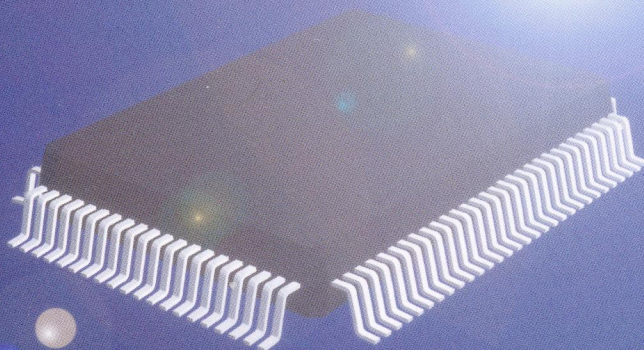




Mitsubishi Microcomputers
M16C Family

**New
architecture
for
16-bit
microcomputers.**



*Unsurpassable range of features including high-efficiency C-programming
Capability, noise reduction, high-speed processing and bug-correction function make the
M16C an ideal choice.*

M16C

Supreme New Model Arrives!

What functions will be required for 16-bit microcomputers in the future?

Mitsubishi Electric took a new approach.

Smoother product development. Microcomputers of the past were designed and built on specialized architectures for specific purposes and applications. CISC and RISC, accumulator machines and register machines. To meet the processing demands of multimedia, speed-up model changes and provide true power to system engineers, Mitsubishi has broken free from conventional concepts. We adopted a new 16-bit microcomputer architecture that enables use of high-efficiency C programming, noise suppression, high-speed processing, and program correction. All merits and no disadvantages in our supreme new model.

M16C New Concept A New Architecture

New solutions utilize both hardware and software strategies—

New Architecture

M16C employs a new architecture that combines programming that has higher efficiency than accumulator machines and operability that is freer than register machines. Duplicate instructions provide new advantages by allocating reduced instructions (instruction set 1) for frequent operations and complex instructions (instruction set 2) for complicated operations.

Reduced instructions (instruction set 1)

With two series of registers allocated to operation, the degree of programming freedom has been improved higher than that of conventional accumulator machines, making it possible to program using compact instructions.

Complex instructions (instruction set 2)

Although the length of each instruction is larger, the degree of programming freedom is better than that of register machines. The set of powerful complex instructions makes the entire program smaller than it would be if programmed using instruction set 1.

Register→register } Operations are possible.
Memory→register } Memory → memory is also possible.
Register→Memory }

Handles 1-, 4-, and 8-bit operations, too —

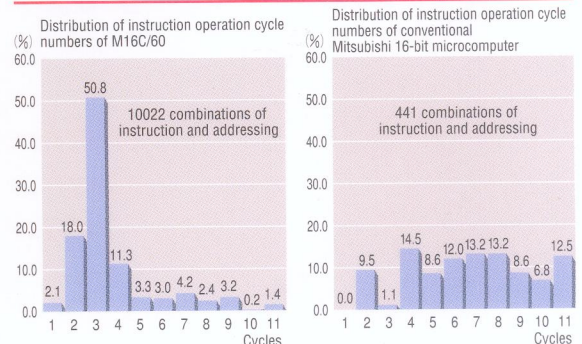
Powerful Instructions

M16C provides enhanced 1-, 4-, and 8-bit operations. Enhanced 1-bit processing able to perform bit processing in various fields, high-speed handling of 4-bit data, 8-bit processing of improved efficiency, and 16-bit processing at higher speed.

Solution of throughput problems—
High-speed Processing

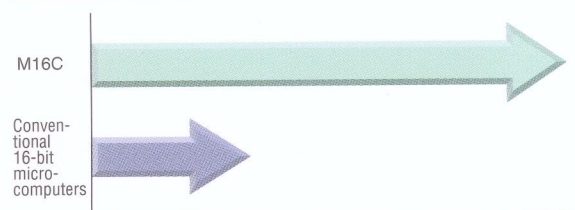
The processing speed of M16C has been significantly improved by an easy-to-use instruction set. Many one-cycle instructions are supported, and 71% of complex instructions are executed within three cycles (0.3μs at 10MHz). This matches the performance of RISC microcomputers that execute simple instructions in one cycle each. The code size of M16C is about half that of recent RISC microcomputers with high coding efficiency. The build-in multiplier can perform a 16 X 16 bits operation in only five cycles.

Comparison of instruction operation cycles

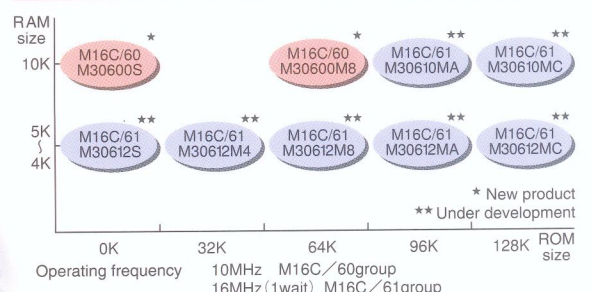


Practical capability of M16C is more than described by comparing the shortest instruction operation times.

Faster processing

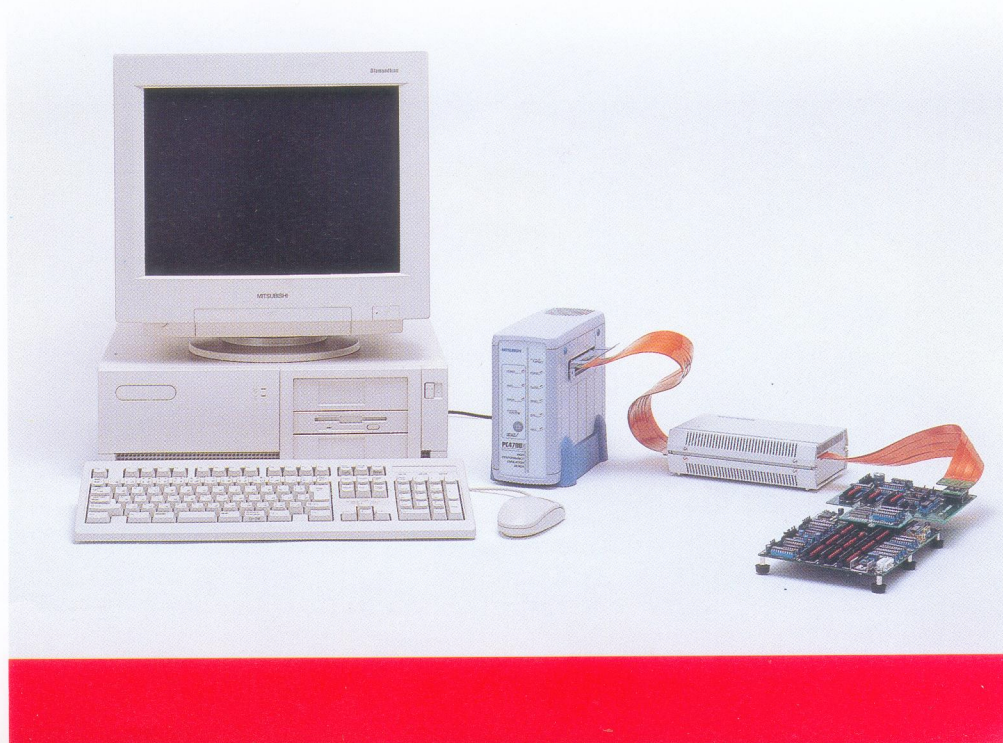


M16C/60 Seriese





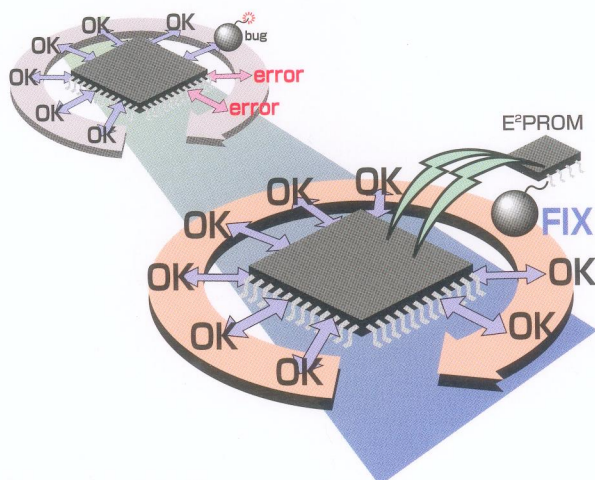
M16C, A History-Making 16-bit Microcomputer



The New Concept M16C — A Wealth of Advantages

An Industry First! Program correction

The larger a program, the greater potential for software bugs. M16C employs an address matching interrupt for correcting a program which that multiple bugs (at least two). This function not only keeps debugging cost and time to a minimum, it eliminates the need for re-manufacturing the microcomputer from the mask. This frees you from accumulating defective stock and from losing customers due to shipping delays.



Optional power saving for portable equipment— Low Operating Voltage, Low Power Consumption

Low-voltage operation and low power consumption well-known features of Mitsubishi microcomputers are further improved in M16C. Low power consumption of 18mW (at 3V, 7MHz, 1 wait) saves power and energy.

Linear Address Space without 64K-byte border Wide Address Space

The M16C single-chip microcomputer provides a 1M byte address space without the 64K border. In addition, excellent code efficiency that utilizes 64K bytes for 70K to 80K bytes conventional microcomputers gives you sufficient space.

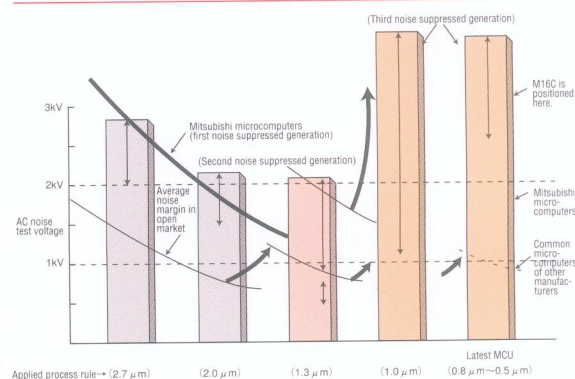
Noise reduced to below 1/100 of conventional Mitsubishi microcomputers— Radiation Noise suppressed

Up to now, noise suppression has been a problem because noise was often undetected until the last stage of product development. M16C has improved noise suppression to reduce radiation noise to 20dB lower than conventional Mitsubishi microcomputers. Count on M16C to be used for product development in new fields such as hand held information terminals.

No misoperation under 20,000V static electricity Prevention of Noise-induced misoperation

For development of products such as controllers for automobile air bags and suspension gears where high reliability is required, misoperation induced by noise cannot be tolerated. M16C is designed to function safely under electric charges of 20,000 volts. Its noise margin of safety is two to five times that of conventional Mitsubishi microcomputers.

Noise margin test results of typical Mitsubishi microcomputers



Various functions— High Function Peripheral Circuits

The built-in DMAC significantly improves throughput by eliminating the need for processing interrupts from data auto transfer to A-D converter auto fetch. M16C incorporates other various peripheral circuit functions including multifunctional serial I/O, large-capacity memory, and CRC operation circuit to support an easy-to-use programming environment.

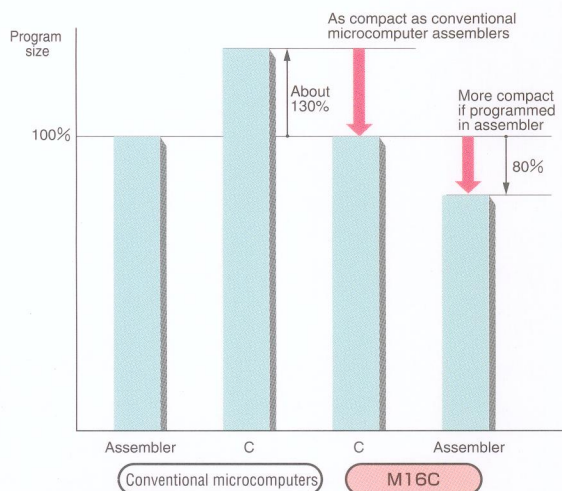
Advantages.

M16C

Top level compact size— Use of High Efficiency C Language Programming

While maintaining the ease of programming in assembler, development efficiency in C language is also high. Development will not be delayed because of large program size, since ROM capacity for C language is as high as that of assembler used for conventional microcomputers.

M16C language program size



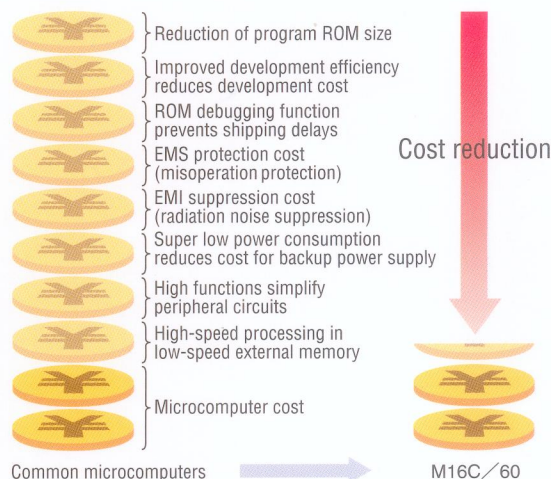
Why C? Comparison of C and assembler

	Assembly language	C language	M16C C language
availability	✗ Dedicated by manufacturer	○ General-purpose	○ General-purpose
Ease of development	△ Poor	○ Good	○ Good
Memory efficiency and operation speed	○ Good	△ Poor	○ Good

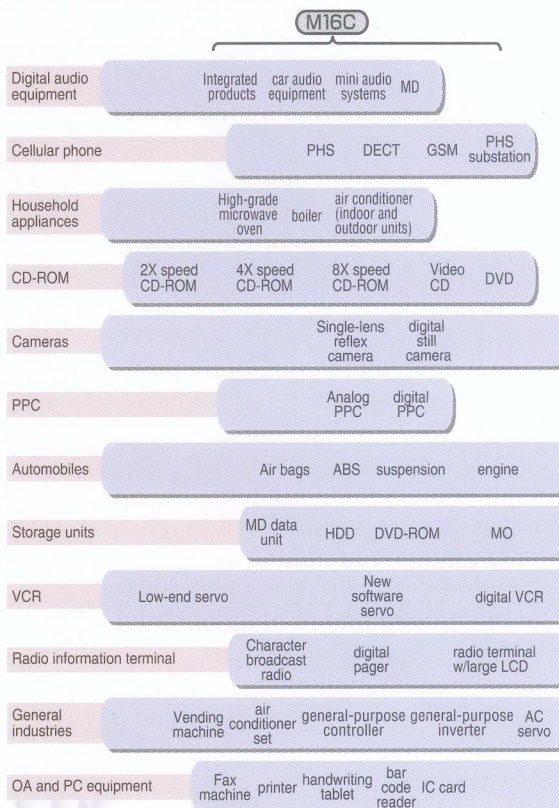
Various tools available Enhanced Development Environment

Compact, high-function emulators and versatile software tools are provided. Various tools for M16C are also available from third party sources. A wide choice of development tools improves your design environment.

Total cost reduction



Fields of application



High-efficiency C programming

Program correction

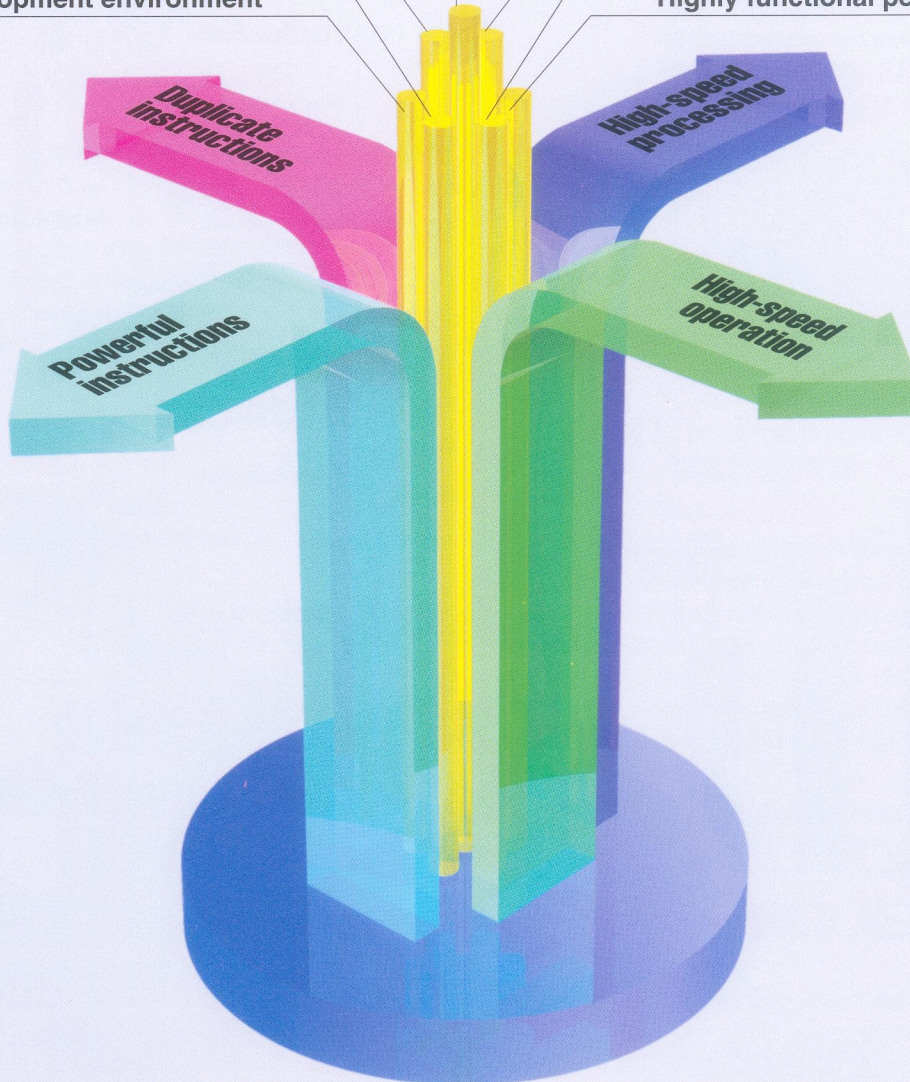
Low-voltage Low-power, operation

Noise suppression

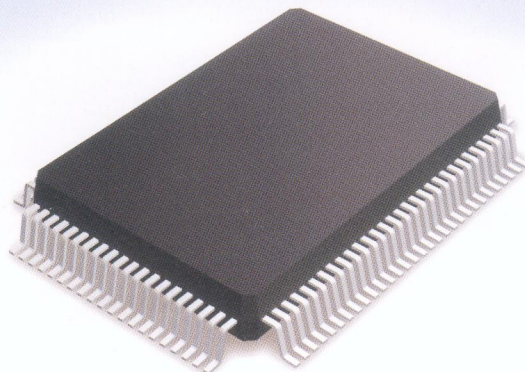
Wide address space

Improved development environment

Highly functional peripheral circuits



M16C



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