

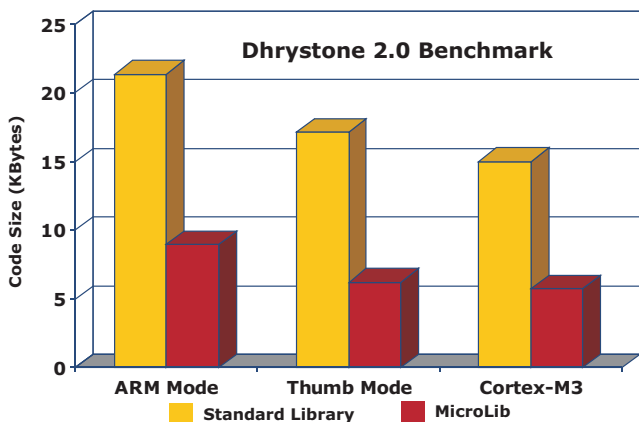
The RealView® **Microcontroller Development Kit** is the complete software development environment for all ARM7™, ARM9™, Cortex™-M1, and Cortex-M3 processor-based devices.

It combines the industry leading RealView compilation tools (by ARM) with the Keil™ μ Vision® IDE/Debugger, providing developers with an easy to use, feature-rich environment optimized for ARM Powered® devices.

The RealView Microcontroller Development Kit (MDK) provides an easy-to-use development interface, with many unique features designed to help you develop your project quickly and easily. Save time by using the **Device Database** to automatically configure device and project parameters. Benefit from better verification by using the integrated **Device Simulator** which accurately models more than 260 ARM Powered devices including the ARM instruction set and on-chip peripherals.

RealView Compiler Performance

The RealView MDK is based on the ARM RealView compilation tools, recognized as delivering the tightest, highest performing code for all ARM-Powered devices. In addition, further code size savings can be gained by selecting the new **MicroLib**, which has been specifically developed and optimized for embedded systems.



By using MicroLib, the library code sizes can be significantly reduced, enabling product memory and cost savings.

**ARM RealView C/C++
Compilation Tools with MicroLib**

**Easy-to-use IDE Supports
Complete Development Cycle**

**Complete Device Support
Including Peripheral Simulation**

**JTAG & Serial Wire Debug
plus Real-Time Trace**

**Deterministic and Preemptive
RTX RTOS Kernel**

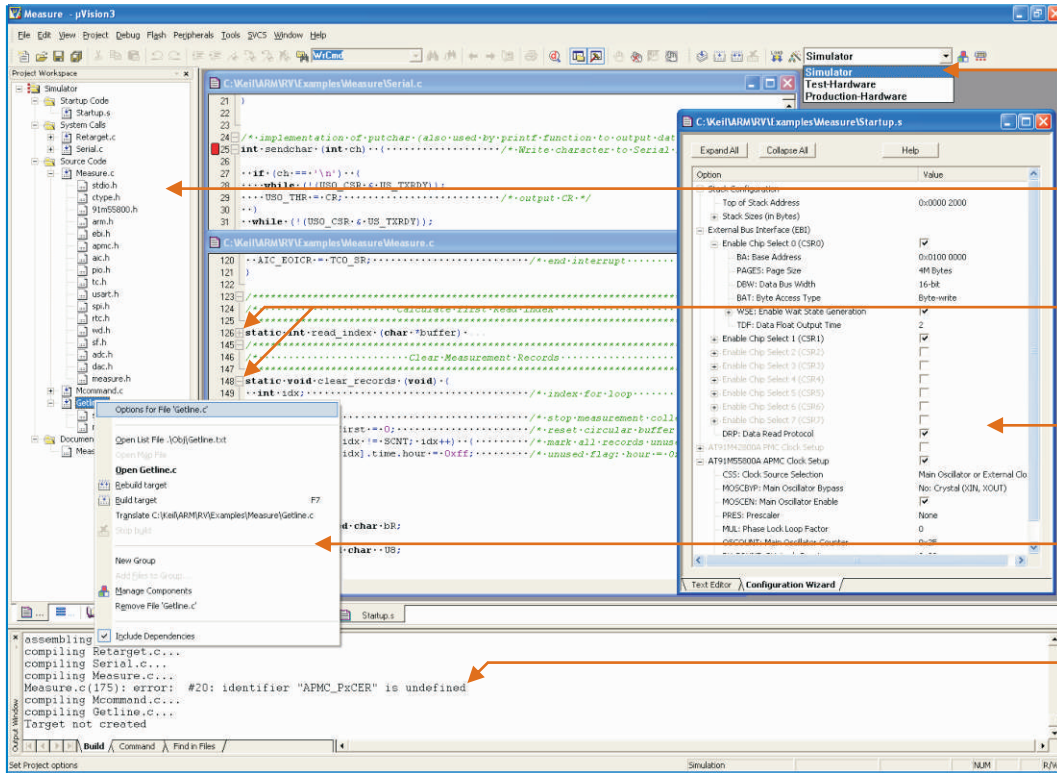
RealView Microcontroller Development Kit

Examples and Templates

- RealView C/C++ Compiler
- RTX RTOS Kernel
- μ Vision Device Database
- μ Vision Debugger and Analysis Tool
- Complete Device Simulation

The RealView Microcontroller Development Kit offers a complete development environment for all ARM Powered standard devices.

µVision Project Management



Each project may contain multiple target configurations.

The project workspace lists source and header files and helps organize your project.

Document outlining gives you a better overview of your source code.

The configuration wizard simplifies editing setup files.

Context menus provide flexible configuration of all aspects of your project.

Double-click on messages to locate the erroneous line in the source code.

Project Configuration

The µVision IDE incorporates a Device Database of supported ARM Powered microcontrollers. In µVision projects, required options are set automatically when you select the device from the Device Database.

µVision displays only those options that are relevant to the selected device and prevents you from selecting incompatible directives. Only a few dialogs are required to completely configure all the tools (assembler, compiler, linker, debugger, and flash download utilities) and memory map for your application.

Project Management

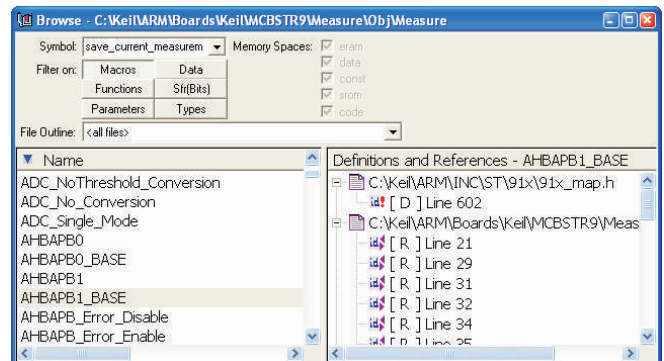
File Groups allow you to group associated files together. They may be used to separate files into functional blocks or to identify engineers in your software team.

Project Targets allow you to create several programs from a single project. You may require one target for testing and another target for a release version of your application. Each target allows individual tool settings within the same project file.

Editor and Source Browser

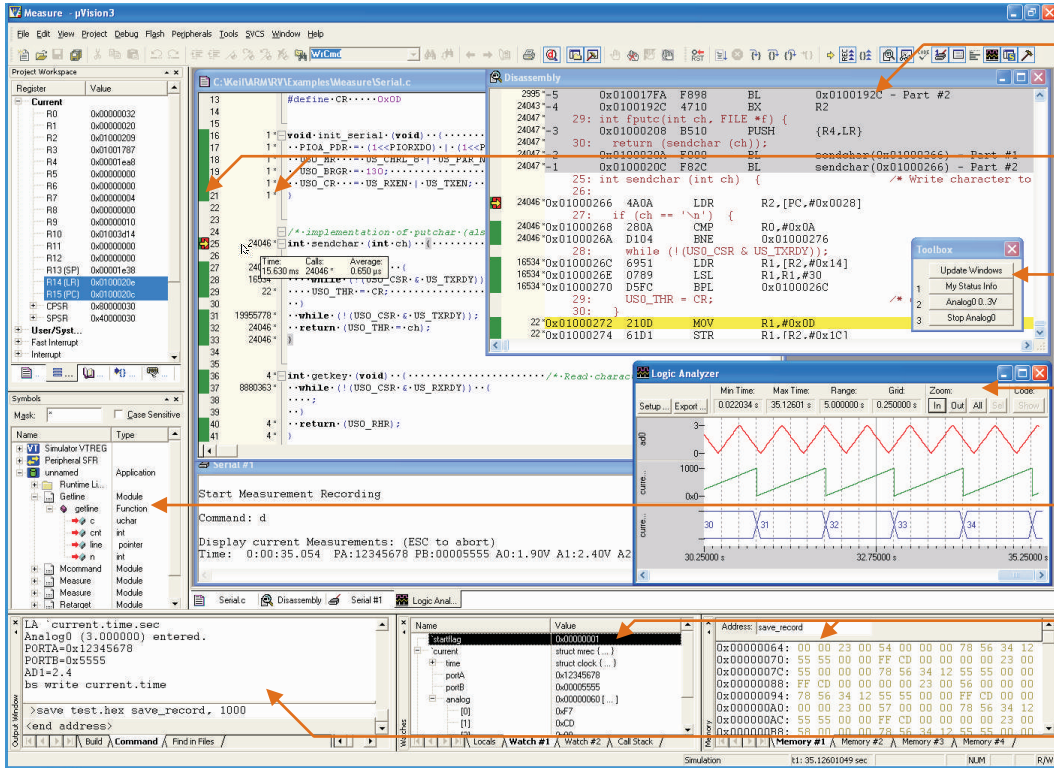
The µVision Editor includes all the standard features you expect in a professional editor. Workflow is optimized with intuitive toolbars providing quick access to editor functions, most of which are also available while debugging for easy source code changes.

The integrated µVision Source Browser quickly displays information about symbols and variables in your program using the F12 key and the Source Browser Window.



The Source Browser provides instant details on variable definitions and usage.

µVision Program Debugging and Simulation



The disassembly window shows trace intermixed with source code.

Code coverage and profiling information display in the source window.

The toolbox contains user definable buttons to run commands or debug

The logic analyzer shows changes to variables and signals over time.

Symbol names may be dragged and dropped to other debugger windows.

Memory and watch windows display important program variables.

Enter debug commands into the command tab of the output window.

Debugger and Device Simulator

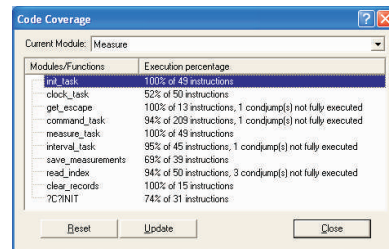
The µVision **Debugger** supports complex breakpoints (with conditional or logical expressions) and memory access breakpoints (with read/write access from an address or range). The debugger also displays code coverage and execution profiling information in the editor windows.

Additionally, the µVision Debugger simulates a complete ARM Powered microcontroller including the instruction set and on-chip peripherals. These powerful simulation capabilities provide serious benefits and promote rapid, reliable embedded software development and verification.

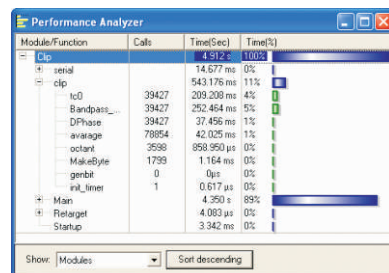
- Simulation allows software testing with no hardware.
- Improve overall reliability with early software debugging.
- Simulation allows breakpoints that are not possible with hardware debuggers.
- Simulation allows for optimal input signals (hardware debuggers add extra noise).
- Signal functions are easily programmed to reproduce complex, real-world input signals.
- Single-step through signal processing algorithms.
- Test failure scenarios that would destroy real hardware.

Analysis Tools

The µVision Debugger provides powerful analysis tools for fast application development, verification and optimization.



µVision provides code coverage statistics for application verification.



Performance Analyzer shows execution time for tasks and programs.

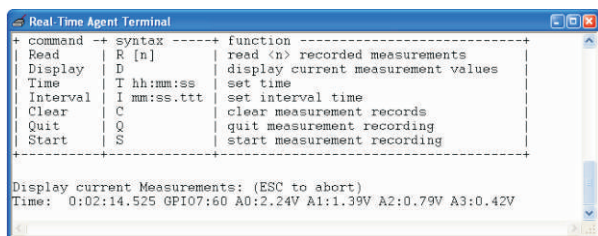
ARM7/9 Debugging

Debugging of ARM7 and ARM9 processor-based devices is supported via the standard 5-wire JTAG interface using the Keil **ULINK[®]2** Adapter. When used with μ Vision, ULINK2 enables you to download programs to on-chip and external Flash, set breakpoints, view memory contents, and single-step through your program.

Real-Time Agent

Debugging using JTAG requires the processor to be halted to allow memory modifications or setting of breakpoints, this is not always practical in an embedded application.

By adding the Keil **Real-Time Agent** to your application, you are able to view and modify your target's memory, and set breakpoints on-the-fly without stopping your program. Serial data communication which would normally be output via a serial channel can be displayed in the **Real-Time Agent Terminal** window.

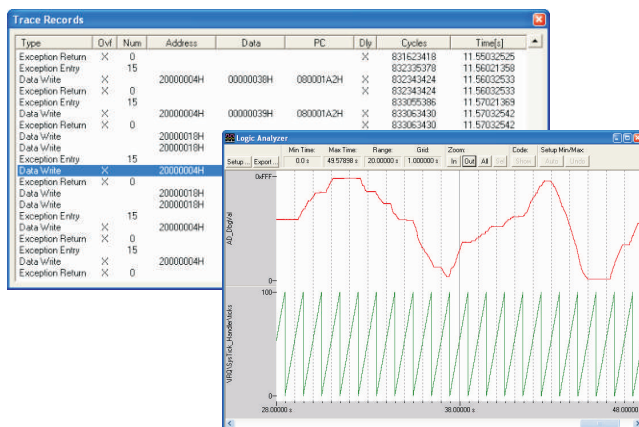


The μ Vision Real-Time Agent Terminal displays serial and printf style information which would normally be output through an on-chip serial channel.

Cortex-M3 Debugging

Cortex-M3 processor-based devices offer a new **Serial Wire (SW)** debug mode, replacing the JTAG interface with a 2-pin interface, and offering new features.

The **Serial Wire Viewer (SWV)** uses one further pin and provides Real-Time Trace information about: interrupt execution, data read/write of selected variables, event counters, and user trace data.

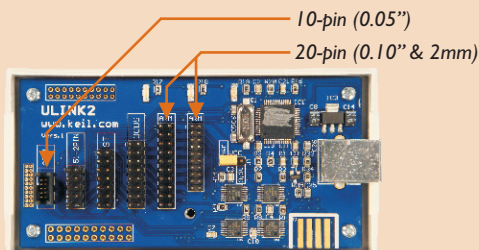
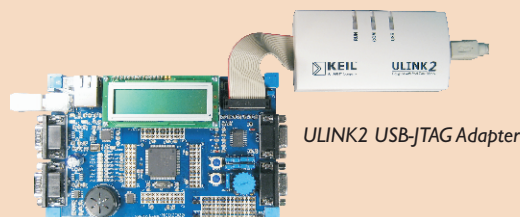


The Logic Analyzer and Trace Records windows display trace information in real-time while the processor continues operating at full speed.

For detailed information, refer to www.keil.com/apnotes/docs/apnt_197.asp.

Hardware Debugging using ULINK2

- **ULINK2** connects via USB to the target board. It supports JTAG and Serial Wire modes including SWV Real-Time Trace.
- **Three** connector types are supported by ULINK2:
 - 20-pin (0.1" & 2mm) - used on most evaluation boards.
 - 10-pin (0.05") - new space saving connector.
- **JTAG, SW** and **SWV** interfaces are all supported within the standard 20-pin and 10-pin connector pin-outs.
- Further information is available at www.keil.com/ULINK2.



ULINK2 supports three ARM debug connectors

ETM Trace

Some ARM Powered devices also include an Embedded Trace Macrocell™ (ETM) which enables instruction and data trace. MDK supports this style of trace with the addition of a third-party trace unit and a software plug-in.

RTX Kernel

Today, microcontroller applications demand more critical control, often requiring simultaneous execution of multiple tasks in a real-time environment.

While it is possible to implement an embedded program without using a real-time kernel, the proven Keil RTX allows developers to concentrate on application development, save time, produce a reliable, expandable system and makes software development easier.

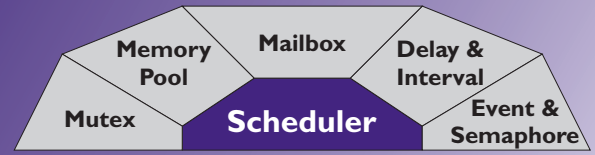
RTX is a royalty-free, deterministic real-time kernel with multiple task priority levels, round-robin, and preemptive context switching. It has been specifically developed for the ARM architecture, with a further optimized Cortex-M feature-set.

RTX Real-Time Kernel Specifications		
General Specifications	ARM7 / ARM9	Cortex-M3
Defined Tasks (max)		Unlimited
Active Tasks (max)		254
Task Priority Levels		1 - 254
Signals / Events		16 per task
User Timers		Unlimited
Semaphores / Mailboxes / Mutexes		Unlimited
Context Switch	<7µS	<4µS
Interrupt Lockout time	3.1µS	0µS
Memory Requirements	ARM7 / ARM9	Cortex-M3
CODE Space	<4.5KB	<4KB
RAM Space (Kernel)		~500 Bytes
RAM Space (Task)		TaskStackSize + 52 Bytes
Typical Timing Performance	ARM7TDMI	Cortex-M3
CPU Clock Speed	60MHz	72MHz
Initialize system, start task	46.2µS	22.1µS
Create defined task, (no task switch)	17.0µS	8.1µS
Create defined task, (with task switch)	19.1µS	9.3µS
Delete task	9.3µS	4.8µS
Task switch (by os_tsk_pass)	6.6µS	3.9µS
Set event (no task switch)	2.4µS	1.9µS
Send semaphore (no task switch)	1.7µS	1.6µS
Send message (no task switch)	4.5µS	2.5µS
Max. Interrupt lockout for IRQ ISR's	3.1µS	0µS

CODE and **RAM** space depend on which RTX functions are used. Detailed performance figures are available at www.keil.com/support/man/docs/rlarm.

RTX is provided as fully configurable object code within the **Microcontroller Development Kit** and as source code in the **Real-Time Library**.

RTX Kernel



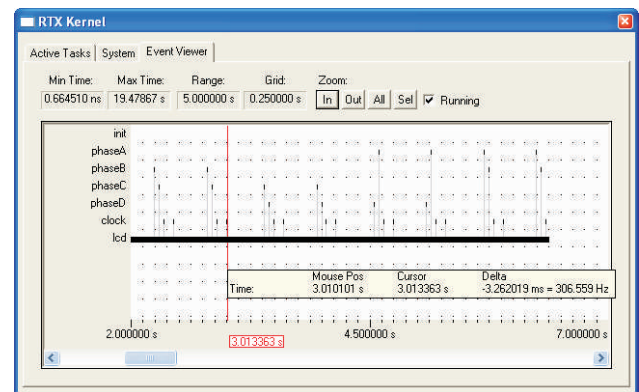
RTX Kernel Function Overview

- **Task Management Functions** allows you to create and delete tasks. RTX supports up to 254 active tasks, each with 254 priority levels, multiple instances of the same task are supported.
- **Task Stacks** are allocated from a stack memory pool or can be supplied when a task is created.
- **Fast Memory Pool Management** allows you to create an unlimited number of fixed size pools while providing fully deterministic allocation times.
- **Event Flag Management** allows synchronization with up to 16 event flags per task.
- **Time Management and Timer Callback Functions** support time delays (interval or timeout) for tasks.

Kernel Aware Debugging

RTX is fully integrated in the µVision **Debugger** making it easy to monitor task status and kernel activity.

The RTX dialogs display all aspects of the kernel; such as active tasks, stack loading, and system resource usage.



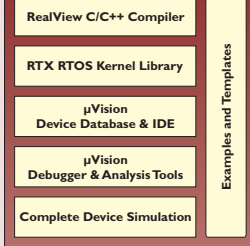
Task and event timing is conveniently displayed in the Event Viewer, more detailed information can be viewed by pointing the cursor at specific points.

ARM Microcontroller Development Tools

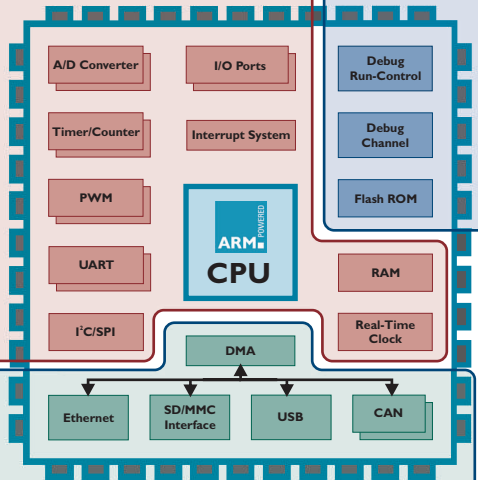
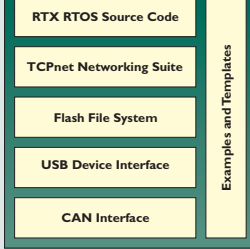
Microcontroller Development Kit (MDK)

- Best-in-class ARM RealView® C/C++ Compiler.
- Genuine Keil μVision® IDE/Debugger/Simulator.
- Royalty-free RTX Real-Time Operating System.
- Easy device configuration with Device Database support for more than 260 ARM Powered devices.

RealView® Microcontroller Development Kit



RealView® Real-Time Library



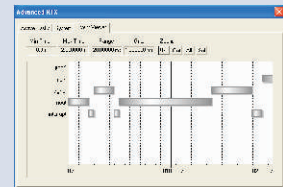
Real-Time Library (RL-ARM)

- RTX Real-Time OS with Source Code.
- TCP/IP Suite with Server Applications.
- File System for ROM and Memory Cards.
- Supports USB Standard Device Drivers.
- CAN Driver with RTOS Interface.

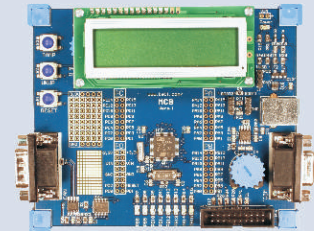


ULINK2® Adapter

- JTAG & SerialWire Interface.
- Target Debugging.
- Flash Programming.
- Real-Time Trace and on-the-fly debugging.



Evaluation Boards



Keil provides a wide range of evaluation boards for devices based on ARM7, ARM9 and Cortex-M3.

Europe:

Keil
Bretonischer Ring 15
85630 Grasbrunn
Germany

Phone +49 89 / 45 60 40 - 0
Support +49 89 / 45 60 40 - 24
FAX +49 89 / 46 81 62
Email sales.intl@keil.com
support.intl@keil.com

United States:

Keil
1501 10th Street, Suite 110
Plano, Texas 75074
USA

Phone +1 800 348 8051
+1 972 312 1107
FAX +1 972 312 1159
Email sales.us@keil.com
support.us@keil.com



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Program examples and detailed technical information are available from your distributor and our web site (www.keil.com).