A Guide to CodeWarrior Development Studio for HC(S)08/RS08 Microcontrollers

May 24, 2006

What is new in this release?

All sections have been updated per your requests, check particularly:

- New derivatives supported (see specifications, service packs)
- New Device Initialization section
- Connection support for RS08 microcontrollers
- More on licensing, getting started, links, documentation and Q&A's

1 CodeWarrior Development Studio for HC(S)08/RS08

CodeWarrior Development Studio for HC(S)08/RS08 is an integrated suite of tools containing all the components needed to bring an application from the concept stage to the release to the market of a finished product.

CodeWarrior Development Studio contains the following set of tools:
*   * Integrated Development Environment (IDE)
*   * Project Wizard, Project Manager
*   * Processor Expert™ with Beans™ (1)
*   * Device Initialization™ (2)
*   * Editor, Compiler, linker and Macro/Absolute Assembler
*   * Graphical Debugger with new Debug Module and multi-target interface capability
*   * Simulator with Data Visualization and I/O Stimulation (3)
*   * Flash programming tools
*   * Many features can be set to user's preferences with the project preferences panel and the targets preferences panels.

(1) Processor Expert helps save design time by assisting the user in the definition of the application environment and generating support code without having to read and learn a lot about the device, its peripherals, the registers and their bit field settings.
(2) Device Initialization
 (3) Data Visualization helps save debugging time (especially with the simulator before hardware is available) by providing a graphical display of bit status and byte values. I/O Stimulation provides graphical, real-time control of bit levels or byte values as inputs to the application.

An evaluation copy can be requested from Freescale.
It is possible to evaluate the full featured Professional Edition by requesting a license, free of charge, valid for 30 days. Contact your Freescale salesperson or distributor.

2 Specifications

2.1 Version of products

Release 5.1   Current release of CodeWarrior Development Studio for HC(S)08/RS08

*   • The EY16A service pack supporting the M68HC908EY16A and MC68HC908EY8A will be posted on the CodeWarrior download page in June 2006. It will be on the July Service Pack CD.
*   • The JR12 service pack support the MC9S08JR12 will be posted on the CodeWarrior download page in June 2006. It will be on the July Service Pack CD.

2.2 Processors supported by the current release (without service pack)

CodeWarrior supports all the HC08 and HCS08 derivatives in production at the time of its development. New derivatives are (and will be) supported by 'Service Packs' until the next release (see following section).
For latest updates, link to download HC(S)08 Service Packs .

- AB:	AB32
*- AP:	AP8, AP8A, AP16, AP16A, AP32, AP32A, AP64, AP64A
- AS:	AS60, AS60A
*- AW:	AW32, AW48, AW60
- AZ:	AZ32A, AZ60A
- BD:	BD48
- EY:	EY8, EY8A, EY16, EY16A
*- GB/GT:	GB32, GB32A, GB60, GB60A, GT16, GT32, GT32A, GT60, GT60A
- GP/GT:	GP32, GT8, GT16,
- GR:	GR4, GR8, GR16, GR16A, GR32A, GR48A, GR60A
- GZ:	GZ8, GZ16, GZ32, GZ48, GZ60
- JB:	JB8, JB12, JB16
- JG:	JG16
- JK:	JK1, JK3, JK8, JK16
- JL:	JL3, JL8, JL16
- JW:	JW32
#- KA:	KA2
- KX:	KX2, KX8
- LB:	LB8
- LD:	LD64
- LJ:	LJ12, LJ24
- LK:	LK24
- LT:	LT4, LT8
- LV:	LV8
- MR:	MR8, MR16, MR32
- QB:	QB4, QB8
- QC:	QC4, QC8, QC16
*- QG:	QG4, QG8
- QL:	QL2, QL3, QL4
- QT:	QT1, QT1A, QT2, QT2A, QT4, QT4A, QT8
- HLC908QT:	QT1, QT2, QT4
- QY:	QY1, QY1A, QY2, QY2A, QY4, QY4A, QY8
- HLC908YT:	QY1, QY2, QY4
- RF/RK:	RF2
- SR:	SR12
*- RC:	RC8, RC16, RC32, RC60
*- RD:	RD8, RD16, RD32, RD60
*- RE:	RE8, RE16, RE32, RE60
*- RG:	RG32, RG60

Note:
* Denotes HCS08 derivatives with new background debug module. They are supported by a BDM target interface.
# Denotes RS08 derivatives, which are supported by a BDM target interface.

2.3 Service Packs available for new derivatives

Service Packs are packages developed to support new derivatives (full new stationery or complement of the stationery). "New derivatives" are devices introduced after the release of CodeWarrior.
Service packs are available from our web site (see links at the end of this document). Whenever possible, these service packs will be integrated into the next release.

Service Packs for Release 3.1:

• CW08 V3.1 USB Service Pack	(February 3, 2005)	Adds USB 2.0 support for USB Mon08 and BDM Multilinks, adds SYNCH support, displays CPA connection information
• CW08 V3.1 FSICEBASE Service Pack	(March 15, 2005)	Adds support for following EMs with new FSICE emulator: EML908KX, EM08MR32, EM08AS60, EM08AZ60, EML08GZ, EML08QTQY, EML08SR, EM08BD48, EML08AB32, EML08GP32, EML08LJLK, EML08JBJG, EM08JB, EML08RK/RFRK, EM08EY, EML08AP
• CW08 Processor Expert V2.95	(March 17, 2005)	Adds Processor Expert support for the following derivatives: GT16, GT60 in new 48-pin package, JB8 in new 24-pin package, QT8, RC8, RD8, RE8. Also contains assembly include files for AB16A, AZ32, AZ32A.
• CW08 V3.1 LB Service Pack	(March 17, 2005)	LB8, LB4
• CW08 V3.1 JW32 Service Pack	(March 17, 2005)	JW32
• CW08 V3.1 FSICEBASE Service Pack	(April 19, 2005)	Re-release adding support for following EMs: EML08GPGT, EML08GZ16, EML08JL8, EML08JLJK, EM08JW32, EM08LB8, EML08LD64, EML08LJ12, EM08MR8, EML08QBLTY, EML08QL
• CW08 Processor Expert V2.96	(May 23, 2005)	Adds Processor Expert support for the following derivatives: GR16A, GR32A, GR48A, GR60A, AP64A, JL16, JK16, AW60, AW48, AW32. Also contains updated C header and assembly include files for the following derivatives: QL4, QL3, QL2.
• CW08 V3.1 GR60A Service Pack	(June 29, 2005)	GR60A, GR48A, GR32A, GR16A
• CW08 V3.1 AW60 Service Pack	(June 29, 2005)	AW60, AW48, AW32
• CW08 V3.1 AP64A Service Pack	(June 29, 2005)	AP64A, AP32A, AP16A, AP8A
• CW08 V3.1 GB60A Service Pack	(June 29, 2005)	GB32A, GB60A, GT32A, GT60A
• CW08 V3.1 QG8 Service Pack	(October 25, 2005)	QG8, QG4
• CW08 Processor Expert V2.97	(November 4, 2005)	Adds Processor Expert support for the following derivatives: JL3, QC16, QC8, QC4, EY8, QG8, QG4, MC13213, MC13212, and MC13211
• CW08 V3.1 QY4A Service Pack	(November 30, 2005)	QT4A, QT2A, QT1A, QY4A, QY2A, QY1A
• CW08 V3.1 LV8 Service Pack	(February 2, 2006)	LV8
• CW08 V3.1 QC16 Service Pack	(February 21, 2006)	QC16, QC8, QC4

- CW08 V3.1 LT8 Service Pack   (February 21, 2006)   LT8, LT4
- CW08 V3.1 Programming Algorithms   (February 21, 2006)   Updates programming algorithms for all HC(S)08 derivatives for all P&E Multilinks, Cyclones, and Cyclone Pros

Service Packs for Release 5.0:
- CW08 V5.0 Patch 1   (February 21, 2006)   Corrects non-volatile register declarations in the header files and automatically generated code
- CW08 V5.0 LV8 Service Pack   (February 2, 2006)   LV8
- CW08 V5.0 LT8 Service Pack   (February 21, 2006)   LT8, LT4
- CW08 V5.0 QC16 Service Pack   (May 5, 2006)   Add FSICE support for QC16 & QC8

2.4   Board supported (see also the hardware section)

We try to have stationery support for evaluation boards that we receive information on (see useful links section.). This support can take the form of a stationery folder generated by the CodeWarrior Team or by the vendors themselves (see section on useful links). The support can also be in the form of a tutorial on how to download and run the code.

Freescale   All ICS and EM boards available from Freescale
68HC908QT4 Evaluation Board (tutorial available separately)

Axiom   M68DEMO908GB60
M68EVB908GB60

SofTec Microsystems   InDART and PK solutions are supported by CodeWarrior (SofTec CD). There are solutions for both HC08 and HCS08 derivatives. See 'Questions and Answers' for the stationery supporting this.

Future Electronics   908Badge Boards (Tutorial available from Future Electronics)

2.5   Languages

CodeWarrior Development Studio for HC(S)08/RS08 supports a wide range of languages from absolute assembly to C++ with compact C++ for small memory footprints.

2.5.1   Assembly

Develop in the old way with absolute assembly or in a more complex form with multiple relocatable assembly files, cross-referenced labels and variables but still close to the code with full control of the performance.
There is no code size limitation on development in assembly mode.

2.5.2   C

C is code-size limited to 16Kbytes of code in the 'free of charge' Special Edition. There are two upgrade license keys from the Special Edition: a 32Kbytes and a 64Kbytes. C is unrestricted with the Standard Edition and the Professional Edition. The C compiler supports the HC(S)08 microcontrollers.

2.5.3 C++, Compact C++ and EC++

C++ is limited to 1Kbytes of code in the Special and the Standard Edition. There is an upgrade license key for the Standard Edition. C++ is unrestricted with the Professional Edition. The C++ compilers support the HC(S)08 microcontrollers.

2.5.4 Language support

Each template in the stationery also contains header files with description of registers, bytes and bits as they appear in the derivatives' user manuals to make easier the writing of the code. Templates have the project entirely set up so that developers can concentrate on writing the application code in the 'main' section of the program as indicated in the source file: " **/* write your code here */** ".
Templates are also prepared for several "**targets**" allowing the developer to select the right set of files and move quickly from full simulation to evaluation board and customer's target without extra work.

3 Unrivaled Features but so easy to use

CodeWarrior Development Studio for HC(S)08/RS08 has been designed to simplify the development of microcontroller-based applications by helping engineers concentrate on the key part of their project: writing the code. CodeWarrior can be made as simple to use as small assembly-code applications require or as feature-full as the most demanding developers can ask for. Furthermore, CodeWarrior for HC(S)08 combines several tools whose features are unrivaled today: The Processor Expert tool at the definition phase of a project with its libraries of standard, complex and software beans™, and the enhanced Simulator/Debugger with Data Visualization and I/O Stimulation capability to shorten the debugging phase of a project.

3.1 Smart Linker

The smart linker is a panel with graphical adjustment of different parameters to optimize the code. No need to remember complex command lines to set multiple parameters during compilation and linking process. More than 50 different optimizations can be achieved with the control panel of the Smart Linker. Adjust for code density, execution speed, compilation time or information available from the tools and the equivalent command line is displayed so you can remember what setting was used.
See 'useful links' and 'documentation'

3.2 Device Initialization

Device Initialization provides a fast and easy way to configure and generate initialization code for HC(S)08 microcontrollers. The Device Initialization tool contains only one set of beans: Peripheral Initialization Beans. The initialization code can be generated in either assembly or C code.

During the Code Generation process the Device Initialization tool generates a function named MCU_Init with the initialization code for the CPU peripherals the user selected - configured to the user's specifications.

To use the MCU_Init function – the user just inserts the function call at the start of their application code.

This tool dramatically saves the time to learn about a new device and the time to correct mistakes and help concentrate on the real part of the application, the added value of a project.

See 'useful links' and 'documentation'

3.2.1 Peripheral Initialization Beans

The Peripheral Initialization Beans provide the lowest level of hardware abstraction. With Device Initialization the user is able to configure the control registers for each of the peripherals on the silicon and the Device Initialization tool generates the necessary initialization code in assembly or C code.

HC08

- Init_ADC_HC08   Analog-to-Digital Converter (ADC)
- Init_AnalogModule_HC08   Analog Module (AnM)
- Init_BDLC_HC08   Byte Data Link Controller (BDLC)
- Init_COP_HC08   Computer Operating Properly (COP)
- Init_EEPROM_HC08   EEPROM Memory (EEPROM)
- Init_GPIO_HC08   General Purpose Input Output (GPIO)
- Init_HRP_HC08   High Resolution PWM (HRP)
- Init_IIC_HC08   Inter-IC Bus (IIC)
- Init_IRQ_HC08   External Interrupt Module (IRQ)
- Init_KBI_HC08   Keyboard Interrupt Module (KBI)
- Init_LCD_HC08   Liquid Crystal Display (LCD)
- Init_MSCAN_HC08   Motorola Scalable Controller Area Network (MSCAN)
- Init_OpAmp_HC08   Op Amp / Comparator module (OpAmp)
- Init_OSD_HC08   On-Screen Display (OSD)
- Init_PPI_HC08   Programmable Periodic Interrupt(PPI)
- Init_PWM_HC08   Pulse Width Modulator (PWM)
- Init_PWMMC_HC08   Pulse-Width Modulator for Motor Control (PWMMC)
- Init_PWU_HC08   Periodic wakeup module (PWU)
- Init_RTC_HC08   Real Time Clock (RTC)
- Init_SCI_HC08   Serial Communications Interface (SCI)
- Init_SLIC_HC08   Slave LIN Interface Controller (SLIC)
- Init_SPI_HC08   Serial Peripheral Interface (SPI)
- Init_SyncProc_HC08   Sync Processor
- Init_TBM_HC08   Timebase Module (TBM)
- Init_TIM_HC08   Timer Interface Module (TIM)
- Init_USB_HC08   Universal Serial Bus (USB)
- Init_USBHUB_HC08   Universal Serial Bus (USBhub)

HCS08

- Init_ACMP_HCS08   Freescale Analog Comparator (ACMP)
- Init_ADC_HCS08   Analog-to-Digital Converter (ADC)
- Init_AWT_HCS08   AutoWake-up Timer module (AWT)
- Init_CMT_HCS08   Carrier Modulator Transmitter (CMT)
- Init_COP_HCS08   Computer Operating Properly (COP)
- Init_FLASH_HCS08   Flash Memory (FLASH)
- Init_GPIO_HCS08   General Purpose Input Output (GPIO)
- Init_IIC_HCS08   Inter-IC Bus (IIC)

-	Init_IRQ_HCS08	External Interrupt Module (IRQ)
-	Init_KBI_HCS08	Keyboard Interrupt Module (KBI)
-	Init_MTIM_HCS08	Modulo Timer (MTIM)
-	Init_RTI_HCS08	Real Time Interrupt (RTI)
-	Init_SCI_HCS08	Serial Communications Interface (SCI)
-	Init_SPI_HCS08	Serial Peripheral Interface (SPI)
-	Init_TPM_HCS08	Timer/PWM (TPM)

RS08

-	Init_ACMP_RS08	Freescale Analog Comparator (ACMP)
-	Init_COP_RS08	Computer Operating Properly (COP)
-	Init_GPIO_RS08	General Purpose Input Output (GPIO)
-	Init_KBI_RS08	Keyboard Interrupt Module (KBI)
-	Init_MTIM_RS08	Modulo Timer (MTIM)
-	Init_RTI_RS08	Real Time Interrupt (RTI)

See 'useful links' and 'documentation

3.3   Processor Expert™

Processor Expert is a Rapid Application Design (RAD) tool that combines easy-to-use component based application creation with an expert knowledge system. Functionality of CPU and on-chip peripherals as well as higher levels of specific applications are encapsulated into components called **Embedded Beans**.

This powerful tool frees up developers from the long effort of learning bits and bytes of new peripherals and how to properly set them up to implement the desired functions. It allows the developer to describe how built-in peripherals and their hardware environment will be used and it automatically generates the code to properly initialize, write to and read these peripherals.

This tool dramatically saves the time to learn about a new device and the time to correct mistakes and help concentrate on the real part of the application, the added value of a project.

3.3.1   Processor Expert Beans

3.3.1.1   Basic Beans

Basic Beans (or standard beans) refer to the basic blocks such as parallel ports, timers, A/D converters, and simple serial interfaces as well as simple functions using them. The Basic Beans are listed below. Basic Bean support is dependent on the peripherals and pins available on a particular derivative.

-	ADC	A/D converter
-	AsynchroSerial	Asynchronous serial communication
-	BitIO	General 1-bit Input/Output
-	BitsIO	General Multi-Bits Input/Output (1-8 bits)
-	BWimage	Black & White image
-	Byte2IO	General Two-Bytes Input/Output
-	Byte3IO	General Three-Bytes Input/Output
-	Byte4IO	General Four-Bytes Input/Output
-	ByteIO	General Byte Input/Output (8 bits)
-	Capture	Timer capture encapsulation
-	COLimage	Color image

-	EventCntr16	Event counter 16-bit
-	EventCntr32	Event counter 32-bit
-	EventCntr8	Event counter 8-bit
-	ExtInt	External interrupt
-	FreeCntr16	Free running 16-bit counter
-	FreeCntr32	Free running 32-bit counter
-	FreeCntr8	Free running 8-bit counter
-	FreescaleHRP	High Resolution PWM
-	FreescaleOpAmp	Op Amp / Comparator module
-	IntEEPROM	Internal EEPROM
-	InterruptVector	Interrupt vector handled in user code
-	PPG	Programable pulse generation
-	PWM	Pulse width modulation
-	RTIshared	Real Time Interrupt Shareable
-	SW_I2C	SW emulated I2C using two I/O pins.
-	SWSPI	Software synchronous serial communication
-	SynchroMaster	Master for synchronous serial communication
-	SynchroSlave	Slave for synchronous serial communication
-	TimerInt	Periodic interrupt
-	TimerOut	Flip-flop output 1:1
-	WatchDog	WatchDog beanSee 'useful links' and 'documentation

3.3.1.2   Software Beans

The Software Beans library is a collection of software modules developed to interface to popular external peripherals such as serial SPI sensors, LCD modules, Flash memory modules, A/D and D/A converters as well as implementing low level functions such as keyboard matrix, software SPI function, 7-segment display or simple FFT or FIR functions. These beans are 'free of charge' to customers purchasing the Standard Edition or Professional Edition of CodeWarrior.

3.3.1.3   Advanced Beans

Advanced Beans (or complex beans) refer to the beans supporting complex peripherals such as complex A/D conversions. Advanced Beans are available to customers purchasing the Professional Edition of CodeWarrior. The Advanced Beans are listed below. Advanced Bean support is dependent on the peripherals and pins available on a particular derivative. Advanced Beans are available to customers purchasing the Professional Edition of CodeWarrior.

HC(S)08

-	AsynchroMaster	Asynchronous serial communication - master
-	AsynchroSlave	Asynchronous serial communication - slave
-	ExternalFile	External Binary File Converter
-	InternalI2C	Internal I2C Communication Interface
-	KBI	Keyboard
-	StringList	String List Converter
-	Term	ANSI Terminal
-	TimeDate	Time and date

HC08 Only

- BDLC   BDLC serial communication (HC08)
- DDC1   DDC1 communication interface (HC08)
- FreescaleAnalogModule   Freescale Analog module (HC08)
- FreescaleBEMF   Back ElectroMagnetic Force (HC08)
- FreescaleCAN   CAN communication for Freescale implementation (HC08)
- FreescalePWM   Pulse width modulation - special version (HC08)
- FreescaleUHFTransmitter   UHF Transmitter (HC08)
- LCD   Liquid Crystal Display (HC08)
- OSD   On-Screen Display (HC08)
- PWMMC   Pulse width modulation for motor control (HC08)
- RTC   Real Time Clock (HC08)
- SyncProc   Sync Processor (HC08)
- USB   USB device bean (HC08)
- USBHUB   USB HUB device (HC08)

HCS08 Only

- FreescaleAnalogComp   Analog comparator on Freescale HCS08 derivates
- FreescaleCMT   Freescale Carrier Modulator Transmitter (HCS08)
- IntFLASH   Internal FLASH (HCS08)

See 'useful links' and 'documentation


3.3.2   Bean Wizard™

The Bean Wizard™ is the tool that allows you to create your own beans that address the specific needs of an application, like the support of using a generic peripheral in a very specific way.

3.4   Data Visualization & I/O Stimulation

The Data visualization, with the complementary function of I/O stimulation is a tool that allows the developer to attach graphical representation of hardware functions to the input and/or output registers of peripherals and display the real-time status of the functions implemented by the peripherals. Typical and simple examples are LEDs and bar graphs displays, switches and potentiometers.

Command files can be attached to these functions to expand the capability to provide stimulation and display of the direct environment of the microcontroller used for the application, getting closer to the final hardware and before code is downloaded in the application.

This tool significantly accelerates the development of an application by allowing the validation of the software part of the application before downloading it to the platform, thus isolating hardware related issues. Another benefit is the ability to test and validate "hardware" changes at the simulation level with the time and product savings such a feature allows.
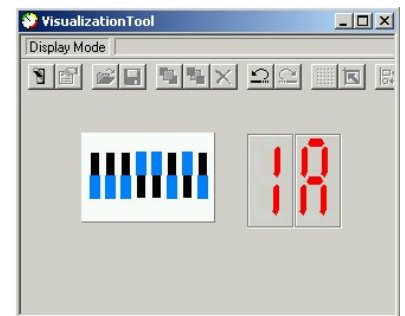
See 'useful links' and 'documentation'

4 Features of Special, Standard and Professional Editions

CodeWarrior for HC(S)08 is available in different versions to suit customers' needs.

	Special Edition			Standard Edition	Professional Edition
	CWX-HXX-SE			**CWS-H08-STDED-CX**	**CWS-H08-PROED-CX**
Compiler Options		**CWS-H08-C32K-CX**	**CWS-H08-C64K-CX**		
	16Kbytes	32Kbytes	64Kbytes	Unlimited	Unlimited
CODEWARRIOR					
IDE 5.x	32 files	Unlimited	Unlimited	Unlimited	Unlimited
Macro Assembler	Y	Y	Y	Y	Y
Pre-configured Projects	Y	Y	Y	Y	Y
Flash Programming	Y	Y	Y	Y	Y
Simulator (P&E techn.)	Y	Y	Y	Y	Y
Data Visualization	1 component, 3 elements			Unlimited	Unlimited
Decoder				Y	Y
Libmaker				Y	Y
Session Record & Play					Y
OSEK awareness					Y
PC-Lint Plugins					Y
PROCESSOR EXPERT					
Basic Beans	Y	Y	Y	Y	Y
Software Beans				Y	Y
Advanced Beans					Y
Bean Wizard					Y
ENHANCING OPTIONS					
C++ compact C++/EC++	1Kbytes	1Kbytes	1Kbytes	Order key **CWX-H08-ENCHC-KX**	Y
TARGETS (parallel, serial or USB)					
HCS08 Serial Monitor	Y	Y	Y	Y	Y
P&E Multilink(s)	Y	Y	Y	Y	Y
P&E CYCLONE(PRO)	Y	Y	Y	Y	Y
SofTec USB	Y	Y	Y	Y	Y
HC08 MMDS/MMEVS	Y	Y	Y	Y	Y
HC08 FSICE	Y	Y	Y	Y	Y
HCS08 DBG support	Y	Y	Y	Y	Y

4.1 Technical support

- Technical support gives access to trained application engineers who can help customers,
- Technical support also entitles customers to purchase new releases with a 70% discount,
- First year of technical support is included in the price,
- Subsequent years of technical support must be purchased to continue coverage and be entitled to discounts mentioned above.

4.2 Special Edition

TARGET: Special edition is targeted at assembly code projects or small projects with a limited amount of C code. Debugging is mostly done with Evaluation Boards or directly on the target application.

Features: there are some limitations to the special edition:
- Unlimited assembler for HC(S)08 and RS08 microcontrollers
- C compiler limited to 16Kbytes of object code for HC(S)08 microcontrollers
    (There is no code size limitation when developing in assembly.)
- Linker limited to 16K of C code and 1K of C++
- IDE limited to 32 files and no sub-project.
- Projects can have up to 4 targets
- Data Visualization/IO stimulation allows for 1 component with 3 instruments

NOTE: The simulator is from P&E Microsystems.

Options available for the Special Edition

For customers developing C based applications and using more than 16Kbytes of code, two C compiler options are available, a 32Kbytes option and a full 64Kbytes option.

The C compiler upgrade to 32Kbytes offers:
- C compiler object code increased to up to 32Kbytes (1K of C++) for HC(S)08 microcontrollers
- No file limitation for the IDE

The C compiler upgrade to the full 64Kbytes offers:
- C compiler object code for up to 64Kbytes (1K of C++) for HC(S)08 microcontrollers
- No file limitation for the IDE

4.3   Standard Edition

TARGET: Standard edition is targeted at projects developed with C, assembly or a mix of the languages and up to the maximum memory size of the HC(S)08 family. It adds the possibility to closely simulate the interfaces to the processor, making the debugging easier and the time to market shorter.

Features: Standard edition has more features than the special edition:
- Access to Unis Processor Expert software beans to accelerate application designs
- Unlimited C compiler / debugger code size (C++ limited to 1Kbytes) for HC(S)08 microcontrollers
- Unlimited Data visualization/IO stimulation to improve debugging
- No limitation on number of files in the project and subprojects

Customers can also upgrade from one of the C upgrades to the Standard Edition.

Enhancing options available for the Standard Edition

Standard Edition can be complemented with a number of options from the Professional Edition that improve developers' productivity:
- C++/Compact C++/EC++

4.4   Professional Edition

TARGET: Professional edition is targeted at professional, short time to market applications. Developers benefit from a number of unrivaled features available in the CodeWarrior tool suite to develop the most complex applications and meet short time to market goals.

Features: Professional edition includes all the features of the other editions plus:
- C++/Compact C++/EC++ for HC(S)08 microcontrollers
- Code Coverage that allows the user to isolate unused or badly used portions of code
- Profiler/Performance Analysis to identify and optimize critical portions of code
- Advanced Complex beans providing higher level software modules and faster code integration
- Bean wizard to build a software library that can be retargeted to any HC(S)08 or HC(S)12 silicon

- Session Record and Play for automated testing
- OSEK awareness for kernel-level debugging
- Encryption tools
- PC-lint Plug-in to use PC-lint with CodeWarrior Development Studio (purchased separately from Gimpel Software)
- Support of third Parties emulators (Lauterbach, Hitex).

Customers can upgrade from Standard Edition to Professional Edition. Upgrading from a Special Edition C compiler upgrade will be charged as 2 upgrades: a Standard Edition upgrade and a Professional Edition upgrade.

5 Additional Support

CodeWarrior for HC(S)08 has the capability to provide additional support for specific functions.

5.1 OSEK

The CodeWarrior Development Studio for HC(S)08/RS08 Professional Edition is 'OSEK aware'.

5.2 PC-Lint

PC-Lint is a software package that finds errata in your C programs using the K&R and ANSI standards for C. The purpose of *linting* your programs is to determine potential problems prior to integration or porting, or to reveal unusual constructs that may be a source of subtle errors. PC-Lint often finds problems that the compiler alone cannot.
The CodeWarrior Development Studio for HC(S)08/RS08 Professional Edition has PC-Lint plugins.

5.3 MSCAN

The CAN LLD's were developed with a Toucan interface for HC08, HC12 and MPC5xx.

5.4 LIN

The LIN drivers are available free of charge from Freescale.

6 Why update and upgrade?

There are multiple reasons to upgrade to a new release, upgrade from Special Edition to Standard and Professional Edition but the most important one is that it will save money in the long run by reducing the design time, improve re-use and improve the quality of the product, leading to lower maintenance costs.

6.1 Upgrade to Professional Edition

These new features are ALL available in the Professional Edition. Check out the 'Release Notes' folder (or menu Help > Online Manuals in the IDE).
- New project wizard: menu File > New and then 'HC(S)08 New Project Wizard.
- New and updated support for HC(S)08/RS08 families
- BDM support for HCS08 (featuring on-chip DBG/Trigger module and trace)
- On-chip DBG module including trace for HCS08
- New/updated compiler to support HCS08 devices (-Cs08 compiler option)
- New/updated assembler to support HCS08 devices (-Cs08 assembler option)
- Updated prm and library files for existing and new derivatives

- Updated debugger/simulator files
- New visualisation tool in the debugger supporting additional instruments/properties
- Updated online documentation with extended search capability (Help > Online Manuals)
- New Burner utility to support path suppression in the S0 record
- New decoder utility to support HCS08 instruction set
- Updated ClearCase version control plugin
- Updated PC-lint configuration files (matching latest PC-lint release)
- P&E PEDebug: new derivatives/FCS
- Updated Processor Expert supporting new HCS08 architecture
- Updated Device Initialization Tool supporting new RS08 architecture

6.2   Upgrade to Standard Edition

Standard Edition adds many features to the special edition:
- Data visualization/IO stimulation to improve debugging
- Access to Unis Processor Expert software beans to accelerate application designs
- No limitation on C code size
- No limitation on number of files the linker can handle
- Decoder to create a listing from ELF files
- Libmaker to create binary libraries

Standard Edition also offers the possibility to add C/C++ compiler.

6.3   Upgrade C compiler of Special Edition

The C compiler upgrades to 32K or 64Kbytes are for users of the Special Edition requiring more than 16Kbytes of code for HC(S)08 microcontrollers. The use of C code offers portability, faster debugging and design of complex applications that would be very difficult to debug at the assembly level. The C32 upgrade allows generating up to 32Kbytes of code and the C64 upgrade up to 64Kbytes of code.

Both upgrades remove the file limitation for the linker of the 16Kbyte initial version.

7   Software Products: Part numbers

Base Product	Part number
Special Edition Tri-Pak *(includes CodeWarrior Development Studio for HC(S)08, CodeWarrior Development Studio for HCS12(X), and HC(S)08/HCS12(X) Service Pack CD)*	CWX-HXX-SE
Standard Edition	CWS-H08-STDED-CX
Professional Edition	CWS-H08-PROED-CX
Options for Special Edition	**Part number**
C compiler/debugger Upgrade to 32 Kbytes for Special Edition	CWS-H08-C32K-CX
C compiler/debugger Upgrade to 64 Kbytes for Special Edition	CWS-H08-C64K-CX
Options for Standard Edition	**Part number**
C++ / Compact C++ option for Standard Edition	CWX-H08-ENHNC-KX
Product Upgrades	**Part number**
Upgrade from Special Edition to Standard Edition	CWS-H08-STDED-UX
Upgrade from Standard Edition to Professional Edition	CWS-H08-PROED-UX

Technical Support and Product Renewals	Part number
1 year technical support for C compiler upgrade to 32 Kbytes	CWT-H08-C32K-UX
1 year technical support for C compiler upgrade to 64 Kbytes	CWT-H08-C64K-UX
1 year technical support for Standard Edition	CWT-H08-STDED-TX
1 year technical support for Professional Edition	CWT-H08-PROED-TX

8 Hardware Products

There are several hardware connections available to suit the needs of the most demanding. CodeWarrior has built-in drivers to communicate with these different interfaces and make the function transparent to the user. Many connections are now available:

- Standard **RS232 to Serial** monitor (HCS08 devices with flashed monitor)
- Multilink **USB to Mon08** for HC08
- Multilink **USB to BDM** for HCS08
- CyclonePRO serial/USB/Ethernet to mon08 (HC08) and BDM (HCS08)
- SofTec inDart **USB to Mon08** for HC08
- SofTec inDart **USB to BDM** for HCS08

8.1 Multilinks

The Multilink is an easy to use, low-cost development tool for Freescale's HC(S)08 Flash MCUs. It provides the interface for in-circuit emulation, debugging and programming through the HC(S)08's standard MON08 or BDM serial debug/breakpoint interface.

P&E has recently redesigned the USB Mon08 Multilinks (Rev D) and USB BDM Multilinks (Rev C) to be RoHS compliant. P&E also added a charge pump to the USB BDM Multilink to support the higher Flash programming voltage required for RS08 microcontrollers.

8.2 CyclonePRO

The Cyclone Pro provides all the capabilities of the Multilink plus the ability to operate as a standalone programmer with pushbuttons and LEDs to control the operations. It supports multiple host-target interfaces: serial, parallel, USB and Ethernet to Mon08 and BDM. The Cyclone Pro replaces the Mon08 Cyclone. The Cyclone Pro (Rev C) has recently been redesigned to be RoHS compliant and to add support for RS08 microcontrollers.

8.3 InDART (SofTec Microsystems)

USB-based inDART-HC(S)08 takes advantage of Freescale's CodeWarrior Development Studio for HC08 and the ISP (In-System Programming) feature to program the FLASH memory of the target microcontroller. Together with CodeWarrior, inDART-HC(S)08 provides you with everything you need to write, compile, download, in-circuit emulate and debug user code. inDART-HC(S)08

Design Kits come together with an Evaluation Board to permit an easy and fast start-up. C and Assembly examples are available for a first debugging process. Contact SofTec Microsystems or Freescale distributors directly.

8.4 In-Circuit Simulation (ICS)

Freescale's In-Circuit Simulator Kits are our lowest cost tools for developing and debugging target systems incorporating Freescale's most popular HC08s. In-circuit simulation allows you to use the actual inputs and outputs of your target during simulation of the code.
CodeWarrior supports ICS kits. ICS kits are NOT being created for new HC08 derivatives. The same support is provided with the USB Mon08 Multilinks.

8.5 Modular Evaluation System (MMEVS)

The Modular Evaluation System (MMEVS) is Freescale's two-board emulator for the 68HC(9)08 Family of microcontrollers. The MMEVS consists of a Platform Board and an Emulator Module (EM) which adapts emulator functionality to any of a variety of 68HC(9)08 microcontrollers. Connected to your target system, the emulator replicates the actual target system MCU.
Use this economical system to perform traditional debugging activities such as executing code in run or step mode, setting break points, monitoring or modifying CPU registers, memory and application variables, and creating log or script files to record test results or create test suites. CodeWarrior supports MMEVS.

8.6 Modular Development System (MMDS)

The Modular Development System (MMDS) is a full featured emulator system for developing embedded systems using 68HC(9)08 microcontrollers. In addition to incorporating the debug features of the Modular Evaluation System (MMEVS), the MMDS adds advanced features such as real-time, dual-ported memory and a bus state analyzer to capture user-defined bus cycles or events. Use the dual-ported memory to tune filter circuits or monitor changes to program variables while your program is running at full speed. Verify nested or complex program flows using the bus state analyzer's full range of sequenced or logical event triggering and data capture modes. CodeWarrior supports MMDS.

8.7 Freescale In-Circuit Emulator (FSICE)

The Freescale Semiconductor in-circuit emulator (FSICE) is a full-featured emulator system for developing embedded systems using HC08 microcontrollers. The FSICE system consists of a base station and a MCU emulator module (EM). Connected to your target system, the emulator replicates the actual target system MCU. The CodeWarrior development environment (IDE) interface allows for quick edits and changes to assembly code, which makes design, debug, and real-time evaluation of

the target system as efficient as possible. Use this economical system to perform traditional debugging activities such as executing code in run or step mode, setting break points, monitoring or modifying CPU registers, memory and application variables, and creating log or script files to record test results or create test suites.

In addition to incorporating the debug features of the traditional emulators, FSICE adds advanced features such as a built-in USBMULTILINK08 cable for in-circuit Flash programming, Ethernet interface for remote debugging and application development, and real-time bus analyzer with 24 general-purpose logic inputs for capture user-defined bus cycles or events. The bus state analyzer can also help a designer debug the MCU support circuitry, verify nested or complex program flows using the full range of sequenced or logical event triggering and data capture modes, and ensure proper timing by using the custom time tag clock.

The FSICEBASE currently supports the following EM Emulation Modules:

EML08AB32	EML08GPGT	EM08JW32	EM08MR32
EML08AP	EML08GZ	EM08LB8	EML08QBLTY
EM08AS60	EML08GZ16	EML08LD64	EML08QCBLTY
EM08AZ60	EM08JB	EML08LJ12	EML08QL
EM08BD48	EML08JBJG	EML908KX	EML08QTQY
EM08EY	EML08JL8	EML08LJLK	EML08RK/RFRK
EML08GP32	EML08JLJK	EM08MR8	EML08SR

9   Hardware Products: Part numbers

Product	Part number
USB to Mon08 Multilink cable (HC08 only)	USBMULTILINK08E
USB to BDM Multilink cable (HCS08 and HCS12)	USBMULTILINKBDME
Cyclone Programmer Serial/USB/Ethernet	M68CYCLONEPROE
SofTec inDART products	Call SofTec or Distributors
ICS In-Circuit Simulator (device specific)	ICS08xxx
MMEVS (requires device specific EM Emulation Module)	M68MMEVS0508
MMDS (requires device specific EM Emulation Module)	M68MMDS0508
FSICE (requires device specific EM Emulation Module)	FSICEBASE

10 Pricing

For reasons of consistency, pricing is not published in this document. Please consult the Product Availability Guide or contact the nearest Freescale office.

11 Licensing

CodeWarrior Development Studio for HC(S)08/RS08 can be licensed in different ways:
  - The Special Edition license key is "free of charge" and installed with the product.

- The Standard and Professional Editions require license keys that can be floating licenses, dongle licenses or node locked to a computer

12 Getting started with Special Edition

12.1 Option 1: Obtaining the CD

There are several ways to obtain the CD containing CodeWarrior Development Studio for HC(S)08.

12.1.1 On-Line buy

CodeWarrior Development Studio for HC(S)08/RS08 can be purchased directly from our Web site:

Link to Buy Direct

12.1.2 On-line Request

This is a link for on-line request for an evaluation CD
In case of difficulty, contact your Freescale sales office or distributor.

12.1.3 Request from Freescale LDC

Freescale Literature Distribution Center (LDC): 1-800-441-2447

Request: CWX-HXX-SE

12.2 Option 2: Downloading the software

CodeWarrior for HC(S)08

CodeWarrior for HC(S)08 can be downloaded from our Web site:

http://www.freescale.com/cw5

Select "**Download**". The first time, you will be presented with a questionnaire. Fill in this questionnaire and submit it. Immediately, you can download the .exe file containing the CodeWarrior software.

Service Packs

Freescale is committed to supporting the family of HC(S)08 products with the best possible development tools. New derivatives are also introduced that may require dedicated files or software modules to be supported by the existing version of the tools. Service packs are made available for download on Freescale web site. Visit:

Link to download HC(S)08 Service Packs

Click on the link for "Updates and Patches", this will take you to the page with the service packs available for a specific CodeWarrior release.

13 Getting started with Standard or Professional Editions

13.1 Ordering

Standard Edition, Professional Edition, yearly technical support packages and upgrade packages can be ordered directly from the Freescale WEB site:

Click on the following link to on-line store for HC(S)08 products

13.2 Registering and getting a license

You need a license key to activate the Standard Edition or the Professional Edition. You can register your product directly from the CodeWarrior IDE. Select **Help > Register Product** from the main menu — the CodeWarrior IDE starts your browser, taking you to Step 1 of the on-line registration form

Registration Form Step 1

Enter your email address in the appropriate fields. Click on the **Begin Registration** button and the second screen appears. Follow on-screen instructions to complete remaining pages of the form (Thank You page is last) — within a few minutes Freescale will email your license authorization code.

When you receive the email, select **Help > License Authorization** from the CodeWarrior main menu. The **Licence Authorization** dialog box appears. Paste the license authorization code from the email into the **License Authorization** dialog box. When you click the **OK** button — the **License Authorization** dialog box updates and the IDE automatically gets the license key and installs it in the correct location.

NOTE: If you downloaded the software from the Freescale web site, you might not have a registration code. You can request a registration code from license@freescale.com. Special

Edition customers do not need to register. The Special Edition license file is automatically installed with the software.

13.3 Manually installing the key

To manually install the license key follow the steps below. You can find the license.dat file in the directory where you installed the CodeWarrior software. The default is: C:\Program Files\Freescale\CW08 V5.0

- **Open license.dat**
  - o Start a text editor such as Notepad
  - o Open license.dat file
- **Copy license key you received from Freescale**
- **Paste license key on new line at bottom of** license.dat **file**
- **Save** license.dat **file**
- **Close** license.dat **file – license is installed; IDE uses new license next time you start the CodeWarrior IDE**

NOTE: Do not move or delete the license.dat file. If you receive additional keys for other CodeWarrior components, you can add the additional keys to the license.dat file.

14 Tutorials

We have developed five tutorials to help developers get acquainted with the rich feature set of the CodeWarrior tools. These tutorial include:

- Assembly Tutorial,
- C Tutorial,
- Processor Expert,
- Assembly with Device Initialization,
- C with Device Initialization.

You can access these tutorials from the Startup Dialog in CodeWarrior Development Studio for HC(S)08/RS08 v5.0.
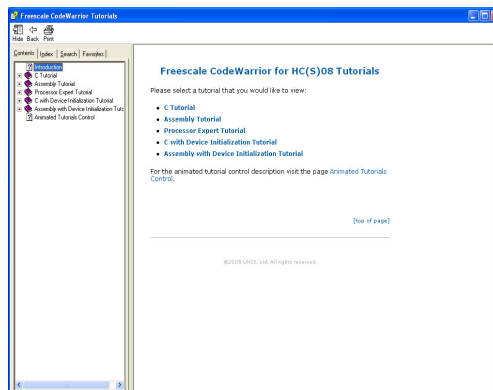
15 Training

You can access on-line training on the Freescale WEB site at Technical Learning Center.

16 Useful Links

To visit CodeWarrior site or get technical support:

CodeWarrior: http://www.freescale.com/codewarrior

Technical Support: http://www.freescale.com/support

Links to our Processor Expert tool and related beans:
http://www.processorexpert.com

For introduction on the beans
    http://www.processorexpert.com/eb/main.html

For details on beans to support external devices (A/D, displays, other beans)
    http://www.processorexpert.com/eb/hw_beans.html

For details on software only beans (data processing, process control, other beans)
    http://www.processorexpert.com/eb/sw_beans.html

For details on beans related to internal MCU modules (SCI, SPI, A/D, other beans)
    http://www.processorexpert.com/eb/basic_beans.html

When you get to individual beans, the left menu allows you to see details and usage example.

Links to board vendors:

SofTec Microsystems:	http://www.softecmicro.com
Future Electronics:	http://www.futureerc.com

17 Benchmarks

Benchmarking probably is an 'art' for itself. It may be difficult to find the 'ideal' switches for benchmarking. It heavily depends on the benchmark and the goal you want to achieve. Code density is one thing, and code speed another. The compiler manual already lists an option set for 'general' purpose, and the 'Smart Sliders' in the compiler are helping in this area too.

There are several aspects to consider in optimizing the code and the result will be a best combination of these rather than one only piece. If compiler switches play an important role, the way the linker is used plays a significant role for the final application as well as the programming style and the goals to achieve.
For a very critical benchmark, we suggest that customers work with our engineering team which already has a lot of expertise and, quite important, they know their tools best.

18 Documentation

There is a lot of documentation available:

- Direct 'F1 key' help from inside the CodeWarrior applications,
- Manuals, tutorials, examples in the CodeWarrior software,
- Manuals on the CD.

There is a lot of documentation on the different components of CodeWarrior Development Studio.
All the manuals can be found on the CD and can be installed on the hard drive, depending on the installation chosen. Look for the folder "CodeWarrior Manuals" on the CD or in the directory where CodeWarrior Development Studio is installed.

Printed manuals can also be ordered from the Freescale Literature Distribution Center (LDC): 1-800-441-2447.

19 Questions and Answers

- **Q:** Where do I find the manuals for CodeWarrior tools, especially on Processor Expert?
  A: Within CodeWarrior, use the Processor Expert menu and chose the documentation you want. There are html and pdf version of the documentation, if that was installed, in the CodeWarrior folder: C;\\….\CodeWarrior…\Bin\Plugins\Support\ProcessorExpert\

  There is also information and links on CodeWarrior web pages under 'Processor Expert'.

- **Q:** Is there a flash-programming capability without opening CodeWarrior tools?
  A: In the CodeWarrior folder where software was installed, there is a PROG folder containing the program BURNER.EXE. Double-click on it and you have the function.

  There is a manual too: In the CodeWarrior folder where software was installed, there is a CODEWARRIOR MANUALS folder, in the PDF folder open the MANUAL_BURNER.PDF file. There are several shortcuts to the burner already and they can be accessed out of the project preference panels too (burner preference panel).

- **Q:** Is there added support for new derivatives in older versions of CodeWarrior?
  A: No. Development effort is made on the most recent release of the tool suite. Adding new derivatives requires some effort especially in the testing of all combinations, all derivatives to make sure nothing has been 'broken' in CodeWarrior tools. Retrofitting previous releases would add significant load to the engineering team and we need to focus on improving the tools and supporting quickly new derivatives.