

Production Programming of Microchip AVR® and SAM Microcontrollers

Description

This application note covers both AVR® and SAM microcontrollers, but not PIC® microcontrollers.

AVR and SAM microcontrollers are Flash-based, therefore, the program memory needs to be programmed with a firmware image for the end-product to operate as desired. During *development* it is recommended to use the combined programming and debugging tools from Microchip, which integrate directly in the Atmel Studio IDE. However, for *production programming*, it is recommended to use third-party programming tools that are intended for industrial environments. Another option is to order the microcontrollers preprogrammed from Microchip or from a programming house.

Features

- Microchip Technology Inc. Programming Solutions
- Third-Party Programming Solutions
- Programming Services

Table of Contents

De	escription	1
Fe	eatures	1
1.	Microchip Development and Programming Tools	4
2.	Preprogrammed Microcontrollers	5
3.	Third-Party Programming Tools	6
4.	Introduction of Listed Third-Party Programming Offerings	9
	4.1. Advantech Equipment	
	4.2. ASIX	
	4.3. BPM Microsystems	
	4.4. Data I/O	10
	4.5. Dataman	
	4.6. EE Tools, Inc	
	4.7. Elnec	
	4.8. Elprotronic Inc.	
	4.9. Equinox Technologies	
	4.10. HI-LO Systems	
	4.11. Leap Electronic Co., Ltd.	
	4.12. MikroElektronika	
	4.13. Opteeq Technologies Ltd	
	4.14. Phyton, Inc	
	4.15. Ronetix	
	4.16. RPM Systems	
	4.17. SMH Technologies	
	4.18. Softlog Systems	
	4.19. System General	
_	4.20. Xeltec Inc	
5.	Programming Houses	17
6.	How to Register as a Third-Party Design Partner	18
7.	Revision History	19
Th	ne Microchip Web Site	21
Cu	ustomer Change Notification Service	21
Cu	ustomer Support	21
Mi	icrochip Devices Code Protection Feature	21

Legal Notice	22
Trademarks	22
Quality Management System Certified by DNV	23
Worldwide Sales and Service	24

1. Microchip Development and Programming Tools

To identify the correct programming and debugging tool for a microcontroller from Microchip, go to the microcontroller product webpage and from the quick access links above the product name, click the development tools icon (See Figure 1.1). This will show a list of development tools for the product. The SAM-ICE[™] supports programming and debugging of all SAM microcontrollers. SAM devices can also be programmed using the SAM-BA[®] bootloader (with various interface options). The Atmel-ICE is a programming and debugging tool that supports all of the AVR and SAM microcontrollers. AVR microcontrollers can also be programmed using the AVRISP mkII. However, note that the AVRISP mkII does not support debugging.

Note: The above mentioned programming tools are not recommended for production programming as they are designed for development environments. SAM-BA can be considered as an exception, as it does not depend on a physical tool, but the software only.

SAM-ICE: http://www.microchip.com/developmenttools/productdetails.aspx?partno=at91sam-ice

SAM-BA programming: http://www.microchip.com/developmenttools/productdetails.aspx?partno=atmel +sam-ba+in-system+programmer

AVRISP mkll: http://www.microchip.com/developmenttools/productdetails.aspx?partno=atavrisp2

Atmel-ICE: http://www.microchip.com/DevelopmentTools/ProductDetails.aspx?PartNO=atatmel-ice

Atmel-ICE for **AVR**® Programming In Mass Production: http://ww1.microchip.com/downloads/en/AppNotes/00002466A.pdf

Figure 1-1. Development Tools Icon



ATTINY817

In Production

The ATtiny817/816/814/417 is a series of microcontrollers featuring the 8-bit AVR® processor with hardware multiplier - running at up to 20MHz and with up to 8KB Flash, 512B SRAM and 128 bytes of EEPROM in 14-, 20- and 24-pin packages. The series uses the latest Core Independent Peripherals with low power features. Including Event System, intelligent analog and advanced peripherals. Capacitive touch interfaces with proximity sensing and driven shield are supported by the integrated QTouch® peripheral touch controller.



2. Preprogrammed Microcontrollers

Microchip and many Microchip distributors offer preprogrammed microcontrollers. In this case, the binary image is provided to Microchip or the distributor. This solution is obviously less flexible if changes are made frequently to the preprogrammed firmware and does have MOQ implications, but can have advantages related to reduced production time for the end-product.

To request preprogramming of Microchip microcontrollers contact microchipDIRECT, your local Microchip sales office, or your distributor.

microchipDIRECT: https://www.microchipdirect.com/programming/

3. Third-Party Programming Tools

For production programming and, e.g., to perform in-system calibration or parameter customization for the end-product, it is recommended to use professional third-party programming tools.

The list of third-party programming tools in the following table includes programming solutions for use in both development and production. Gang programmers in this context refer to single and multi-site programmers, where devices are inserted into the programming fixture to be programmed. This is in contrast to in-system programming, where the device to program is mounted on the PCB while being programmed. Both kinds of programmers can thus be used in production environments, while in-system programmers are usually preferred for development purposes.

Table 3-1. Third-Party Vendors of Programming Tools in Alphabetic Order

Company Name	ARM [®] Support	AVR [®] Support	Programmer Intended for	Gang	In-system
Advantech Equipment Corp.	Yes	Yes	Production (and	Yes	No
Taiwan ROC			development)		
http://www.aec.com.tw/					
ASIX s.r.o.	Yes	Yes	Development and	No	Yes
Czech Republic			production		
http://tools.asix.net/index.htm					
BPM Microsystems	Yes	Yes	Production and	Yes	No
USA			development		
http://www.bpmmicro.com/					
Data I/O, Corporation	Yes	Yes	Production and	Yes	No
USA			development		
http://dataio.com					
Dataman Ltd.	Yes	Yes	Production (and	Yes	Yes
UK			development)		
www.dataman.com					
EE Tools, Inc.		Information	n missing: contact vend	or	
USA					
www.eetools.com					
ELNEC s.r.o.	Yes	Yes	Production (and	Yes	Yes
Slovak Republic			development)		
http://www.elnec.com/					

continued					
Company Name	ARM [®] Support	AVR [®] Support	Programmer Intended for	Gang	In-system
Elprotronic Inc.	Yes	Yes	Production	Yes	Yes
Canada					
https://www.elprotronic.com/					
Equinox Technologies Ltd.	Yes	Yes	Production, field-	Yes	Yes
United Kingdom			service, and development		
http://www.equinox-tech.com/			development		
HI-LO System Research Co. Ltd.	Yes	Yes	Production (and	Yes	No
Taiwan ROC			development)		
http://www.hilosystems.com.tw/					
Leap Electronic Co., Ltd.	Yes	Yes	Production (and	Yes	No
Taiwan ROC			development)		
http://www.leap.com.tw/					
MikroElektronika d.o.o.	No	Yes	Development	No	Yes
Serbia					
http://www.mikroe.com/					
Opteeq Technologies Ltd.	Yes	Yes	Production (and	Yes	Yes
China			development)		
http://www.opteeq.com/en/					
Phyton [™] , Inc.	Yes	Yes	Production and	Yes	Yes
USA			development		
http://www.phyton.com					
Ronetix GmbH	Yes	Yes	Production and	No	Yes
Austria			development		
http://www.ronetix.at/					
RPM Systems Corporation	Yes	Yes	Production and development	Yes	Yes
USA			development		
http://www.rpmsys.com/					
SMH Technologies [™]	Yes	Yes	Production and development	Yes	Yes
Italy			developitietit		
http://www.smh-tech.com					

continued					
Company Name	ARM [®] Support	AVR [®] Support	Programmer Intended for	Gang	In-system
Softlog Systems (2006) Ltd. Israel http://www.softlog.com/	Yes	Yes	Production and development	Yes	Yes
System General Corporation Taiwan ROC http://www.sg.com.tw	Yes	Yes	Production (and development)	Yes	No
Xeltek Inc. USA http://www.xeltek.com/	Yes	Yes	Production and development	Yes	Yes

A general list of third-party vendors for Microchip products can be found at the pages below (not limited to programming tools). It is recommended to refer to this list for the most recent information about third-party tools.

4. Introduction of Listed Third-Party Programming Offerings

The descriptions below are provided by the third-party vendors listed in the previous section's table and contain additional information related to the programming products and the services these vendors offer. The third-party vendors are listed in alphabetic order.

Note: The descriptions below do not reflect any recommendations by Microchip.

4.1 Advantech Equipment

The **Labtool-48UXP** is a universal programmer for development and low-volume production. It supports most of the Microchip AVR 8-bit MCUs, up to 64 pins, in various packages including PLCC, SOIC, TSSOP, SOT23, TQFP, QFN, and QFP. In addition, through adapters with up to 64 pins, it also supports the Microchip ARM7TDMI MCU in 64/48 pins in TQFP package, as well as the complete line of Microchip 8951-C1 and 51-C12 MCUs.

The **Labtool-848XP** is a production gang programmer for high density NOR Flash and Flash-based MCUs with EEPROM. It supports parts of the AVR 8-bit family as well as the 89C51-1C and -2C MCUs from Microchip. The **Labtool-848UXP** can also be customized with additional chip support upon customer request. In addition, if the default chip support is not sufficient, Advantech Equipment can be contacted to add the chip support with custom software.

Labtool-48UXP universal programmer: http://www.aec.com.tw/lt-48uxp.htm

Labtool-848XP gang programmer: http://www.aec.com.tw/lt-848xp.htm

4.2 ASIX

ASIX s.r.o. founded in 1991 has entered the development tools business in the mid-'90s. Since 2004, ASIX has been offering an In-System USB Programmer, **PRESTO**, which supports many Microchip devices including AVR, '51, and ARM7TDMI MCUs, as well as Serial EEPROM and Flash memories. In 2012, ASIX introduced a **FORTE** programmer, which offers more features and higher speed. Both programmers are primarily intended for development and service purposes, but many of them are also used for small and medium volume production (up to a couple of thousand units/day), typically with multiple programmers working in production lines. User-friendly and highly configurable software, called **UP**, supports production programming (serial number generator, remote control from command-line, Windows® messages, DLL library, etc.). Updates of **UP** and other software tools for **PRESTO** and **FORTE** are freely available. ASIX offers fast and effective technical support including new device implementation at customer request.

Company webpage: http://www.asix.net/

4.3 BPM Microsystems

BPM Microsystems is the leading global provider of device programming systems for test and measurement systems, factory integration software, and solutions for the semiconductor and electronics industries.

Founded in 1985, BPM Microsystems serves more than 2.000 companies in over 40 countries, including tier 1 Automotive suppliers, programming centers, original equipment manufacturers (OEM), contract manufactures and semiconductor manufacturers. BPM programmers offer high-performance device handling, advanced serialization, and quality control, meeting the highest programming and cyber-

security standards for automotive, aerospace, medical, industrial and mobile device applications. BPM's intelligently designed systems deliver the lowest programming cost per device. From low-volume first articles to high-volume production, BPM Microsystems has a solution to meet customers' needs today and into the future.

BPM Microsystems full-line of programmers and support includes:

The **BPM 3910**, the latest Automated Programming System (APS). Its combination of speed, throughput, ease-of-use, and small footprint makes the 3910 a value-packed programmer in a class by itself.

https://bpmmicro.com/programmers/automated-programmers/3910-2/

The flagship product, the **BPM 4900**, is the most universal production programmer with the highest throughput and is configurable with a variety of input/output options, 3D inspection and advanced laser marking.

www.bpmmicro.com/programmers/automated-programmers/4900-2/

When quality is critical, and volumes are smaller, BPM has two manual programming solutions. The BPM 2900L features four socket card receptacles with an integrated lever socket actuator and universal pressure plate. Up to eleven 2900L can be connected to one computer for up to 44 devices programmed simultaneously.

https://bpmmicro.com/programmers/manual-programming-systems/2900l/

The BPM 1900 is the first article programming system of BPM Microsystems with a single socket receptacle and is upgradeable to the 2900L.

https://bpmmicro.com/programmers/manual-programming-systems/1900-2/

BPM Microsystems supports 50.000+ devices from over 200 semiconductor manufacturers. New socket cards and algorithms are continually added and can be developed quickly to meet future programming needs.

For more information, please visit the company's website at www.bpmmicro.com

4.4 Data I/O

Data I/O is the world's leading provider of manual and automated device programming systems for Flash, Microcontroller, and Logic devices. They serve electronics manufacturers around the world including OEM, ODM, EMS, and programming centers. Programming systems and value-added software solutions enable the customers to:

- Streamline programming with their production processes
- Meet their specific quality requirements
- Ensure that the devices are programmed at maximum speed and with the highest quality

Data I/O creates best-in-class production solutions including:

PSV7000 Automated high-speed automated handler: www.dataio.com/PSV7000

RoadRunner3 Inline automated just-in-time programmer: http://www.dataio.com/Solutions/RoadRunner-Family

FlashPAK III Manual programmer: http://www.dataio.com/Solutions/FlashPAK-Family

4.5 Dataman

With over 30 years of experience, Dataman is a world-leading provider of device programmers.

Dataman designs and sells products that stand out from the crowd and continue to provide market-leading solutions. Dataman offers a comprehensive range of programming solutions suitable for every requirement from design and development to large-scale production.

Dataman currently supports over 80.000 devices (Nov. 2013), with updates every 3-4 weeks adding 200-300 new chips. Support can be added for missing devices quickly and typically free of charge. Their universal programmers come as standard with a 3-year warranty, free life-time technical support, and software updates.

Company webpage: https://www.dataman.com/

4.6 EE Tools, Inc.

In 1992, EE Tools, Inc. started manufacturing a line of low-cost device programmers with an emphasis on MOS programming. EE Tools later developed a series of bipolar memory and logic programmers to complement the earlier products, and have since then grown to become one of the most well-known universal device programmer manufacturers worldwide. From their headquarter in San Jose, through a network of distributors around the globe, they are able to stay on top of the expanding device programmer market and provide customers with the best performance products and support. All products are backed with full technical support and free software updates for the product's lifetime.

Stand-alone and Production Programmer: MultiMax-8G+

PC-driven Production Programmer via USB Interface: ProMax-4G

PC-driven Development Programmer via USB Interface: TopMax2, ChipMax2

EPROM Eraser: Model 10, Chip-20

EPROM Emulator via USB Interface: EEROM-8U

For more information, please visit the company's website at http://www.eetools.com/

4.7 Elnec

Elnec is a leading provider of solutions for programming memories, microcontrollers, and other programmable devices in Europe. Elnec is committed to set a new standard in the industry by providing universal, highly reliable, and cost-effective programming solutions for devices in any package, whether programmed in a socket or through ISP on a circuit board. Elnec offers programming adapters; more than 800 models of universal, specialized, and BGA adapters.

Their product range includes support for Microchip AVR 8-bit, AVR 32-bit, ARM-based, and 8051 microcontroller: Production programmers with multi-site concurrent programming for high-volume manufacturers, and Universal programmers with single-site programming for developers and low-volume manufacturers.

Production programmers: http://www.elnec.com/products/production-programmers/

Universal programmers: http://www.elnec.com/products/universal-programmers/

Programming adapters: http://www.elnec.com/products/programming-adapters/

4.8 Elprotronic Inc.

Elprotronic Inc. is an engineering company dedicated to supplying its customers with innovative and reliable hardware and software solutions, especially production programming tools. Elprotronic offers **FlashPro** and **GangPro (6x)** programmers available in three adapters: USB-FPA-6.1, XStream-Iso, and XStreamPro-Iso. With programming speed ranging from ~65KB/s for the USB-FPA-6.1, to 1 MB/s in the XStream adapters, all adapters are supported with a GUI and DLL or shared library API. All adapters are Windows® compatible, but additionally the XStream adapters are Debian® and Raspbian® Linux® compatible as well. The XStream-Iso adapter provides galvanic isolation and real-time current measurement down to 20 μA, whereas the XStreamPro-Iso adapter is more sensitive with measurement down to 50 nA (Deep Sleep mode currents). All Eprotronic adapters are USB compatible, whereas the XStreamPro-Iso also has Ethernet (and Power over Ethernet) support and Stand-Alone mode.

FlashPro-ARM(XS): SAM, http://www.elprotronic.com/XS-FLASHPRO-ARM-1V

GangPro-ARM(XS): SAM, http://www.elprotronic.com/XS-GANGPRO-ARM-1V

FlashPro-M(XS): AVR, http://www.elprotronic.com/XS-FLASHPRO-M-1V

4.9 Equinox Technologies

Equinox Technologies offers a comprehensive range of development, field-service, and production programming tools, which support In-System Programming (ISP) of Microchip AVR and ARM microcontrollers. The **EPSILON5-MK4** and **FS2009USB** portable programmers operate in Stand-Alone mode and are therefore ideally suited to low-throughput production programming and field-service applications. The **ISPnano - Series 3/Series 4 GANG and MUX** families of ISP programmers offer scalable, high-speed production programming solutions from 1 to 32 channels (Gang mode) and 2-256 channels (Multiplexed mode). All programmers offer comprehensive ESD and overvoltage protection.

EPSILON5-MKIV - Portable stand-alone ISP programmer: http://www.equinox-tech.com/products/details.asp?ID=1575

FS2009USB - Portable stand-alone ISP programmer: http://www.equinox-tech.com/products/details.asp? ID=1561

ISPnano Series 4 - Production ISP programmer: http://www.equinox-tech.com/products/details.asp? ID=1538

ISPnano-MUX 2/4/8 - Multiplexed ISP programmer: http://www.equinox-tech.com/products/details.asp? ID=1498

4.10 HI-LO Systems

HI-LO has been devoted to providing device programmers and programming/testing solutions, with reliable quality at a reasonable price for over 30 years. Their product range covers engineering, production programmers, automated device programming systems, and 3D lead/marking inspection systems. HI-LO is one of the market leaders regarding to Device Programming Equipment and Programming services in Pan Asia. (Hong Kong, Taiwan, China, Japan, etc.)

HI-LO Systems product pages: www.hilosystems.com.tw/en

4.11 Leap Electronic Co., Ltd.

Leap Electronic is deeply involved in the field of IC testing and programming equipment, supplying many series of products such as programmers, automation systems, and logic analyzers. The range of programmers varies from universal to gang programmers, all of which can support both AVR and ARM. Moreover, Leap Electronic also has the capability of providing programming services. Four branches are established in China, in order to provide customers well-organized and professional services. Email: overseas1@leap.com.tw.

Leaper-56 (Single-site programmers): https://sites.google.com/site/leapleaptronixen/programmer_series/LEAPER-56

Leaper-456 (Development programmers): https://sites.google.com/site/leapleaptronixen/programmer series/LP-456?pageUrlChanged=LP-456

AH-160 (Gang programmer series): https://sites.google.com/site/leapleaptronixen/automated_system/ah-160

AH-480 (Gang programmer series): https://sites.google.com/site/leapleaptronixen/automated_system/ah-480

4.12 MikroElektronika

mikroProg[™] for AVR is a fast USB programmer supporting numerous AVR microcontrollers. It is supported with **mikroC**[™], **mikroBasic**[™], and **mikroPascal**[™] compilers for AVR, but may also be used as a stand-alone programming tool. Outstanding performance, easy operation, and low price are its top features. Elegant minimalistic design, clean matte white plastic finish, and color indicator LEDs make **mikroProg** for AVR the first of its kind.

mikroProg for AVR webpage: http://www.mikroe.com/mikroprog/avr/

mikroElektronika AVR compilers: https://www.mikroe.com/compilers/compilers-avr

4.13 Opteeg Technologies Ltd.

Opteeq S-Series is an ultra-fast, industrial grade, In-System Programmer. It universally supports different types of programming interfaces and silicon architectures. Thanks to its compact size and software library, **S-Series** can be easily integrated into other production equipment, e.g., functional or circuit testing machines, testing fixtures, etc. Additionally, **S-Series** can also be used as a desktop programmer. To satisfy various output volumes, **S-Series** offers models with one, four, or eight physical programming channels. Its capability to work stable and the protection of target circuit make the S-Series an excellent choice for mass production of automotive, industrial, and consumer electronics.

Opteeq Technologies product page: http://www.opteeq.com/en/product.html

4.14 Phyton, Inc.

Phyton **ChipProg** line of device programmers for both development and production include single-site, gang parallel, and In-System Programmers. They provide extremely fast Flash programming for Microchip SAM D20, SAM3, SAM4, AVR, C51, and AT89LP microcontrollers, memory devices, and PLDs. Multiple Phyton programmers can be controlled from one computer for concurrent programming, from a friendly GUI, remotely from ATE via DLL, or in Command Line mode. The **ChipProg** software

features script language and other tools for programming automation, allowing the writing of serial numbers and signatures into the chips. Adapters are available (BGA, QFN, QFP, TSOP, SOIC, PLCC, etc.).

ChipProg-ISP webpage: http://phyton.com/categories/product/chipprog-isp ChipProg-G41 webpage: http://phyton.com/categories/product/chipprog-g41 ChipProg-481 webpage: http://phyton.com/categories/product/chipprog-481

Device Finder webpage: http://phyton.com/device-search

4.15 Ronetix

Ronetix is an Austrian manufacturer of high-quality software tool kits, debug probes, and programmers for wide-range CPUs and cores. Ronetix's JTAG Flash programmer **PEEDI** is a production and development solution for high-speed programming on-board and on-chip Flash devices on all ARM and AVR based MCUs.

- Programming of over 1000 NOR Flash chips, NAND Flash, OneNAND Flash
- · Programming of Data Flash, SPI Flash devices
- Programming of a JFFS2 image to a NAND Flash
- Working in Stand-Alone mode in the production line (with an MMC/SD card)
- Multicore programming; upgrade to PEEDI JTAG Emulator

For more information, see: http://www.ronetix.at/flash-programmer.html

4.16 RPM Systems

RPM Systems Corporation with *MPQ* Four-port In-Circuit Gang Programmers provide programming support with:

- One image on up to four devices in parallel
- Up to 16 MPQs can be interconnected to provide programming of up to 64 devices in parallel
- Up to four separate program images can be stored on the programmer, allowing optional standalone operation, and making programming fast and efficient
- Stand-alone, ATE-controlled, or PC-controlled operation
- Device Serialization feature allows automatic serialization of programmed devices
- Secure Image Management feature provides code security and allows restrictions on the number of parts programmed from each image
- Support for Microchip AVR, AVR32, and ARM devices
- Support for SPI, PDI, TPI, JTAG, and SWD Microchip programming interfaces

More information at http://www.rpmsys.com/products.htm

4.17 SMH Technologies

SMH Technologies is a global, independent, high-tech company leader in Silicon Device In-System Programming and related services for the electronic boards manufacturing industry. **FlashRunner** series, the company's professional Silicon Device In-System Programming platform, is the result of the decennial experience in micro-code encoding for 8-, 16-, and 32-bit processors. **FlashRunner** helps customers enhance quality, save time, and optimize manufacturing cycles. SMH continuously improve their offer by

releasing new programming algorithms weekly. Thanks to **FlashRunner** flexible and modular design, the same algorithms are to be used on all of the models.

FlashRunner I series: A range of high-performance In-System Programmers for Flash-based microcontrollers and serial memories. Targets production environments and works in full Stand-Alone mode or controlled by a host system.

FlashRunner Quattro is a high-integration In-System Gang Programmer based on the FlashRunner technology, designed for programming multi-PCB panel assemblies.

FlashRunner FRPXIA3 is a PXI module for Gang In-System Programming. First in the world programming solution for PXI system, it has full hardware and software ATE integration and multitarget parallel programming channels.

4.18 Softlog Systems

Softlog Systems specializes in In-Circuit Serial Programming[™] for Microchip microcontrollers. The ICP product line comprises several high-speed, production-grade in-circuit programmers, each of which offers a set of robust features and flexible options that can be adapted to each customer's specific production requirements.

The following products have support for AVR and SAM devices:

- 1. ICP2(G3)
- 2. ICP2GANG(G3)
- 3. ICP2COMBO(G3)
- 4. ICP2PORT(G3)

Softlog products are available for sale through microchipDIRECT: https://www.microchipdirect.com/

Softlog System product page: http://www.softlog.com/index.asp?page=ICP2&parentid=2

List of supported devices: http://www.softlog.com/userfiles/file/Downloads/Device%20list.pdf

4.19 System General

In response to increasing customer demands for programming IC devices, System General provides total solutions in terms of manual and automated equipment primarily used for mass production. Currently, System General supports more than 22.000 ICs from major IC manufacturers, including the Microchip AVR and ARM-based families. The supported IC list can be found in one of the links below. As for automated solutions, the **AP710** is intended for handling small and fragile CSP packages and serves as the universal programming platform, while the **AP720** is optimized for high-volume production, carrying four nozzles and is able to run with four programmers simultaneously. In addition, programming solutions support eMMC/NAND/NOR/MCU and CPLD devices and software updates are free of charge throughout the product life of the programming equipment.

System General Products: http://www.sg.com.tw/instruGP/product_E.asp System General Chip List: http://www.sg.com.tw/instruGP/search_E.asp

4.20 Xeltec Inc.

Xeltek Inc. offers professional high-speed programming solutions for in-system production programming of AVR microcontrollers. **SuperPro IS01** is intended for small to medium-scale production. **SuperPro**

IS03 and **SuperPro XPS01** are for large-scale production and multiple **SuperPro IS03** units can be set up to program multiple microcontrollers in parallel, to save production time. All programming tools are controlled through the **SuperPro software**, and some can also be controlled by command line and LabVIEW. The **SuperPro software** has multilingual support including English, Chinese, German, French, and other languages.

SuperPro IS01 webpage: http://www.xeltek.com/isp-programmers/in-system-programmers-superprois01/

SuperPro IS03 webpage: http://www.xeltek.com/isp-programmers/superpro-is03-in-system-isp-programmer/

SuperPro XPS01 webpage: http://www.xeltek.com/isp-programmers/superpro-xps01-isp-production-workstation/

SuperPro software webpage: http://www.xeltek.com/SuperPro-Software-Download-Center/

5. Programming Houses

Programming services are also available from distributors. Contact your distributor for more information about programming services.

Table 5-1. Other Programming Houses in Alphabetic Order (not limited to)

Company Name	Products Supported	Other Services
A&J Programming USA http://www.ajprogram.com/	AVR [®] , ARM [®]	Ink and laser marking, coplanarity check and inspection, dry pack.
Falcon Denshi K.K. Japan http://www.falcon-denshi.co.jp/en	SAM3, SAM4, SAMA5, SAM9	
HI-LO Electronics AB Sweden www.hilo.nu	AVR [®] , ARM [®]	Laser and ink marking. Repacking according to the customer's needs.
HI-LO Systems Research Co., Ltd. Taipei, Taiwan http://www.hilosystems.com.tw/en/	AVR [®] , ARM [®]	Programming of NAND, NOR Flash, etc.
Minato Holdings, Inc. Japan http://www.minato.co.jp/en	SAM3, SAM4	
Prochild International, Incorporated Korea http://www.prochild.com	AVR [®] , ARM [®]	
Program Automation Inc. USA http://www.progauto.com/	AVR [®] , ARM [®]	Programming of memories and FPGA.
Xeltek Co., Ltd. China http://www.xeltek.com.cn/	AT89C51, AVR, SAM7, SAM3, SAM4, SAM D20	Programming of PLD, GAL.

6. How to Register as a Third-Party Design Partner

Microchip's Worldwide Design Partner network provides a channel between our authorized Design Partners and customers in need of technical expertise and cost-effective solutions in a timely manner. If you are interested in joining, e.g. registering programming tools for Microchip microcontroller products, send us an email: design partner Program webpage for more information.

For additional tool recommendations, please see the recommended third party tools list on Microchip's website.

7. Revision History

Doc. Rev.	Date	Comments
D	10/2018	 Table 3-1, updated Third-Party vendors of programming tools: Updated Elprotronic and BPM Microsystems information. Updated company names for EE Tools Inc., HI-LO, Microelectronic d.o.o., Opteeq Technologies Ltd., Python Inc., SMH Technologies. Added website link for System General Corporation. Section 4.3 BPM Microsystems, added description. Section 4.5 Dataman, added company webpage link. Section 4.6 EE Tools, Inc., added company webpage link. Added section 4.8 Elprotronic Inc. and adjusted subsequent section numbers. Section 4.9, fixed company name. Section 4.11, added trademarks. Section 4.12, fixed company name. Table 5-1, added trademarks and fixed company name capitalization. Section 6, added link to recommended Third-Party tools list on Microchip's website. Other minor editorial changes.
С	03/2017	 Updated with Softlog information. Updated Table 3-1 Third-Party Vendors of Programming Tools in Alphabetic Order. Added section 4.17 Softlog Systems.
В	12/2017	 In Chapter 1, link for Atmel-ICE for AVR[®] is added. Some minor editorial updates.
A	06/2017	 Converted to Microchip format and replaced the Atmel document number 42215. Opteec added. New documentation template.
42215D	10/2016	A complete update with several changes in the application note.

continued	continued			
Doc. Rev.	Date	Comments		
42215C	01/2015	SMH details added.		
42215B	01/2014	EE Tools, Dataman, and Segger added.		
42215A	11/2013	Initial document release.		

The Microchip Web Site

Microchip provides online support via our web site at http://www.microchip.com/. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- Product Support Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- General Technical Support Frequently Asked Questions (FAQ), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

Customer Change Notification Service

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at http://www.microchip.com/. Under "Support", click on "Customer Change Notification" and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or Field Application Engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://www.microchip.com/support

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.

 Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Legal Notice

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Heldo, JukeBlox, KeeLoq, Kleer, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, Anyln, AnyOut, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, memBrain, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2018, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-3758-1

Quality Management System Certified by DNV

ISO/TS 16949

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.



Worldwide Sales and Service

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office	Australia - Sydney	India - Bangalore	Austria - Wels
2355 West Chandler Blvd.	Tel: 61-2-9868-6733	Tel: 91-80-3090-4444	Tel: 43-7242-2244-39
Chandler, AZ 85224-6199	China - Beijing	India - New Delhi	Fax: 43-7242-2244-393
Tel: 480-792-7200	Tel: 86-10-8569-7000	Tel: 91-11-4160-8631	Denmark - Copenhagen
Fax: 480-792-7277	China - Chengdu	India - Pune	Tel: 45-4450-2828
echnical Support:	Tel: 86-28-8665-5511	Tel: 91-20-4121-0141	Fax: 45-4485-2829
nttp://www.microchip.com/	China - Chongqing	Japan - Osaka	Finland - Espoo
support	Tel: 86-23-8980-9588	Tel: 81-6-6152-7160	Tel: 358-9-4520-820
Veb Address:	China - Dongguan	Japan - Tokyo	France - Paris
www.microchip.com	Tel: 86-769-8702-9880	Tel: 81-3-6880- 3770	Tel: 33-1-69-53-63-20
Atlanta	China - Guangzhou	Korea - Daegu	Fax: 33-1-69-30-90-79
Ouluth, GA	Tel: 86-20-8755-8029	Tel: 82-53-744-4301	Germany - Garching
el: 678-957-9614	China - Hangzhou	Korea - Seoul	Tel: 49-8931-9700
ax: 678-957-1455	Tel: 86-571-8792-8115	Tel: 82-2-554-7200	Germany - Haan
ustin, TX	China - Hong Kong SAR	Malaysia - Kuala Lumpur	Tel: 49-2129-3766400
el: 512-257-3370	Tel: 852-2943-5100	Tel: 60-3-7651-7906	Germany - Heilbronn
Soston	China - Nanjing	Malaysia - Penang	Tel: 49-7131-67-3636
Vestborough, MA	Tel: 86-25-8473-2460	Tel: 60-4-227-8870	Germany - Karlsruhe
el: 774-760-0087	China - Qingdao	Philippines - Manila	Tel: 49-721-625370
ax: 774-760-0088	Tel: 86-532-8502-7355	Tel: 63-2-634-9065	Germany - Munich
Chicago	China - Shanghai	Singapore	Tel: 49-89-627-144-0
asca, IL	Tel: 86-21-3326-8000	Tel: 65-6334-8870	Fax: 49-89-627-144-44
el: 630-285-0071	China - Shenyang	Taiwan - Hsin Chu	Germany - Rosenheim
ax: 630-285-0075	Tel: 86-24-2334-2829	Tel: 886-3-577-8366	Tel: 49-8031-354-560
allas	China - Shenzhen	Taiwan - Kaohsiung	Israel - Ra'anana
ddison, TX	Tel: 86-755-8864-2200	Tel: 886-7-213-7830	Tel: 972-9-744-7705
el: 972-818-7423	China - Suzhou	Taiwan - Taipei	Italy - Milan
ax: 972-818-2924	Tel: 86-186-6233-1526	Tel: 886-2-2508-8600	Tel: 39-0331-742611
etroit	China - Wuhan	Thailand - Bangkok	Fax: 39-0331-466781
lovi, MI	Tel: 86-27-5980-5300	Tel: 66-2-694-1351	Italy - Padova
el: 248-848-4000	China - Xian	Vietnam - Ho Chi Minh	Tel: 39-049-7625286
louston, TX	Tel: 86-29-8833-7252	Tel: 84-28-5448-2100	Netherlands - Drunen
el: 281-894-5983	China - Xiamen		Tel: 31-416-690399
ndianapolis	Tel: 86-592-2388138		Fax: 31-416-690340
loblesville, IN	China - Zhuhai		Norway - Trondheim
el: 317-773-8323	Tel: 86-756-3210040		Tel: 47-72884388
ax: 317-773-5453			Poland - Warsaw
el: 317-536-2380			Tel: 48-22-3325737
os Angeles			Romania - Bucharest
Mission Viejo, CA			Tel: 40-21-407-87-50
el: 949-462-9523			Spain - Madrid
ax: 949-462-9608			Tel: 34-91-708-08-90
el: 951-273-7800			Fax: 34-91-708-08-91
taleigh, NC			Sweden - Gothenberg
el: 919-844-7510			Tel: 46-31-704-60-40
ew York, NY			Sweden - Stockholm
el: 631-435-6000			Tel: 46-8-5090-4654
an Jose, CA			UK - Wokingham
el: 408-735-9110			Tel: 44-118-921-5800
el: 408-436-4270			Fax: 44-118-921-5820
anada - Toronto			
el: 905-695-1980			
ax: 905-695-2078			