RENESAS

Mitsubishi Microcomputers
Development Support Tool Catalog

MITSUBISHI
Mitsubishi Tools

Mitsubishi tools enable you to obtain maximum performance from your Mitsubishi microcomputers.

maximum usability

THIRD PARTIES
Third-Party Tools

Further enhances third-party tie-ups.

USER SUPPORT
User Support

Mitsubishi backs you up in your MCU development, with the support you need - when you need it.

http://www.tool-spt.maec.co.jp/index_e.htm

MITSUBISHI TOOLS
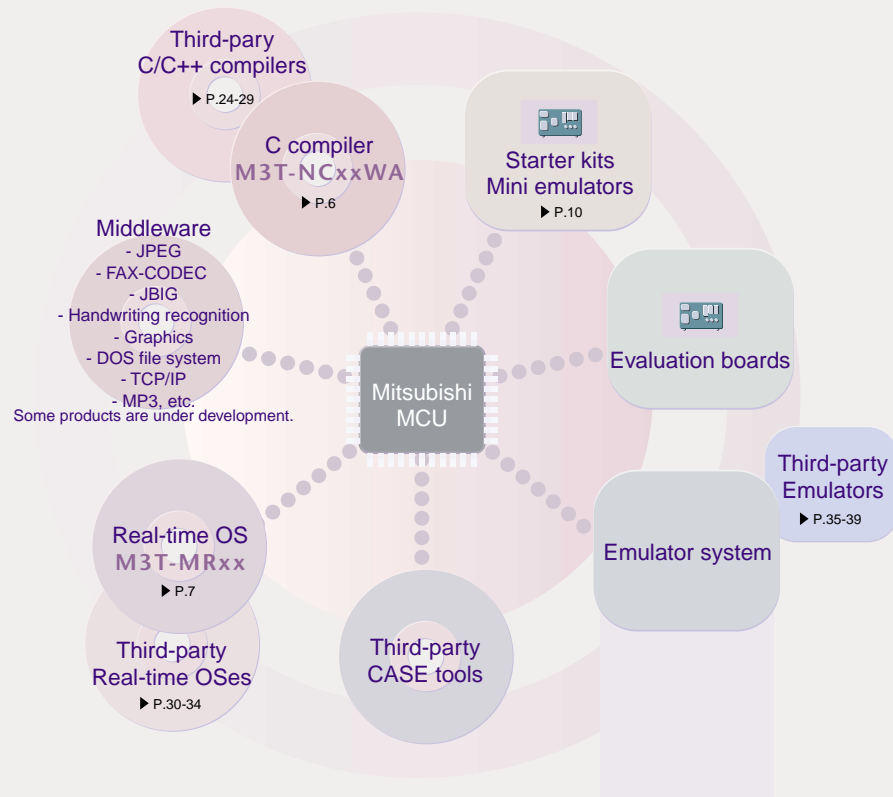
Mitsubishi Tool Product Line

Supports a wide range of MCUs - from 4-bit to 32-bit

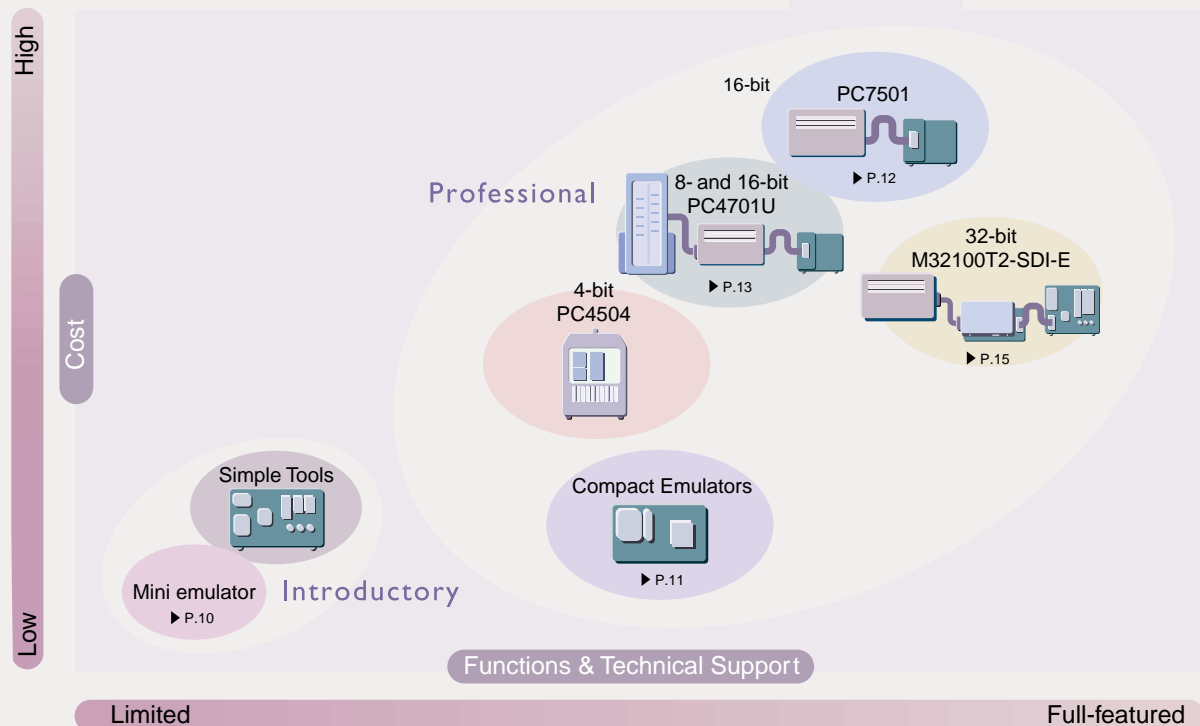| MCU			Introductory and evaluation	Cross tool	Real-time OS	Simulator debugger	Compact emulator system	Emulator system		
								Emulator debugger	Emulator	Emulation pod and others
32-bit	M32R Family	M32R/ECU Series		Cross tool kit M3T-CC32R with IDE TM ● P.6	M3T-MR32R P.7	M3T-PD32RSIM ● P.8		M3T-PD32R P.15	M32100T2-SDI-E P.15	
16/32-bit	M16C Family	M32C/80 Series	Starter kit** P.10	C compiler M3T-NC308WA with Assembler & IDE TM P.6	M3T-MR308 P.7	M3T-PD308SIM P.8		M3T-PD308F P.12	PC7501 P.12	M30830T-EPB
16-bit		M16C/80 Series	Mini emulator Starter kit P.10				M30800T-CPE M30803T2-CPE** P.11	M3T-PD308 P.13	PC4701U P.13	M30803T-RPD-E
		M16C/60 M16C/30 M16C/20 M16C/10 Series	Mini emulator Starter kit P.10	C compiler M3T-NC30WA with Assembler & IDE TM ● P.6	M3T-MR30 P.7	M3T-PD30SIM ● P.8	M30620T-CPE M30100T2-CPE** P.11	M3T-PD30F P.12 / M3T-PD30 P.13	PC7501 P.12	M3062PT-EPB** / M30xxxTx-RPD-E
	7700 Family	7900 Series		C compiler M3T-NC79WA with Assembler & IDE TM ● P.6		M3T-PD79SIM P.8		M3T-PD79 P.13	PC4701U	M37900T2-RPD-E
		7770 Series	Simple tool	C compiler M3T-NC77WA with Assembler M3T-RASM77 & IDE TM ● P.6		M3T-PD77SIM ● P.8		M3T-PD77 P.13		M377xxxT-RPD-E
8-bit	740 Family	38000 740 7200 7600 Series	Simple tool	Assembler M3T-SRA74 with IDE TM P.6		M3T-PD38SIM ● P.8	M38000T2-CPE**	M3T-PD38 P.13	PC4701U P.13	M38000TL2-FPD M3xxxxT-RPD(-E)
4-bit		4500 Series		Assembler ASM45			M34514T2-CPE**	M3T-PD45	PC4504	MCU board
		720 Series		Assembler ASM72				M3T-RTT72	PC4400	Option board

IDE : Integrated development environment
● : Tryout version downloadable from the Mitsubishi Tool Homepage http://www.tool-spt.maec.co.jp/trial/trys_e.htm
** : Under development

Various Tool Products Offering Seamless Development Environment

Mitsubishi Electric helps you build development environments compatible with Mitsubishi MCUs. Functions are continuously enhanced and new products regularly developed to meet evolving customer needs. In addition to Mitsubishi proprietary tools, many third party tools are compatible with Mitsubishi MCUs. Greater convenience is our constant goal for user support. Mitsubishi now provides real-time support through our own website.

Third-pary
C/C++ compilers
▶ P.24-29

C compiler
M3T-NCxxWA
▶ P.6

Starter kits
Mini emulators
▶ P.10

Middleware
- JPEG
- FAX-CODEC
- JBIG
- Handwriting recognition
- Graphics
- DOS file system
- TCP/IP
- MP3, etc.
Some products are under development.

Mitsubishi
MCU

Evaluation boards

Third-party
Emulators
▶ P.35-39

Emulator system

Real-time OS
M3T-MRxx
▶ P.7

Third-party
Real-time OSes
▶ P.30-34

Third-party
CASE tools

Mitsubishi Emulator Lineup - from 4-bit to 32-bit

High

Cost

Low

Professional

16-bit   PC7501
▶ P.12

8- and 16-bit
PC4701U
▶ P.13

32-bit
M32100T2-SDI-E
▶ P.15

4-bit
PC4504

Simple Tools

Compact Emulators
▶ P.11

Mini emulator
▶ P.10

Introductory

Functions & Technical Support

Limited   Full-featured

Integrated Development Environment

| 32-bit M32R Family | 16/32-bit M32C/80 Series | 16-bit M16C/80 Series | 16-bit M16C/60, 30, 20,10 Series | 16-bit 7900 Series | 16-bit 7770 Series | 8-bit 740 Family |

For details on the supported functions, refer to the datasheet of each product.

Integrated development environment TM integrates some processes for software development. Compared with the development using each tool alone, TM takes a load off your development processes and increases operability. Therefore, TM offers you an extremely efficient development environment.

Integrated Development Environment TM

Tools (such as text editor, compiler, assembler, debugger) registered with TM can be invoked and option-controlled from the TM's screen with its consistent GUI. It is also possible to check execution results output from the registered tools on the screen.

• Invoking and controlling development tools
  - Registered tools can be invoked by clicking on the button on the window.
  - From the list of file names and labels displayed on the window, the tool related to each file can be invoked.

• High Operability under Windows
  Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 compatible. TM GUI provides easy source file registration, tool setting, and tool operation control.

• We suggest a cooperative environment between components
  TM's screen consists of the following four separate windows. You can display only the windows you need.
  - General control = Project bar
  - Creating a project = Project editor
  - Showing build results = Builder
  - Static program analysis = Inspector

• Product information management in project files
  Information on user-developed systems can be managed as a single project file. One project file is made for each user product. The information managed by the project file includes file information, target MCU information and tool information.
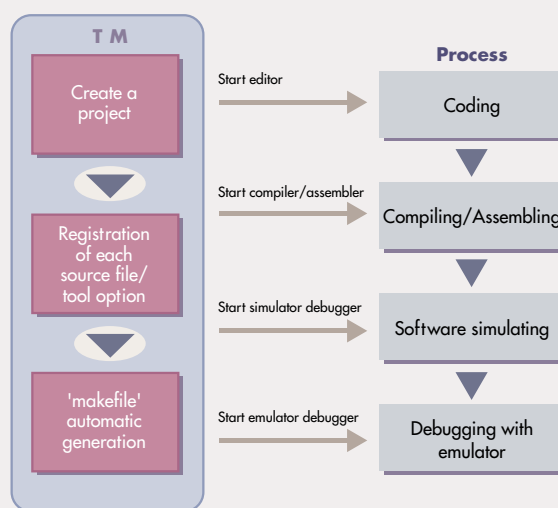
Processing flow and TM functions

• Automatic 'makefile' Function
  Generates automatically a makefile from the information on a project. Tools other than a compiler, assembler and linker can be registered easily in a makefile to invoke them.

• Static program analysis
  Definitions and viewing locations of variables and functions are analyzed and displayed as a list based on information available after compiling and linking. Tag-jumps can be made from displayed results.

• Changeover from existing software/projects
  Since the makefile can be read, it is easy to change over from existing development environments.

• Online help
  Online help of each tool can be referenced from TM.

• User's manual (PDF format)

Programming Environment with High Usability

For details on the supported functions, refer to the datasheet of each product.

Mitsubishi offers a programming environment for C, assembly and structured languages. And, the integrated development environment TM makes programming highly efficient and ensures high operability. All the products run on Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000 and Windows NT 4.0.

M3T-CC32R for 32-bit M32R Family

C Compiler cc32R

- Conformance with ANSI
- Supports Floating-point operation.
- Generates ROMable object code.
- Optimization functions
- Base register function, which reduces the size of ROM.
- #pragma ADDRESS, #pragma INTERRUPT and #pragma SECTION are available.
- Supports debugging optimized code.
- Outputs utilization size of the stack into a file.
- Supports four memory models.

- Online upgrade from our website
- Trial version software (free) is downloadable from our website

Integrated Development Environment TM

▶ For details, see P. 5.

Assembler as32R

- Chooses the shortest operand specification automatically
- Provides many powerful macro-instructions
- Adjusts instruction alignment automatically
- Simple handling 32-bit immediate data
- Lists results of assembling (object code) with assembler source lines

M3T-NC308WA for 16/32-bit M32C/80 Series, 16-bit M16C/80 Series
M3T-NC30WA for 16-bit M16C/60, 30, 20, 10 Series
M3T-NC79WA for 16-bit 7700 Family 7900 Series
M3T-NC77WA for 16-bit 7700 Family 7770 Series

C Compiler NCxx

- Compliance with ANSI standards.
- Performs very high code efficiency, comparable to assembler
- #pragma extension provides various ROMable features.
- Specifiable near/far variables.
- Supports real-time OS M3T-MRxx
- C source level debugging information
- Standard library
- Calculating stack size (stk and STK viewer)
- Displaying the mapping information (MAP viewer)
- Online upgrade from our website
- Trial version software (free) is downloadable from our website

Integrated Development Environment TM

▶ For details, see P. 5.

Relocatable Assembler ASxx

- Generates optimized codes with effective use of MCU instruction sets.
- Complete macro instructions.
- Tag files
- Library function
- Absolute address lists
- Cross reference lists
- Supports standard object formats
  - IEEE-695
  - Motorola S format
  - Intel HEX format

M3T-SRA74 for 8-bit 740 Family

Relocatable Assembler SRA74

- Structured instructions
- Automatically selects memory-efficient addressing modes.
- Generates tag files containing assemble error messages.
- Library function

- Free software including an absolute address list generation tool, multiple file cross referencer and others
- Online upgrade from our website

Integrated Development Environment TM

▶ For details, see P. 5.

* The xx found in product names varies according to MCU family and series.

µITRON-Based Real-time OSes

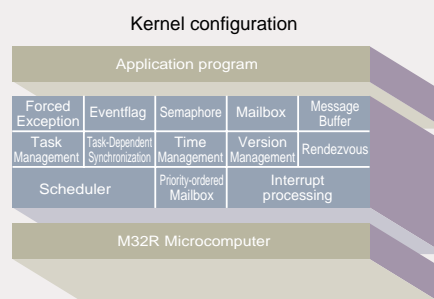| 32-bit M32R Family | 16/32-bit M32C/80 Series | 16-bit M16C/80 Series | 16-bit M16C/60, 30, 20, 10 Series | | | |

For details on the supported functions, refer to the datasheet of each product.

Mitsubishi provides real-time OS in compliance with µITRON specifications, supporting real-time of real-time control systems as well as debugging functions. Real-time OS M3T-MRxx facilitates a programming and reduces the amount of time required to develop application software.
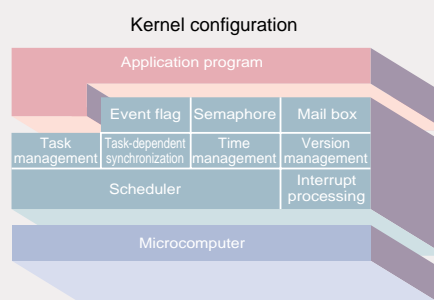
Real-time OS M3T-MR32R for 32-bit M32R Family

Kernel configuration

- WindowsXP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 compatible

- Conforms to µITRON* specifications
  * The µITRON architecture standard developed by Dr. Ken Sakamura at the University of Tokyo.

- Strong real-time characteristics and more compact size.

- Excellent interfaces with C language and assembler language.

- Specifying data made easier with configurator.

- Fast processing

- Development of application software using C

- Allows developers to configure a large scale system accessing to an external memory.

Application program

Forced Exception	Eventflag	Semaphore	Mailbox	Message Buffer
Task Management	Task-Dependent Synchronization	Time Management	Version Management	Rendezvous
Scheduler		Priority-ordered Mailbox	Interrupt processing	

M32R Microcomputer

- Debug functions using the Mitsubishi emulator and debugger

- Fast interrupt response

- Online upgrade from our website

Real-time OS M3T-MR308 for 16/32-bit M32C/80 Series, 16-bit M16C/80 Series
Real-time OS M3T-MR30 for 16-bit M16C/60, 30, 20, 10 Series

Kernel configuration

- WindowsXP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 compatible

- Conforms to µITRON* specifications
  * The µITRON architecture standard developed by Dr. Ken Sakamura at the University of Tokyo.

- Strong real-time characteristics and more compact size.

- Excellent interfaces with C language and assembler language.

- Specifying data made easier with configurator.

- Fast processing

- Development of application software using C

- Allows developers to configure a large scale system accessing to an external memory.

- Debug functions using the Mitsubishi emulator and debugger

Application program

Event flag	Semaphore	Mail box
Task management	Task-dependent synchronization	Time management	Version management
Scheduler		Interrupt processing

Microcomputer

Kernel configuration varies according to MCU series.

- Fast interrupt response

- Context selection function reduces RAM size to be used.

- Online upgrade from our website

Simulator Debugger's Application Development without Target Hardware

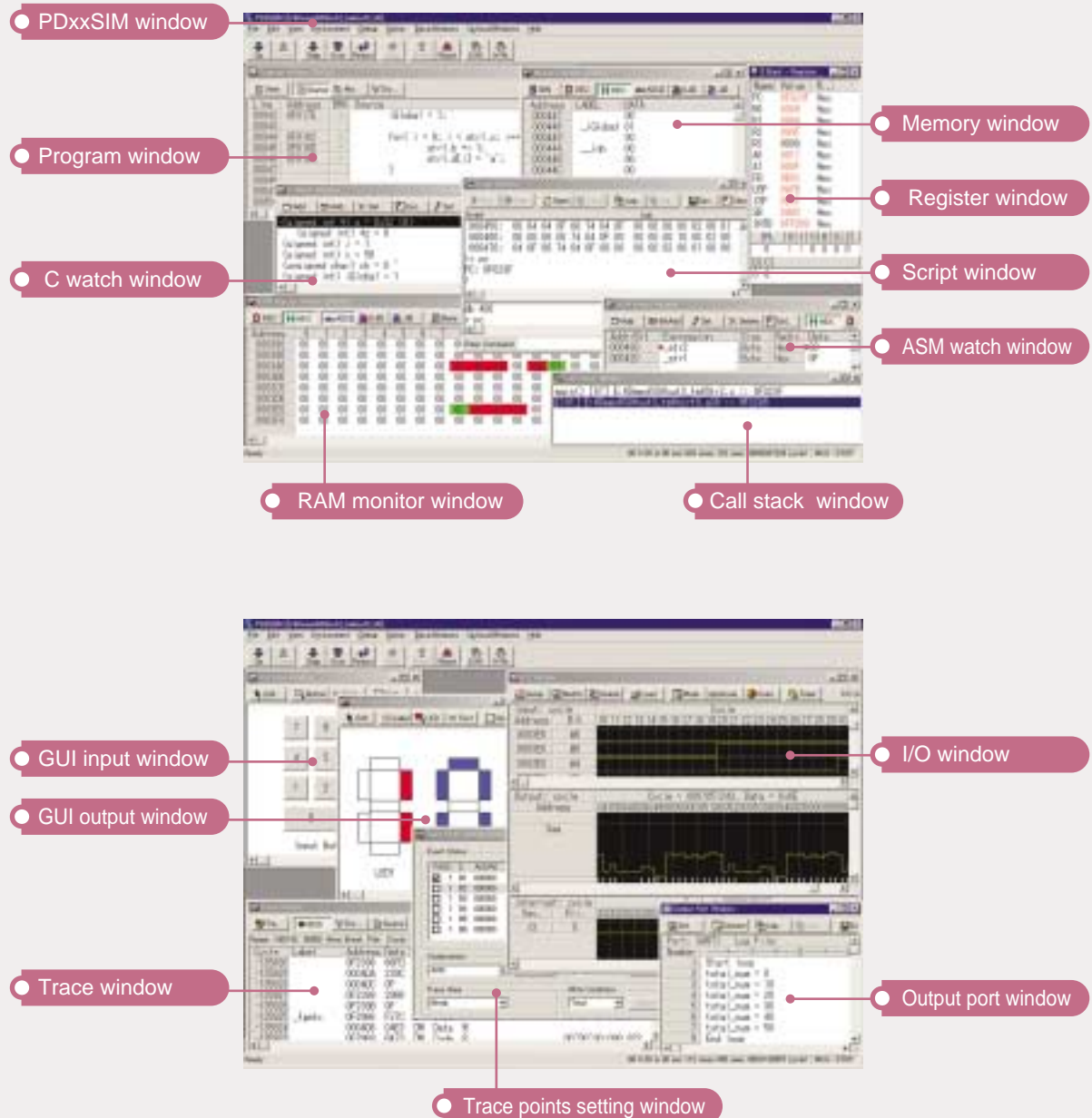| 32-bit M32R Family	16/32-bit M32C/80 Series	16-bit M16C/80 Series	16-bit M16C/60, 30, 20, 10 Series	16-bit 7900 Series	16-bit 7770 Series	8-bit 740 Family

For details on the supported functions, refer to the datasheet of each product.

Recently, it has become the general practice to employ a large team of engineers to develop software products for microprocessor because of the larger sizes of the software today. This has made necessary tools for debugging individual software modules before they are assembled into a larger product. M3T-PDxxSIM is a simulator debugger for these kinds of needs.

Simulator Debugger M3T-PDxxSIM

- Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 compatible
- Command simulation for measuring machine cycles
- I/O and interrupt simulation
- Target input/output over GUI

PDxxSIM window

Program window

C watch window

Memory window

Register window

Script window

ASM watch window

RAM monitor window

Call stack window

GUI input window

GUI output window

I/O window

Trace window

Output port window

Trace points setting window

* The xx found in product names varies according to MCU family and series.

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Debugger's New Customization Functions

32-bit M32R Family	16/32-bit M32C/80 Series	16-bit M16C/80 Series	16-bit M16C/60, 30, 20,10 Series	16-bit 7900 Series	16-bit 7770 Series	8-bit 740 Family

For details on the supported functions, refer to the datasheet of each product.

PDSDK COM* Kit for Debugger Customization

It is possible to access the debugger internal function from COM-compliant applications. The debugger is disclosing the interface, including CPU execution control, acquisition and setting of memory & register contents, and software break point setting or the like. Fully employing these interfaces makes it possible to expand the debugger function in the same manner as in Custom Builder CBxx.

Development Environment
You can use the Windows application development tool supporting "COM", such as Microsoft Corporation's "Visual Basic" and "Visual C++". Also, since many reference books for such development tools commercially available are now in stores, it is much easier to obtain information for preparing the applications as well. In particular, "Visual Basic" is called "RAD" (Rapid Application Development) tool, with which even a program beginner can create applications with ease. GUI can be prepared intuitionally by manipulating the mouse.

Application Examples
The GUI part on the target board can be created as a pseudo target. For GUI on the target board, it is possible to utilize standard control parts

that "Visual Basic" and "Visual C++" are provided with, such as a button. Also available are freeware and shareware control parts (Active X control). It is possible to write the memory contents at target program stop into the cell of table calculation software Excel. The data are totalized automatically, thereby facilitating data analysis and graphic display.

* "COM" is short for "Component Object Model" - Standard for linking with OS and applications that is proposed by Microsoft Corporation.
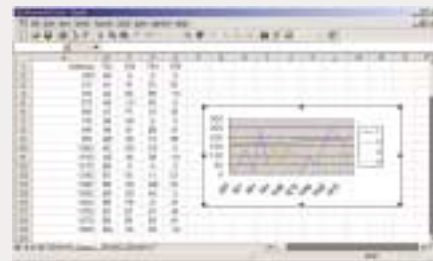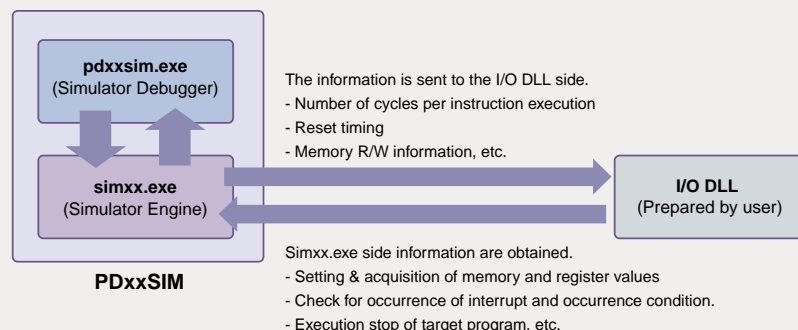
I/O DLL Kit for Debugger Customization

Development Environment
The I/O DLL function is provided to create I/O simulation with Microsoft "Visual C++". Mitsubishi offers "Visual C++" project and each function pattern as a template. The user can describe I/O to the port, occurrence of interrupt and peripheral I/O operation, etc. inside its function in C/C++ language to prepare a project. When the project thus created is built, "Visual C++" generates a DLL (Dynamic Link Library) file. This DLL file is read at PDxxSIM startup with the simulator engine.

Application Examples
The use of I/O DLL enables simulation in link with external tools; for example, Excel interface is accessed from the I/O DLL function, thus making it possible to output the value written in memory to the Excel file. Since the data is fetched at the timing in which the memory was read and written from the simulator engine, there arises no unexpected failure in acquiring data.

pdxxsim.exe
(Simulator Debugger)

The information is sent to the I/O DLL side.
- Number of cycles per instruction execution
- Reset timing
- Memory R/W information, etc.

simxx.exe
(Simulator Engine)

I/O DLL
(Prepared by user)

PDxxSIM

Simxx.exe side information are obtained.
- Setting & acquisition of memory and register values
- Check for occurrence of interrupt and occurrence condition.
- Execution stop of target program, etc.

* The xx found in product names varies according to MCU family and series.

Introductory Emulator Line for M16C Family MCUs

| | **16/32-bit** **M32C/80 Series** | **16-bit** **M16C/80 Series** | **16-bit** **M16C/60, 30, 20, 10 Series** | | | |

For details on the supported functions, refer to the datasheet of each product.

Starter Kit

Supports basic functions at a low cost. No target connection necessary.

Supported MCUs
For the M32C/83 Group
- M3A-0835 (30 MHz@5 V, 100-pin)
- M3A-0836 (30 MHz@5 V, 144-pin)
For the M16C/80 Group
- M3A-0801G02 (20 MHz@5 V, 100-pin)
- M3A-0802G02 (20 MHz@5 V, 144-pin)
For the M16C/62 Group
- M3A-0654G01 (10 MHz@3 V)
- M3A-0654G02 (16 MHz@5 V)

Operating environment
Windows XP, Windows Me, Windows 98,
Windows 95, Windows 2000

Components
- Starter kit main unit
- Dedicated serial cable
- Limited edition C compiler KNCxxWA
- Remote debugger KDxx
- Flash memory programmer M16C Flash Starter
- Manuals, etc.

For more details ▶ http://www.infomicom.maec.co.jp/M16C/mctope.htm

Mini Emulator

Supports basic functions at a low cost. No target connection necessary.

Supported MCUs
For the M32C/83 Group
- M3A-0841 (30 MHz@5 V, 100-pin)
For the M16C/80 Group
- M3A-0800G02 (20 MHz@5 V, 100-pin)
For the M16C/62 Group
- M3A-0652G01 (10 MHz@3 V, 100-pin)
- M3A-0652G02 (16 MHz@5 V, 100-pin)
For the M16C/20 Group
- M3A-0250 (10 MHz@5 V, 52-pin or 56-pin*)
*Converter board M3A-0260 required

Operating environment
Windows XP, Windows Me, Windows 98,
Windows 95, Windows 2000

Components
- Mini emulator main unit
- Dedicated serial cable
- LCC socket
- Limited edition C compiler KNCxxWA
- Remote debugger KDxx
- Flash memory programmer M16C Flash Starter
- Manuals, etc.

For more details ▶ http://www.infomicom.maec.co.jp/M16C/mctope.htm

Monitor Debugger Library (Under development)

• With Remoto Debugger KDxx, this library allows you to debug and monitor your program during the program's execution.
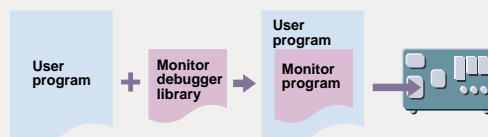
Supported MCUs
M16C/62A(M), M16C/62N, M16C/80, M16C/20, M32C/80, M16C/62P

Operating environment
Windows XP, Windows Me, Windows 98,
Windows 95, Windows 2000

Components
Debug monitor program etc.

User
program + Monitor debugger library → User program Monitor program →

* The xx found in product names varies according to MCU family and series.

Low-Cost, All-in-One Compact Emulators

| | 16/32-bit M32C/80 Series | 16-bit M16C/80 Series | 16-bit M16C/60,20 Series | | | |

Compact Emulators

Mitsubishi Electric has a wide selection of development tools ranging from the evaluation boards called the "Starter Kit" which are suitable for use at education and performance evaluation stages to high-performance emulators featuring abundant debug functions.

Among these, the compact emulators provide a superior cost-performance ratio, making it a compactly designed and low-cost emulator most suitable for use in small to medium-scale development projects.

• Compact Size & Low Cost
The emulator main unit comes in a significantly reduced size, compared with conventional emulator systems. So handy that you can take it out and debug at any time. Only the frequently used functions are incorporated in it. That's why it is available at low cost.

• All-in-One Package
This product package includes not only the emulator main unit but also the limited cross tools, so, you can program and debug your applications as soon as you open the package.

• Full-fledged Debug Functions
Available at affordable prices though, it has all the functions needed for the actual development, such as real-time trace and hardware breaks. The table below compares the functions between the compact emulators and the high-performance emulator PC4701U.

MCU			Type name	Availability	Remark
16/32-bit		M32C/83 Group	S30830T-CPE	Available	Made by Sunny Giken Inc.
16-bit	M16C Family	M16C/80 Group	M30800T-CPE	Available	Internal 10KB RAM supported
			M30803T2-CPE	Available	Internal 20KB RAM supported
		M16C/62 Group M16C/62A	M30620T-CPE	Available	—
		M16C/62 Group M16C/62P	S3062PT-CPE	Under development	Made by Sunny Giken Inc.
		M16C/10 Group	M30100T2-CPE	Under development	—
8-bit	740 Family	740, 38000 Series	M38000T2-CPE	Under development	—
4-bit	4500 Series	4513, 4514 Group	M34514T2-CPE	Under development	—

Components
- Emulator main unit
- Emulator debugger PDxxM
- Limited edition C compiler NCxxM
- Interface cables, etc.
- User's Manual (English/Japanese)

Operating environment
Windows 98, Windows 95, Windows 2000, Windows NT 4.0

For more info ▶ http://www.tool-spt.maec.co.jp/sales/index_e.htm

Comparison with Emulator PC4701U

	Compact emulators		High-end emulator
	M30620T-CPE	M30800T-CPE	PC4701U
Applicable MCUs	M16C/62 Group M16C/62A	M16C/80 Series	M16C Family, 7700 Family, 740 Family
MCU modes	Single-chip mode		Supports all modes for MCUs
Software break	64 points		64 points
Hardware break	N/A 1	point (Bus detection only)	6 points (Bus detection/Interrupt/External trace signal) AND/OR/State transition
Exception event detection	N/A		Access protect
Real-time trace	• Trace range: 32K-cycle • Trace data: 20-bit address, 16-bit data, 12-bit MCU status • Trace modes: 2 modes (Before Break/After Go)		• Trace range: 32K-cycle • Trace data: Bus, 8-bit external trace signal, 40-bit time stamp • Five trace modes: Break/Before/About/After/Full • Can be recorded ON/OFF by events. • Can be used for performance analysis and overhead measurement.
Real-time RAM monitor	N/A		1024 bytes (Data/Accessed or not/Final access result)
Time measurement	Execution time between program start to stop		Execution time between program start to stop, Maximum/minimum/average execution time and pass count of specified four zones, Count clock : Equal to MCU Clock or 16 MHz
C0 coverage	N/A		Available
Host computer interface	RS-232C serial (Max. 115.2K bps)		LAN (10BASE-T), USB (USB 1.1, Full-speed), LPT Parallel
Connection to Target System	Connect the LCC probe on the back of the emulator board with the LCC socket mounted on the target.		Via an emulation pod (option), connect to the target.
Event output	N/A		Break signals: One point, Event signals: 6 points
External trace signal input	N/A		TTL level: 8 points

New Emulator System PC7501 for M16C Family

PC7501 Emulator System

The PC7501 is an emulator with full bus trace. This model aims at adapting to a target system with Mitsubishi M16C Family MCU operating at 66 MHz. Just replacing an emulation probe designed specifically for each MCU allows you to configure emulation systems for various kinds of M16C Family MCUs.

The PC7501 provides enhanced debugging features compared to the already-existing PC4701U emulator. And its compact design results in space savings.

Emulator PC7501

- An emulator with full bus trace which aims at adapting to a target system with Mitsubishi M16C Family MCU operating at 66 MHz
- Compact design cramming all functions into an cabinet for emulation pod
- Just replacing an MCU-dependent firmware allows to debug various MCUs
- High-speed download
- Substantial debugging functions
  Enhanced debugging features compared to a conventional model (PC4701U)
- Laying out an MCU on the probe located directly above a target promotes electrical equivalence
- LAN, USB and LPT interfaces available
- AC adapter conforming to safety standards
- Power supply voltage: 100-240V, 50/60Hz
- FCC, CE certified
- PC7501 Emulator Website

Emulator PC7501 Specifications

	PC7501 system
Supported MCUs	M32C/80 Series M16C/62 Series M16C/62P Group etc.
Maximum operating frequency	66 MHz
MCU modes	Single-chip Memory expansion Microprocessor
Emulation memory	The default is 4 MB (max. 16 MB)
Power voltage	2.7 - 5.5 V (depends on MCU-dependent part)
AC supply voltage for emulator unit	Included
Software break	64 points
Hardware break	16 points Execution address/Bus detection/Interrupt/External trigger signal
Hardware break condition	AND/OR/AND (same time) /State transition Pass counts: 255 times
Exception event detection	Access protect
Real-time trace	128 bits x 256K cycles Can be recorded ON/OFF by events
Real-time RAM monitor	4,096 bytes (256 bytes x 16 blocks) Data / Last access result
Time measurement	Execution time between program start to stop Maximum/minimum/average execution time and pass count of specified four zones Count clock : Equal to MCU Clock or 16 MHz
C0 coverage	256 KB x 32 blocks
Event output	Break x 1, event x 7
External trigger input	TTL level x 8
PC interface	LPT *1, USB *2 (USB 1.1, Full-speed), LAN *3 (10Base-T)
Overseas standards	Compliant

*1. Printer port: ECP, EPP, Byte/Compatibility and Nibble/Compatibility modes are supported.
*2. With the USB interface of the PC7501, not all hardware (such as host computer, USB devices, USB hub) combinations will work and are guaranteed.
*3. An Ethernet cable for LAN is not packaged and is not available as an option.

Emulator Debugger M3T-PD308F, M3T-PD30F
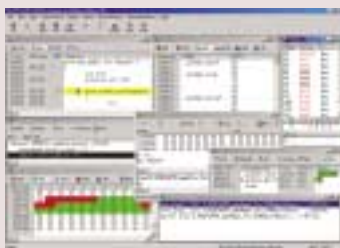
- Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 support
- Easy operations with overlapping multi-windows and GUI
- Drag & drop support for more comfortable operation
- C/Assembly language source-level debugging functions
- Debugging functions for real-time OS
- Real-time RAM monitor
- Real-time tracing, C0 coverage, time measurement and other advanced features
- Supports LAN, USB and LPT parallel interfaces
- Online help

8-bit & 16-bit Common Emulator PC4701U

		16-bit M16C/80 Series	16-bit M16C/60, 30, 20,10 Series	16-bit 7900 Series	16-bit 7770 Series	8-bit 740 Family

PC4701U Emulator System

The PC4701U emulator system meets your needs for a flexible development environment, improving debugging efficiency in your application programs. This system can even support MCUs developed in the future, simply by changing the emulation pod.

Emulator PC4701U Specifications

	PC4701U system
Supported MCUs	M32C/80 Series M16C/80, 60, 20 Series 7770 Series 740 Family
Maximum operating frequency	20 MHz
MCU modes	Single-chip Memory expansion Microprocessor
Emulation memory	Max. 2 MB (depends on MCU-dependent part)
Power voltage	2.7 - 5.5 V (depends on MCU-dependent part)
AC supply voltage for emulator unit	Included
Software break	64 points
Hardware break	6 points Execution address/Bus detection/Interrupt/External trigger signal
Hardware break condition	AND/OR/AND (same time) /State transition Pass counts: 255 times
Exception event detection	Access protect
Real-time trace	112 bits x 32K cycles Can be recorded ON/OFF by events
Real-time RAM monitor	1,024 bytes Data / Last access result
Time measurement	Execution time between program start to stop Maximum/minimum/average execution time and pass count of specified four zones Count clock : Equal to MCU Clock or 16 MHz
C0 coverage	256 KB
Event output	Break x 1, event x 6
External trigger input	TTL level x 8
PC interface	LPT *1, USB *2 (USB 1.1, Full-speed), LAN *3 (10Base-T)
Overseas standards	Compliant

*1. Printer port: ECP, EPP, Byte/Compatibility and Nibble/Compatibility modes are supported.
*2. With the USB interface of the PC7501, not all hardware (such as host computer, USB devices, USB hub) combinations will work and are guaranteed.
*3. An Ethernet cable for LAN is not packaged and is not available as an option.

Emulator PC4701U

- Support almost all of Mitsubishi 8- and 16-bit MCUs (Available for MCUs with operating frequency of 20MHz or less. For over 20 MHz, use the PC7501 system.)
- High-level breaks and real-time trace
- Performance evaluation functions such as C0 coverage and time measurement
- Real-time RAM monitor
- LAN, USB and LPT interfaces available
- Compact and AC power circuit-equipped
- UL, FCC, CE certified
- Emulator debugger bundled
- The latest emulator debugger downloadable from the Mitsubishi Tool Homepage.
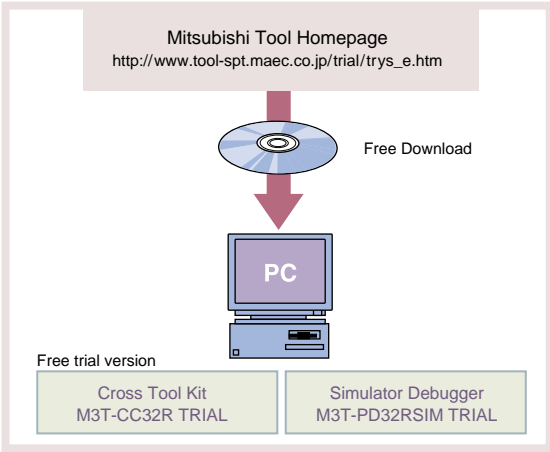 http://www.tool-spt.maec.co.jp/pc4701/index_e.htm

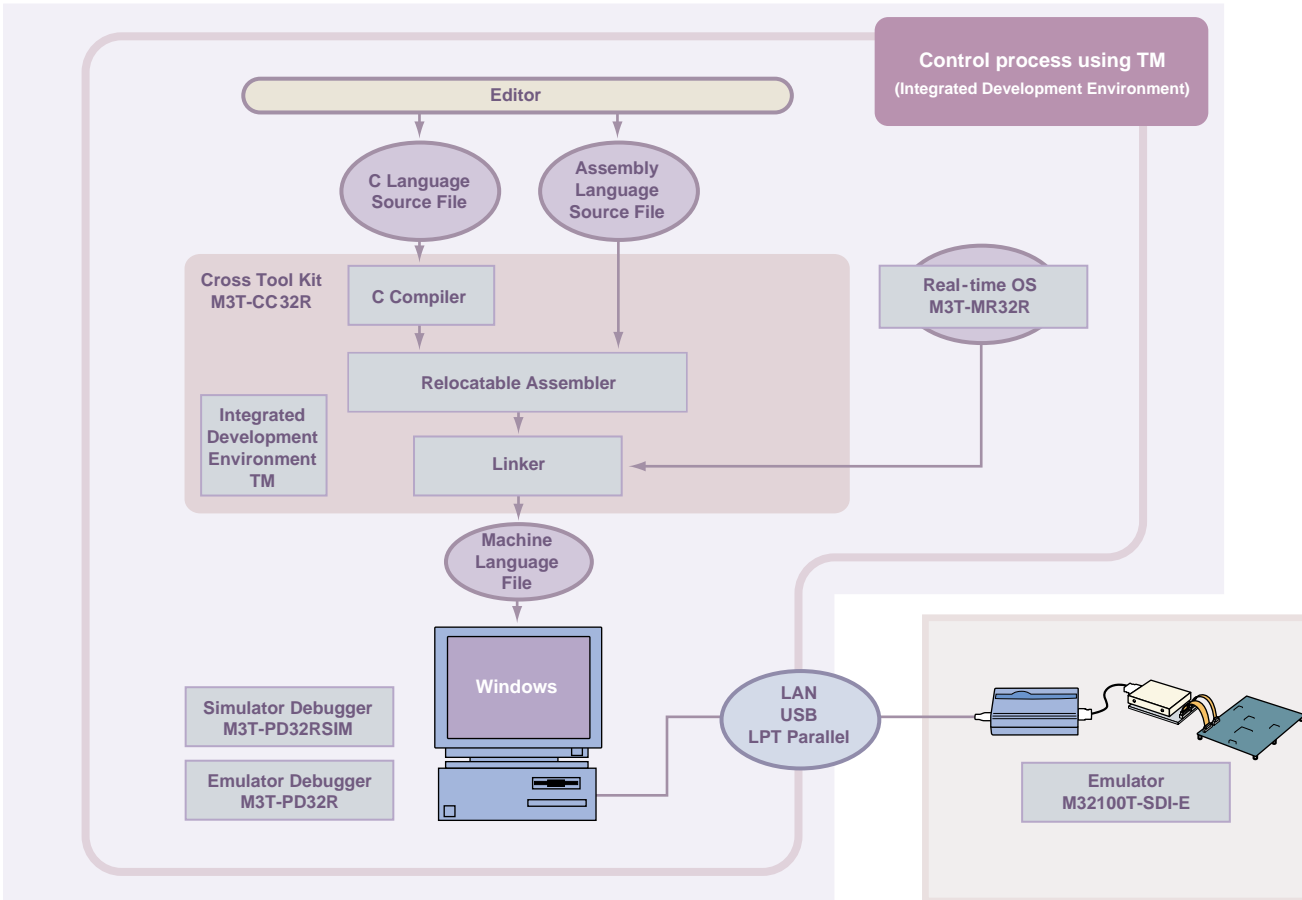### Emulator Debugger M3T-PD308, M3T-PD30, M3T-PD79, M3T-PD77, M3T-PD38

- Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 support
- Easy operations with overlapping multi-windows and GUI
- Drag & drop support for more comfortable operation
- C/Assembly language source-level debugging functions
- Debugging functions for real-time OS
- Real-time RAM monitor
- Real-time tracing, C0 coverage, time measurement and other advanced features
- Supports LAN, USB and LPT parallel interfaces
- Online help

Mitsubishi 32-bit M32R Family Development Tools

- Integrated development environment with total support from coding to debugging
- Programming environment offering development in C/assembly language
- Real-time OS conforming to μITRON specifications that supports development of real-time control systems
- Easy-to-use debuggers featuring GUI and user-customized windows
- Emulator adapted for high-speed operation of M32R and supporting on-board debugging by the SDI (Scalable Debug Interface)

Introductory Tools

Mitsubishi Tool Homepage
http://www.tool-spt.maec.co.jp/trial/trys_e.htm

Free Download

PC

Free trial version

Cross Tool Kit M3T-CC32R TRIAL	Simulator Debugger M3T-PD32RSIM TRIAL

Professional Developers Tools

Control process using TM
(Integrated Development Environment)

Editor

C Language Source File

Assembly Language Source File

Cross Tool Kit M3T-CC32R

C Compiler

Real-time OS M3T-MR32R

Relocatable Assembler

Integrated Development Environment TM

Linker

Machine Language File

Windows

Simulator Debugger M3T-PD32RSIM

Emulator Debugger M3T-PD32R

LAN
USB
LPT Parallel

Emulator M32100T-SDI-E

M32100T2-SDI-E Emulator System

The M32100T2-SDI-E emulator system can improve efficiency when debugging a program with features for MCU's high-speed operations, and MCUs with JTAG-based SDI (Scalable Debug Interface) on the target board can be controlled.

Emulator Debugger M3T-PD32R

- Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0 compatible
- LPT Parallel and LAN interfaces supported
- C language source-level debugging functions
- Debug functions for Real-time OS M3T-MR32R
- Real-time trace (Unsupported in some instances)
- Real-time RAM monitor
- Supports customization function. ▶P. 9
- Bundled with Mitsubishi emulators (The latest version downloadable)

Emulator Debugger M32100T2-SDI-E

- Adopting SDI (Scalable Debug Interface) specifications
- Allows you to effect not only the conventional in-circuit connection but also the JTAG connection (via the SDI connector) to the onboard MCU.
  - Onboard debugging and on-site tests
  - Eliminates poor contact and space shortage resulting from probing.
  - The SDI pin - an exclusive pin - maintains the electrical equivalence of the user pin.
  - Downloading programs to the Flash ROM of MCU
- A number of debugging features that conform to the M32R's high clock frequency
  - Debugging with zero-wait states
  - Real-time trace (512K cycle) and Real-time RAM monitor
- Power supply range: 100 to 240 V
- Compliant with FCC standards and CE marking
- Supports future MCUs by upgrading the emulator debugger
- SDI emulator site

  http://www.tool-spt.maec.co.jp/sdi/index_e.htm

JTAG connection

Communications Interfaces

- LAN (10BASE-T)
- USB (USB 1.1, Full-speed)
- LPT parallel (Printer port: ECP, EPP, Byte-compatible and Nibble-compatible modes)
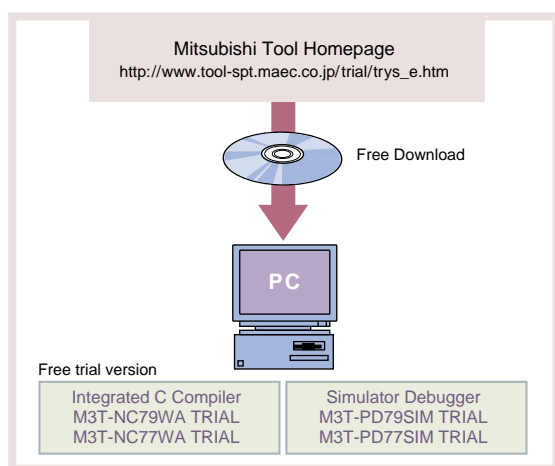
In-circuit connection

Mitsubishi 16/32-bit M16C Family Development Tools

- Integrated development environment with total support from coding to debugging
- Programming environment offering development in C/assembly/structured language
- Real-time OS conforming to μITRON specifications that supports development of real-time control systems
- Easy-to-use debuggers featuring GUI and user-customized windows
- Emulator debugger supporting powerful real-time OS debugging function
- Emulator for M16C, 7700, 740 Families supporting USB interface (PC4701U)
- New emulator system for M32C/80 Series MCUs (PC7501)

Introductory Tools (M16C/80 Series only)

Mitsubishi Tool Homepage
http://www.tool-spt.maec.co.jp/trial/trys_e.htm

Free Download

Free trial version

Integrated C Compiler
M3T-NC308WA TRIAL
M3T-NC30WA TRIAL

Simulator Debugger
M3T-PD308SIM TRIAL
M3T-PD30SIM TRIAL

- Main unit
- Control software
- Limited edition C compiler
- Manual (PDF)
- Sample program

Mini Emulator
M3A-0841
M3A-0800G02
M3A-0652G01
M3A-0652G02
M3A-0250

Starter Kit
M3A-0835
M3A-0836
M3A-0801G02
M3A-0802G02
M3A-0654G01
M3A-0654G02

Professional Developers Tools

Editor

Control process using TM
(Integrated Development Environment)

C Language Source File

Assembly Language Source File

Structured Language Source File (M16C/60, 30, 20, 10 only)

Integrated C Compiler
M3T-NC308WA
M3T-NC30WA

C Compiler

Real-time OS
M3T-MR308
M3T-MR30

Relocatable Assembler

Integrated Development Environment TM

Linker

Machine Language File

Simulator Debugger
M3T-PD308SIM
M3T-PD30SIM

Emulator Debugger
M3T-PD308F(for PC7501)
M3T-PD308(for PC4701U)
M3T-PD30F(for PC7501)
M3T-PD30(for PC4701U)

Windows

LAN
USB
LPT Parallel

- Emulator main unit
- Emulator debugger
- Limited edition C compiler
- Interface cable
- Power supply cable
- Manual (PDF)

Compact Emulator
M30803T2-CPE **
M30800T-CPE
M30620T-CPE

Emulator PC7501   Emulation Probe M30xxxT-EPB
(More than 20 MHz)

Emulator PC4701U   Emulation Pod
(20 MHz or less)

** Under development

Emulator Selection according to Stage and Scale of Product Development

Mitsubishi offers various emulator products to meet the needs of all M16C MCU development environments, allowing the customer the flexibility to choose the perfect product to meet their specific needs.

Full-featured

Functions & Technical Support

Limited

Professional

High-end   ▶ P.12
PC7501 emulator
+ Full-feature C compiler M3T-NCxxWA (separately available)
+ Emulator debugger M3T-PDxxF (separately available)
- Support for M16C MCUs' operating frequency of over 20MHz
- Full-feature debug functions including realtime trace and RTOS support
- Software upgrade service
- News delivery by e-mail

20MHz Operating frequency

High-end   ▶ P.13
PC4701U emulator
+ Full-feature C compiler M3T-NCxxWA (separately available)
- Full-feature debug functions including realtime trace and RTOS support
- Software upgrade service
- News delivery by e-mail

Low-price   ▶ P.11
Compact emulators
- All-in-one package
- Limited edition C compiler included
- Full range of basic functions including realtime trace
- News delivery by e-mail

▶ P.10
Mini emulator & Starter kit
- Limited edition C compiler included
- Basic functions and target debugging

▶ P.10
Monitor debugger library (Under development)
- Download from the Mitsubishi MCU homepage

Introductory

Cost

Low   High

* The xx found in product names varies according to MCU family and series.

16° bit

Mitsubishi 16-bit 7700 Family 7900,7770 Series Development Tools
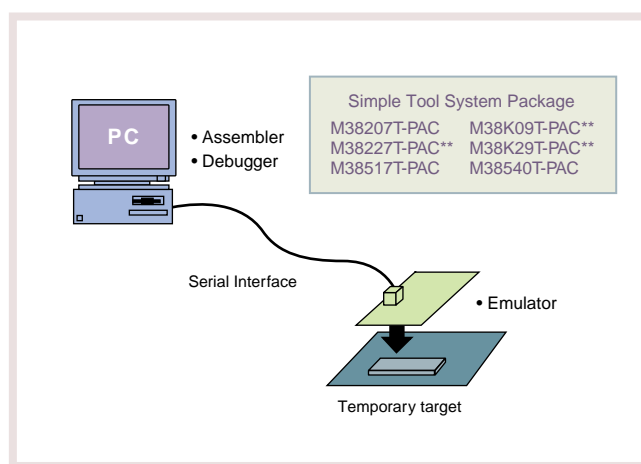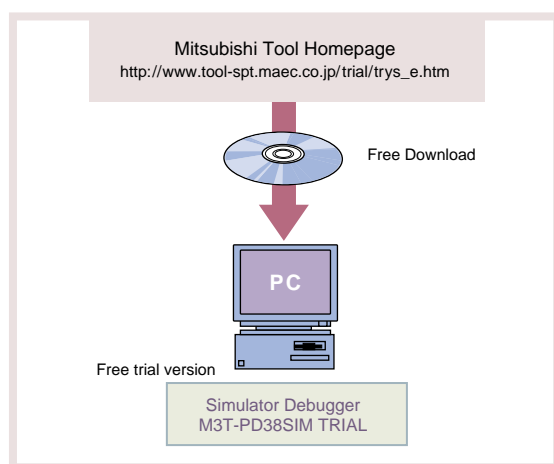
For more information
http://www.tool-spt.maec.co.jp/datsheet/7900_e/index.htm
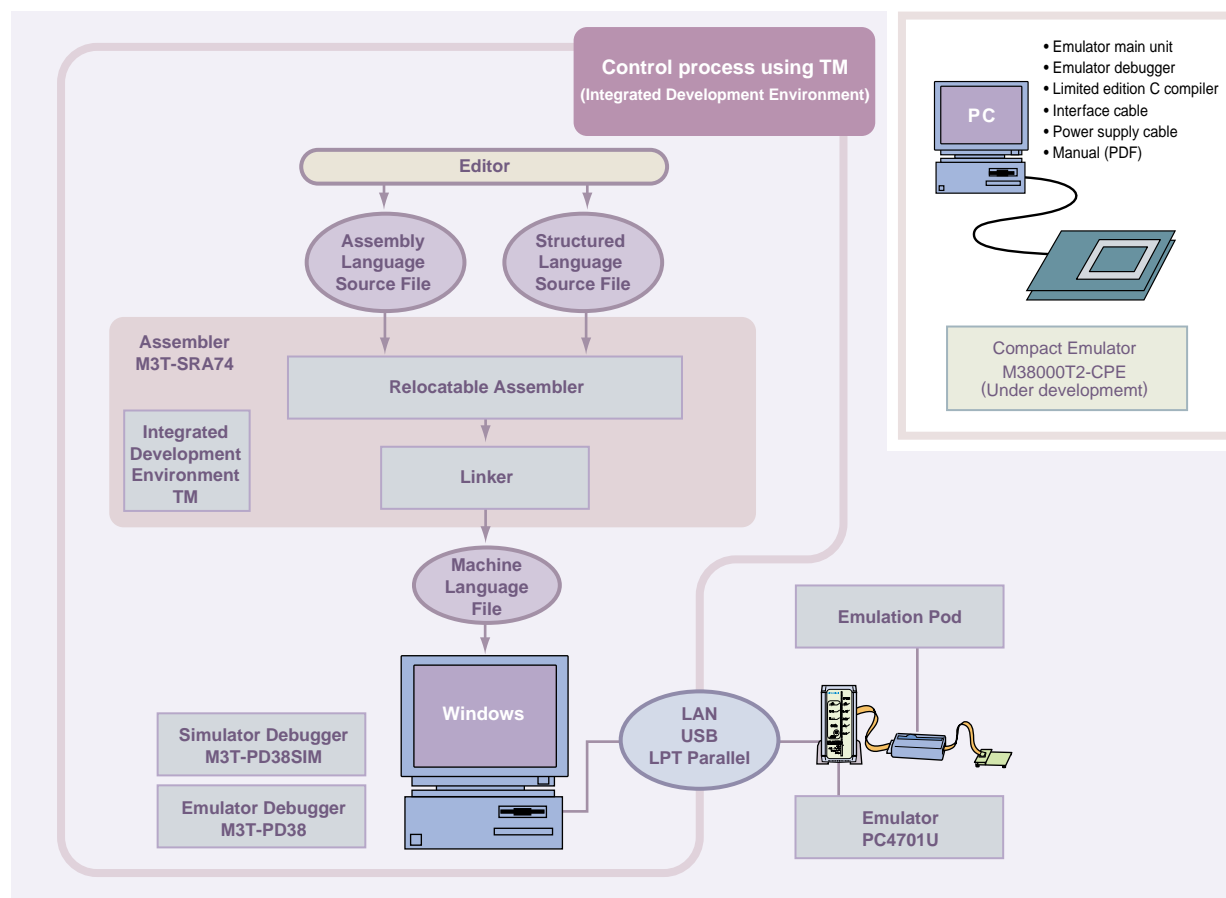http://www.tool-spt.maec.co.jp/datsheet/7700_e/index.htm

- Integrated development environment with total support from coding to debugging
- Programming environment offering development in C/assembly/structured language
- Easy-to-use debuggers featuring GUI and user-customized windows
- Emulator for M16C, 7700, 740 Families supporting USB interface

●● Introductory Tools

Mitsubishi Tool Homepage
http://www.tool-spt.maec.co.jp/trial/trys_e.htm

Free Download

PC

Free trial version

Integrated C Compiler	Simulator Debugger
M3T-NC79WA TRIAL	M3T-PD79SIM TRIAL
M3T-NC77WA TRIAL	M3T-PD77SIM TRIAL

●● Professional Developers Tools

Control process using TM
(Integrated Development Environment)

Editor

C Language Source File

Assembly Language Source File

Structured Language Source File

Integrated C Compiler M3T-NC79WA M3T-NC77WA

C Compiler

Relocatable Assembler

Integrated Development Environment TM

Linker

Machine Language File

Simulator Debugger M3T-PD79SIM M3T-PD77SIM

Emulator Debugger M3T-PD79 M3T-PD77

Windows

LAN
USB
LPT Parallel

Emulation Pod

Emulator PC4701U

Standalone version of Relocatable Assembler M3T-RASM77 is also available.

8-bit 740 Family

Mitsubishi 8-bit 740 Family Development Tools

- Programming environment offering development in assembly/structured language
- Debugger environment for more efficient team development
- The development environment looks and feels more consistent, thanks to the same operability and interface for all tools.
- Emulator for M16C, 7700, 740 Families supporting USB interface
- Accessory tools for connecting to all of target systems
- Optimal tools are available for every process-from software development to debugging and mounting

Introductory Tools

Mitsubishi Tool Homepage
http://www.tool-spt.maec.co.jp/trial/trys_e.htm

Free Download

PC

Free trial version

Simulator Debugger
M3T-PD38SIM TRIAL

PC
• Assembler
• Debugger

Simple Tool System Package
M38207T-PAC   M38K09T-PAC**
M38227T-PAC**   M38K29T-PAC**
M38517T-PAC   M38540T-PAC

Serial Interface

• Emulator

Temporary target

** Under development

Professional Developers Tools

Control process using TM
(Integrated Development Environment)

Editor

Assembly Language Source File

Structured Language Source File

Assembler M3T-SRA74

Relocatable Assembler

Integrated Development Environment TM

Linker

Machine Language File

Windows

Simulator Debugger M3T-PD38SIM

Emulator Debugger M3T-PD38

LAN USB LPT Parallel

Emulation Pod

Emulator PC4701U

• Emulator main unit
• Emulator debugger
• Limited edition C compiler
• Interface cable
• Power supply cable
• Manual (PDF)

PC

Compact Emulator
M38000T2-CPE
(Under developmemt)

4-bit 4500 Series

Mitsubishi 4-bit 4500 Series Development Tools

For more information
http://www.tool-spt.maec.co.jp/datsheet/4500_e/index.htm

- Tool line for Mitsubishi's high-cost-performance 4-bit 4500 Series
- Software tools for Windows XP, Windows Me, Windows 98, Windows 95, Windows 2000, Windows NT 4.0
- Optimal tools are every process‑from software development to debugging and mounting

Assembly Language Source File

Cross Referencer

Absolute Assembler

Cross Reference File

HEX Format Machine Language File

Emulator Debugger & Absolute Assembler M3T-PD45

Emulator PC4504

Serial

Windows

Emulator Debugger

PC

- Emulator main unit
- Emulator debugger
- Limited edition C compiler
- Interface cable
- Power supply cable
- Manual (PDF)

Compact Emulator
M34514T2-CPE
Under development

4-bit 720 Series

Mitsubishi 4-bit 720 Series Development Tools

For more information
http://www.tool-spt.maec.co.jp/datsheet/720_e/index.htm

- Tool line for Mitsubishi's high-cost-performing 4-bit 720 Series

Assembly Language Source File

Cross Referencer

Absolute Assembler

Cross Reference File

HEX Format Machine Language File

Emulator Debugger & Absolute Assembler M3T-RTT72

Emulator PC4400

Serial

PC

Emulator Debugger

THIRD PARTY TOOLS

Third-Party Tool Product Line

| MCU | Cross Tools | Real-Time OSes | Emulators & Debuggers |

32-bit

M32R Family

Cross Tools		Real-Time OSes		Emulators & Debuggers	
D-CC/M32R, D-C++/M32R Wind River Systems	P.24	pSOSystem/pRISM+ Wind River Systems	P.30	advicePLUS, advice Yokogawa Digital Computer	P.35
GNUPro Red Hat	P.24	OSEKWorks Wind River Systems	P.30	EZlyzer Yokogawa Digital Computer	P.36
OPENplus Gaio Technology	P.27	OPENplus (G-OS) Gaio Technology	P.27	UniSTAC/J for M32R/E Sophia Systems	P.37
TargetLink, Prototyper dSPACE NEW	P.28	osCAN M32R Vector Informatik	P.31	SingleStep Wind River Systems	P.40
MATLAB NEW MathWorks	P.29	PrOSEK NEW eSOL	P.34		
ASCET-SD, LabCar, INCA ETAS NEW	P.29				

16/32-bit

M16C Family

M32C/80 Series

Cross Tools			Emulators & Debuggers	
Embedded Workbench EWM32C IAR Systems NEW	P.25		advicePLUS, advice NEW Yokogawa Digital Computer	P.36
			UniSTAC for M32C NEW Sophia Systems	P.37

M16C/80 Series

Cross Tools		Real-Time OSes		Emulators & Debuggers	
Embedded Workbench EWMC80 IAR Systems	P.25	OPENplus (G-OS) Gaio Technology	P.27	advicePLUS, advice Yokogawa Digital Computer	P.35
OPENplus Gaio Technology	P.27	Nucleus µiPLUS, PLUS Accelerated Technology	P.24	MultiSTAC for M16C/80 Sophia Systems	P.37
code|lab EDE NEW Accelerated Technology	P.27	CMX-RTX CMX Systems	P.33		

M16C/60 M16C/30 M16C/20 M16C/10 Series

Cross Tools		Real-Time OSes		Emulators & Debuggers	
Embedded Workbench EWM16C IAR Systems	P.25	osCAN M16C Vector Informatik	P.31	advicePLUS, advice Yokogawa Digital Computer	P.35
EDE TASKING	P.26	RTXC Lineo	P.32	MultiSTAC for M16C/6X Sophia Systems	P.37
OPENplus Gaio Technology	P.27	OPENplus (G-OS) Gaio Technology	P.27	Ultra-M16C Ashling Microsystems	P.38
MakeApp IAR Systems	P.26	embOS M16C SEGGER Microcontroller Systeme	P.31	EMUL-M16C-PC Nohau	P.39
		CMX-RTX CMX Systems	P.33		
		Enea OSE OSE Systems			

16-bit

7700 Family

7900 Series

Emulators & Debuggers	
advice Yokogawa Digital Computer	P.35

7770 Series

Cross Tools		Real-Time OSes		Emulators & Debuggers	
Embedded Workbench EW7700 IAR Systems	P.25	embOS M7700 SEGGER Microcontroller Systeme	P.31	advice Yokogawa Digital Computer	P.35
OPENplus Gaio Technology	P.27	CMX RTX CMX Systems	P.33	Ultra-7700 Ashling Microsystems	P.38

8-bit

740 Family

Cross Tools		Real-Time OSes		Emulators & Debuggers	
Embedded Workbench EW740 IAR Systems	P.25	osCAN M7600 Vector Informatik	P.31	advice Yokogawa Digital Computer	P.35
OPENplus Gaio Technology	P.27				

Programmers

NET IMPRESS Yokogawa Digital Computer P.40	AF9709B, AF9708, AF9723 Ando Electric P.41	Flasher 4 SEGGER Microcontroller Systeme P.42	ALL-11 HI-LO SYSTEMS P.42	MFW-1, SFW-62SA Sunny Giken P.43

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.

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wide variety of combinations

As part of the Mitsubishi microcomputer development environment, a variety of tools are available from third-party companies. Choose the combination of third-party and Mitsubishi tools that is best for you. Some examples are given here below. Mitsubishi Electric will continue to work with other tool manufacturers to meet the growing diversity of customer needs.

Combinations of Mitsubishi and third-party tools for the M32R Family MCUs

Emulator \ Cross Tool	M3T-CC32R Mitsubishi	D-CC/M32R, D-C++/M32R Wind River Systems	GNUPro Red Hat	OPENplus Gaio Technology
M32100T2-SDI-E Mitsubishi	Yes	Yes	-	-
advicePLUS, advice, Ezlyzer Yokogawa Digital Computer	Yes	Yes	Yes	Yes
UniSTAC for M32R/E Sophia Systems	Yes	Yes	Yes	Yes

Combinations of Mitsubishi and third-party tools for the M32C/80 Series MCUs

Emulator \ Cross Tool	M3T-NC308WA Mitsubishi	EWM32C IAR Systems
PC7501 Mitsubishi	Yes	Yes
advicePLUS, advice Yokogawa Digital Computer	Yes	-
HyperSTAC for M32C Sophia Systems	Yes	Yes

Combinations of Mitsubishi and third-party tools for the M16C/80 Series MCUs

Emulator \ Cross Tool	M3T-NC308WA Mitsubishi	EWMC80 IAR Systems	OPENplus Gaio Technology
PC4701U Mitsubishi	Yes	Yes	-
advicePLUS, advice Yokogawa Digital Computer	Yes	-	Yes
MultiSTAC for M16C/80 Sophia Systems	Yes	-	Yes

Combinations of Mitsubishi and third-party tools for the M16C/60, 30, 20, 10 Series MCUs

Emulator \ Cross Tool	M3T-NC30WA Mitsubishi	EWM16C IAR Systems	EDE Altium	OPENplus Gaio Technology
PC4701U Mitsubishi	Yes	Yes	Yes	-
advicePLUS, advice Yokogawa Digital Computer	Yes	Yes	-	Yes
MultiSTAC for M16C/6x Sophia Systems	Yes	Yes	Yes	Yes
Ultra-M16C Ashling Microsystems	Yes	Yes	Yes	-
EMUL-M16C-PC Nohau	Yes	Yes	-	-

Combinations of Mitsubishi and third-party tools for the 7700 Family 7900 Series MCUs

Emulator \ Cross Tool	M3T-NC79WA Mitsubishi
PC4701U Mitsubishi	Yes
advice Yokogawa Digital Computer	Yes

Combinations of Mitsubishi and third-party tools for the 7700 Family 7770 Series MCUs

Emulator \ Cross Tool	M3T-NC77WA Mitsubishi	EW7700 IAR Systems	OPENplus Gaio Technology
PC4701U Mitsubishi	Yes	Yes	-
advice Yokogawa Digital Computer	Yes	Yes	Yes
Ultra-7700 Ashling Microsystems	Yes	Yes	-

Combinations of Mitsubishi and third-party tools for the 740 Family MCUs

Emulator \ Cross Tool	M3T-SRA74 Mitsubishi	EW740 IAR Systems	OPENplus Gaio Technology
PC4701U Mitsubishi	Yes	Yes	-
advice Yokogawa Digital Computer	Yes	Yes	Yes

Third-party Cross Tools -1

C compiler D-CC/M32R, D-C++/M32R, FastJ/M32R, RTA/M32R

- D-CC is compliant with the ANSI C X3.159-1989 standard.
- D-C++ is compliant with the ANSI X3J16 C++ standard and supports exception processing, templates, runtime type information and STL.
- It employs the latest optimization technology. By optimizing the characteristics of the target processor, generated objects are very high code-efficient.
- Supports position independent code (PIC).
- FastJ compiles Java language source code to native CPU machine code.
- RTA Suite is a powerful combination of visual run-time analysis tools including Visual Interactive Profiler, Run-Time Error Checker, Link Map Analyzer.
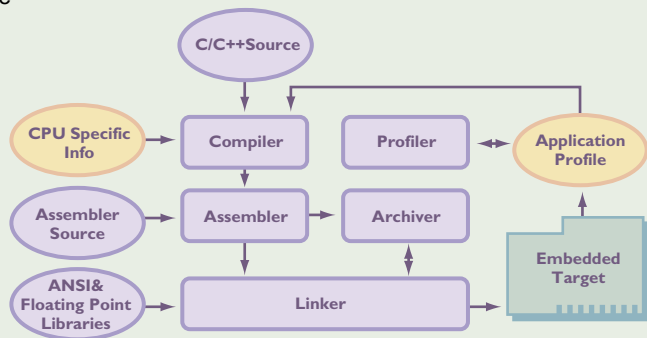
Supported MCUs : 32-bit M32R/ECU Series

Contact Information

Wind River Systems, Inc.
Corporate Headquarters
TEL: +1-510-748-4100 (800-545-9463) FAX: +1-510-749-2010
Email: inquiries@windriver.com
http://www.windriver.com/

C compiler GNUPro

- GNUPro for M32R Family consists of C and C++ compiler, gdb debugger, gas, simulator and utilities and hosted on Solaris, Windows NT and others.
- Progressive updated releases-twice a year Cygnus updates the entire GNUPro toolchain and distributes this to contracted customers.
- GNUPro is based on The GNU General Public License so that users can use, copy and distribute GNUPro without paying any additional charge.
- And its runtime library is not based on GNU GPL so that compiled application program is not restricted by GNU GPL.
- The source code comprehension tool, Source-Navigator is bundled.
- 5-day acknowledgment to support requests
- For support and pricing, contact http://www.redhat.com/.
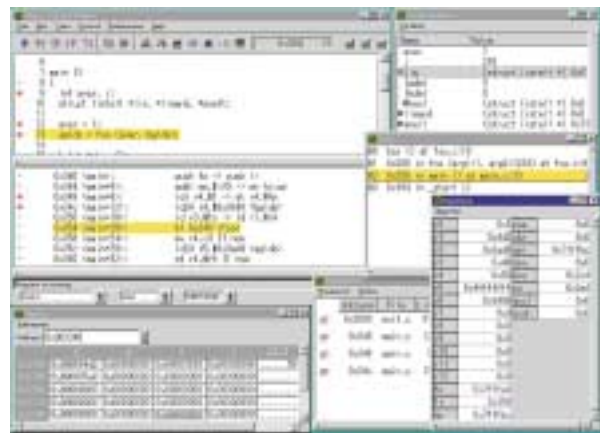
Supported MCUs : 32-bit M32R/ECU Series

Contact Information

Red Hat, Inc.
TEL: +1-408-542-9600 FAX: +1-408-542-9699
http://www.redhat.com/
Contact Sales:
http://www.redhat.com/apps/response/gnupro_contact.html

Third-party Cross Tools - 2

IAR Systems   http://www.iar.com/

IAR Embedded Workbench™ for Mitsubishi 740, 7700, M16C and M32C Family of Microcontrollers

The IAR Embedded Workbench is a set of highly sophisticated and easy-to-use development tools for programming embedded applications. It integrates the IAR C/EC++ compiler, assembler, linker, librarian, text editor, project manager and C-SPY debugger in one integrated development environment (IDE). With its built-in chip-specific optimizer, the IAR Embedded Workbench generates very efficient and reliable FLASH/PROMable code for the chip families. In addition to this solid technology, IAR also provides professional worldwide technical support.

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)
- A modular and extensible IDE running under Windows 98/ ME/NT4/2000/XP
- Create projects, edit files, compile, assemble, link and debug your applications within the seamlessly integrated environment
- Tool options configurable on global, group of source files, or individual source files level
- Full support for the 740, 7700, M16C and M32C series of microcontrollers

COMPILER
- ISO/ANSI standard C and EC++ Compiler
- Multiple levels of optimizations for code size and execution speed
- Extended keywords specific for the 740, 7700, M16C and M32C
- Easy and fast interrupt handling directly in C/EC++
- Mixed C/EC++ and assembly listings
- Support for Inline Assembly

ASSEMBLER
- A powerful relocating macro assembler with a versatile set of directives and operators
- Built-in C language preprocessor, accepting all C macro definitions

IAR XLINK
- Complete linking, relocation and format generation to produce FLASH/PROMable code
- Flexible segment commands allowing detailed control of code and data placement
- Support for a wide range of industry-standard symbolic formats including Elf/Dwarf, compatible with most popular emulators
- Links only functions/variables needed by the application
- Generates checksum of code for run-time checking
- Graphical configuration of the linker command file (for M32C)

IAR XLIB
- For creating and maintaining libraries and library modules
- Listings for entry points and symbolic information

ISO/ANSI C and EC++ LIBRARIES
- All required ISO/ANSI C libraries included (character handling, input/output, general utilities, string handling, math and trigonometric, low-level routines, etc)
- Extended C and EC++ library (100+ functions) with math and floating point support
- All low-level routines such as writechar and readchar provided in full source code for user customization

IAR C-SPY SIMULATOR
- Complex code and data breakpoints
- C/EC++ call stack with parameters (for M32C)
- Complete support for stack unwinding even at high optimization levels (M32C)
- I/O and interrupt simulation
- Versatile monitoring of registers, structures, call chain, locals, global variables and peripheral registers
- Fine-grain single stepping (M32C)
- Profiling and code coverage
- Plug-in architecture allows support for any RTOS-aware debugging

Supported MCUs : 16/32-bit M32C/80 Series NEW
16-bit M16C/80 Series
16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit 7700 Family 7770 Series
8-bit 740 Family

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http://www.iar.com/

Denmark, and visualSTATE support center:
IAR Systems A/S
TEL: +45 8625 1111 FAX: +45 8625 1191
Email: info@iar.dk
http://www.iar.com/

Third-party Cross Tools - 3

IAR visualSTATE™

IAR visualSTATE is a suite of fully integrated tools for the entire embedded software development process. It includes a UML-compliant graphical design environment, advanced verification and validation tools, and a very powerful code generator. When developing with visualSTATE the entire application is based on the design, and due to the unique technology it is possible to perform exhaustive testing and to generate reliable and production-ready C-code-in just a few seconds. The generated code is absolutely consistent with the design, it executes deterministically and can even be more compact than handwritten code.

Contact Information
See P. 25.

Device Driver Wizard IAR MakeApp™

IAR MakeApp is a family of visual development tools that helps you design and implement peripheral device drivers in a more quick and easy way than ever before. IAR MakeApp is currently available for M16C/62 devices.
Visual configuration of peripheral modules
- Automatic calculation of special function register (SFR) settings
- Optimising code generator creates device driver source code automatically
- Generates initialization, runtime control and interrupt handler functions
- Built-in rule-checking prevents any attempt to make illegal settings
- Advanced statistics on the device configuration and resource usage
- Device driver function, Port pin and Interrupt browsers
- Graphical colour coded overview of multiplexed pin usage

TASKING M16C Software Development Toolset

- Fully integrated Embedded Development Environment (EDE)
- ISO C++/EC++ and ANSI C/MISRA C Compiler
- Support for Mitsubishi .x30 output format
- CrossView Pro Simulator with Mitsubishi ROM-monitor support
- TASKING M16C Flasher (integrated in EDE)

Embedded development environment EDE
Embedded Development Environment delivers push-button control of development tasks spread over many tools
- Enhanced and ease to use EDE
- Tree-view based dialog for setting project options
- Right-mouse clicks that expedite a variety of tasks within EDE

C++ / EC++ and C / MISRA C Compiler
ISO- and ANSI-compliant Compilers
- Scalable C++ Compiler which makes selective disabling of C++ features simple
- MISRA C code checking in order to prevent error-prone C constructs

CrossView Pro Simulator
- High performance CrossView Pro Simulator
- Flexible breakpoint configuration
- Mitsubishi ROM-Monitor support

TASKING M16C Flasher
- Integrated into the TASKING EDE
- Flasher interacts with the standard Mitsubishi Electric on-chip flash tool
- Flashes a Motorola S-Record, IEEE 695, or Intel Hex

Packaging and Host-platform support
- TK499-024 : EDE, C++/EC++ and C Compiler, Assembler, Linker/Locator, CrossView Pro Simulator, Mitsubishi ROM-monitor support & TASKING M16C Flasher
- Available on PC/Windows, PC/Linux/SUN/Solaris & HP/UX platforms.

Supported MCUs : 16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit M16C/10 Series

TASKING
Embedded software development from Altium

Contact Information
Corporate Headquarters:
Altium Limited
http://www.altium.com/
http://www.tasking.com/

Third-party Cross Tools - 4

Gaio Technology Co., Ltd.   http://www.gaio.com/

IDE for embedded real-time systems OPENplus

OPENplus can well serve for whole development processes of embedded systems.

- Cross Tools
  - Generation of effective ROMable codes by C/C++ Optimizing Cross C compiler "XCC++/XCC-V"
  - Assembler and utilities "XASS-V"
  - Instruction Set Simulator "XDEB-V"
  - Online Debugger "XDDI-V"
- Native Environment Simulator
  - Native environment embedded systems development tool "Native-G"
- CASE Tool
  - Integration CASE tool for embedded systems "CasePlayer2"
- RTOS
  - micro ITRON based "NORTi Version 4"
- System LSI Co-Verification Solution
  - C language model HW/SW Co-verification simulator "System-G"

Supported MCUs : 32-bit M32R Family
16-bit M16C/80 Series
16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit 7700 Family 7770 Series
8-bit 740 Family

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TEL: +81-3-3662-3041 FAX: +81-3-3662-3043
E-mail: sales@gaio.co.jp
http://www.gaio.com/

Accelerated Technology, Embedded Systems Division of Mentor Graphics http://www.acceleratedtechnology.com/

Embedded Development Environment - code|lab EDE NEW

When it comes to developing embedded software you need an environment where all of your tools are just a click away. Enter code|lab™ EDE, a revolutionary concept based on the easy to understand, widely used, ubiquitous Microsoft Visual Studio™. If you are developing software, chances are you are using a Windows machine. If you are developing an embedded system, you can now use the familiar Windows paradigm to edit, build, and test you application. If you can use Microsoft Excel, Word, or Internet Explorer, you can use code|lab EDE!

code|lab EDE is a standard plug-in to Microsoft Visual Studio. Building, testing, and completing embedded applications has always been fun, now the process that you use to accomplish this can be fun as well. No more tracking multiple files to find your compile errors. No more hassling with cumbersome, not to mention inconsistent, makefiles. No more searching for the right command line to invoke your debugger. Just simple, easy to use, point and click access to everything you need, including a wealth of tools that are available through other add-ins to Visual Studio.

Rather than re-inventing the wheel, we have combined forces with some of the strongest code generation tools development teams in the industry to provide you with a choice based on cost/performance considerations that meet your needs. code|lab EDE's Project Manager gives you the freedom to determine what compiler, assembler, librarian, and linker switches you need.

code|lab EDE reduces your time-to-market by enabling a shorter time to productivity. Its consistency is not limited to a common look-and-feel; it supports a common development method throughout your development process. As you move from prototyping to target development; if you change the compiler, if you change the debugger and connections, or if you change the evaluation board, the way you use code|lab to design and develop your product does not change.

Supported MCUs : 16-bit M16C/80 Series

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E-mail: info@acceleratedtechnology.com
http://www.acceleratedtechnology.com/
http://www.mentor.com/embedded/

dSPACE GmbH http://www.dspace.de/

TargetLink Production Code Generation Software NEW

- Production code generation directly from MATLAB/Simulink/Stateflow
- ANSI C code with the efficiency of handwritten code, for fixed-point and floating-point microcontrollers
- Full support of Stateflow 3.0 and 4.x
- Target-specific code with Target Optimization Modules, e.g., Mitsubishi M32R
- TargetLink Target Simulation Module for testing the generated code on evaluation boards, e.g., Mitsubishi M32R

Alongside powerful tools for function prototyping, tools for automatic production code generation are gaining in importance. Having speeded up the development process by rapid control prototyping, automatic code generation is essential to avoid setbacks. Time-consuming and error-prone handcoding is becoming a thing of the past. A 40% reduction in development time is no longer a rarity and is giving users a new sense of time as they develop ECUs.

Advantages of TargetLink

In addition to cutting development time, there are other important advantages:

- Intuitive and easy to use
- Fully configurable to company coding style
- Permanent consistency between model and C code
- Code documentation always up-to-date
- Direct code verification via simulation
- Shorter debugging and commissioning phases
- Greater focus on the model design
- Low development effort even at a high level of model complexity

DS556/557 MELCO JTAG/SDI Interface Board* NEW

dSPACE Prototyper allows you to test and optimize your functions in a real vehicle quickly and reliably. When existing ECU (electronic control unit) code needs to be optimized, or new functions added, you can take these ECUs as your basis for function prototyping. dSPACE Prototyper executes the new functions, while the ECU is responsible for executing the existing code, and for input/output. dSPACE Prototyper's bypass technology is the standard method of developing individual functions like improved engine idling control or innovative techniques for diagnosing misfires.

Integration of New Functions on M32R-based ECUs

As an add-on to dSPACE Prototyper, the DS556/557 MELCO JTAG/SDI Interface Board is specifically designed for bypassing Mitsubishi M32R-based ECUs. Communication between the ECU system and dSPACE Prototyper is via the JTAG port of the M32R CPU.

Product components

- Simulink block library for programming ECU interface graphically
- DS556 Interface Board (ISA bus board)
- DS557 POD (plug-on device, mounted into plastic case)
- Cables to connect dSPACE Prototyper, and the DS556 and DS557 boards

* Please note that the DS556/557 is not an off-the-shelf dSPACE product. Thus, software updates are not performed proactively, and compatibility with subsequent software versions is not automatically guaranteed. Please contact dSPACE for information on technical requirements.

Supported MCUs : 32-bit M32R/ECU Series

Third-party Cross Tools - 6

ETAS K.K. http://www.etas.co.jp/

Total Development Environment for M32R NEW

From Concept to Production Code: ASCET-SD
- Easy design of algorithms and specifications with a graphical user interface
- Combinations of discrete and CT-models possible
- Automatic code generation for floating point and fixed point calculation
- Integrated OS editor
- Target-identical prototyping with ES1000 and built-in RTOS
- OSEK-based RTOS ERCOSek with mass production experience
- Maximum flexibility and reusability of protect data

"Hardware-in-the-Loop" Test System: LabCar
- Test Drive in the lab with real time vehicle simulation
- Total validation from system control functions to electric characteristics of components
- Investigation of problems using actual measured data from vehicle tests
- Simulation of ECU networks
- Thorough system validation by test automation

Integrated Calibration and Acquisition System: INCA
- Optimized for measurement and calibration in automotive environment
- Support up to 100Mbps by using emulator test probe ETK which can be installed inside ECU
- On-line parallel measurement and calibration of control parameters using ETK, CAN or ISO9141 interface
- Compliant with ASAM-MCD1/2/3
- Integrated data analysis and documentation
- ECU on-board flash programming and error diagnostics

Supported MCUs : 32-bit M32R/ECU Series

Contact Information
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http://www.etas.co.jp/

Cybernet Systems Co., Ltd. http://www.cybernet.co.jp/MATLAB/

MATLAB/Simulink/Stateflow - an integrated tool chain for embedded control systems development NEW

The MATLAB family of products, developed by The MathWorks, offers an integrated solution for the embedded control systems development from control algorithm/logic design to automatic ANSI-C code generation.

"Executable Specifications": The graphical specifications that you can simulate.
You can develop a graphical block diagram for control algorithm using Simulink. Stateflow, a powerful extension to Simulink, is based on statechart and flowchart modeling methods and facilitates complex logic design. The seamless integration of Simulink and Stateflow makes it possible to efficiently develop the "executable specifications" of the embedded control system software.

Generates ANSI-C source codes automatically.
Using Real-Time Workshop and Stateflow Coder, you can generate an ANSI-C source code automatically from your Simulink/Stateflow control software model. Then the generated code can be compiled/cross-compiled and downloaded onto a variety of targets, including both of rapid prototyping and embedded hardware (For the embedded applications, Real-Time Workshop Embedded Coder is recommended).

A rich set of tools for design and analysis.
The MATLAB product family offers a rich set of optional tools which support various tasks such as "plant" modeling, controller gain selection, and test & measurement applications.

Product Configuration Example
- MATLAB
- Simulink
- Simulink Performance Tools
- Stateflow
- Real-Time Workshop
- Stateflow Coder
- Real-Time Workshop Embedded Coder
- Control System Toolbox

Supported MCUs : 32-bit M32R/ECU Series

Contact Information
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Applied Systems Sales Department
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http://www.cybernet.co.jp/MATLAB/

Third-party Real-time OSes - 1

Real-time OS/Integrated development environment pSOSystem™ /pRISM+®

• **Used with over 38 million licensed consumer products**

pSOSystem has been given a very warm reception as a 32-bit embedded OS for compact, mass-produced consumer products such as car navigation system, set-top box, digital cameras. Already, it has been shipped in more than 38 million licensed products.

• **pSOS is one of the few OSs to clear strict reliability standards of the FAA and FDA.**

This reliability is backed by extensive application. It is embedded and used-for example-in important safety devices of private aircraft.

• **Epilogue communication function that will open up a new world on the Internet**

To expand the environment of embedded equipment to homes everywhere, the latest network functions such as IPv6, SNMP, RMON are necessary. Use Epilogue Series products.

• **pRISM+ framework that supports embedded control software from design to implementation**

The diversity of tools needed in the design, simulation, debugging and mounting phases of embedded software development have been linked to the basic components in an open environment via a CORBA interface. This makes it possible to team-engineer and reuse software resources across the entire development process.

Products Supporting the Entire Development Process

Supported MCUs : 32-bit M32R/ECU Series

OSEK/VDX Compliant RTOS OSEKWorks™

Complete support of OSEK/VDX open standard (OS Ver2.0r1, COM Ver2.1r1, NM Ver2.5)

• Highly scalable run-time components
• Ultra-fast context switching and system calls
• Provides BSPs including source code for SFR setting
• Modular OS objects : down to individual API call level
• Integrated graphical configurator
• 3 development packages including Tornado® integrated development environment

OSEKWorks
• OSEK run-time components
• OIL Configurator/OIL Reader

OSEKWorks Development Kit (ODK)
• Includes OSEKWorks and Diab
• Compiler (Evaluation only)

Tornado for OSEKWorks
• Includes ODK and Tornado integrated development environment
• MITSUBISHI-ICE available
• CrossWind debugger
• WindSh/Browser/Launcher
• WindView®/Diab, RTA, etc

[OIL Configurator]

Supported MCUs : 32-bit M32R/ECU Series

Third-party Real-time OSes - 2

Vector Informatik GmbH   http://www.vector-informatik.de/

Multitasking real-time operating system osCAN

- Economical multitasking RTOS, optimized for embedded control applications.
- Fully compliant with industrial standard OSEK/VDX V2.1.
- An optimized CAN driver for the internal CAN controller is provided. A complete set of communication modules, renown in the automotive industry, is available : for instance network management, transport protocols etc.
- Applications based on the CAN-bus are supported by an excellent tool chain.
- Worldwide support.
- No runtime royalties.

Supported MCUs : 32-bit M32R Family
16-bit M16C/6N Group
8-bit 740 Family 7630 and 7632 Groups
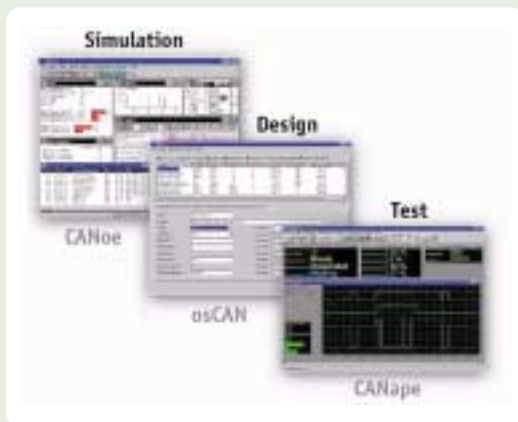
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http://www.vector-japan.co.jp/

SEGGER Microcontroller Systeme GmbH   http://www.segger.com/

Real-time OS/μKernel embOS M16C, M7700

(Available in specific areas)

- embOS is a real-time operating system for embedded applications designed to offer the benefits of a fully fledged multitasking system.
- It features the entire palette of communication mechanisms such as mailboxes, events and different kinds of semaphores. All tasks and communication instances can be dynamically created, deleted and configured.
- The kernel is fully interruptible and so efficient that it can be used in very time critical situations.
- Memory footprint in both RAM and ROM is so small that it can be used in single-chip applications, leaving maximum room for the user-program.
- embOS is priority controlled: Out of the tasks in READY-state, the one with the highest priority is active. Tasks that have identical priorities are executed "quasi-simultaneously" in round robin. If no task is ready, embOS automatically puts the CPU in to a power-saving mode in the idle-task.
- Task profiling (resolution microsecond)
- API call trace
- Tick stepping : system can execute one tick at a time
- TCP/IP stack available

Supported MCUs : 16-bit M16C/80 Series
16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit 7700 Family

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http://www.segger.com/

Accelerated Technology, Embedded Systems Division of Mentor Graphics   http://www.acceleratedtechnology.com/

Real Time Operating System Nucleus PLUS

The reliable and proven source code, no royalty Real Time OS, Nucleus PLUS was developed based on an evaluation of the most prominent commercial real-time kernels on the market. Nucleus PLUS provides components such as semaphores, pipes, messages, timers and queues and its source code is well documented for easy understanding. Nucleus PLUS has all functionality that is necessary for your system including task control, task communication, task synchronization, memory management, interrupt management and so on. Nucleus PLUS is compact, fast and ROMable so you can control your system efficiently.

NUCLEUS PLUS

Supported MCUs : 16-bit M16C/80 Series

Contact Information
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FAX: +1-251-661-5788
E-mail: info@acceleratedtechnology.com
http://www.acceleratedtechnology.com/
http://www.mentor.com/embedded/

Nucleus µiPLUS   NEW

Nucleus µiPLUS was developed based on Accelerated Technology's high performance and high functionality real time/multi tasking OS, Nucleus PLUS and it is compatible with µITRON4.0 specification. 95% of Nucleus µiPLUS is written in C and used as a library. In order to use Nucleus µiPLUS, you create an application that uses service calls that are specified by µITRON4.0 then link it to Nucleus µiPLUS librarian. The generated image can be executed either by downloading to the target or placing it ROM. Light and fast thread switching is one of the features of Nucleus µiPLUS. By using the supplied configuration tool, you can also generate the definitions for µiPLUS automatically. As with the other Nucleus products, Nucleus µiPLUS is provided with source code and royalty free. Also, Nucleus µiPLUS has a complete, native Nucleus PLUS interface which means all of Accelerated Technology's add-on products such as networking (Nucleus NET), graphics (Nucleus GRAFIX), file system (Nucleus FILE) and world wide web server (Nucleus WebServ) are available immediately.

NUCLEUS*i*PLUS

Lineo, Inc.   http://www.lineo.com/

Real-time OS   RTXC

- Royalty-free source code included
- RTXC has small ROM and RAM requirements
- ROMable and completely configurable
- Single kernel/interrupt stack minimizes stack RAM usage
- RTXC supports M16C interrupt leveling
- Tight IAR compiler binding enhances kernel execution
- RTXC Characterization Suite provides complete testing on M16C
- Benchmark data available on M16C
- Includes board & processor specific sample applications
- Binding Manual specific to M16C and IAR compiler
- Preemptive, time-sliced, and round-robin task scheduling
- Fixed or dynamically changeable task priorities
- Intertask communication/synchronization via semaphores, messages, queues
- RAM management through static and dynamic memory partitions
- Timeout capability on blocking actions
- Well-indexed 650-page User's Manual
- System level debug facility included
- Interactive system generation utility included
- Written primarily in ANSI C

Supported MCUs : 16-bit M16C/60 Series
16-bit M16C/20 Series

Contact Information
Lineo, Inc. (formerly Embedded Power Corporation)
Email: sales@lineo.com
http://www.lineo.com/

Third-party Real-time OSes - 4

CMX Systems, Inc. http://www.cmx.com/

Real Time OS CMX-RTX

- Royalty-free
- Free Source Code
- Supports Mitsubishi or IAR or TASKING C compilers
- Truly Preemptive RTOS
- Smallest Memory Footprint
- Fastest Context Switch Times
- Lowest Interrupt Latency Period
- Scalable
- Flexible
- 95% Written in C Code
- Scheduler and Interrupt Handler Written in Assembly for Speed and Optimization
- Nested Interrupts
- All Functions Contained in a Library
- Interrupt Callable Functions
- Optional Cooperative and Time-slicing Scheduling
- Task, Message, Queue, System, Event, Memory, Resource, Semaphore, and Timer Management
- Excellent Documentation with Examples
- Free Service and Support
- Unlimited Users or Projects per Site
- Extremely Economical Pricing

> Supported MCUs : 16-bit M16C Family M32C/80 Series
> 16-bit M16C/60 Series
> 16-bit M16C/20 Series
> 16-bit 7700 Family 7770 Series

Networking – CMX-MicroNet

- No PC or Gateway Required. Runs Natively on Processor !
- Extremely Small ROM/RAM Requirements
- No Proprietary Protocols
- Royalty-free
- Free Source Code
- Supports IAR C compiler
- Use With or Without an RTOS
- Many Ethernet Drivers Supported
- Simple and Familiar Programming API
- Supports Dial Up, Direct, or Ethernet Connectivity
- Web Server Supports Java Applets and CGI Calls
- Scalable
- Flexible
- Written in 100% C Code
- Very Portable
- All Functions Contained in a Library
- Excellent Documentation with Examples
- Free Service and Support
- Extremely Economical Pricing

> Supported MCUs : 16/32-bit M16C Family M32C/80 Series
> 16-bit M16C/60 Series
> 16-bit M16C/20 Series

Networking-CMX TCP/IP

- Royalty-free
- Free Source Code
- 100% RFC Compliant
- Supports Mitsubishi or IAR C compilers
- Full Featured Regression Test and Sample Program
- Standard BSD Sockets
- Use With or Without an RTOS
- Standard IBM PC Reference Port
- Most Ethernet Drivers Included
- High Performance
- Memory Usage Localized and Deterministic
- Simple and Familiar Programming API
- Scalable
- Flexible
- Written in C Code
- All Functions Contained in a Library
- ROM-able
- Excellent Documentation with Examples
- Free Service and Support
- Extremely Economical Pricing

> Supported MCUs : 16/32-bit M16C Family M32C/80 Series
> 16-bit M16C/60 Series
> 16-bit M16C/20 Series

Contact Information
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TEL: 01-508-872-7675 FAX: 01-508-620-6828
Email: cmx@cmx.com
http://www.cmx.com/

Third-party Real-time OSes - 5

RTOS compliant with OSEK SB2 PrOSEK NEW

- **Compatible with various ECU**

  PrOSEK can comply with ECU, which requires memory savings by providing the compliance functions of BCC1, BCC2, ECC1 and ECC2 and communications compliance functions of CCC1, CCC2 and CCC3. PrOSEK also provides configuration tools compatible with the OSEK Implementation Language (OIL); therefore users can use limited numbers of functions that ECU really needs.

- **Innovative compact design**

  PrOSEK is ready to support OS and COM out of OSEK/VDX. For OS data construction, PrOSEK is designed to minimize RAM capacity.

- **Basic tasks and expansion tasks**

  PrOSEK controls the interruption handler activated by basic tasks, expansion tasks and interruption. The system call to call those tasks and interruption is in compliance with OSEK. Tasks and interruptions are written in C language as standard; but it is possible to write them in assembler language.

- **Interface for hook routine**

  PrOSEK can define the user routine (hook routine) in OS internal processing. PrOSEK provides an interface to implement the hook routine for each start time, shutdown, error occurrence in system calls, and task switching.

- **Providing Source Code**

- **Royalty Free**

- **Customization Service - Please don't hesitate to contact us!**

eSOL offers a complete product lineup from IDE to Middlewares apart from "PrOSEK".

- eBinder (μITRON Integrated Development Environment)
- PrKERNEL (RTOS compliant with μITRON2.0)
- PrKERNELv4 (RTOS compliant with μITRON4.0)
- Pr FILE (a file system compliant with FAT12/16/32 and VFAT)
- Pr CONNECT (a TCP/IP protocol stack)
- PrUSB (USB stack for embedded system compliant with USB1.1)
- PrBROWSER (a browser for embedded WEB)

Supported MCUs : 16-bit M16C/80 Series

Third-party Emulators - 1

Emulator advicePLUS NEW

- Scalable configuration for each demand of debugging phase. By dividing Common module for control communication with host and Option module for processor dependence, YDC supply proper configuration for each requirement with affordable price.
- Trace clock support 150MHz with 20ns resolution time-stamp
- Choice of 8/16/32MB overlay memory option module
- High performance interface: 100Base-TX/USB
- Overlay memory support for internal ROM/RAM
- Event resource 15 points. State condition trigger
- Option module for SDRAM trace
- Profile option module/Coverage option module

Supported MCUs : 32-bit M32R/ECU Series

Emulator advice

- General-purpose in-circuit emulator.
- Everything including memory area and interrupts are open to the user.
- Supports high speed emulation of internal ROM/RAMs.
- Prevents mistriggers caused by prefetches and delayed branching.
- Event setup function for maximum 6 points and 4 levels.
- Multiple point break conditions and powerful execution control.
- Formidable trace function with multiple measurement functions.
- Highly sophisticated debugger : microVIEW-G loaded.
- Powerful real-time OS support.

Supported MCUs : 32-bit M32R/E Series
(32160F3UFP, M32160F4UFP)
16-bit M16C/80 Series
16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit 7700 Family 7900 Series
16-bit 7700 Family 7770 Series
8-bit 740 Family

Debugger microVIEW-Plus

- Windows native debugger
- Visual easy operation with mouse for complicated setting.
- Support C/C++/assembler source code.
- Symbol/Register window displays every information with tree-style.
- Ethernet, RS232C and GPIB flexible-connection.
- Watch windows update by manual, at break and time-interval. Tab categolise.
- Memory dump windows allows edit, compare, search and fill functions.
- microVIEW-plus supports RTOS extensions.

Contact Information
See P. 36.

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Third-party Emulators - 2

Emulator EZlyzer

- Supports with no-wait up to MAX frequency.
- Everything including memory area and interruptions are available.
- EZlyzer supports M32R family internal on-chip debug SDI.
- Supports real-time memory access during program execution.
- Max 4MB ROM emulation memory.
- High level debugger : microVIEW-EZ.

Supported MCUs : 32-bit M32R/ECU Series

Contact Information

U.S. and Canada:
Yokogawa Digital Computer Corporation of America
ICE devision.
TEL: +1-408-941-0130   FAX: +1-408-041-0121
E-mail: Sales@advice-PLUS.com
http://www.advice-PLUS.com/

Europe:
Ashling Microsystems Limited
TEL: +353-61-334466   FAX: +353-61-334477
http://www.ashling.com/

Other countries:
Yokogawa Digital Computer Corporation
TEL: +81-42-333-6216   FAX: +81-42-352-6106
E-mail: info@advice.ydc.co.jp
http://www.ydc.co.jp/advice/advice-e/index.htm

Third-party Emulators - 3

Sophia Systems Co., Ltd.   http://www.sophia.com/

Emulator HyperSTAC for M16C/62P NEW

- Supports Mitsubishi M16C/62P microcontroller
- 2 hardware breakpoints
- Unlimited software breakpoints
- Download to Flash Memory capability
- Real-time Trace trigger
- Internal access trace capability
- View/Modify internal peripheral
- Coverage/Performance Analyzer
- Watchpoint, a powerful Windows 98/Me/NT/2000/XP high-level language debugger, provides common user interface for all Sophia Systems emulators
- System Requirements, OS: Windows 98/Me/NT/2000/XP

Supported MCUs : 16-bit M16C/62P Series

Emulator UniSTAC/J M32R/E

- Supports Mitsubishi M32170/171 Series, 32102 microcontroller
- Supports SDI-2 trace interface
- Supports On-Chip Debugging
- 4 hardware breakpoints
- Unlimited software breakpoints
- Branch instruction history and data traceable
- Download to Flash Memory capability
- Sophia original M32R evaluation board
- Supports Mitsubishi M32R Evaluation Board
- Watchpoint, a powerful Windows 98/Me/NT/2000/XP high-level language debugger, provides common user interface for all Sophia Systems emulators
- Systems Requirements, OS: Windows 98/Me/NT/2000/XP

Supported MCUs : 32-bit M32R/ECU Series

Emulator HyperSTAC for M32C/83 NEW

- Supports Mitsubishi M32C/81, M32C/82, M32C/83 microcontroller
- 3 hardware breakpoints
- Unlimited software breakpoints
- Download to Flash Memory capability
- Real-time Trace trigger
- Internal access trace capability
- View/Modify internal peripheral
- Coverage/Performance Analyzer
- Watchpoint, a powerful Windows 98/Me/NT/2000/XP high-level language debugger, provides common user interface for all Sophia Systems emulators
- Systems Requirements, OS: Windows 98/Me/NT/2000/XP

Supported MCUs : 16/32-bit M16C Family M32C/80 Series

Emulator MultiSTAC M16C/60, 61, 62, 80

- Supports Mitsubishi M16C/60, 61, 72, 80 microcontrollers (100, 144 pin QFP packages)
- Real-time execution with 0 wait-states up to 20MHz
- Unlimited software breakpoints
- Internal access trace capability
- View/Modify internal peripheral
- Watchpoint, a powerful Windows 98/Me/NT/2000/XP high-level language debugger, provides common user interface for all Sophia Systems emulators
- Systems Requirements, OS: Windows 98/Me/NT/2000/XP

Supported MCUs : 16-bit M16C/80 Series
16-bit M16C/60 Series

Contact Information
Sophia Systems Co., Ltd.
TEL: +1-408-467-9911   FAX: +1-408-467-9910
E-mail: sales@sophia.com
http://www.sophia.com/

Third-party Emulators - 4

Ashling Microsystems Ltd.   http://www.ashling.com/

Emulator Ultra-M16C, Ultra-7700

- Real-time non-intrusive in-circuit emulators for Mitsubishi M16C and 7700 16-bit microcontroller families and their derivatives
- Source-level Debugger and integrated development environment hosted under Windows, Windows 95/98 and Windows NT
- Uniform environment supports editing, C compiling, assembling, in-circuit emulation and C source level debugging
- On-the-fly breakpoints, trigger set-up, trace display and data monitoring
- Performance Analysis and Code Coverage Measurement systems
- Interchangeable probe cards for all derivatives and packages, including on-chip Flash derivatives
- Support for all M16C and 7700 compilers and assemblers (Tasking, IAR and Mitsubishi)
- Up to 16MB emulation (overlay) memory
- Dual-port RAM for on-the-fly variables monitoring
- Powerful, multi-buffer trace, with 6-level triggering
- Debugging support for Real-Time Operating Systems
- Developed in co-operation with Mitsubishi
- Stand-alone system, with universal power supply
- ISO 9001 certified supplier

Supported MCUs : 16-bit M16C/61 Group
16-bit M16C/62 Group
16-bit 7700 Family 7770 Series

Contact Information

International Headquarters:
Ashling Microsystems Ltd.
TEL: +353-61-334466 FAX: +353-61-334477
E-mail: sales.ie@ashling.com
http://www.ashling.com/

U.S. and Canada:
Ashling Microsystems Inc.
TEL: +1-408-732 6490 FAX: +1-408-732 6497
E-mail: sales.usa@ashling.com

Germany:
AK Elektronik
TEL: +49 8250 9995-0
E-mail: pkl@ak-elektronik.de
E-mail: gt@ak-elektronik.de

France:
Ashling Microsystemes sarl
TEL: +33 1 4666 2750
E-mail: sales.fr@ashling.com

UK:
Ashling Microsystems (UK) Limited
TEL: +44 1 256 811998
E-mail: sales.uk@ashling.com

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Third-party Emulators -5

Nohau Corporation   http://www.nohau.com/

Emulator EMUL-M16C-PC

- On-Line Chip Manual
- Real-Time Access
- Windows User Interface
- Flexible trace triggers
- Selective trace recording
- Performance Analysis
- Code Coverage
- PC Based
- Software and Hardware Breakpoints
- Full symbolic debugging
- Special Functions Register support
- Real-time emulation
- Window for source level debugging
- Macro Support
- "Support over IP" captures the power of the Internet, enabling users at multiple sites to access an emulator.

Supported MCUs : 16-bit M16C/62 Group
16-bit M16C/61 Group

Contact Information
Nohau Corporation
TEL: +1-408-866-1820 FAX: +1-408-378-7869
E-mail: sales@nohau.com
http://www.nohau.com/

Wind River Systems, Inc.   http://www.windriver.com/

Integrated Development Environment SingleStep™

SingleStep is an integrated debugging environment usable in D/E/I series of 32-bit RISC MCU M32R Family for embedded use. Owing to the SingleStep, developers of embedded systems can shorten the time-to-market of sophisticated and optimized applications and greatly reduce development cost.

- Integrated debugging environment by sophisticated GUI with high operability.
- Optimized program debugging.
- Simultaneous designing of H/W and S/W by Simulator.
- Networked emulation solutions offering scalable tool sets.
- Less project risk by RTOS integration.
- Automatic regression/unit testing by powerful scripting language

Supported MCUs : 32-bit M32R/ECU Series

Contact Information
Wind River Systems, Inc.
Corporate Headquarters
TEL: +1-510-748-4100 (800-545-9463) FAX: +1-510-749-2010
Email: inquiries@windriver.com
http://www.windriver.com/

Third-party Programmers -1

In-circuit Flash Micom Programmer NET IMPRESS Series

NET IMPRESS is a universal in-circuit flash micom programmer for programming various types of flash micoms soldered on the user system. The NET IMPRESS family consists of the following four models specially designed to enable programming in specific fields of application.

Model	Outline	Application field		
		Development	Production	Maintenance
AF220	Including Ethernet (10Base-T) interface model	Yes	Yes	Yes
AF210	Standard model	Yes		Yes
AF120	One-touch key model with Ethernet interface	Yes	Yes	Yes
AF110	One-touch key model		Yes	Yes

The combination of NET IMPRESS and dedicated IMPRESS module enable the expanded functions.

• Control Module

The NET IMPRESS control modules give you the freedom and flexibility to program microcontrollers manufactured by different companies. In addition to the extensive line-up of basic modules for AF200, you can also use the IMPRESS Modules that come loaded with various extended functions. You can now program all sorts of different microcontrollers by changing the control modules, or just by exchanging the IMPRESS Module definition or parameters.

- IMPRESS Definition Download Function (/P4 or larger model)
  This enables you to switch your target micom without swapping the control module. (License for extra IMPRESS Definition can be purchased.)

- AZ282: F/DF sheet supports efficient installation of each programming condition specified from the target system.

- DOS Area
  The following control modules are available for each type of microcontroller (Specify the model code when ordering).

Model	Flash memory	DOS area
/P2(2M)	- 128 KB	About 1.7 MB
/P5(4M)	- 768 KB	About 3 MB
/E6(4M)	- 2 MB	About 1 MB*

* /E6 is for production line application.

• Remote Control Application

NET IMPRESS offers two types of remote control software.

• Stand-alone operation

The Stand-alone Operation mode offers you the freedom of portable programming.

Supported MCUs : 32-bit M32R/ECU Series
16-bit M16C/80 Series
16-bit M16C/62 Series
16-bit M16C/22 Series
16-bit M16C/21 Series
16-bit M16C/20 Series
16-bit 7700 Family 7900 Series 7920 Series
16-bit 7700 Family 7900 Series 7902 Series

Contact Information

U.S. and Canada:
Yokogawa Digital Computer Corporation of America
TEL: +1-408-244-1932
FAX: +1-408-244-1881
http://www.ydc.co.jp/micom/index_E.htm

Europe:
Ashling Microsystems Limited
TEL: +353-61-334466
FAX: +353-61-334477
http://www.ashling.com/

Japan:
Yokogawa Digital Computer Corporation
Instruments Division
TEL: +81-42-333-6224
FAX: +81-42-352-6107
http://www.ydc.co.jp/micom/index_E.htm

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.

Third-party Programmers - 2

Ando Electric Co., Ltd.   http://www.j-fsg.co.jp/

Flash Programmer AF9709B, AF9708

As demand for microcontrollers with internal flash memory continues to rise, the device programmers used to write data must support not only writes to single devices, but serial writes to onboard devices. The Ando Electric AF9709B programmer handles both parallel and serial write processing. We also offer the AF9708, with a reduced function set and a lower price.

- Handles both serial and parallel programming
- High-speed programming: Up to 1 Mbit/3 s*
  * for x16-bit write. Varies with device characteristics.
- Prompt support for new devices
- Large-capacity programming: Handles 256 Mbit buffer RAM (AF9708: 16 Mbit)
- High-speed data transfer: Equipped with 10Base-T as standard for high-speed FTP transfer (Not provides as standard equipment in AF9708)

Gang Programmer AF9723

AF9723 received CE marking in September 1999.The AF9723 Gang Programmer consists of the main unit, which is equipped with eight device sockets, the Ethernet unit, and an optional expansion RAM board. A complete line-up of units is available to handle diverse flash devices, flash microcontrollers and cards.

Supported MCUs : 16-bit M16C/80 Series
16-bit M16C/62 Group
16-bit M16C/20 Series
16-bit 7700 Family 7900 Series
16-bit 7700 Family 7770 Series
8-bit 740 Family

- High-speed programming: Up to 1 Mbit/3 s*
  * for x16-bit write. Varies with device characteristics.
- High-speed data transfer (direct LAN connection)
- Large-capacity programming: Handles 64 Mbit buffer RAM
- Prompt support for new devices
- Eight-device gang programming

Contact Information

U.S. and Canada:
FXP LIMITED, INC.
Mr.Geary Africa
TEL: +1 310 204 5141
FAX: +1 310 815 9773
E-mail: holepack@aol.com
http://www.j-fsg.co.jp/

Europe:
Ando Europe B.V. (European Headquarters)
TEL: +31 (0)20 698 1441
FAX: +31 (0)20 699 8938
E-mail: miyazaki@ando.nl
http://www.j-fsg.co.jp/

Japan:
Flash Support Group, Inc.
TEL: +81-53-428-8380
FAX: +81-53-428-8377
E-mail: support@j-fsg.co.jp
http://www.j-fsg.co.jp/

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.

SEGGER Microcontroller Systeme GmbH   http://www.segger.com/

FLASHER 4 Programming tool for Mitsubishi flash microcontrollers with on-chip flash (Available in specific areas)

- Small, compact housing
- Easy to use windows program
- Serial (in target) and parallel programming supported
- Programming / Verifying / Read back supported
- User or boot area selectable (in parallel mode)
- 512kbyte RAM to store target program
- High speed programming: app 3 sec. for 256 kb in parallel mode, app. 9 sec for 256kb in serial mode with 16MHz target
- Can be used in a production environment
- PC program for batchmode processing, allowing usage in automated testsystems, on request
- Standalone mode (req. parellel adapter)
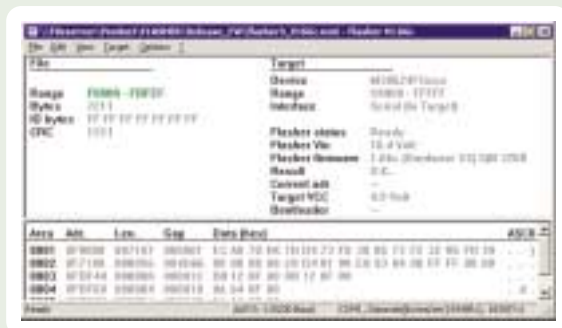
Supported MCUs : 16-bit M16C/80 Series
16-bit M16C/60 Series
16-bit M16C/20 Series
16-bit 7700 Family 7906 Group
8-bit 740 Family 38000 Series

Contact Information
SEGGER Microcontroller Systeme GmbH
TEL: +49 2103 8958-99 FAX: +49 2103 8958-60
E-mail: info@segger.com
http://www.segger.com/

HI-LO SYSTEMS CO., LTD.   http://www.hilosystems.com.tw/

Universal Programmer ALL-11

- ALL-11 supports programming just about every type of device.
- Adapters and converters support nearly every type of IC package including PLCC, SOP, TSOP, QFP, TQFP, PGA and much more.
- ALL-11 includes a high speed CPU and expandable memory buffer to meet programming needs today and into the future.
- A high speed serial port (115K baud) connects the programmer to any desktop or laptop PC running Windows 95/98/2000/NT.
- New SMD SIMM module pin driver circuits provide extremely accurate programmingwaveforms, high speed, high reliability and a compact form factor.
- Pin drivers are fully programmable to support programming of standard and low voltage device.
- ALL-11 is compact enough to use for field engineering work.
- PACKs range from universal PACK to multiple sockets gang programming PACK.

Supported MCUs : 16-bit M16C/62 Group
8-bit 740 Family 38000 Series 3886 Group

Contact Information
HI-LO SYSTEM RESEARCH CO., LTD.
TEL: +886-2-8792-3301 FAX: +886-2-8792-3285
E-mail: sales@hilosystems.com.tw
http://www.hilosystems.com.tw/

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.

Third-party Programmers - 4

Sunny Giken Inc.   http://www.sunnygiken.co.jp/english/

Multifunctional Flash Microcomputer Programmer MFW-1

MFW-1 is a flash microcomputer programmer supporting Mitsubishi Electric Flash Memory Internal Microcomputer. Though MFW-1 is a small, it is serial programming, parallel programming by one unit, and it can be used as a gang programmer by the addition of the adapter. As for the function side as well, it features all contact pin test functions. Therefore, MFW-1 are the multiple function flash microcomputer programmers of the convenient function loading fully.

- Supports parallel programming mode
- Supports serial programming mode
- All signal pin contact test
- Supports gang programming
- Supports boot areas function
- Supports lock bit function
- Supports block function
- Can program to the user and boot ROM areas at the same time
- Supports ID code function
- Supports ROM code protect function
- Can be disconnected from the PC for standalone use
- Supports Windows 98/95/NT/2000/Me
- Comply with CE marking and FCC regulations

Supported MCUs : 16/32-bit M16C Family M32C/83 Group
16-bit M16C/80 Group
16-bit M16C/62 Group
16-bit M16C/6N Group
16-bit M16C/24 Group
16-bit M16C/22 Group
16-bit M16C/21 Group
16-bit M16C/20 Group
16-bit M16C/2N Group
8-bit 740 Family 7641 Group
8-bit 740 Family 38C2 Group
8-bit 740 Family 38K0 Group
8-bit 740 Family 38K2 Group

Ultra Small Flash Microcomputer Programmer SFW-62SA

SFW-62SA is a flash microcomputer programmer only for serial programming Mitsubishi Electric Internal Microcomputer M16C family. SFW-62SA is convenient to reprogram data on mass production lines or when conducting maintenance, because it is ultra small, ultra lightweight. It is used in the same way as standard flash programmers, because a basic function is satisfactory.

- Supports serial programming mode
  (Standard serial I/O mode)
- Ultra small (card size) Approx. 55(W)x85(H)x17(D) mm
- Ultra light Approx. 55 g
- Supports lock bit function
- Supports block function
- Supports ID code function
- ROM code protect function
- Supports data copy function
- Supports Windows 98/95/NT/2000/Me
- Comply with CE marking and FCC regulations

Supported MCUs : 16-bit M16C/80 Group
16-bit M16C/62 Group
16-bit M16C/6N Group

Contact Information
Mitsubishi Electric Semiconductor
Application Engineering Corporation
Email: support@apl.maec.co.jp
http://www.sunnygiken.co.jp/english/

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.

Always Something New about Development Tools

Mitsubishi Tool Homepage provides the latest information on Mitsubishi development tools and the latest version software for current Mitsubishi tool customers, and this site provides various information such as the product outline and trial version software for future customers.

Search
You can quickly search the entire site.

What's New
Look here for the information newly updated in this homepage and topics related to Mitsubishi tool products. This is your guide to new products and upgrades.

Topics
New and upgraded products are featured here every month.

Mitsubishi Tool Homepage - Third Parties
http://www.tool-spt.maec.co.jp/link/3_list_e.htm

Mitsubishi MCU Technical Information Homepage
http://www.infomicom.maec.co.jp/indexe.htm
This site specially provides the updated technical information of Mitsubishi MCUs and related products.
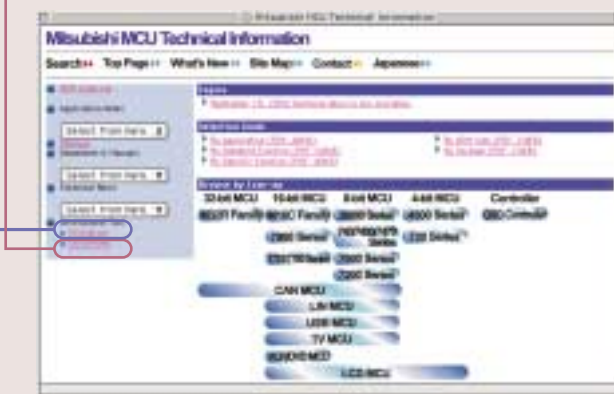
For Present Mitsubishi Tool Customers

Tool News
Information updates regarding Mitsubishi development support tools are made twice monthly.

FAQs
Here, inquiries as to Mitsubishi development support tools and responses are presented in a Q&A format.

Online Upgrade
Customers with licensed IDs for software products can download the latest version of their software from this site, free of charge.

Emulator
This site specially provides the various information of the new emulators such as PC7501, PC4701U.

For Prospective Mitsubishi Tool Customers

Products (Data Sheets)
Data sheets for each tool product, describing product outline, characteristics, and functions in the HTML format.

Manual Download
Download the major products' manuals in PDF format for detailed specifications of the Mitsubishi tool products.

Trial Software Download
The site for downloading trial versions of Mitsubishi's software tools.

Compact Emulator
This site provides various information such as the product outline, the tutorial and FAQs for the compact emulators.

Third Parties
This site provides some information about third-party products and contact information.

Mitsubishi Semiconductor Homepage
http://www.mitsubishichips.com/
This site specially provides general information of Mitsubishi MCUs and related products.

Related Documents

Mitsubishi publishes the below documents related to microcomputer development tools. Offering everything from general product introductions to detailed technical information, they can be used for whatever your purpose or need.

General Information

Semiconductor General Catalog

The Semiconductor General Catalog lists all the Mitsubishi semiconductor products by type name. This information makes it possible to search for anything from type names to products. Development tool products are also listed in this catalog.
(Published annually)

Microcomputer Catalog

The Microcomputer Catalog introduces all Mitsubishi microcomputers. Functions, performance, transition of MCU core and general descriptions can be searched for by field of application.
(Published annually)

Download (PDF format)
http://www.infomicom.maec.co.jp/doclist/catalog.htm
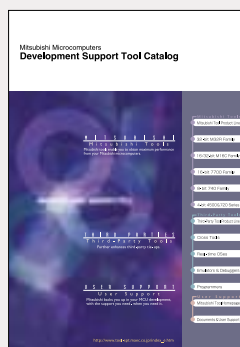
Development Tool Catalog

(This catalog)
The Development Tool Catalog introduces Mitsubishi and third party tools for Mitsubishi microcomputers. Most of the tool products are listed in this catalog.
(Published annually)
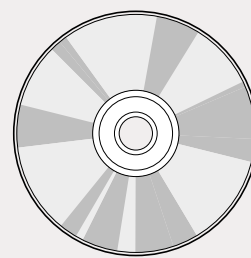
Accessory Guide

The Accessory Guide introduces MCU package converters and other accessories for diverse microcomputer package variations.
(Published annually)

Latest information
http://www.tool-spt.maec.co.jp/datsheet/acce_e/index.htm

MCU Specific Information

Microcomputer Family Catalog

Microcomputer catalogs introduce Mitsubishi's microcomputers in detail, giving features and functions for each MCU family. Information about development support tools is also contained.

Download (PDF format)
http://www.infomicom.maec.co.jp/doclist/catalog.htm
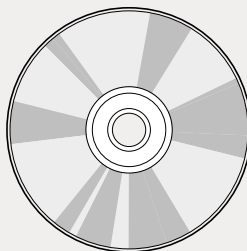
Microcomputer Group Data Sheet

Microcomputer Data Sheets provide technical information and explanations on basic performance including an overview, features and uses of microcomputer products.

Latest information
http://www.infomicom.maec.co.jp/
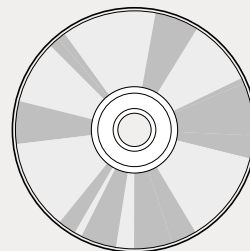
Microcomputer Family Tool Data Sheet

Tool Data Sheets provide information on product configurations, overview, features and specifications of major tool products of each MCU series.

Latest information
http://www.tool-spt.maec.co.jp/datsheet/prod_e.htm

User Support

Operating Environment of Software Tool Products

	32-bit	16-bit		8-bit	4-bit	
	M32R Family	M16C Family	7700 Family	740 Family	4500 Series	720 Series
IBM PC/AT compatibles			Windows XP Windows Me Windows 98 Windows 95 Windows 2000 Windows NT 4.0			DOS

How to Purchase

To purchase the Mitsubishi development support tool products, contact your nearest distributor.

How to Get Technical Assistance

■ User Registration ● ● ● ● ● ● ● ● ●

Contact Mitsubishi Electric Semiconductor Application Engineering Corporation
Microcomputer Tool Department

User Registration Office

E-mail: regist@tool.maec.co.jp or your nearest distributor
FAX: +81-6-6398-6191 or your nearest distributor

■ Technical Support ● ● ● ● ● ● ● ● ●

Contact your nearest local distributor.

http://www.tool-spt.maec.co.jp/index_e.htm
http://www.mitsubishichips.com/contact/location/index.cgi

Renesas Technology Corp.

Nippon Bldg.,6-2,Otemachi 2-chome,Chiyoda-ku,Tokyo,100-0004 Japan