



# A Guide to CodeWarrior Development Studio for Microcontrollers

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### What is new in this release?

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

- New architectures supported
- New derivatives supported (see specifications, service packs)
- Connection support for ColdFire V1 microcontrollers
- Device initialization and Processor Expert support for ColdFire V1 microcontrollers
- Updated licensing procedure

## 1 CodeWarrior Development Studio for Microcontrollers

Freescale's CodeWarrior™ Development Studio for Microcontrollers is a single, integrated tool suite designed to get you on the design fast track with RS08, HC(S)08 and ColdFire V1 members of the Freescale Controller Continuum. The CodeWarrior tool suite provides optimized tools to take full advantage of the Freescale microcontroller you selected for your design.

- Integrated Development Environment (IDE)
- Project Manager
- New Project Wizard
- MCU Change Wizard
- Processor Expert™ with Beans™ (1)
- Device Initialization™ (2)
- Build system with optimizing C/C++ compilers for HC08, HCS08 and ColdFire V1 microcontrollers
- Assembler (absolute, relocatable, mixed and in-line) for HC08, HCS08, RS08 and ColdFire V1 microcontrollers
- Graphical Debugger with support for on-chip trace and multi-connection capability
- Simulator with Data Visualization and I/O Stimulation (3)
- Flash programming tools
- Flexible features that can be configured to user's preferences with project and target preferences panels.

(1) Processor Expert provides a fast and easy way to configure and generate initialization code and low level drivers for HC08, HCS08, and ColdFire V1 microcontrollers.

(2) Device Initialization provides a fast and easy way to configure and generate initialization code for HC08, HCS08, RS08 and ColdFire V1 microcontrollers

(3) Data Visualization saves 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.

The [Special Edition](#) can be downloaded free of charge from the Freescale WEB.

To evaluate the full featured Professional Edition free of charge for 30 days contact your Freescale salesperson or distributor or request it [online](#).

## 2 Specifications

### 2.1 Version of products

Release 6.0 Current release of CodeWarrior Development Studio for Microcontrollers

Release 6.1 Next release scheduled for September 2007. This release will add the production RS08 C compiler.

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

CodeWarrior supports all the HC08, HCS08, RS08 and ColdFire V1 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/RS08/ColdFire V1 Service Packs](#) .

### HC08

- AB: AB32
- AS: AS60, AS60A
- AZ: AZ32A, AZ60A
- BD: BD48
- EY: EY8, EY8A, EY16, EY16A
- GP: GP32
- GT: 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
- 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
- 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: RF2
- SR: SR12

### HCS08

- AW: AW32, AW48, AW60
- AP: AP8, AP8A, AP16, AP16A, AP32, AP32A, AP64, AP64A
- DE: DE32, DE60
- DN: DN16, DN32, DN48, DN60
- DV: DV16, DV32, DV48, DV60
- DZ: DZ16, DZ32, DZ48, DZ60
- EN: EN16, EN32

- GB: GB32, GB32A, GB60, GB60A,
- GT: GT8A, GT16, GT16A, GT32, GT32A, GT60, GT60A
- LC: LC36, LC60
- QD: QD2, QD4
- QE: QE64, QE96, QE128
- QG: QG4, QG8
- RC: RC8, RC16, RC32, RC60
- RD: RD8, RD16, RD32, RD60
- RE: RE8, RE16, RE32, RE60
- RG: RG32, RG60

**RS08**

- KA: KA1, KA2

**ColdFire V1**

- QE: QE64, QE96, QE128

**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

**Service Packs for Release 5.1:**

- CW08 V5.1 QY4A Service Pack (June 14, 2006) Adds FSICE support for QT4A, QT2A, QT1A, QY4A, QY2A, QY1A
- CW08 V5.1 GT16A Service Pack (July 16, 2006) GT16A, GT8A
- CW08 V5.1 Compiler Patch 1 (July 21, 2006) HC08 compiler update to fix the spill conflict error after reloading the X register
- CW08 V5.1 JW32 Service Pack (July 24, 2006) Adds FSICE support for JW32
- CW08 V5.1 JB8 Service Pack (July 28, 2006) Adds FSICE support for JB8
- CW08 V5.1 AS/AZ60A Service Pack (August 16, 2006) Adds FSICE support for AS60A, AS32A, AZ60A, AZ32A
- CW08 V5.1 EY16A Service Pack (August 22, 2006) Adds FSICE support for EY16, EY8, EY16A, EY8A
- CW08 V5.1 JR12 Service Pack (August 28, 2006) JR12
- CW08 V5.1 AP64/AP64A Service Pack (August 29, 2006) Adds FSICE support for AP64, AP32, AP16, AP8, AP64A, AP32A, AP16A, AP8A
- CW08 V5.1 GP/GT Service Pack (August 30, 2006) Adds FSICE support for GP32, GT16, GT8

**Service Packs for Release 5.1 (continued):**

- CW08 V5.1 LJ/LK Service Pack (October 23, 2006) Adds FSICE support for LJ24, LJ12, LK24
- CW08 V5.1 QC16 Service Pack (October 23, 2006) Adds FSICE support for QC16, QC8, QC4
- CW08 V5.1 Open Source BDM Service Pack (November 3, 2006) Adds support for HCS08 Open Source BDM connection, RS08 Open Source BDM connection
- CW08 V5.1 MR Service Pack (December 11, 2006) Adds FSICE support for MR32, MR16, MR8
- CW08 V5.1 MC1321X Service Pack (January 19, 2007) MC13211, MC13212, MC13213, MC13214
- CW08 V5.1 LC60 Service Pack (February 2, 2007) LC60, LC36
- CW08 V5.1 KA1 Service Pack (February 9, 2007) KA1
- CW08 V5.1 PE Update v2.99 (February 19, 2007) Adds Processor Expert support for GT16A, GT8A, DZ60, DZ48, DZ32, DZ16, DV60, DV48, DV32, DV16, DN60, DN48, DN32, DN16, EN32, EN16, DE60, DE32, LC60, LC36, QD4, GR8A, GR4A
- CW08 V5.1 DZ/DV/DN/DE/EN Service Pack (February 19, 2007) DZ60, DZ48, DZ32, DZ16, DV60, DV48, DV32, DV16, DN60, DN48, DN32, DN16, DE60, DE32, EN32, EN16
- CW08 V5.1 SG8/SH8 Service Pack (March 2, 2007) SG8, SG4, SH8, SH4
- CW08 V5.1 EL32 Service Pack (March 23, 2007) EL32, EL16, SL16, SL8
- CW08 V5.1 AW60 Service Pack (April 16, 2007) Updates TRIM algorithms and OSBDM support for AW60, AW48, AW32 and adds support for AW16
- CW08 V5.1 QD4 (May 24, 2007) QD4
- CW08 V5.1 AC60 Service Pack (July 16, 2007) AC60, AC48, AC32

**Service Packs for Release 6.0:**

- CW MCU V6.0 QE128 Service Pack (July 2, 2007) Addresses erratum with first MCF51QE and MC9S08QE silicon that affects the ICS frequency output.

**2.4 Board support (see also the hardware section)**

Example projects can be used as templates for your own projects. There are example projects for each of the boards listed below.

- HC08**
- DEMO908AP64
  - DEMO908GZ60
  - DEMO908JL16
  - DEMO908LB8
  - DEMO908QB8
  - DEMO908QC16

<b>HCS08</b>	DEMO9S08AW60 DEMO9S08LC60 DEMO9S08QG8 DEMOQE128 EVBQE128 EVB9S08DZ60 USBSPYDER08
<b>RS08</b>	DEMO9RS08KA2 DEMO9RS08KA2SP USBSPYDER08
<b>ColdFire V1</b>	DEMOQE128 EVBQE128

## 2.5 Languages

CodeWarrior Development Studio for Microcontrollers supports a wide range of languages from absolute assembly to C++.

### 2.5.1 Assembly

The tools suite supports absolute assembly, relocatable assembly and in-line assembly for HC08, HCS08, RS08 and ColdFire V1 microcontrollers. There is no code size limitation for assembly language development.

Assembly language is NOT an option in the New Project Wizard for ColdFire V1 microcontrollers. If you would like to create an assembly language project for a ColdFire V1 microcontroller, you can use the assembly language example project as a template.

### 2.5.2 C

In the Special Edition, which is available “free of charge”, C code is limited to 32Kbytes for HC(S)08 microcontrollers and 64Kbytes for ColdFire V1 microcontrollers. There is a single C compiler upgrade, which allows you to develop C code up to 64Kbytes for HC(S)08 microcontrollers and 128Kbytes for ColdFire V1 microcontrollers. C code is unlimited with the Standard Edition and the Professional Edition.

### 2.5.3 C++

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 tool suite includes C++ compiler support HC(S)08 and ColdFire V1 microcontrollers.

### 2.5.4 Language support

Each project also contains header files with descriptions of registers, bytes and bits as they appear in the microcontroller’s reference manuals to make writing code easier. The project is set up so you can concentrate on writing your application code in the ‘main’ section of the program as indicated in the source file: “/\* **write your code here** \*/”.





## 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)

### ColdFire V1

- Init\_ACMP\_COLDFIREV1                Freescale Analog Comparator (ACMP)
- Init\_ADC\_COLDFIREV1                 Analog-to-Digital Converter (ADC)
- Init\_COP\_COLDFIREV1                 Computer Operating Properly (COP)
- Init\_FLASH\_COLDFIREV1                Flash Memory (FLASH)
- Init\_GPIO\_COLDFIREV1                 General Purpose Input Output (GPIO)
- Init\_IIC\_COLDFIREV1                 Inter-IC Bus (IIC)
- Init\_IRQ\_COLDFIREV1                 External Interrupt Module (IRQ)
- Init\_KBI\_COLDFIREV1                 Keyboard Interrupt Module (KBI)
- Init\_RTC\_COLDFIREV1                 Real-Time Counter(RTC)
- Init\_SCI\_COLDFIREV1                 Serial Communications Interface (SCI)
- Init\_SPI\_COLDFIREV1                 Serial Peripheral Interface (SPI)
- Init\_TPM\_COLDFIREV1                 Timer/PWM (TPM)

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 time consuming effort to learn the 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 allows you to catch and fix configuration issues and resources conflicts during the design phase, so you can reduce your time to market and increase your product quality.*

### **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.

#### HC08

- AsynchroMaster    Asynchronous serial communication - master
- AsynchroSlave    Asynchronous serial communication - slave
- BDLC              BDLC serial communication
- DDC1              DDC1 communication interface

- ExternalFile External Binary File Converter
- FreescaleAnalogModule Freescale Analog module
- FreescaleBEMF Back ElectroMagnetic Force
- FreescaleCAN CAN communication for Freescale implementation
- FreescalePWM Pulse width modulation - special version
- FreescaleUHFTransmitter UHF Transmitter
- InternalI2C Internal I2C Communication Interface
- KBI Keyboard
- LCD Liquid Crystal Display
- OSD On-Screen Display
- PWMMC Pulse width modulation for motor control
- RTC Real Time Clock
- StringList String List Converter
- SyncProc Sync Processor
- Term ANSI Terminal
- TimeDate Time and date
- USB USB device bean
- USBHUB USB HUB device

#### **HCS08**

- AsynchroMaster Asynchronous serial communication - master
- AsynchroSlave Asynchronous serial communication - slave
- ExternalFile External Binary File Converter
- FreescaleAnalogComp Analog comparator on Freescale derivatives
- FreescaleCAN CAN communication for Freescale implementation
- FreescaleCMT Freescale Carrier Modulator Transmitter
- InternalI2C Internal I2C Communication Interface
- IntFLASH Internal FLASH
- KBI Keyboard
- LCD Liquid Crystal Display
- StringList String List Converter
- Term ANSI Terminal
- TimeDate Time and date

#### **ColdFire V1**

- AsynchroMaster Asynchronous serial communication - master
- AsynchroSlave Asynchronous serial communication - slave
- ExternalFile External Binary File Converter
- FreescaleAnalogComp Analog comparator on Freescale derivatives
- InternalI2C Internal I2C Communication Interface
- IntFLASH Internal FLASH
- KBI Keyboard
- StringList String List Converter
- Term ANSI Terminal
- TimeDate Time and date

See 'useful links' and 'documentation'

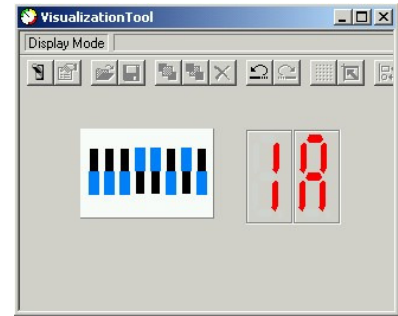
### 3.3.2 Bean Wizard™

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 <b>CWX-HXX-SE</b>		Standard Edition <b>CWS-H08-STDED-CX</b>	Professional Edition <b>CWS-H08-PROED-CX</b>
Compiler Options	32Kbytes	<b>CWS-H08-CUPG-CX</b> 64Kbytes	Unlimited	Unlimited
<b>CODEWARRIOR</b>				
IDE 5.x	Unlimited	Unlimited	Unlimited	Unlimited
Macro Assembler	Y	Y	Y	Y
Pre-configured Projects	Y	Y	Y	Y
Flash Programming	Y	Y	Y	Y
Simulator (P&E techn.)	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
<b>PROCESSOR EXPERT</b>				
Basic Beans	Y	Y	Y	Y
Software Beans			Y	Y
Advanced Beans				Y
Bean Wizard				Y

ENHANCING OPTIONS				
C++	1Kbytes	1Kbytes	Order key CWX-H08-ENCHC-KX	Y
TARGETS (parallel, serial or USB)				
HCS08 Serial Monitor	Y	Y	Y	Y
P&E Multilink(s)	Y	Y	Y	Y
P&E CYCLONE(PRO)	Y	Y	Y	Y
SofTec USB	Y	Y	Y	Y
HC08 FSICE	Y	Y	Y	Y
HCS08 DBG support	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 done with Evaluation Boards or directly on the target application.

**Features:** there are some limitations to the Special Edition:

- No limitation on number of files in the project
- Unlimited assembler for HC(S)08, RS08 and ColdFire V1 microcontrollers
- C compiler limited to 32Kbytes of object code for HC(S)08 microcontrollers
- C compiler limited to 64Kbytes of object code for ColdFire V1 microcontrollers
- Linker limited
  - o 32Kbytes of C code for HC(S)08
  - o 64Kbytes of C code for ColdFire V1
  - o 1Kbytes of C++
- 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 32Kbytes of code, a C compiler upgrade is available.

The C compiler upgrade offers:

- C compiler object code for up to 64Kbytes (1K of C++) for HC(S)08 microcontrollers
- C compiler object code for up to 128Kbytes for ColdFire V1 microcontrollers

#### 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 and ColdFire V1 families. It adds the possibility to closely simulate the interfaces to the processor, making 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 and ColdFire V1 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 the C upgrades to the Standard Edition.**

#### **Enhancing option available for the Standard Edition**

- For customers wishing to develop C++ based application a C++ license key can be added to the Standard Edition.

#### **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++ for HC(S)08 and ColdFire V1 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, HCS12(X), ColdFire V1, or DSC 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)

**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 Development Studio for Microcontrollers has the capability to provide additional support for specific functions.

### **5.1 OSEK**

The CodeWarrior Development Studio for Microcontrollers 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 Microcontrollers 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
- MCU Change Wizard
- New and updated support for HCS08, RS08 and ColdFire V1 families
- On-chip DBG module support including trace for HCS08 and ColdFire V1
- New/updated compiler to support HCS08 devices
- New/updated assembler to support HCS08 devices
- Updated prm and library files for existing and new derivatives
- Updated debugger/simulator files
- Updated online documentation with extended search capability (Help > Online Manuals)
- P&E PEDebug: new derivatives/FCS
- Updated Processor Expert supporting new ColdFire V1 architecture and new HCS08 devices
- Updated Device Initialization Tool supporting new ColdFire V1 architecture, new HCS08 devices and new RS08 devices

### 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
- Decoder to create a listing from ELF files
- Standard Edition also offers the possibility to add C++ compiler support.

### 6.3 Upgrade C compiler of Special Edition

The C compiler upgrade is for users of the Special Edition requiring more than 32Kbytes of code for HC(S)08 microcontrollers and 64Kbytes for ColdFire V1. C code offers portability, faster design and debugging of complex applications that would be very difficult to debug at the assembly level.

The C compiler upgrade allows code development up to 64Kbytes of code for HC(S)08 microcontrollers and 128Kbytes for ColdFire V1 microcontrollers.

## 7 Software Products: Part numbers

<b>Base Product</b>	<b>Part number</b>
Special Edition Tri-Pak <i>(includes CodeWarrior Development Studio for Microcontrollers, CodeWarrior Development Studio for HCS12(X), and HC(S)08/HCS12(X) Service Pack CD)</i>	CWX-HXX-SE
Standard Edition	CWS-H08-STDED-CX
Professional Edition	CWS-H08-PROED-CX
<b>Options for Special Edition</b>	<b>Part number</b>
C compiler/debugger Upgrade	CWS-H08-CUPG-CX
<b>Options for Standard Edition</b>	<b>Part number</b>
C++ option for Standard Edition	CWX-H08-ENHNC-KX
<b>Product Upgrades</b>	<b>Part number</b>
Upgrade from Special Edition to Standard Edition	CWS-H08-STDED-UX
Upgrade from Standard Edition to Professional Edition	CWS-H08-PROED-UX

<b>Technical Support and Product Renewals</b>	<b>Part number</b>
1 year technical support for C compiler upgrade	CWT-H08-CPUG-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 user. 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, RS08 and ColdFire V1
- CyclonePRO serial/USB/Ethernet to mon08 (HC08) and BDM (HCS08, RS08, ColdFire V1)
- SofTec inDart **USB to Mon08** for HC08
- SofTec inDart **USB to BDM** for HCS08, RS08, ColdFire V1

### 8.1 Multilink (P&E Microcomputer Systems)



P&E's USB HCS08/HCS12 MULTILINK is a debug interface which allows a PC access to the Background Debug Mode (BDM) on Freescale HCS08, HC(S)12(X), and RS08 microcontrollers. It connects between a USB port on a Windows 98SE/2000/XP/2003 machine and the standard 6 pin "Berg" debug connector on the target.

By using the USB HCS08/HCS12 MULTILINK, the user can take advantage of the background debug mode to halt normal processor execution and use a PC to control the processor. The user can then directly control the target's execution, read/write registers and memory values, debug code on the processor, and program internal or external FLASH memory devices.

### 8.2 CyclonePRO (P&E Microcomputer Systems)



P&E Microcomputer Systems' Cyclone PRO is an extremely flexible tool designed for in-circuit flash programming, debugging, and testing of Freescale HC08, HCS08, HC12, HC(S)12(X), and RS08 microcontrollers.

By connecting to a simple BDM or MON08 header on the target, the Cyclone PRO can program, test, or debug internal memory on a Freescale processor or external flash connected to the processor's address/data bus. The processor or memory device can be mounted on the final printed circuit board before programming.

The Cyclone PRO may be operated interactively via Windows based programming applications as well as under batch or dll commands from a PC. Once loaded with data by a PC it can be disconnected and operated manually in a completely stand-alone mode via the LCD menu and control buttons. The Cyclone PRO has over 3Mbytes of non-volatile memory, which allows the onboard storage of multiple programming images. When connected to a PC for programming or loading it can communicate via the ethernet, USB, or serial interfaces.

### 8.3 inDART-One (SofTec Microsystems)

The inDART-One In-Circuit Debugger/Programmer is a powerful debugging and programming tool for Freescale HC08-, S08-, RS08-, S12- and S12X-based systems.

- Universal: supports Freescale HC08/S08/RS08/S12/S12X through MON08 and BDM interfaces--future ready for new devices and families.
- Gangable: up to 32 instruments controllable from the same PC.
- Fast: fast HC08 programming algorithms drastically reduce production times (typically around 1 second for 32 KB Flash).
- Flexible: seamlessly integrates with CodeWarrior development tools. Dedicated programming interfaces. User-driven through DLL Programming Library.



### 8.4 FlashRunner (SofTec Microsystems)

FlashRunner I series is a range of high-performance, standalone In-System Programmers specific for Flash-based microcontrollers and serial memories. FlashRunner I series is targeted at production environments and can work either in full standalone mode or controlled by a host system.

- Fastest programming algorithms (as fast as target device's memory technology limit), approved by silicon manufacturers;
- Easy ATE integration;
- Standalone operations (projects and code images stored on a memory card);
- Also controllable by any host system via RS-232, Ethernet or USB (depending on the model);
- Supports most ISP protocols (BDM, JTAG, SPI, I2C, MON, ICC, SCI, etc.);
- Flexible, fully configurable;
- Compact and robust design for production environments;
- Data integrity guaranteed (every data transfer to/from the host system or Secure Digital card is CRC tagged).

### 8.5 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	EML08GPGTE	EM08JW32E	EL08MRE
EML08APE	EML08GZ	EM08LB8	EML08QBLTY
EM08AS60	EML08GZ16	EML08LD64	EML08QCBLTY
EM08AZ60	EM08JB	EML08LJ12	EML08QCBLTYE
EM08ASAZ60AE	EM08JB8E	EML908KX	EML08QL
EM08BD48	EML08JBJG	EML08LJLK	EML08QTQY
EM08EY	EML08JL8	EML08LJLKE	EML08RK/RFRK
EML08EY16A	EML08JLJK	EM08MR8	EML08SR
EML08GP32			

## 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
inDART One	INDART-ONE
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 Microcontrollers 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 Microcontrollers can be purchased directly from our Web site:

[Link to Buy Direct](#)

#### 12.1.2 On-line Request

[Link to request an evaluation CD online](#)

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 Development Studio for Microcontrollers

CodeWarrior Development Studio for Microcontrollers can be downloaded from our Web site:

[Download CW MCU v6.0 Special Edition](#)

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 HC08, HCS08, RS08 and ColdFire V1 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:

[Download Service Packs](#)

## 13 Getting started with Standard or Professional Editions

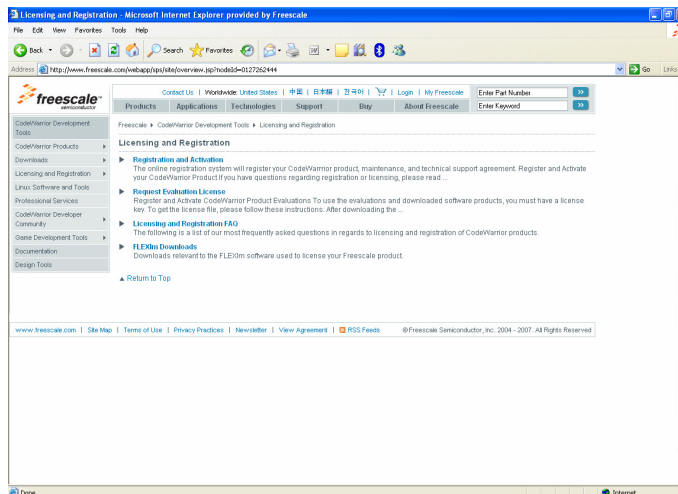
### 13.1 Ordering

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

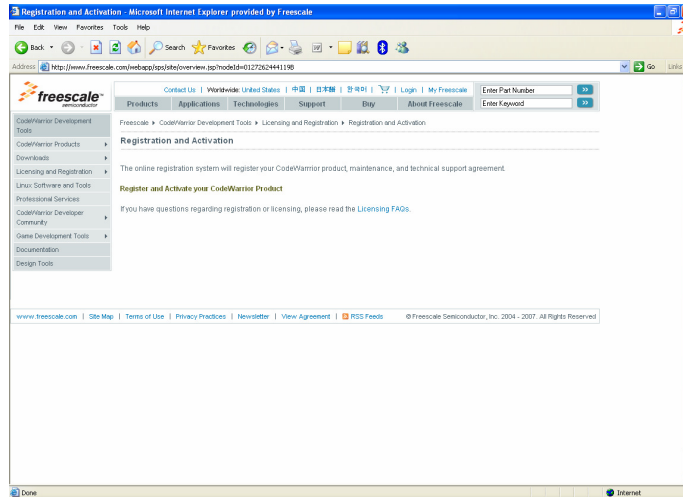
[Link to Freescale Buy Direct](#)

### 13.2 Registering and getting a license

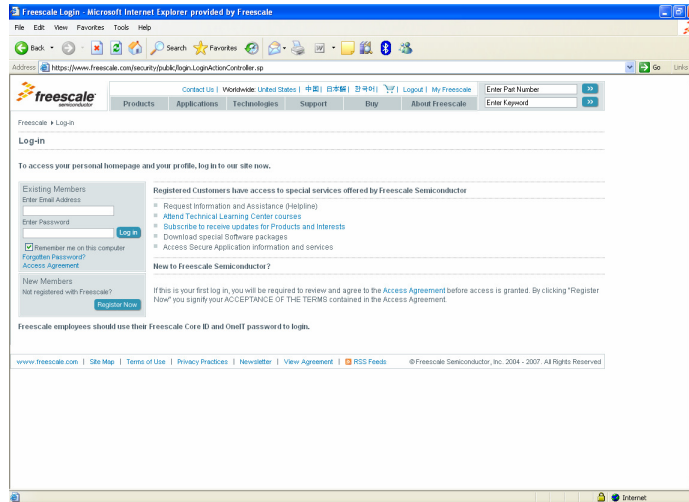
You need a license key to activate the Standard Edition or the Professional Edition. You can register your product directly from the CodeWarrior IDE. Select **Help > Register Product** from the main menu — the CodeWarrior IDE starts your browser, taking you to the on-line registration system.



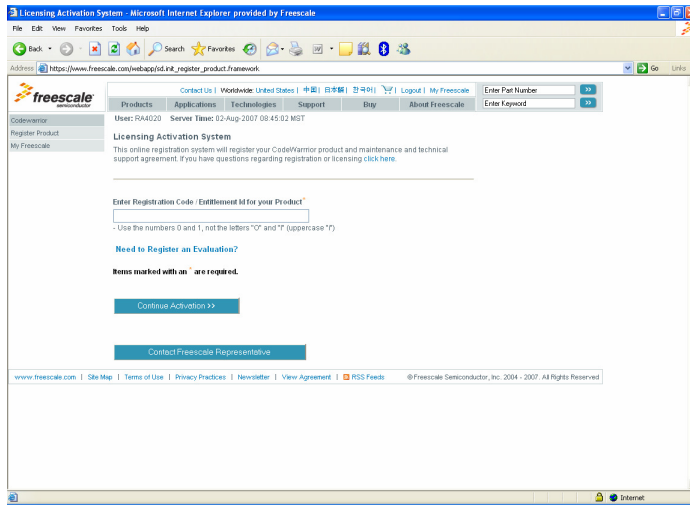
Select **Registration and Activation** and the following screen will appear.



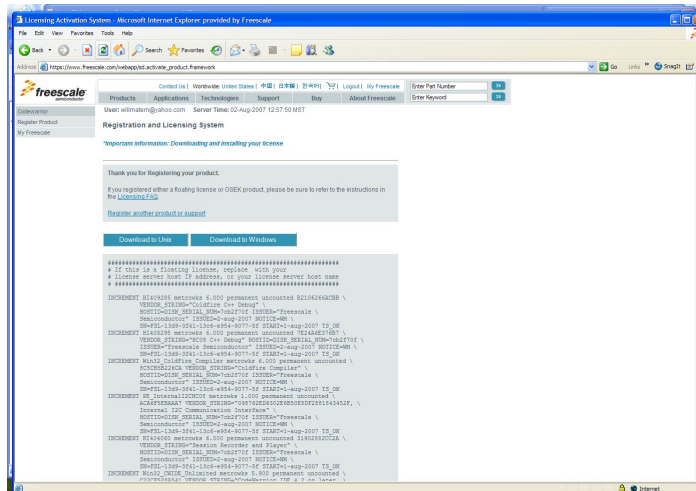
Select **Register and Activate your CodeWarrior Product** and the following log in screen will appear.



Enter your email address and password in the appropriate fields. Click on the **Log in** button and the following Licensing Activation System screen appears.



Enter your Registration Code/Entitlement ID and click on the **Continue Activation** button. Follow the on-screen instructions to complete the remaining pages of the form. When you click the **Continue** button on the last page — the license key will be emailed to your registered email address and the “Thank you” screen will appear with the license key displayed.



You can download the license key directly to your system by pressing the **Download to Windows** button. The IDE will save the license key in the correct location on your system.

**NOTE:** If you downloaded the software from the Freescale web site, you might not have a registration code/entitlement ID. You can request a registration code from [license@freescale.com](mailto: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\CodeWarrior for Microcontrollers V6.0

- **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**

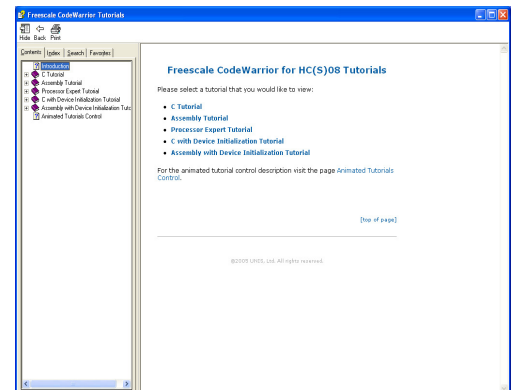
**NOTE:** Do not move or delete the license.dat file. If you receive additional keys for other CodeWarrior components, you can add the additional keys to the license.dat file.

## 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 Microcontrollers v6.0.



## 15 Training

You can access on-line training on the Freescale WEB site at [Technical Learning Center](http://www.freescale.com/technicallearningcenter).

## 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/EBeans.html>

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

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

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

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

### Links to board vendors:

Axiom: <http://www.axman.com>  
SofTec Microsystems: <http://www.softecmicro.com>  
Future Electronics: <http://www.futureerc.com>

## 17 Benchmarks

Benchmarking is an 'art' in itself. It is difficult to find the 'ideal' switches for benchmarking. Compiler and linker configuration depend heavily on the code and the goal you trying to achieve - code density or performance. The compiler manual lists the 'general' purpose option and you can use the 'Smart Sliders' in the compiler to tune the code for your desired result.

There are several things to consider when optimizing code and the best result will be a combination of these rather than just one setting for all cases. Compiler switches, linker configuration, programming style and end goals (code density, performance) all have a significant impact on the final application code.

For a critical benchmark, customers should contact Freescale to discuss benchmarking their code.

## 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 quickly supporting new derivatives.