C Language Controller Provides Advanced New Option for Intelligent Systems

Mitsubishi Electric Corporation* MELSEC-Q Series C Language Controller on Intel® Architecture as an alternative for Industrial PCs delivers Great Performance, Advanced Functions and Excellent Network Connectivity

Today, still the factory automation (FA) has not reached to the current trend of technology adoption, specifically to the controller domain. Primarily needs and requirements of available devices dictate the progress in the control layer. Whereas devices are getting smarter, evolving to take advantages from the progressive trends. To meet the need of devices and to overcome boundaries of those on-going established implementations, controllers need to be moved beyond the status-quo. That is why Mitsubishi Electric Corporation is introducing MELSEC-Q Series of C Language Controllers.

Recent embedded system products have increasingly incorporated support for network connectivity. They open up network access to the vast amount of information that in the past was only available within a closed domain. This has brought the trend for "Big Data" to the world of embedded systems. From now on, the requirement will be to generate and extract useful information from this huge volume of data, and to interpret it in ways that create new value. Intel has been using the term "intelligent systems" to refer to the next-generation platforms used for these embedded system products connected to network and enable new services.

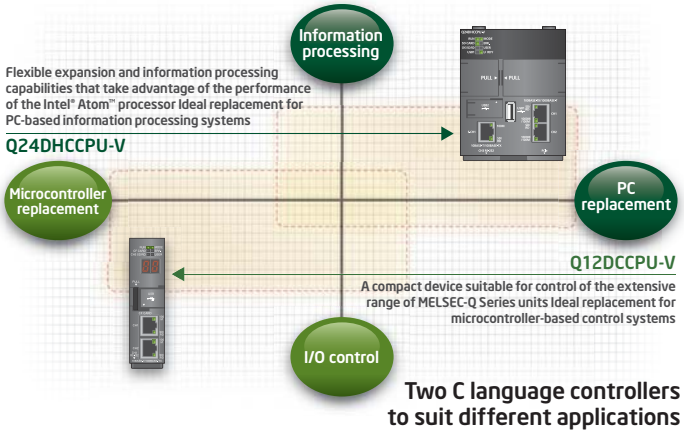
Intelligent systems consist of large numbers of embedded systems connected via a cloud network to back-end server computers. The Q24DHCCPU-V, one of Mitsubishi Electric's MELSEC-Q series of C language controllers, is an embedded solution equipped with numerous features characteristic of intelligent systems, including excellent network connectivity and the high level of processing capacity needed to support sophisticated system control and operation based on large amounts of data collected from sensors or via the network. At the core of this controller is a hardware platform based on the Intel® architecture.

MELSEC-Q Series of C Language Controllers Resolve Numerous Problems Associated with PC-Based Embedded Systems

The increasingly diverse range of practical requirements faced by factory automation (FA) systems has led to an even greater emphasis than before being placed on the processing capacity of embedded systems. Industrial PCs are widely used in applications where this high level of processing capacity is demanded. However, the likelihood that spare parts, special-purpose boards, operating systems (OSs), and other components of industrial PCs will go out of production or be subjected to specification changes is a source of major concern for users. Program development and maintenance can also be very costly due to factors such as the growing complexity of manufacturing processes and the increasing volume of control data.

To overcome these, Mitsubishi Electric has released the MELSEC-Q series of C language controllers as an alternative to Industrial PCs. The MELSEC-Q series C language controllers satisfy the diverse requirements of the FA sector by providing excellent reliability, tolerance of harsh environments, and long-term security of supply. In place of the ladder logic used in conventional sequencers, the controllers use the international standard C languages (C and C++) for greater programming flexibility. This allows users to take full advantage of their existing C language software and development know-how built up similar to when they were using PCs.

The OS used on the MELSEC-Q series of C language controllers is the VxWorks* realtime OS from Wind River. Also, because they come with communications drivers and special-purpose libraries preinstalled, the controllers can be used immediately. An integrated development environment comprising CW Workbench and other software is also available to provide efficient system development, from program editing to compilation, debugging, code analysis, and testing. The controllers can also be combined with partner products to configure a wide range of systems. For example, partner products are available to support program development and on-site operation.



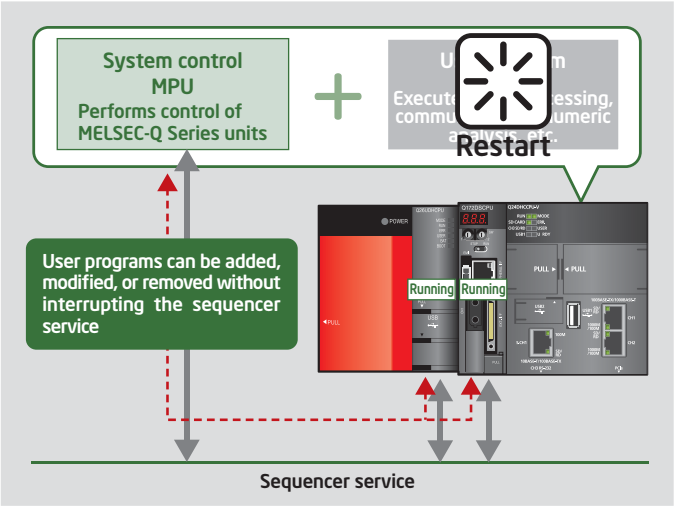
Two C language controllers to suit different applications

Q24DHCCPU-V High-End C Language Controller Features Separate Processors for System Control and User Program Execution

System requirements in recent years have included the processing of large volumes of information and interoperation with other embedded systems via a network. To satisfy these demanding requirements, Mitsubishi Electric has added the new Q24DHCCPU-V as the high-end model to its C language controllers. While previous models used the same processor for both user programs and system control of the C language controller itself, the Q24DHCCPU-V allocates these two different types of processing to separate processors.

Using independent processors for user programs and system control provides seamless and more reliable information processing without being influenced by the system control workload. With this, the processor used for user programs can be restarted without interrupting system control. This provides the flexibility to add, update, or remove user programs without requiring the industrial process to shut down.

Q24DHCCPU-V



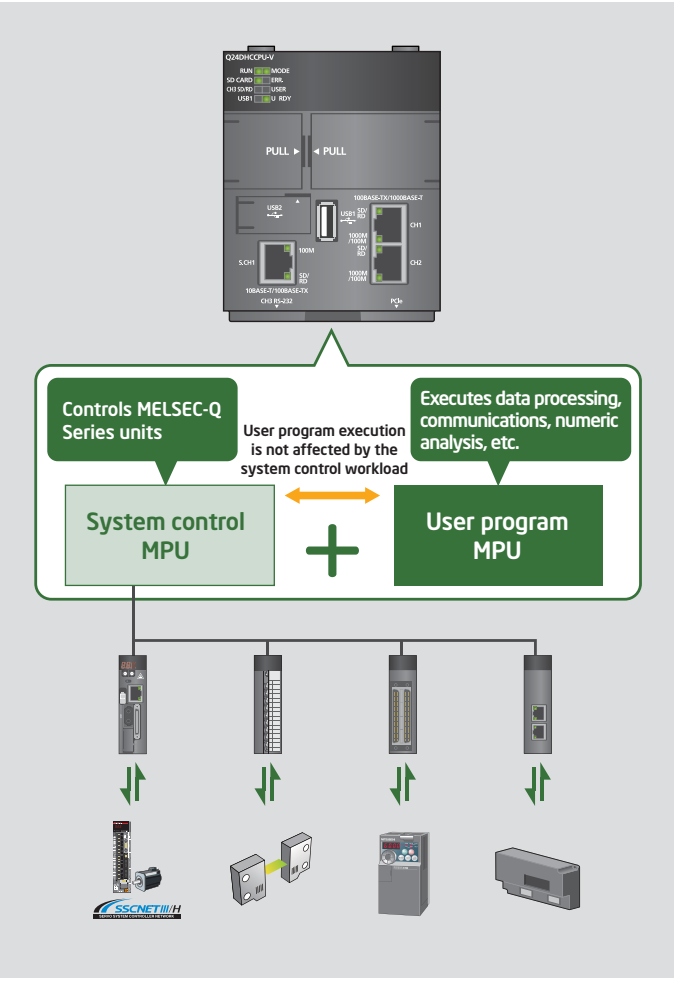
User processor restart function

Intel® Atom™ Processor Adopted for User Programs

A major strength of the MELSEC-Q series of C language controllers is that the hardware has been made considerably smaller than conventional PC-based systems. The controller uses a fan-less design to ensure long-term reliability. While Q24DHCCPU-V high-end model needs to deliver higher levels of processing capacity and realtime performance than have been available in the past, greater processing performance means a proportionate increase in power consumption and heat generation for most microprocessors.

To overcome this trade-off, the Q24DHCCPU-V uses an Intel® Atom™ processor for user program execution. After conducting comparisons with other potential processors, including RISC models made by other companies, Mitsubishi Electric selected the Intel® Atom™ processor as providing the best balance of processing performance, and power consumption.

The Intel® Atom™ processor delivers the high levels of processing performance appropriate for the high-end model in the MELSEC-Q series of C language controllers while also keeping power consumption and heat generation to a minimum. The fan-less design adopted for microprocessor cooling significantly increases reliability. Q24DHCCPU-V provides a seamless migration path by using Intel Atom™ PC based software that allows users to reused developed PC-based embedded systems.



High level of realtime performance

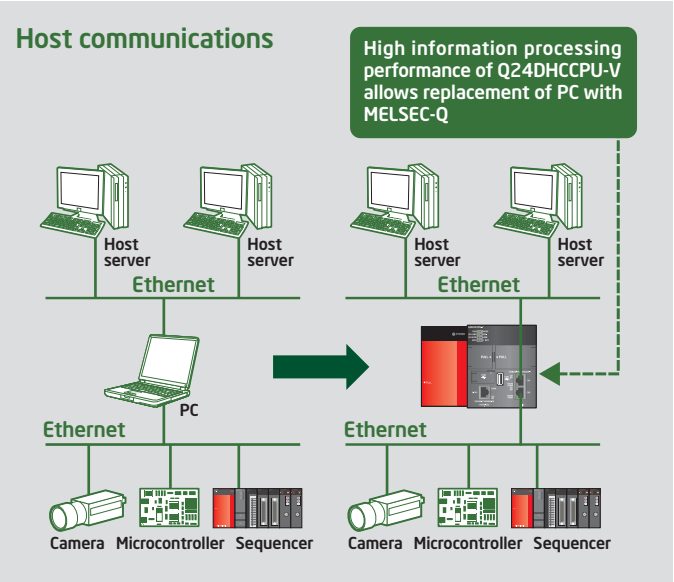
System Configuration Leverages Unique Benefits of Intel® Architecture Wide Range of Standard Interfaces and Excellent Network Connectivity

The standard interfaces available for user programs on the Q24DHCCPU-V are a USB 2.0 port, gigabit ethernet ports, and a PCI Express* expansion connector. These interfaces are provided by the Intel® system controller hub (SCH) chipset for the Intel® Atom™ processor, or by external chips that connect via the SCH chipset. This flexibility provides a wide range of interfaces.

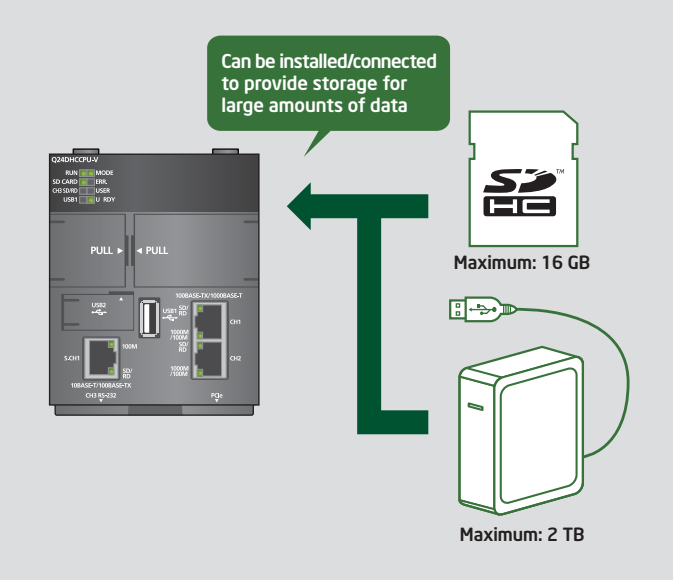
The USB port can be used to connect various different types of peripherals, including storage (up to 2TB). This allows the controller to process large volumes of data in the same way as an industrial PC. Similarly, by installing an external PCI Express* expansion chassis, the PCI Express* expansion connector can be used to attach hardware that supports the PCI Express* or PCI* bus. This gives users the flexibility to configure systems using existing resources, including the connection of special-purpose hardware with specific functions, and PCI* or PCI Express* hardware that is already well supported by existing software.

The gigabit ethernet ports are used for data networking with servers and other network devices. For example, realtime communications with servers helps improve utilization, productivity, and other aspects of plant performance. Similarly, traceability is improved by the collection of large amounts of log data from other controllers and then forwarding it to a server. Also, because the Q24DHCCPU-V is equipped with two gigabit ethernet ports, it is possible to configure independent high-level and plant-level networks that can operate in parallel.

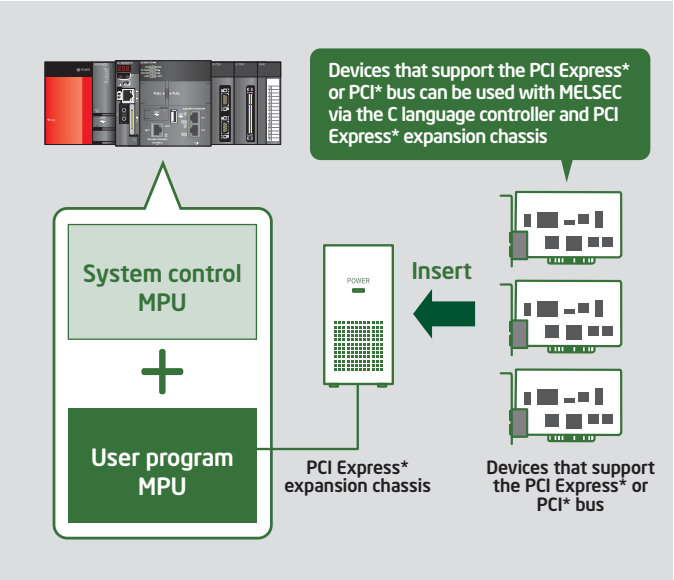
Being compatible with Mitsubishi Electric's iQPlatform, the Q24DHCCPU-V supports interoperation with high-speed, large-capacity sequencers and motion controllers across an ethernet network. It can connect to various controllers, sensors, and other field equipment through the CC-Link IE industrial ethernet communication standard or SSCNETIII/H motion network. In this way, the Q24DHCCPU-V greatly facilitates the connection to and interoperation with all sorts of other systems, making it an embedded solution at the forefront of what Intel is promoting through its "intelligent systems" concept.



High-spec



Support for large amounts of data



PCI Express* expansion connector

Intel® Architecture Provides Ongoing Support for Enhancements to C Language Controller

As platforms for extracting useful value out of huge amounts of data, intelligent systems are demanding even greater levels of processing capacity. Intel's high-performance processors demonstrate their capabilities at the very heart of these systems. Combining advanced semiconductor manufacturing technologies and microarchitectures, Intel microprocessors deliver the excellent processing performance and functionality needed to support the next generation of embedded applications with ease.

Meanwhile, the market for embedded systems continues to demand microprocessors with even lower power consumption. The MELSEC-Q series of C language controllers have a guaranteed operating temperature range of 0 to 55°C. To ensure that they can maintain this high level of durability and reliability despite being incorporated into even more compact housings, it is essential that the power consumption of the controller itself be reduced even further. Mitsubishi Electric also has high expectations for the use of system-on-a-chip (SoC) versions of the Intel® Atom™ processor in future versions of the MELSEC-Q series of C language controller. SoC chips integrate a range of peripheral functions onto the microprocessor.

Because it is common in FA applications for the same program to remain in use for a long time, the reusability of existing software is a key concern for users. The Intel x86 instruction set used in PCs, servers, and now C language controllers has already been in use for several decades. This means that designing software based on the Intel® architecture enhances the scope for reusability and further development. To take even greater advantage of the unique benefits of the Intel® architecture, Mitsubishi Electric has plans to expand the capability of the controller in the future to enable users programs will be able to run on OSs other than VxWorks*.

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Intelligent Systems

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