels](#)
 - added [PC-Driven Serialization in Standalone Mode](#)
 - added new Preferences items – see [Options → Preferences](#)
 - added permanent "Gap Eliminator Summary" window – see 20.1
 - added [RESET Pulse after Operation](#)
 - added [Appendix E: Recommendations for Low Pin Count Devices](#)
 - added recommended power supply part numbers – see 31
 - removed paragraph "Advanced LAN Configuration"
- Revision 8.8.1a (Jul-18):
 - added reference to ICP2-Portable(G3) programmer

ICP Family User's Manual

- added reference to devices with new interfaces (UPDI, TPI, etc.)
- added new Preferences
- Revision 8.1.1a (Mar-17):
 - added reference to G3 programmers: ICP2(G3), ICP2-GANG(G3) and ICP2-COMBO(G3)
- Revision 4.16.1a (Jan-16):
 - added maximum COM port warning
 - added description of manual environment procedure (preferences and serialization, different environment for different channel)
 - added system debug procedure
- Revision 4.13.1a (Jan-15):
 - changed ICP software setup destination (new: C:\Softlog\..., old: C:\Program Files\Soft-Log)
 - added ICP2-COMBO related info
 - added checksum calculation explanation
 - added LAN description
- Revision 4.12.1 (Aug-13):
 - added warning for serialization dialog – see 16.1
 - corrected example 16.2
 - added warning for ICP2-Portable
- Revision 4.10.2 (Aug-12):
 - added “Speed Optimization Utility” paragraph
 - added “Gap Eliminator™” paragraph
 - added new Preferences
- Revision 4.9.2 (Apr-2012):
 - added description of Enhanced ICSP limitations – see 19.6
 - changed appearance of “Preferences”
- Revision 4.9.1 (Jan-2012):
 - added description of “Enhanced ICSP™”
 - GO/PASS/FAIL outputs specified as optional for ICP2-Portable
- Revision 4.8.2 (Aug-2011):
 - added description of “raw” serialization method, serialization screenshots updated
- Revision 4.8.1 (Jul-2011):
 - added Preference “Automatically select PM (flash) range”
 - added standalone serialization – see 16.6
 - added paragraph “Viewing Environment” - see 15
 - added paragraph “Debug and COE Bits” - see 33

40 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

41 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.

42 Contact

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