MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow

iQ Platform
C Controller

C Controller
The highly customizable open platform

UNIX compatible OS
Linux®

Real-time OS
VxWorks®

Introducing the open architecture C Controller now supporting Linux®!

iQ Platform

Improving the reliability of PC/Microcomputer systems. The innovative open platform C Controller.

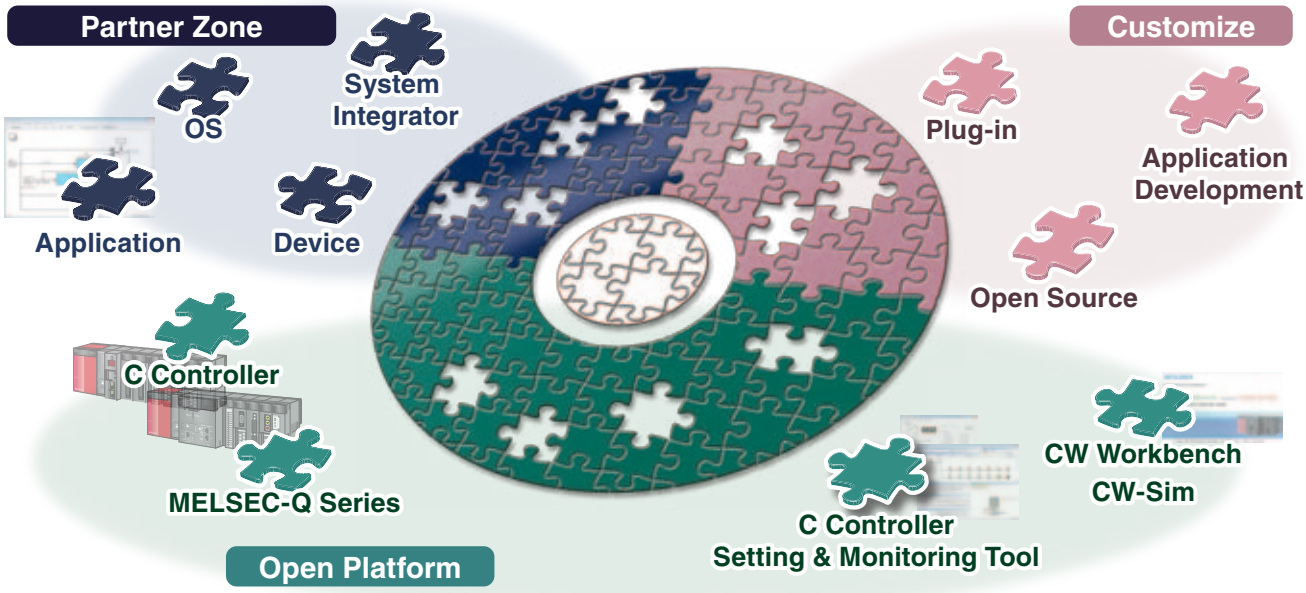
The C Controller is a generic open platform controller that can execute C language type programs, based on the MELSEC system architecture, it utilizes industrial performance such as long term parts supply, high availability, and advanced functionality.
The high-end model Q24DHCCPU-V comes pre-installed with VxWorks®, and supports advanced information processing and control system I/O. The standard model Q12DCCPU-V is a space saving controller that realizes high-speed I/O control. The Q24DHCCPU-LS is an OS independent controller. Linux® based control can be easily realized by installing 3rd Party partner OS, supporting advanced information processing with a user interface environment close to conventional PCs.

Wide scope of applications are realized with the availability of these 3 C Controllers, used together with MELSEC-Q series I/O modules, 3rd Party products, open source, and customized applications/programs.

Providing freedom with a robust, easier and high-performance system.
The MELSEC C Controller will continue to advance as a new platform to replace PC and microcomputers in various different applications.

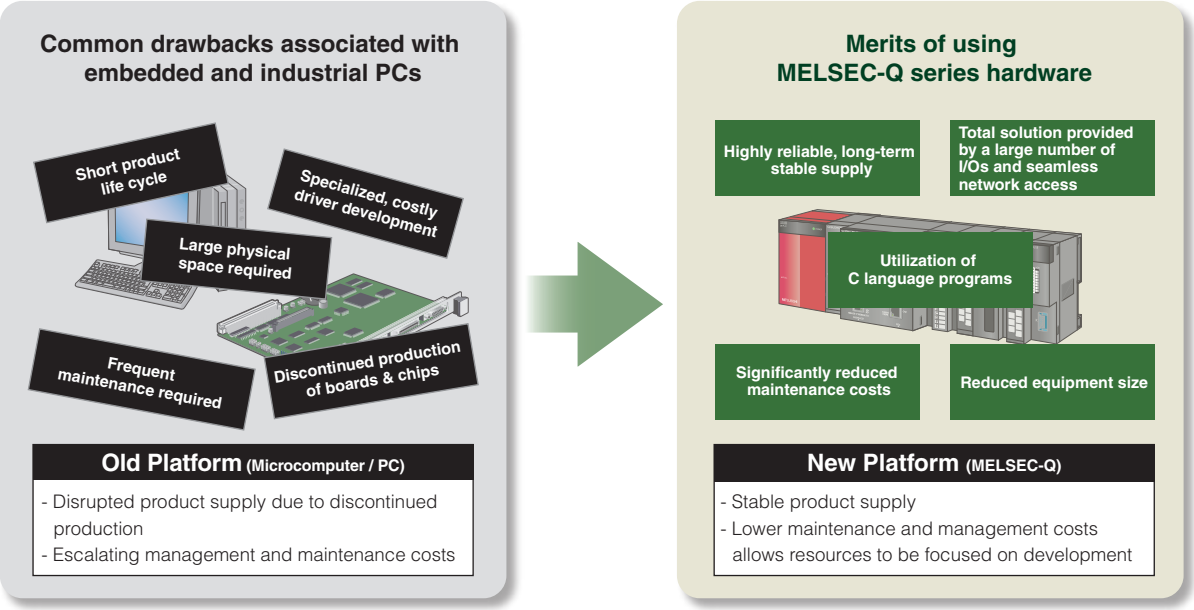
Ideal for a diverse range of systems, based on a generic platform architecture

Leveraging the C Controller to realizing customized systems, by utilization of 3rd Party applications, installation of 3rd Party partner OS, utilization of programs, and open source applications.



The C Controller overcomes the overheads associated with maintaining embedded PCs (micro boards., etc) and industrial PCs realizing a cost effective solution.

The C Controller platform is a solution that realizes PC level functionality without the burden of high maintenance costs usually associated with PCs. In addition, it includes a robust design that is ideal for industrial environments by being based on the high quality MELSEC control system.

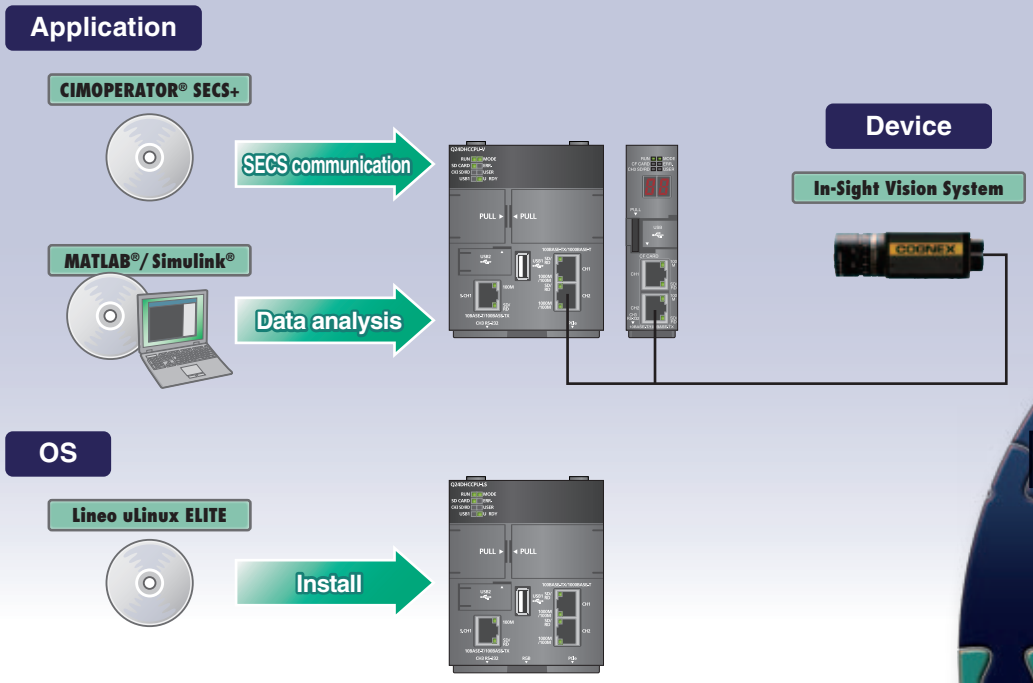


Partner Zone

Utilizing 3rd party products specific to the systems requirements!

Utilize 3rd party products

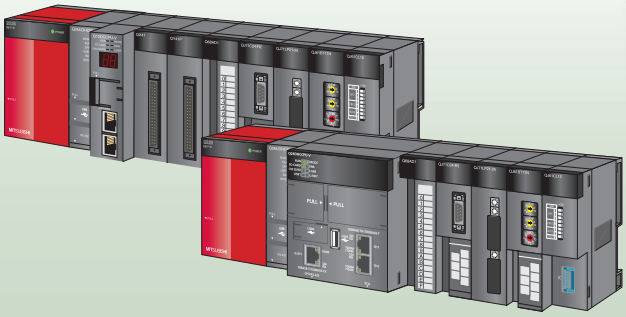
The C Controller can be used as a dedicated module by installing 3rd party applications, OS, and devices.



Easily build a system with real-time OS VxWorks®!

Real-time OS

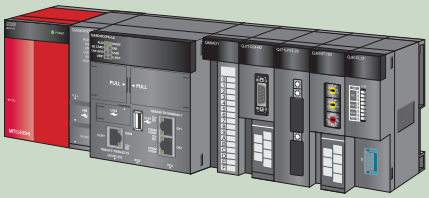
High integrity system can be created with VxWorks®.



OS Independent architecture

Supporting multiple operating systems

Alternative OS can be installed realizing a custom built solution where the user can pick a specific OS suited for the application.



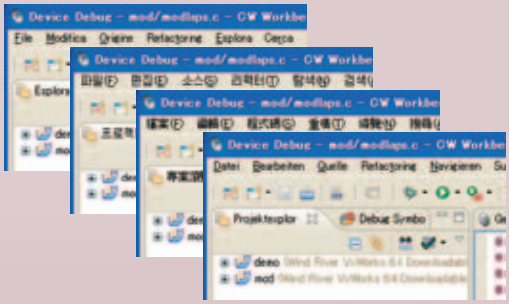
Open Platform

Customize

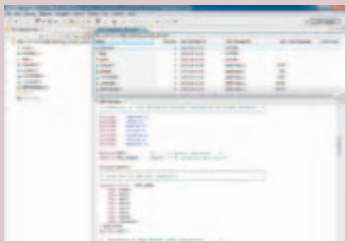
Extend functions with various plug-in tools!!

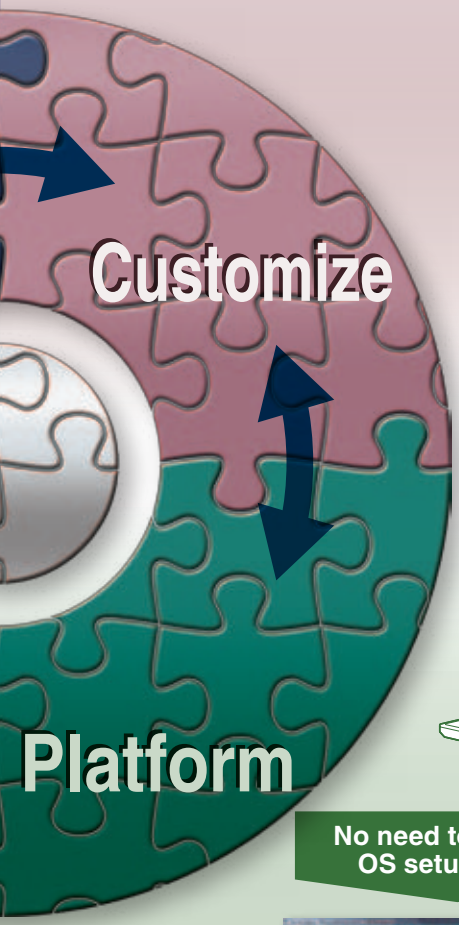
Utilize Eclipse open source plug-ins

Can realize different language menu system, such as Japanese, to Korean, Chinese, English, German, etc.



A vast repository of development tools and other open source plug-in software are available to install.





Intuitive application development!!

Utilize C-Language program attributes

C language based programs can be easily incorporated into the MELSEC system platform.

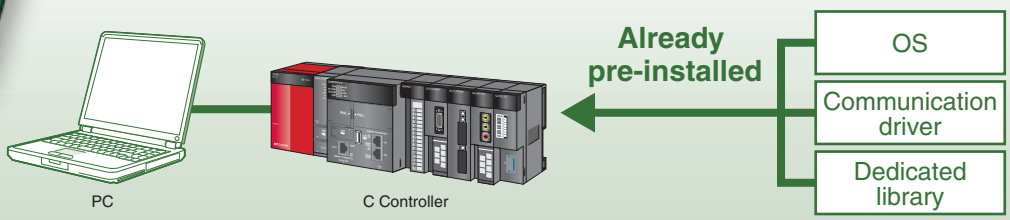
Create user applications utilizing the (API) library

Easily develop user applications by utilizing the VxWorks® and MELSEC diverse range of available APIs.

Utilize Linux® open source customized programs

Within the control system, customized programs can be created using Linux®, in addition to utilizing USB type PC peripherals.

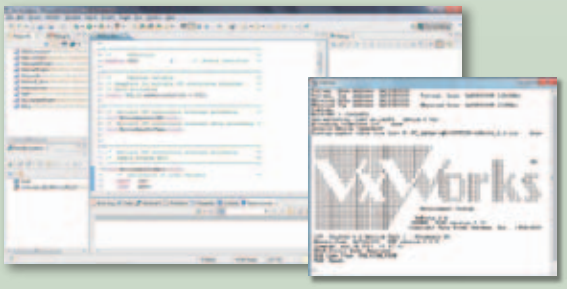
Embedded application development software!!



No need to develop OS setup driver

Work on application development right after installation

Development architecture supported



CW Workbench | **Wind River Workbench** | **CW-Sim / CW-Sim Standalone**

C Controller setting and monitor tool

Line up

3 Separate C controllers for various solutions

High-end model C Controller for information processing needs
Q24DHCCPU-V

Standard model C Controller for high-speed I/O control
Q12DCCPU-V

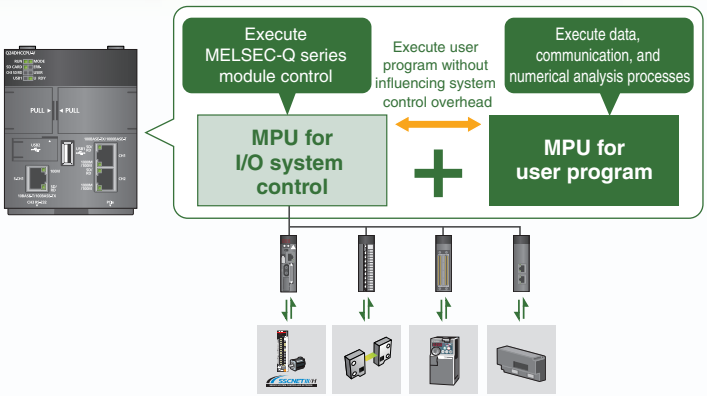
OS independent model C Controller utilizing open source customized programs
Q24DHCCPU-LS NEW

Information processing utilizing the Intel®ATOM™ performance

Q24DHCCPU-V Q24DHCCPU-LS

Incorporates two dedicated MPUs:
- For user program
- For controlling MELSEC system I/Os

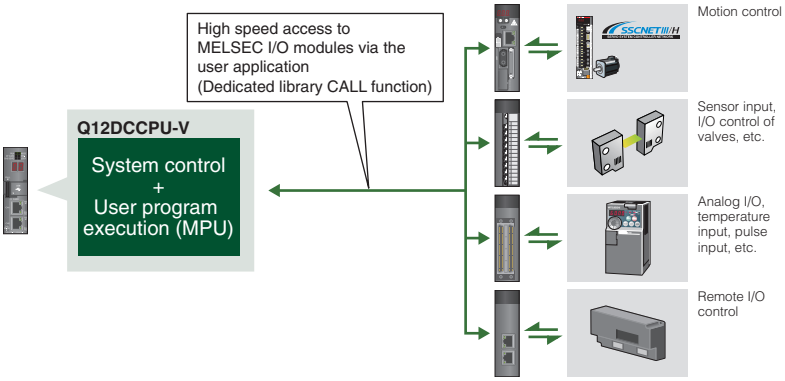
By having both the system and user program on separate MPUs, if there are any variations in the user program overhead, this will not influence the system control side. This is due to the user program utilizing the Intel® ATOM™ characteristics. Hence, realizing an advanced system that is ideal for high speed processing applications without fluctuating performance.
With the open architecture Q24DHCCPU-LS, the customer can install the operating system into Intel® ATOM™ MPU for user program area.



Access various MELSEC-Q series modules directly from the user program

Q12DCCPU-V

Various MELSEC-Q series modules can be directly accessed from the user program using Mitsubishi Electric's dedicated library functions, realizing high-speed, high-accuracy control.

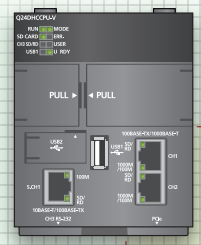


Information processing together with flexible expansion can be realized from inheriting the Intel® ATOM™ performance, ideal for replacing existing PC based information processing systems.

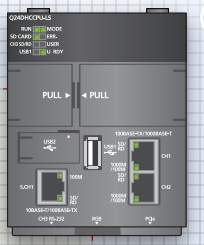
Utilizing the 2MPU architecture with integrated display port, installation of an OS specific to the application is possible, realizing an advanced information processing control system.

Information processing

Q24DHCCPU-V



Q24DHCCPU-LS



VxWorks version OS

OS Independent model

Q12DCCPU-V

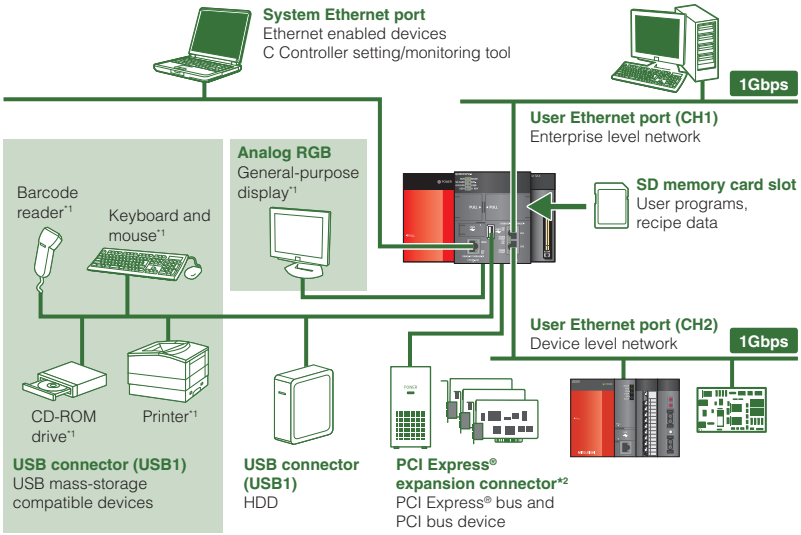
Control various MELSEC-Q series modules when space is limited.
This is ideal for replacing microcomputer based control systems.

I/O control

Extendable system with a diverse range of interfaces available

Q24DHCCPU-V **Q24DHCCPU-LS**

The C Controller includes a variety of interfaces, such as 2ch gigabit Ethernet ports (for user program), 1ch system Ethernet port (for connecting setting/monitoring tool or other MELSOFT products), SD memory card slot, USB connector and PCI Express® *1 expansion connector.
High speed communication to Enterprise level systems and high-volume data handling are realized. In addition, with the PCI Express® *1 interface utilization of existing PCI Bus devices with high-performance requirements are supported.
By supporting the Linux® OS, the system can be freely expanded utilizing various peripheral devices (drivers) and applications.



*1 Usable with Q24DHCCPU-LS installed with Linux® OS.
*2 Supporting PCI Express® base specification Rev. 1.0a x1. Consult with your nearest Mitsubishi office or representative for more information when considering using the PCI Express® expansion connector.

Line up

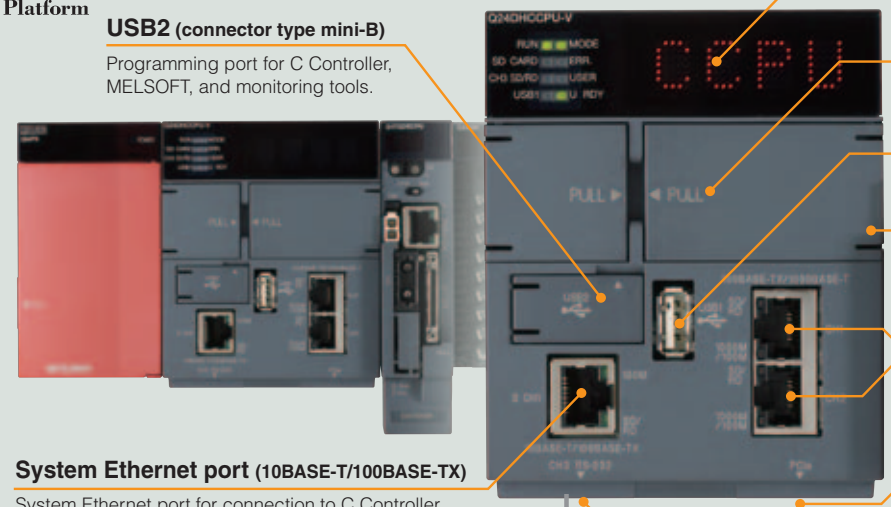
Three types of C Controller module to deliver reassurance

High-end model C Controller for information processing needs

Q24DHCCPU-V

2x MPU
Stable operation, high reliability
Real-time OS VxWorks® pre-installed
iQ Platform compatible
Easy to read display (Dot matrix LED)
Ethernet(3ch.), USB×2,
PCI Express® *1, RS-232

iQ Platform Q24DHCCPU-V



USB2 (connector type mini-B)
Programming port for C Controller, MELSOFT, and monitoring tools.

System Ethernet port (10BASE-T/100BASE-TX)
System Ethernet port for connection to C Controller, MELSOFT, monitoring tools, and other devices supporting Ethernet.

Development environment
- Engineering tool for C Controller CW Workbench.
- Integrated development environment Wind River Workbench.
- Setting/monitoring tools for C Controller.

PC

LED display (Dot matrix type)
For debugging and diagnostics.

SD memory card
For saving user programs and recipe data, etc.

USB1 (connector type A)
For connecting USB devices (USB HDD).

Battery backup RAM
For saving user data (operation history, diagnostics data, etc).

2x Standard Ethernet ports (10BASE-T/100BASE-TX/1000BASE-T)
For TCP/IP communication with computers, etc.

PCI Express® *1 extension connector (on the bottom)
PCI Express®, For connecting to devices supporting PCI Express® or PCI bus connection.

RS-232 (on the bottom)
For connection to serial communication devices.

Ethernet

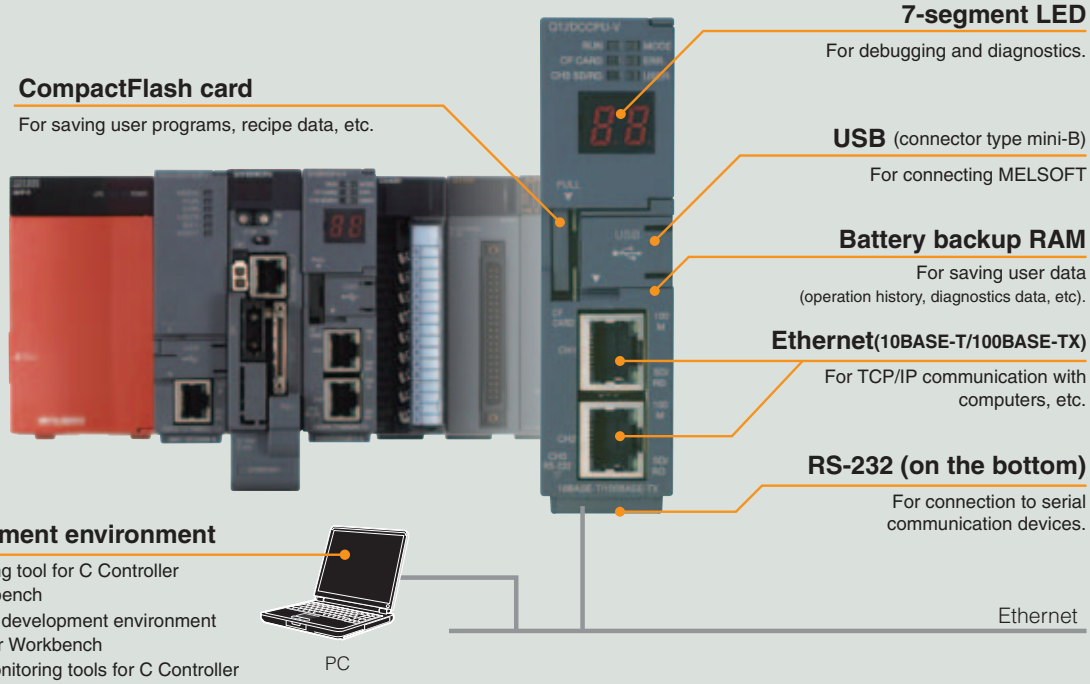
*1 Supporting PCI Express base specification Rev. 1.0a x1.

Standard model C Controller for high-speed I/O control

Q12DCCPU-V

1x MPU
Highly reliable
Compact size
Real-time OS VxWorks® pre-installed
iQ Platform compatible
LED display (7-segment)
Ethernet (2ch.), USB, RS-232

iQ Platform Q12DCCPU-V



Line up

Three types of C Controller module to deliver reassurance

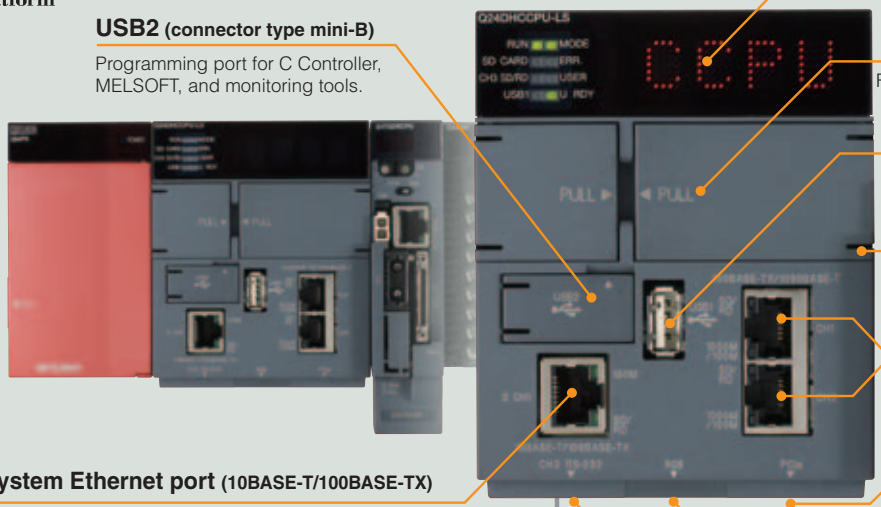
NEW

C Controller OS independent model
for customized open source

Q24DHCCPU-LS

2x MPU
Stable operation, high reliability
Utilize 3rd Party partner OS
Easy to read display (Dot matrix LED)
Ethernet(3ch.), USB×2,
PCI Express® *1, RS-232,
Analog RGB

iQ Platform Q24DHCCPU-LS



USB2 (connector type mini-B)
Programming port for C Controller, MELSOFT, and monitoring tools.

LED display (Dot matrix type)
For debugging and diagnostics.

SD memory card
For saving user programs and recipe data, etc.

USB1 (connector type A)
For connecting to USB devices
(USB HDD, keyboard, mouse, printer and barcode reader, etc.)

Battery backup RAM
For saving user data
(operation history, diagnostics data, etc).

2x Standard Ethernet ports
(10BASE-T/100BASE-TX/1000BASE-T)
For TCP/IP communication with computers, etc.

PCI Express® *1 extension connector (on the bottom)
PCI Express®,
For connecting to devices supporting PCI Express® or PCI bus connection.

System Ethernet port (10BASE-T/100BASE-TX)
System Ethernet port for connection to C Controller, MELSOFT, monitoring tools, and other devices supporting Ethernet.

Analog RGB
For connecting to general-purpose display.

Development environment
- Development environment provided by 3rd Party partner OS.
- Setting/monitoring tools for C Controller.

PC

RS-232 (on the bottom)

Ethernet

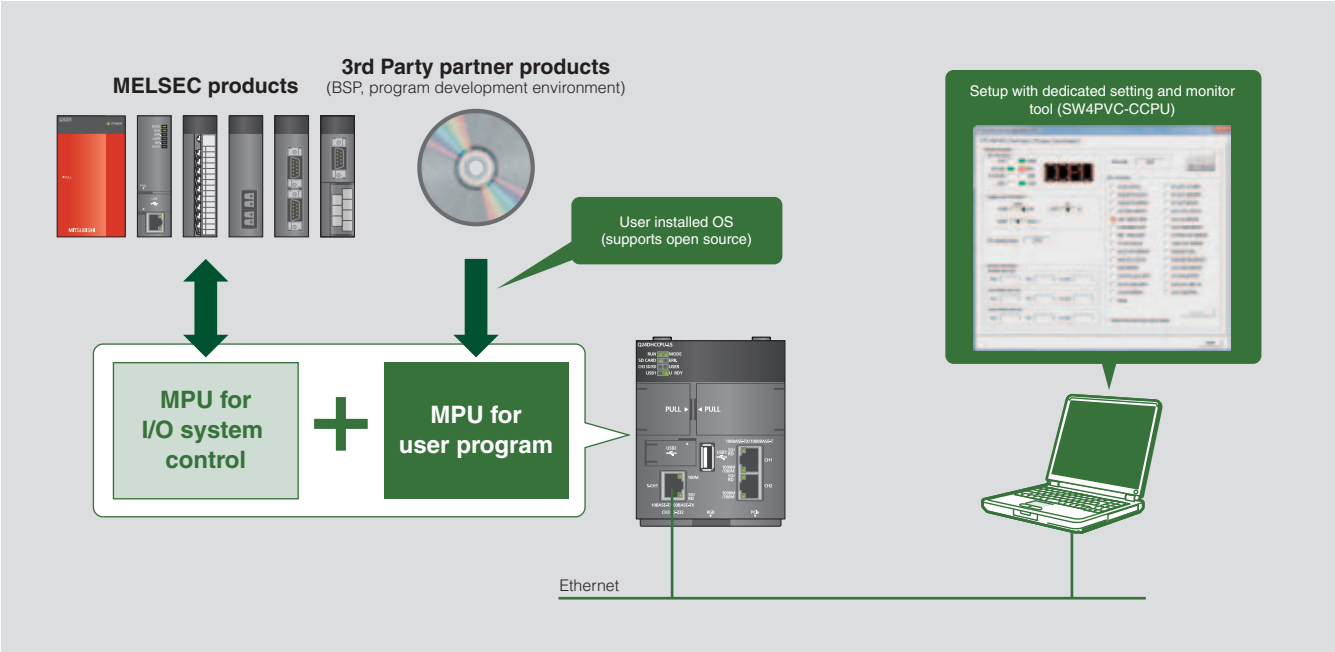
Ethernet

*1 Supporting PCI Express base specification Rev. 1.0a x1.

OS Independent architecture

Customized system by selecting the OS ideal for the application

The OS independent C Controller model is designed for applications which require the ability to install other OS types, such as when utilizing open source programs or PC based peripherals. The LS type C Controller utilizes the 2 MPU architecture which enables an alternative OS to be installed into the user program MPU (Intel® ATOM™). This MPU can also access the system side MPU (SH-4A), which is based on a real-time OS preforming direct control of the system I/O modules. By using products from Lineo Solutions, Inc. Linux® based sample codes can be realized within the control system, for example.



3rd Party partner OS

Lineo@Linux

Lineo uLinux from Lineo Solutions, Inc. is a Linux® based distribution software. Since it is open source based, separate runtime licenses are not required. When used together with the development environment ELITE for uLinux, Linux® based control system can be easily configured using the C Controller, in a short space of time.

LINEO Solutions

URL: http://www.lineo.co.jp/modules/english/

Development environment

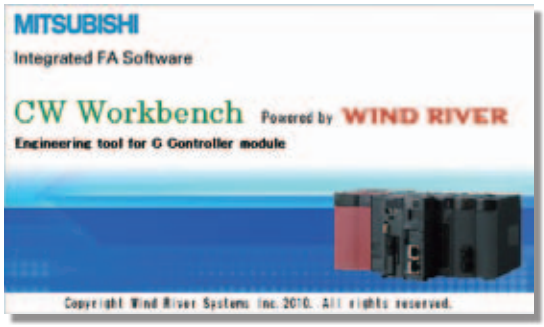
Simplifying user application development

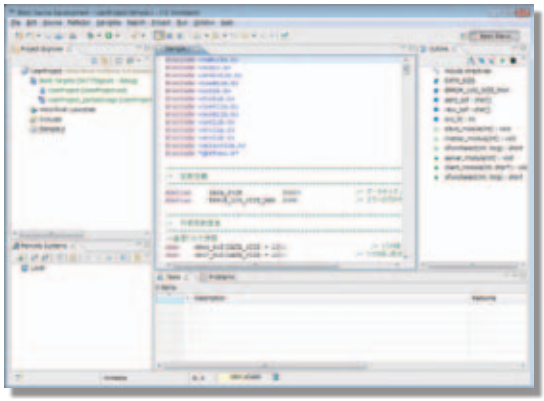
Providing an embedded system development environment at an affordable price

C Controller module engineering tool

CW Workbench

Q24DHCCPU-V
Q12DCCPU-V





Reduced installation costs and easily develop applications

Traditionally, development environments for embedded systems have been very expensive, but now they are affordable.
This allows full-scale embedded systems development at low cost.
CW Workbench has all of the basic functionality expected such as a code editor, compiler, and debugger.
More importantly, the application empowers developers to be able to easily create applications for the C Controller.

Support for multiple languages using plug-ins

Based on the Eclipse platform, CW Workbench supports multiple languages and its functionality can be expanded using third-party plug-ins such as source code management.

Supporting Windows® 7

CW Workbench supports Windows® 7 (32-bit version), Windows Vista® (32-bit version) and Windows® XP (32-bit version) operation systems.

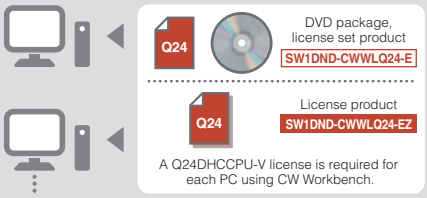
CW Workbench license

Therefore it is important that the correct license is obtained. Different licenses are required to use Q24DHCCPU-V or Q12DCCPU-V with CW Workbench.

For new C Controller customers

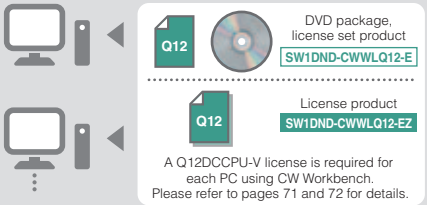
CASE 1 Using Q24DHCCPU-V

Purchase one Q24DHCCPU-V license for each PC using CW Workbench.



CASE 2 Using Q12DCCPU-V

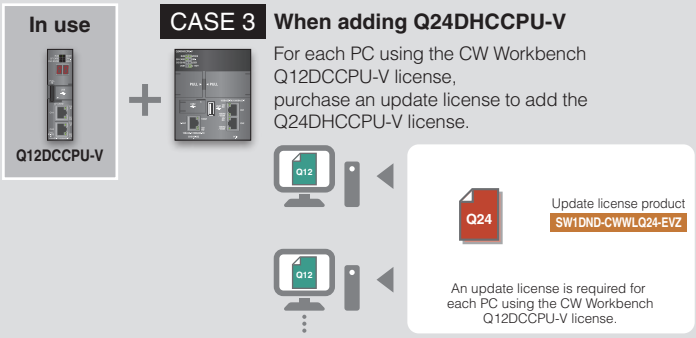
Purchase one Q12DCCPU-V license for each PC using CW Workbench.



For customers already having C Controller

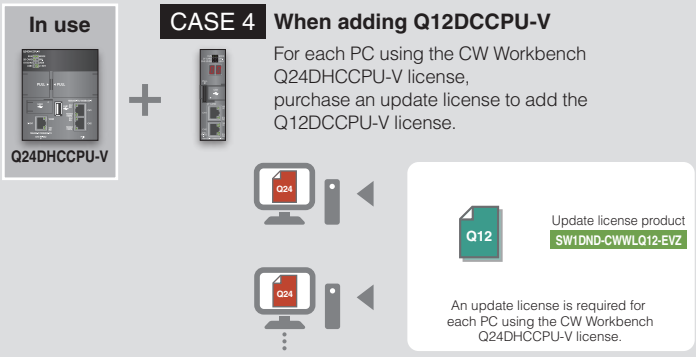
CASE 3 When adding Q24DHCCPU-V

For each PC using the CW Workbench Q12DCCPU-V license, purchase an update license to add the Q24DHCCPU-V license.



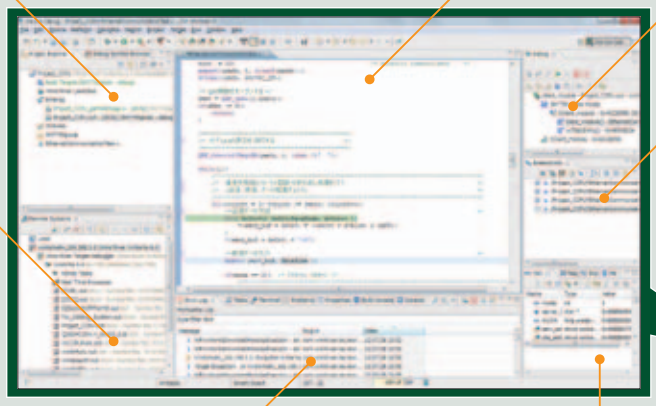
CASE 4 When adding Q12DCCPU-V

For each PC using the CW Workbench Q24DHCCPU-V license, purchase an update license to add the Q12DCCPU-V license.



* Please refer to P71 for details.

CW Workbench



"Project Explorer" window
Manage projects and settings

"Remote Systems" window
Manage connections to hardware

"Build Console" window
Display the build process history

"Editor" window
Edit programs

"Debug" window
Perform debugging

"Breakpoints" window
Manage break points

Ethernet

PC

"Variables" window
View the current local variable values

"Registers" window
View the current register values

"Expressions" window
View the current variable values registered to be watched

"Memory Browse" window
View C Controller's memory dump

VxWorks® Simulator

CW-Sim (license set product *1)

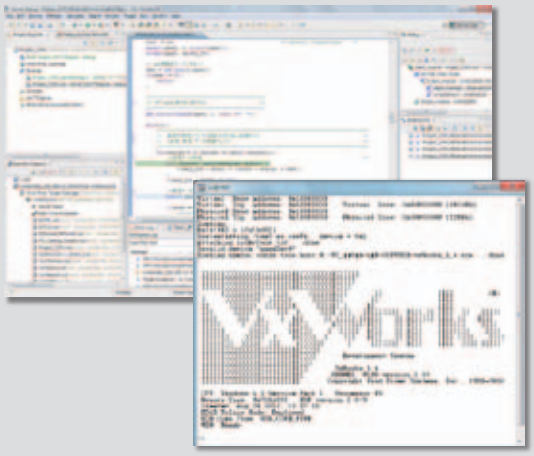
Q24DHCCPU-V
Q12DCCPU-V

SW1DNC-CWSIM-E NEW

CW-Sim Standalone

Q24DHCCPU-V
Q12DCCPU-V

SW1DNC-CWSIMSA-E NEW



- VxWorks® simulation even without the C Controller module.*2
- Improve your program's quality and system's safety before actually operating your system.
- Useful for system debug developed over several PCs and to provide training.

CW-Sim license product simulation environment

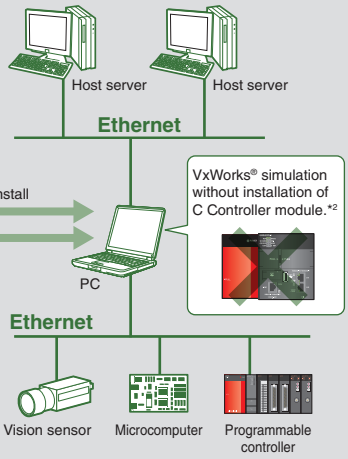
CW-Sim　CW Workbench

Program debug from a PC with CW Workbench installed.

CW-Sim Standalone simulation environment

CW-Sim Standalone (Execution file)　CW-Sim VxWorks® image file

A program can be executed even with a PC not installed with CW Workbench.*3



*1 An additional license product (SW1DNC-CWSIM-EZ) is also available.
*2 CW-Sim and CW-Sim Standalone are equipped with only the minimum required functions of Wind River VxWorks® Simulator.
*3 Step execution not possible.

Development environment

Simplifying user application development

Reduce TCO with simple settings, diagnostics, and monitoring capabilities!

C Controller setting/monitor tools

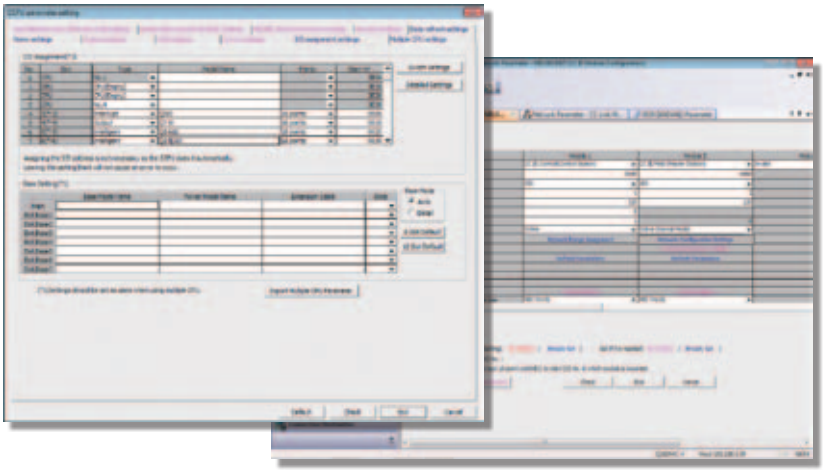
SW4PVC-CCPU Q24DHCCPU-V Q24DHCCPU-LS

SW3PVC-CCPU Q12DCCPU-V

Program-free Parameter Settings

Easily configure C Controller systems, CC-Link IE field networks (for managing the C Controllers)*1, CC-Link IE controller networks, and the parameters*2 for network modules and intelligent function modules such as CC-Link, all without using any programs.

*1: Q12DCCPU-V, SW3PVC-CCPU do not support configuration of CC-Link IE field network parameters.
*2: Q12DCCPU-V, SW3PVC-CCPU do not support configuration of intelligent function module parameters.



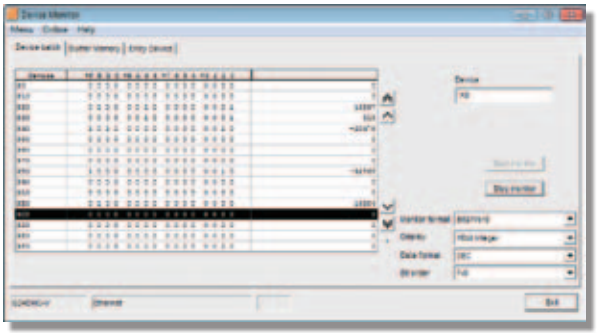
Program-free Diagnostics

Easily diagnose errors that have occurred in the C Controller or historical events within the user application. In addition, detect detailed network status information such as network cable condition, general network status*3.

*3: Q12DCCPU-V, SW3PVC-CCPU do not support diagnosis of the CC-Link IE field network.

Perform monitoring and testing using convenient tools

Monitor the status (I/P, O/P, buffer memory, multi-CPU common memory) of connected modules, together with simple debugging, change of state/value of device memory.



Application development life-cycle support

Wind River Workbench 3.2 2.6.1

Q24DHCCPU-V

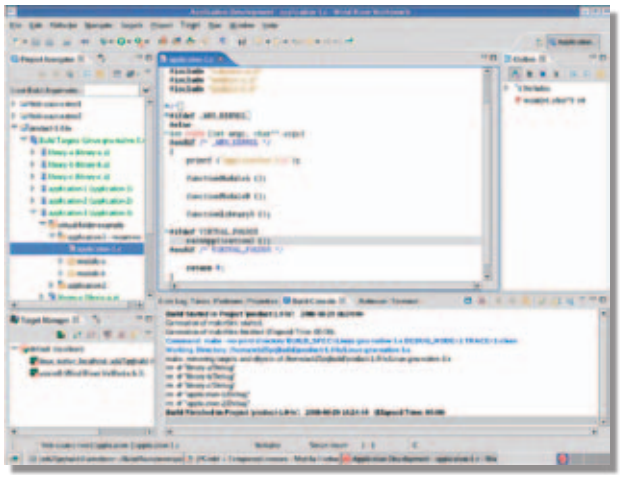
Q12DCCPU-V

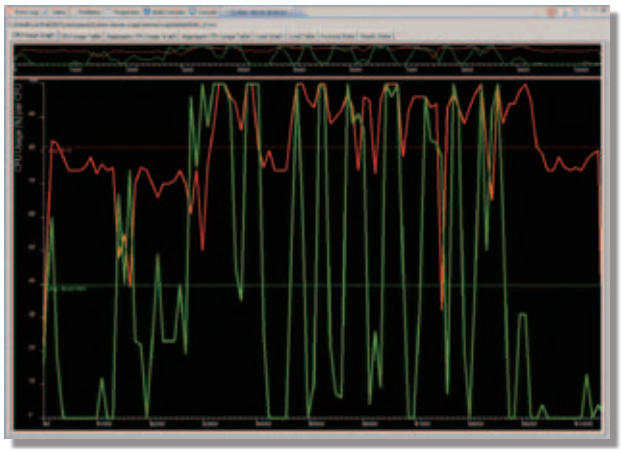
Developed by Wind River

WIND RIVER

Incorporate advanced runtime diagnostic tools

In addition to basic functions for program editing, compiling and source debugging, Wind River Workbench incorporates advanced run-time analysis tools. When detailed analysis are required, various tools are available for revealing the complex interactions of tasks and interrupts, realizing a far more specified way of analyzing and debugging the application.





Embedded Linux® Development Environment

Lineo uLinux ELITE

Q24DHCCPU-LS + Lineo@Linux ELITE

Developed by LINEO Solutions, Inc.

Linux® system development based on the C Controller MPU

ELITE is a GUI based development framework consisting of a Linux® kernel, package and tool chain offered as a basic software configuration. This tool is used together with the C Controller Q24DHCCPU-LS compatible "Board Support Package".
By using ELITE, a Linux® based system perfect for the Q24DHCCPU-LS can be created, whilst enabling editing of source code and utilizing devices.
Also, access to the developers site exclusive for the Q24DHCCPU-LS C Controller to further increase the high-security Linux® based controller's product life cycle.

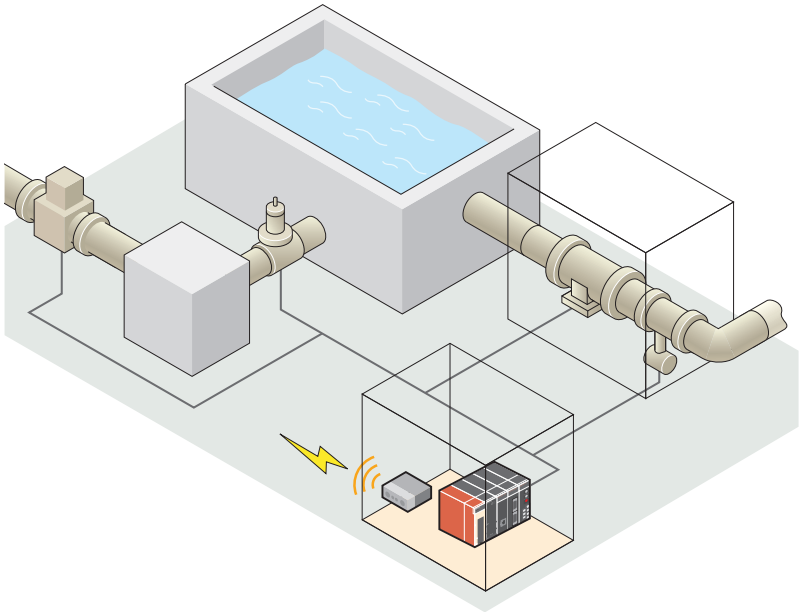
Application Solution

CASE 1

Remote monitoring/control of public infrastructure

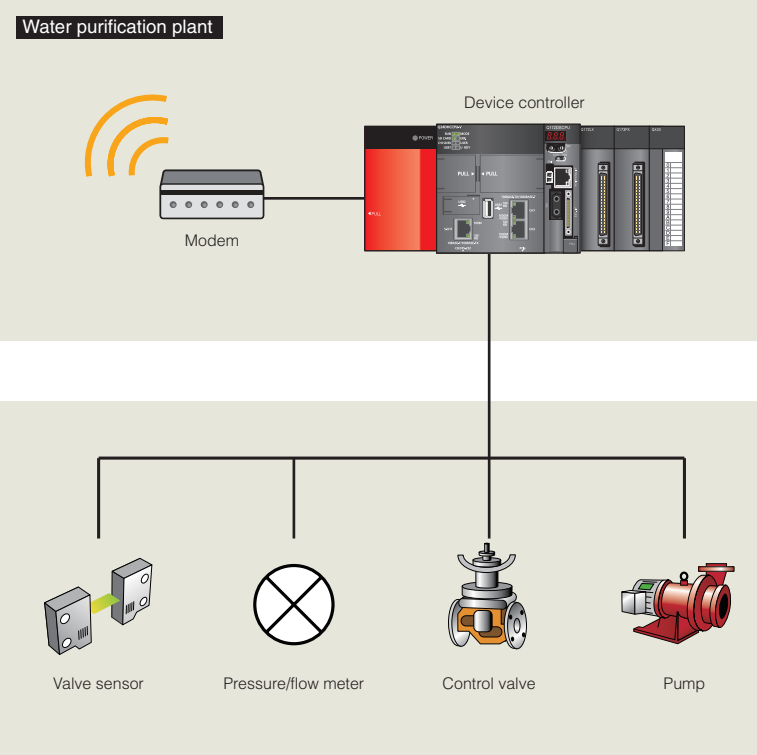
Common issues

- PCs used in harsh locations are not designed for such environments.
- Maintenance concerns such as frequent s/w updates, virus, failure of internal components are quite common with PC systems.
- Dedicated 'C Language' communication programs/protocols are not usually supported by programmable controller systems.



Solution

Increase system life-span by upgrading to MELSEC system platform.



Products within the MELSEC range are designed and manufactured for harsh industrial application requirements and are ideally suited for public infrastructure type applications.

In addition, maintenance costs can be substantially reduced as industrial grade products usually do not require high product replacement cycles associated for PC based systems. Software based upgrades are not as frequent too.

When deciding to upgrade to the MELSEC platform, existing programs and communication protocols can be utilized as supported by the C Controller. There is no need to re-engineer and require expensive recommissioning costs when changing over hardware architectures.

Key advantages

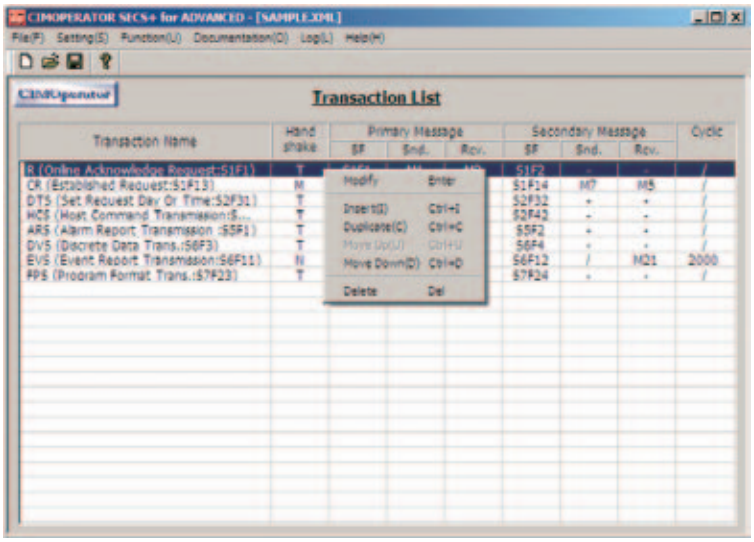
- Maintenance cost reduction
- Robust hardware system
- Few s/w updates required
- Key assets utilization
- Minimum reengineering

CASE 2

Reduce implementation costs for "SECS ready" equipment!

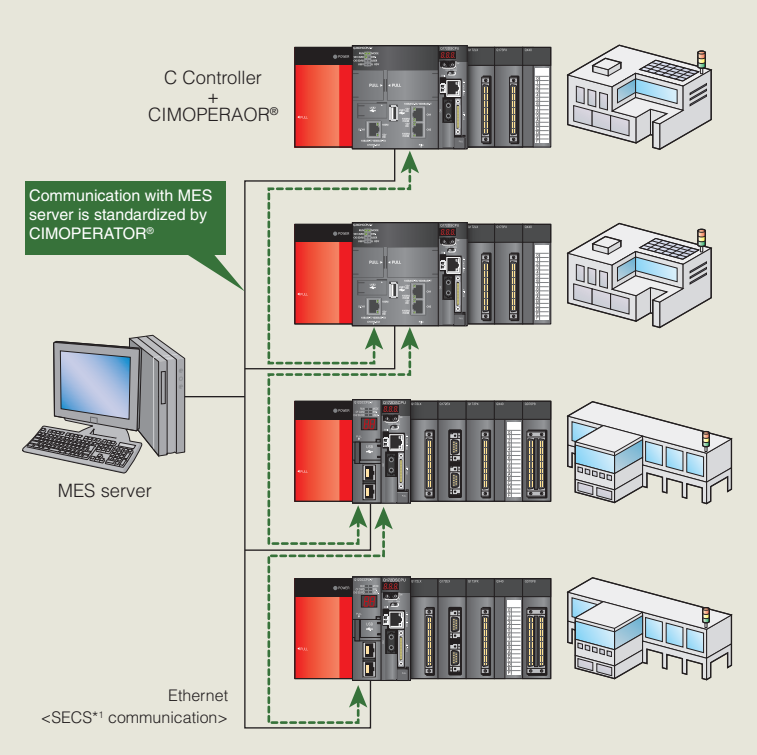
Common issues

- Developing equipment to support SECS*1 communication requires a significant investment in time and costs for the OEM.
- Although SECS*1 interfaces are available from various manufacturers, variances can occur between products which can cause implementation problems even though they are standardized.
- Introducing a PC solution to satisfy SECS*1 communication into the fab can cause clean-room issues because of moving parts such as disk drive, cooling fan, UPS, etc.



Solution

C Controller + CIMOPERATOR® ➡P42



CIMOPERATOR® is a product of NIPPON DENNO CO., LTD.

Utilizing the correlation between the MELSEC system and CIMOPERATOR®, SECS*1 based communication interfaces can be implemented easily throughout the fab.

One of the main benefits is that no separate PC systems are required to realize SECS*1 level communications. Setup is realized using a simple setting GUI rather than extra specific SECS*1 programming required. Not only this brings a reduction in costs as various PC related hardware is no longer required. Also, it eliminates issues when introducing PC systems into the fab environment, especially when clean room operations are used.

The C controller + CIMOPERATOR® solution utilizes the direct link from the MES system to the factory floor provided by the MELSEC solution with CIMOPERATOR® able to store logs linked with the programmable controller. Specific SECS*1 level functionality is realized and flexible to changes in the SECS*1 communication specification without having to update hardware and software modules within the control system.

*1 SECS (SEMI Equipment Communications Standard)

Key advantages

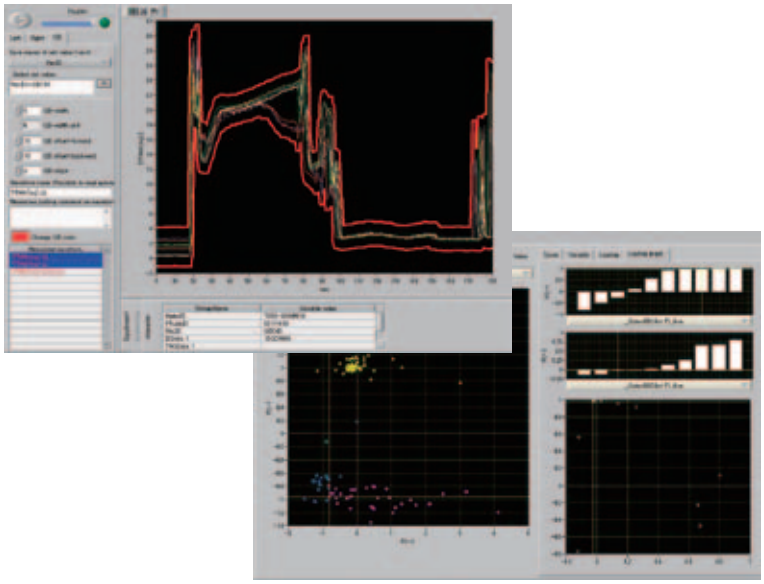
- Easy to implement SECS*1 communication
- No need for extra programming
- Eliminate PC from communication line
- Reduced costs and time
- Industrial level hardware suitable for clean-room
- Event driven analysis improving maintenance
- Enhanced security on factory floor from IT
- Real-time OS controller with PC-like updates not required

CASE 3

Optimized visualization of manufacturing operation data within the fab

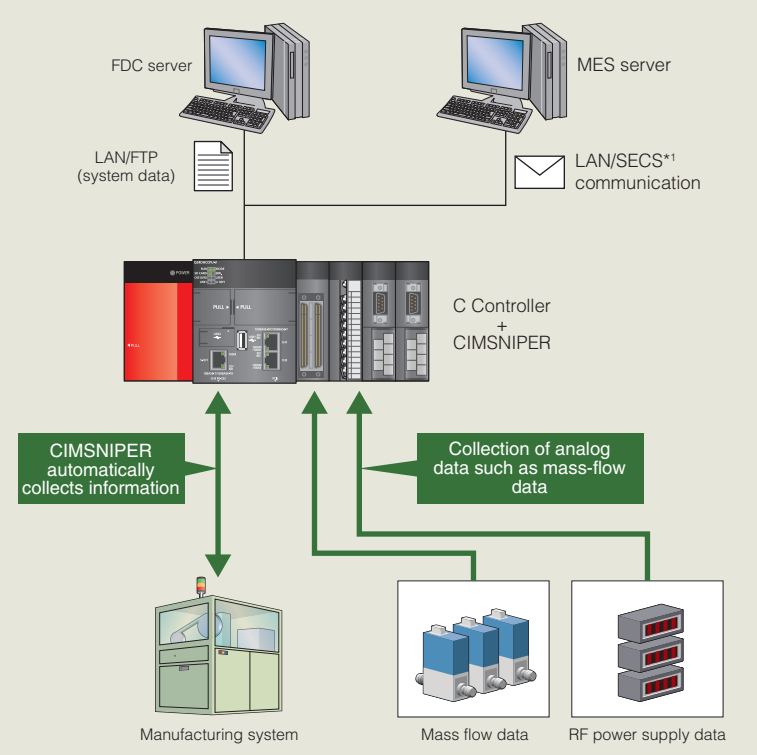
Common issues

- Increased system costs due to modifying process data according to the current maintenance status.
- Extensive programming required for analyzing relevant data for optimum extraction of maintenance and operational data.
- Due to manufacturing information not being detailed enough, actual modification of the manufacturing system can be expensive.
- Maintenance of additional PCs can introduce unnecessary costs and introduce security issues onto the production floor.



Solution

C Controller + CIMSNIPER ➡P43



CIMSNIPER is a product of NIPPON DENNO CO., LTD.

Detailed analysis of the manufacturing process can be achieved by having the C Controller module directly interfacing with CIMSNIPER, a analytical maintenance manufacturing operations software. By having detailed analysis, such as waveform analysis, statistical analysis, correlation, multiple regression, etc., directly extracted from the controller inside the equipment, active monitoring of the manufacturing processes are achieved pin-pointing when manufacturing processes start to deviate allowing to address the problem before the production process deteriorates and the manufacturing process has to be modified.

In addition, materials used in production can be actively monitored indicating the quantity used and the remaining amount waiting to be used. Also, the materials vs process information can be analyzed showing when quality levels deviate when using different material batches.

Implementing this system can be done very easily without any extra programming required with only various parameter settings required via the software. Changes can be done intuitively realizing an easy to maintain manufacturing operations analysis system.

*1 SECS (SEMI Equipment Communications Standard)

Key advantages

- Realize visualization of fab process
- Long product life-cycle
- Data collection from SECS*1 / HSMS / analog / digital
- Easy configuration of S/W
- No process modifications required
- Enhanced industrial level security
- Optimum materials analysis

CASE 4

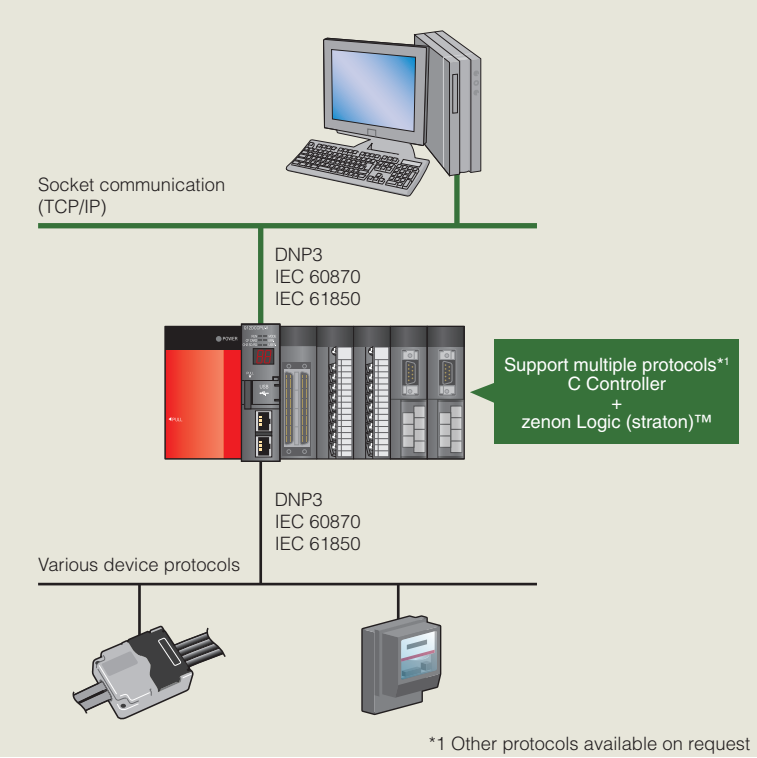
Utilizing dedicated protocols with the C Controller

Common issues

- Increased costs maintaining various different protocols.
- Performance degrades over different protocol drivers and software to realize connectivity.
- Integrating protocol drivers written in C language to discrete control systems can be very difficult.
- Cannot effectively maintain different field devices using various protocols inside the control architecture.

Solution

C Controller + zenon Logic (straton)™ protocol conversion



*1 Other protocols available on request

zenon Logic (straton)™ is a product of COPA-DATA

Within the control system it is quite common to see various different field devices based on different protocols. Although it is quite common to use a PC based system installing various drivers to handle the connection to these devices, this can cause bottle necks along the communication flow.

Adding to this the vast maintenance required whenever hardware becomes obsolete and needs to be changed with continuous updates of drivers required which again adds to the overall cost. Choosing a discrete control system instead such as the MELSEC system results in a much more streamlined control system at the same time reducing costs.

Various protocols can be handled easily within the C Controller module by utilizing zenon Logic (straton)™ a software developed by COPA-DATA, embedded inside the module to provide the flexibility that is required to maintain various different devices and communication protocols. In addition, the MELSEC control system is based on harsh industrial environments and is suitably designed for such situations where PC based solutions would require special enclosures to handle such environments.

Key advantages

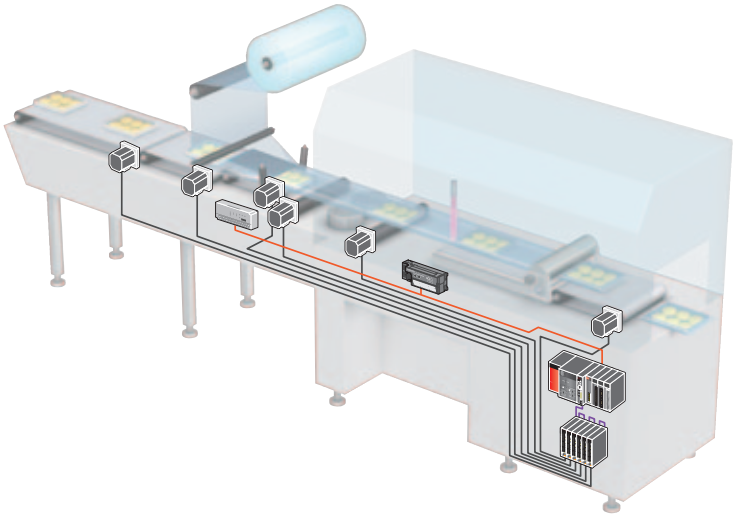
- Handle variables from different devices
- No need to worry about gateway PCs failing
- Open up connectivity to multiple applications
- Industrial spec hardware
- Reduced upgrading costs
- Protocol know-how handled by control system
- Easily define and configure device variables

CASE 5

High-speed I/O applications utilizing custom made programs

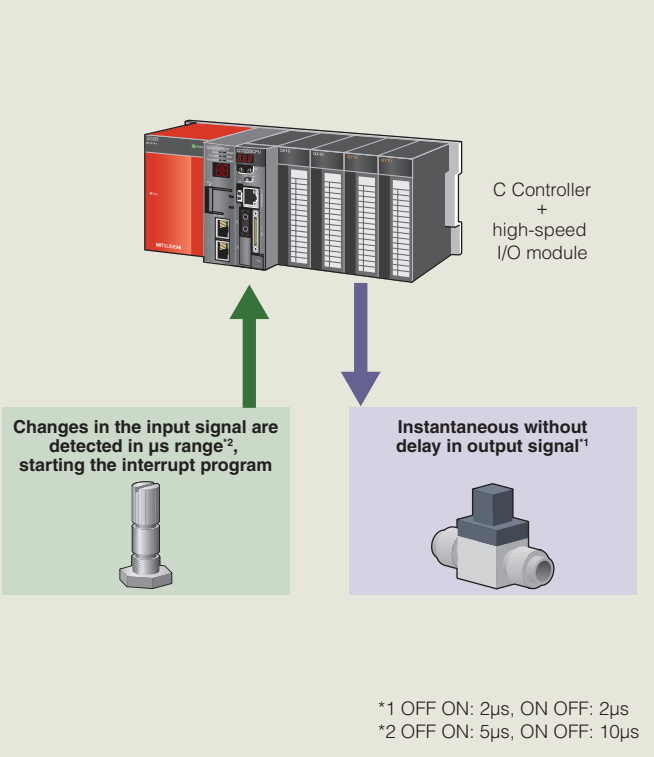
Common issues

- Micro-controller based systems tend to have short life cycle products that have been discontinued.
- Maintenance cycles are difficult as based on a closed system architecture.
- A substantial amount of investment into custom based programs have resulted in systems difficult to upgrade.
- Software virus prone problems are common place with PC based control architectures.
- Getting the right mix of drivers for each hardware component in the control system can substantially increase the commissioning time.



Solution

C Controller + high-speed I/O module



When its time to upgrade the system but certain I/O which require high-speed I/O performance is no longer available can cause a total rethink of the control architecture. This is a common problem with microcomputer and industrial PC based control systems. By switching to the MELSEC control system, these concerns are all but eliminated. Mainly, as the control system architecture is based on long product life cycles with support for discontinued products and a clear upgrade support package.

Although it is uncommon for programmable control systems to have the same performance characteristics as advanced level PCs, the MELSEC system offers a wide range of high-speed, high-performance I/O modules. In addition, if the existing programs are mainly based on C language, this can be utilized by using the C Controller module without having to re-engineer the equipment again.

The MELSEC series also offers high-performance motion control modules that add a further performance upgrade for such applications that require high-speed responses such as in the packaging industry where getting the label on the right way, in the right position at very high-speeds are considered essential in maintaining the manufacturing quality.

Security can also be enhanced as the MELSEC control system eliminates the need to worry about virus prone issues as its not based on PC OS systems, further adding to the security of the overall control system.

Key advantages

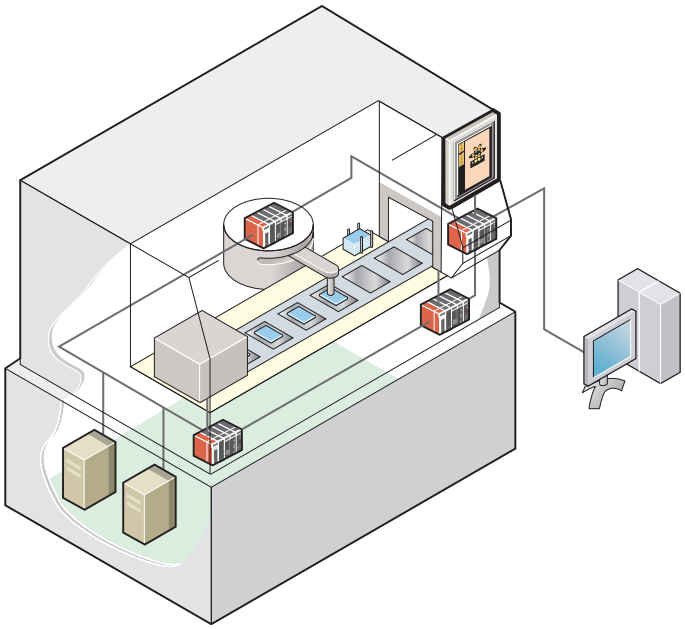
- High-speed I/O performance
- Less discontinued products reducing maintenance costs
- High security systems not weak to software penetration
- Software only requires minor modifications
- Utilize existing programs, no need for complete overhaul
- Robust industrial level build requiring fewer enclosure engineering

CASE 6

Reduced TCO while increasing control performance stability

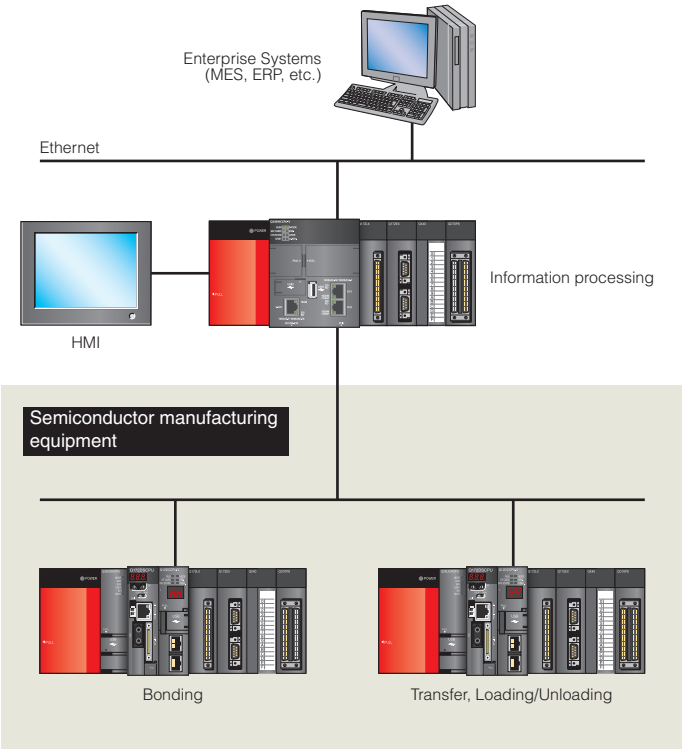
Common issues

- Products becoming obsolete, boards no longer available, discontinued chips are common issues.
- Difficult to update or replace programs created in-house.
- Development software and OS runtime licences are expensive.
- Maintenance cycles are difficult and frequent mainly as equipment have limited space.



Solution

Semiconductor manufacturing equipment



Due to very high footprint costs in the fab, semiconductor manufacturing equipment tend to be very congested with available space at a high premium. With various control products being integrated into these manufacturing systems, maintenance cycles can be quite difficult if frequently required. Opting for a MELSEC based control system greatly reduces the cost of maintenance mainly as once the system has been commissioned it is quite rare for many further changes to be made due to the long life cycle of the products. Also, any changes that are required can be done simply just by exchanging hardware modules with little changes required to the control program software.

In time when systems need to be upgraded, this can be done very easily and at a low cost as the C Controller is based on C language programming and can utilize any original programs that were used previous to the upgrade. Furthermore, most of the programming is very intuitive with various different personnel able to work on the same project without extensive knowledge required.

The precision of the positioning processes such as for loading and unloading of semiconductor wafers is very accurate as it is controlled from the Motion CPU together with high-precision servo motors. In addition, there are no requirements for increased wiring from the motion control system to the main controller as they are all onboard via the Q series high-speed rack, further reducing the need for wiring in the machine.

Key advantages

- Control level interface to SECS/GEM*1
- High-end information processing
- Long lasting products
- Fewer maintenance cycles
- Guaranteed system performance
- Reduced wiring
- Optimize expensive footprint in fab

*1 GEM (Generic Equipment Model)

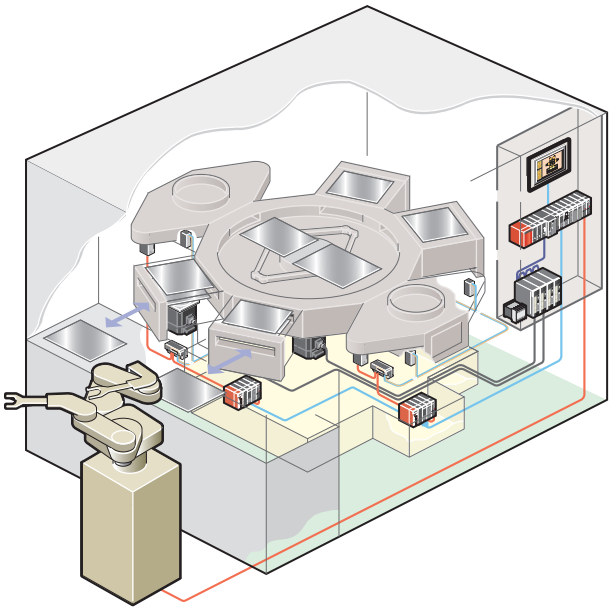
Application Solution

CASE 7

Smaller equipment sizes reduces footprint within the fab

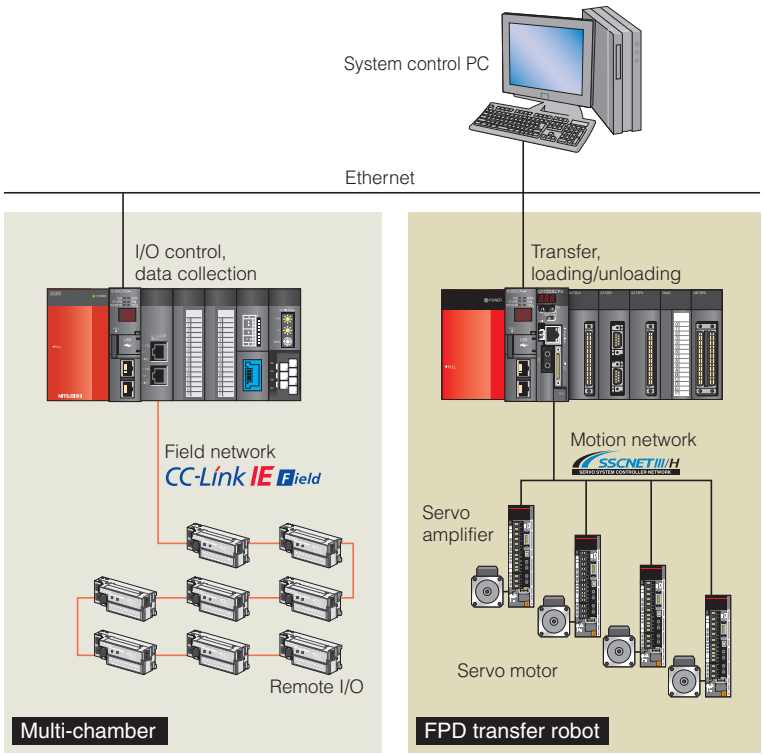
Common issues

- Space can be costly due to complexity of machines and expensive fab space rates.
- Wiring of various hardware can over-complicate the machine causing various maintenance issues.
- Systems developed in-house (PCs / boards) are complicated to maintain.
- Control data communication rates are inadequate and not supporting the amount of data required for production.
- Connectivity to the Enterprise level can introduce a bottle neck in data flow.



Solution

FPD manufacturing equipment



With FPD (Flat Panel Display) manufacturing becoming more complex due to increased throughput, panel sizes, and increases in manufacturing data, manufacturing equipment have to match these needs becoming more complex with further strain on the control system. PC based and microcomputer based solutions are requiring even more boards and software drivers resulting in larger space requirements and increases in maintenance tasks which in the end make the production of such equipment even more expensive. Add to this the further pressure of end users requiring reduction in overall production costs due to miniaturization in consumer products results in the economies of scale for manufacturing being passed onto the OEM.

Implementing the MELSEC control system can reduce these costs, as the system architecture is far more integrated compared to PC based systems and require fewer maintenance cycles. By utilizing the field and motion networks CC-Link IE Field and SSCNET Ⅲ/H, wiring within the equipment can be reduced even when the machines are quite complex. This is achieved mainly due to the iQ Platforms integrated approach by having all control CPUs, (C Controller, programmable controller, motion CPU) all on the same rack, consolidating the control system. In addition, information data can be connected directly to Enterprise level presenting the vast amount of valuable production data to the system.

Key advantages

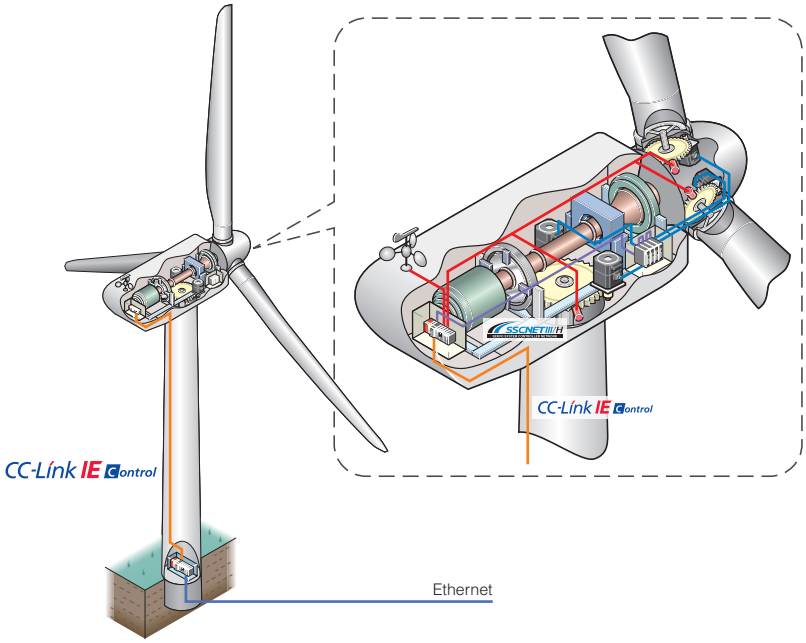
- Reduced equipment sizes
- Reduced wiring
- Enterprise level data connection
- Reduced maintenance
- Increased equipment reliability and performance
- Integrated control architecture
- Standardized solution with fewer customization
- High-speed data collection

CASE 8

Easily integrate renewal energy management/design, while reducing investment and maintenance costs

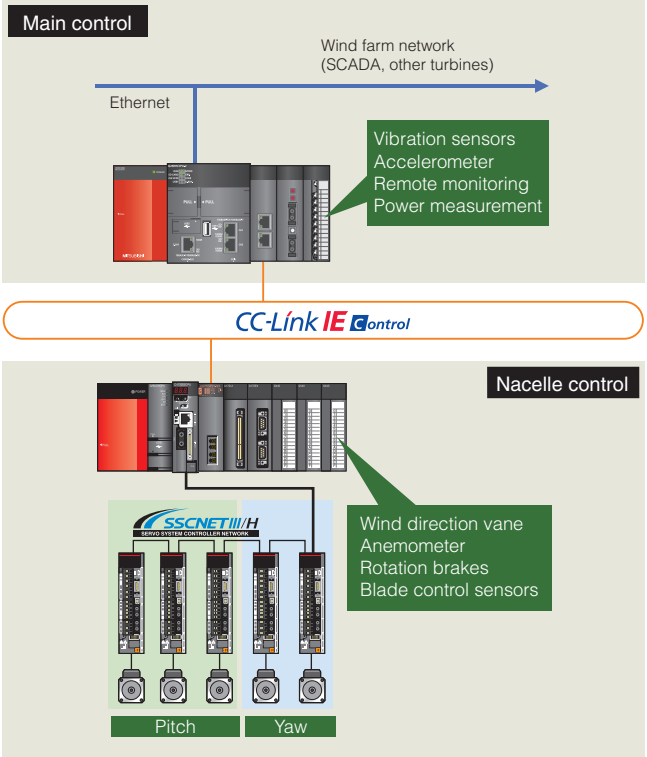
Common issues

- Extensive investment in custom built control system makes overall system cost very expensive.
- Ever changing PC based systems making maintenance difficult.
- Expensive condition monitoring solution required
- Turbines at remote locations require off-site monitoring as unable to visit turbines frequently
- Have to re-engineer all information at design stage when creating the control system



Solution

C Controller + MATLAB® / Simulink® ➡P44



MATLAB®/Simulink® are products of MathWorks Inc.

With an increase of global warming and carbon footprint reduction incentives, renewable energy systems are becoming more common place within the power generation industry. One of these technologies, the Wind Turbine, has gained in share over the past few years and the technology is becoming more common mainly due to its high energy-to-generation ratio.

Designing an effective control system for such an application can be expensive with an extensive investment in engineering required. The collaboration of MathWorks Inc. MATLAB®/Simulink® and the C Controller has provided a way of getting information created at the design stage to the engineering stage of commissioning the control system. C-code can be automatically generated once the simulation and design of the system has been completed, without having to re-enter it all over again which can induce errors in the production chain.

Utilizing the MELSEC control system has increased advantages within the actual control of the turbine too. The pitch and yaw, fundamental features in a windmill which enable optimum utilization of wind speed/direction are controlled directly by the Q series Motion CPU. In addition, condition monitoring algorithms can be executed directly in the C Controller, with real-time values coming from various sensors connected directly to the MELSEC control system. Both the Main control and Nacelle control are connected via CC-Link IE Control system ensuring fast and reliable data communication between systems. The Ethernet line is used for connecting to the overall farm monitoring substation and interconnecting other turbines within the same farm site.

Key advantages

- Reliable control system
- Integration of design stage data
- Accurate control of pitch/yaw
- Farm-wide data visualization
- Extensive real-time power control
- Standard components ensuring easy commisioning
- Flexible, reliable, efficient

CASE 9

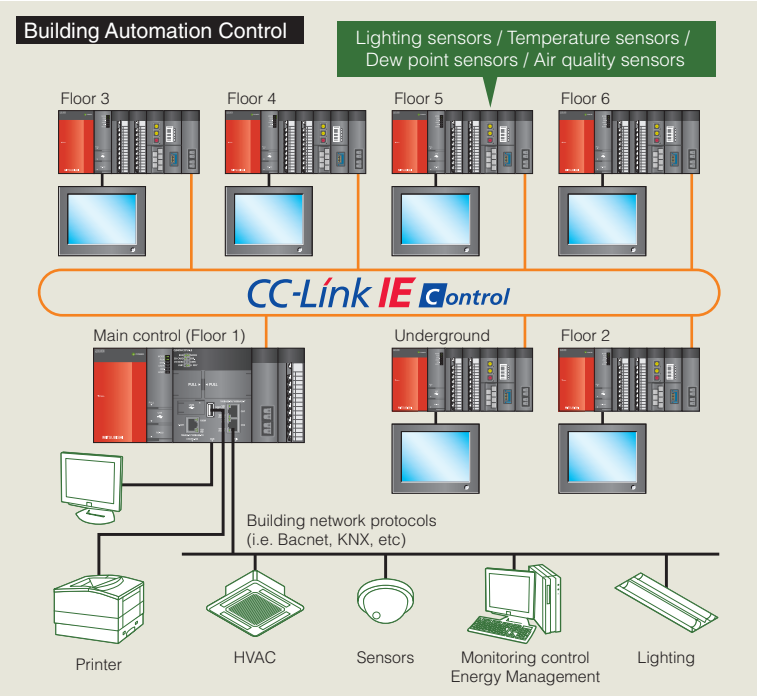
Increase security and ensure effective utilization of energy management capabilities

Common issues

- Building energy costs continually increasing.
- Many different protocols, standards, and products to integrate into the Building Automation System.
- Security issues related to current PC based systems introduce infiltration risks.
- Need to reduce overall building carbon footprint.

Solution

Secure open source based building automation system



BACNET is a trademark of ASHRAE Standards Committee
KNX is a trademark of KNX Association
Linux is a trademark of Linus Torvalds

With Building design technology getting more complex, advance building automation systems are required even more to satisfy ongoing trends in energy conservation. A typical building automation system has many different elements integrated with a diverse range of devices from various 3rd party manufacturers.

With this application example, a customer specifically required to integrate its various devices using known building automation network protocols. The customer eventually decided to base the main control system on the OS-Independent type MELSEC C Controller using a local Linux® based OS software solution. The main reason for the choice was based on security requirements and having an open source solution that enabled taking advantage of the C Controllers capability to install advanced level energy management algorithms.

Building automation, similar to infrastructure solutions are susceptible to online security threats that can be quite serious. Picking a Linux® based solution, gave the customer greater control over its security deployment without disrupting the building automation system. In addition, the C Controllers ability for C language based programming enabled for advanced energy monitoring and control algorithms to be utilized, especially related to the HVAC and lighting control systems. Together with the open platform architecture of the C Controller system, other automation devices such as Inverters and a diverse range of I/O were incorporated into the automation system resulting in an efficient and energy conservation solution.

Key advantages

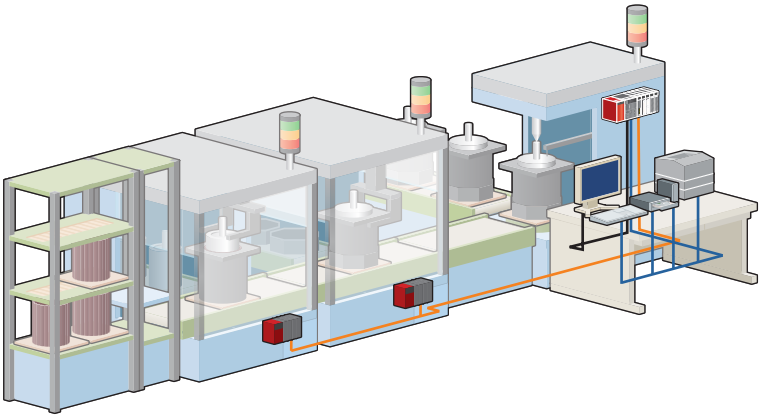
- Increased security.
- Utilization of advanced algorithms.
- Reduction of building carbon footprint.
- Extensive sensor based control solution.
- Integration of various 3rd party devices.
- Attractive economies of scale.
- Flexible to addition of various protocol standards.

CASE 10

Ensuing future availability of parts and improved reliability on an in-line production testing cell

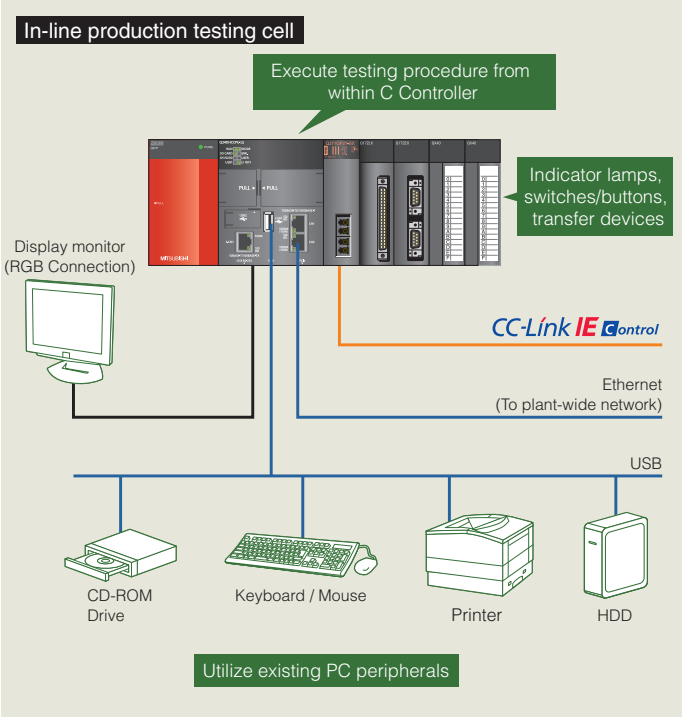
Common issues

- Considering to change to a more reliable system, however integrating existing devices is difficult.
- PC system is not so robust and requires frequent maintenance in addition to coping with the harsh factory operating environment.
- In-line testing cell sometimes viewed as the bottle neck of the production line.
- Multiple maintenance cycles are required as various boards may require driver updates.
- Cannot easily connect to existing production control network.



Solution

C Controller based solution utilizing existing devices



Linux is a trademark of Linus Torvalds

As production cycles are getting more faster and traceability requirements are getting more stringent to improve overall quality, the integration of highly robust discrete control to PC based analytical systems on the production line is becoming more common.

In general, the discrete controller is ideal for actual machine control but has been overlooked for analytical processes such as production management, testing procedure, etc. The development of the C Controller module has enabled a way of satisfying these requirements by having a PC like performance product designed with robust industrial standard requirements which can be installed on the main control system rack.

The controller has an OS independent architecture (in this case with a Linux® OS installed), enabling utilization of several USB type PC peripherals, which usually would have been replaced. The original PC based system was easily replaced and the existing testing program which was a custom made C based program was able to be executed in the C Controller.

In addition, the C Controller system gave possibilities for the cell to be connected to the production wide LAN and to the controller real-time network providing a way to pass on vital production data to the central management system along with the line control system further improving its traceability capabilities. The system was also able to share control information in the machine and interact with various discrete devices, such as switches and indicator lamps.

Key advantages

- Utilization of existing PC peripherals.
- Industrial based robust architecture.
- Open source capabilities.
- Integration to factory network.
- Long term cost efficient replacement.
- Standard components ensuring easy commissioning.
- Utilize C based program.

Features

Designed for ease of use with high performance capabilities

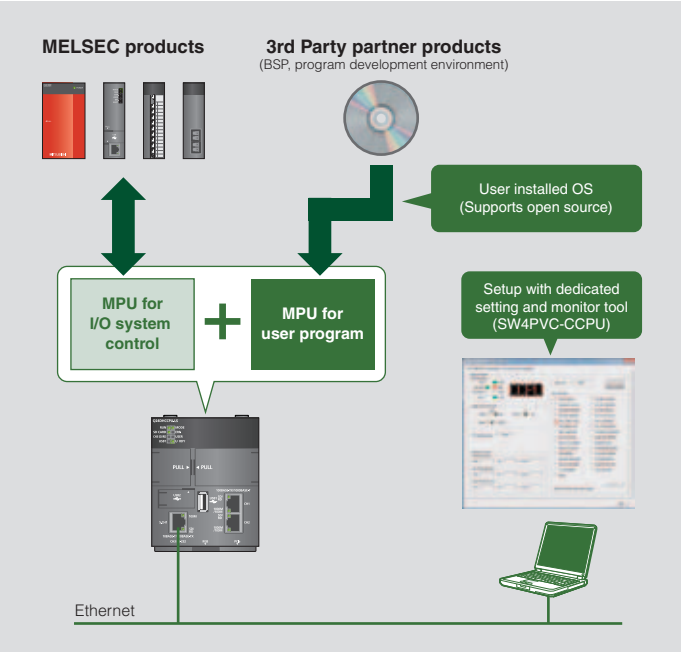
OS Independent architecture

Q24-V ☆☆☆ Q12-V ☆☆☆ Q24-LS ★★★

Realize customized solutions by utilizing a standard OS

The LS type C Controller is based on the OS independent 2x MPU architecture. This enables an OS customized to your applications to be directly installed in the MPU for user programs (Intel® ATOM™).

The MPU for user programs is designed to access the MPU for I/O system control (SH-4A), which is based on a real-time OS. Together with 3rd Party partner products such as from Lineo Solutions, Inc. Linux® based sample codes can be used within the control system, for example.



Advanced performance

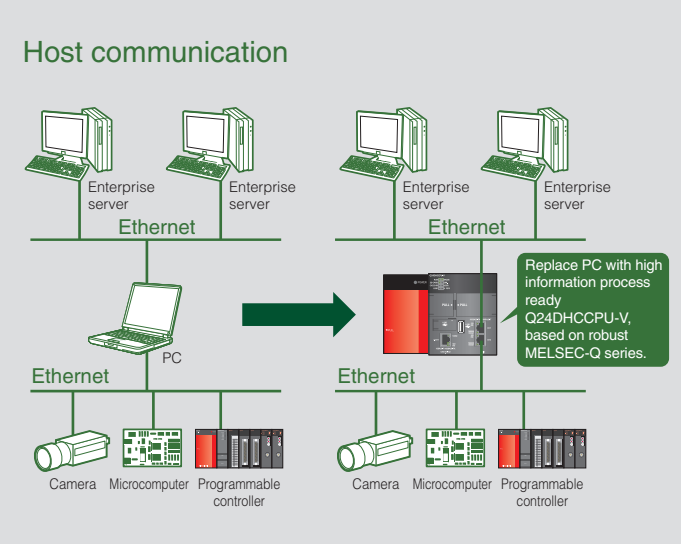
Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

High-speed, large data processing performance

The Intel®Atom™ MPU is included as the main processer for executing the user program, in addition to 512MB of RAM capacity.
Therefore, by utilizing this high information processing capability, large-volume information processing program features usually associated with PCs such as are realized:

- Data processing,
- Numerical operations,
- Communication processing

These unique features enable the customer to transfer to the MELSEC-Q series with minimal effort whilst retaining the high performance features expected for an information processing system. In addition, the system becomes more robust as it is based on an industrial architecture that guarantees a longer product life-cycle with increased reliability across the board.



High real-time properties

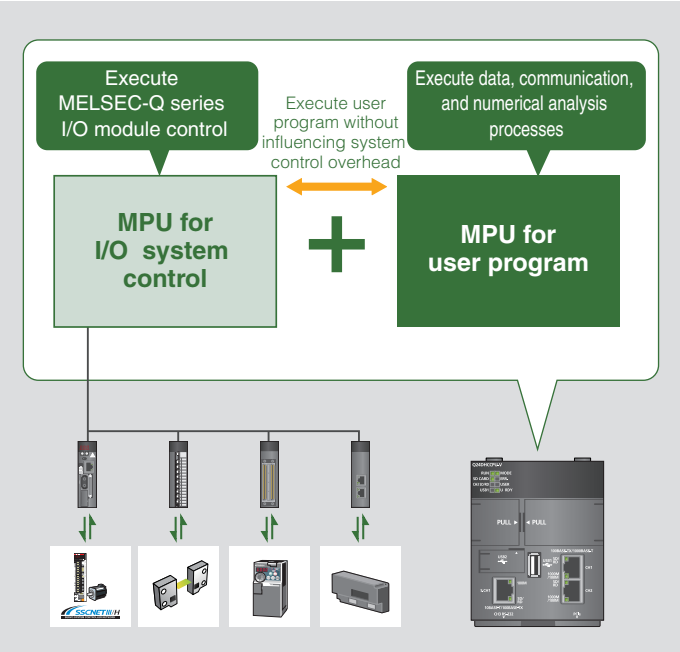
Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Guarantee process performance regardless of overhead

Incorporates two dedicated MPUs.

- For user program
- For controlling MELSEC system I/Os

By having both the system and user program on separate MPUs, if there are any variations in the user program overhead, this will not influence the system control side. This is due to the user program utilizing the Intel®Atom™ characteristics. Hence, realizing an advanced system that is ideal for high speed processing applications without fluctuating performance.



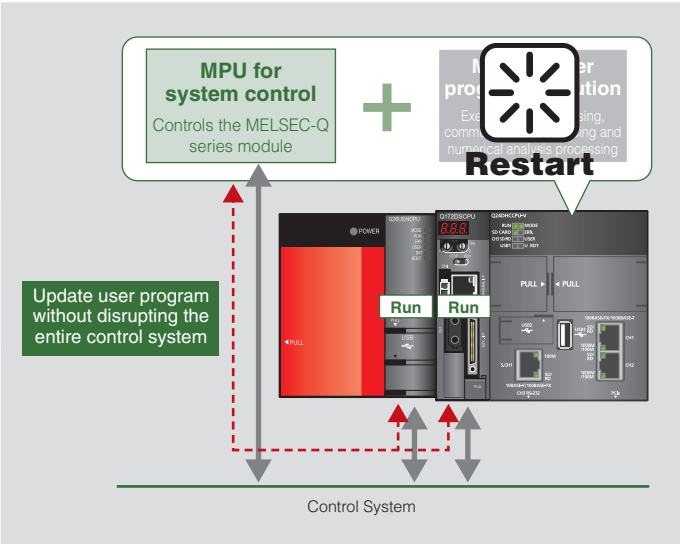
User CPU restart

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Restart user system without resetting control system

When the C Controller is incorporated into a multi-CPU system the user program portion of the C Controller can be reset without disrupting other parts of the controller system. Therefore, if the user program needs to be updated for a routine maintenance task, for example, sequence control can be maintained by the PC CPU, and the same for motion control by the Motion CPU.

This feature is ideal for routine maintenance and sudden error situations where the C Controller portion of the control system needs to be updated or conduct some kind of troubleshooting activity while the rest of the control system can be continued in order not to disrupt the overall production cycle.



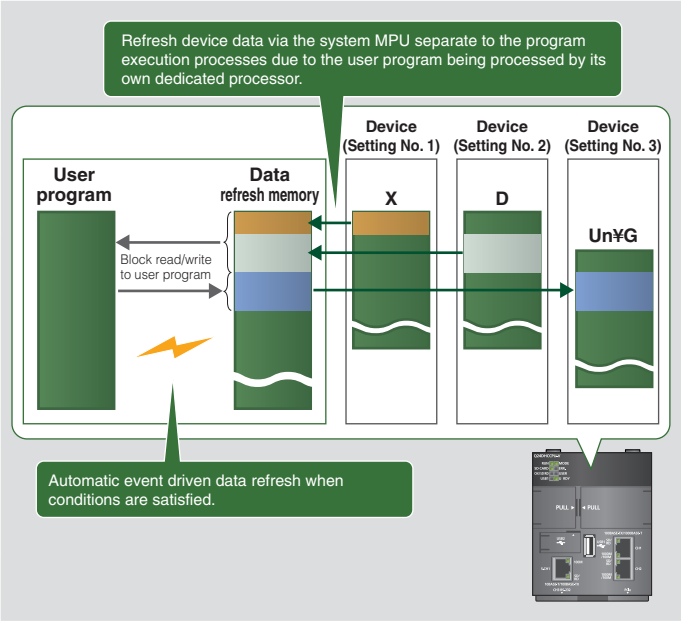
Data refresh

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Improved program/device access efficiency with automatic data refresh capability

The C Controller includes a function that makes it simple to refresh data values automatically without having to include specific code that requires individual monitoring of device values from within the user program. This is achieved by automatically refreshing system I/O devices, intelligent function module buffer memory, and any other memory that is shared within the multi-CPU configuration directly into the C Controllers local memory area.

By simply setting conditions specific to the data refresh memory within the parameters, an interrupt can be initiated when certain given conditions are satisfied. This results in a leaner system with reduced overhead on the user program processing portion of the C Controller.

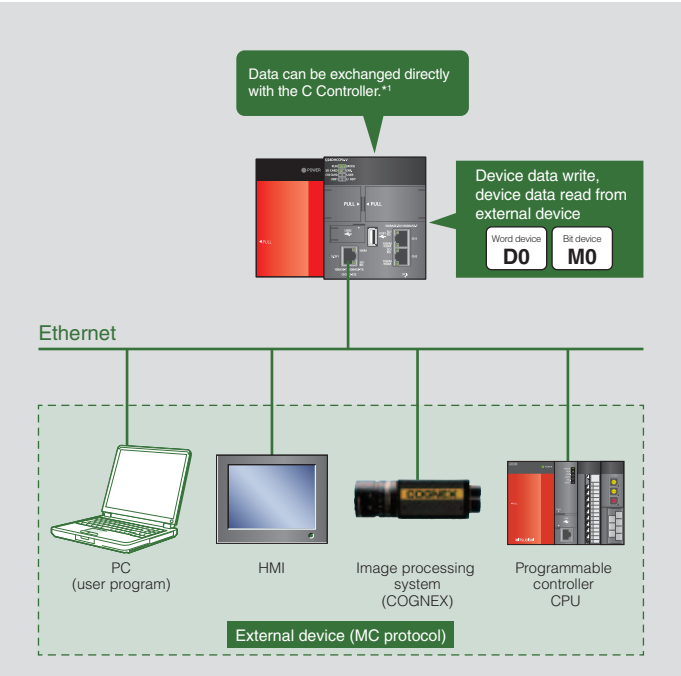


MC Protocol Function

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Easily monitor the system, analyze data and control production from a PC or HMI

MC protocol (QnA compatible 3E frame), the programmable controller communication protocol, is supported via the system Ethernet port.
Various types of units (C Controller, programmable controller) are supported for communication with external devices (PC, HMI, etc.), allowing data to be exchanged with a standard communication method.



*1 Multiple CPU, other station CPUs, and other station CPUs via network cannot be accessed using MC Protocol function.

Traceability

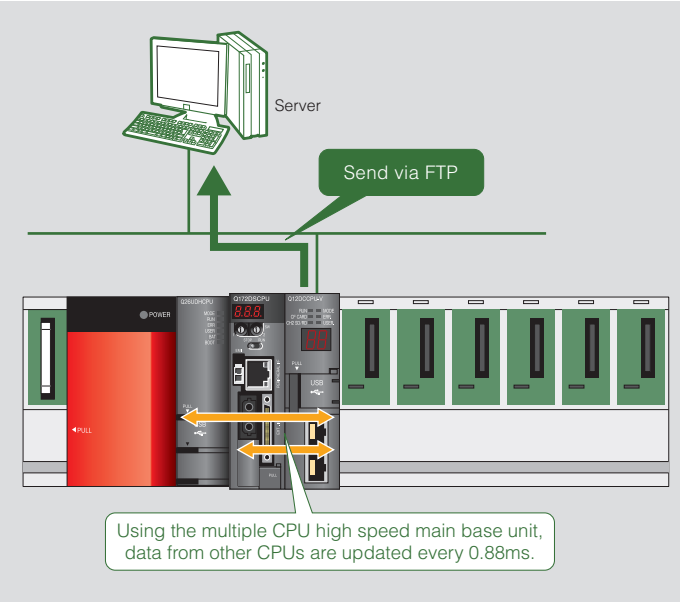
Q24-V ★☆☆ Q12-V ★★★ Q24-LS ☆☆☆

Collect and forward large amounts of data at high speed for comprehensive traceability.

Various types of data can be obtained by the C Controller such as device values from within the programmable controller-CPU and detailed positional and speed information for the servo drive from the motion CPU.

This data can be updated at very fast rates (every 0.88ms) via the multiple CPU high speed main base unit just by using the auto-refresh functionality.

Then only the required data can be compiled within the C Controller for utilization in a log file for presentation to higher level systems such as MES/ERP databases.

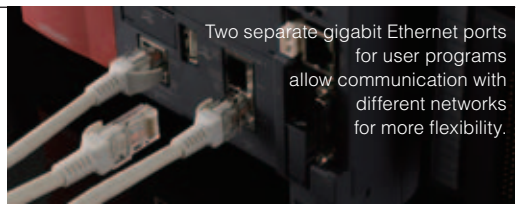


Information system

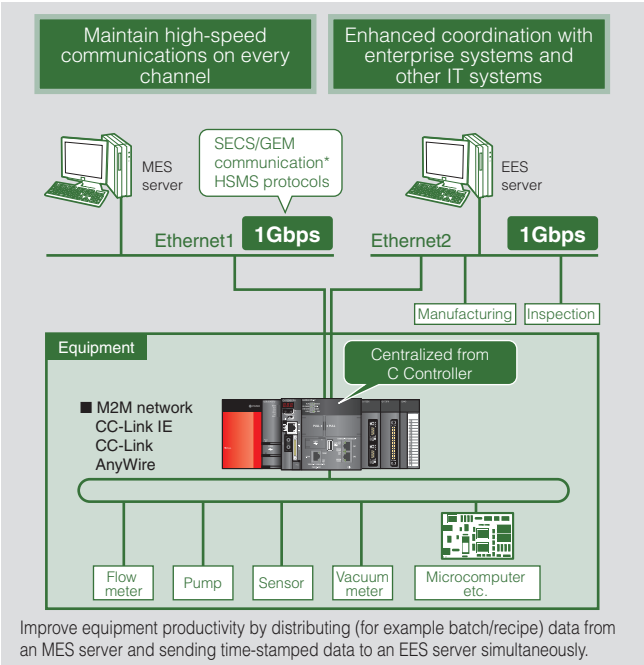
Q24-V ★★★ Q12-V ★☆☆ Q24-LS ★★★

Flexible network structure

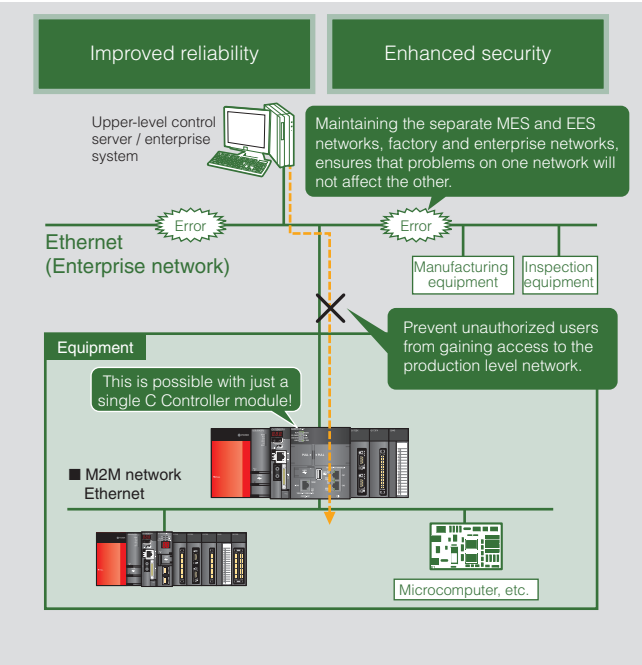
With two gigabit Ethernet ports*1 for user programs, real-time communication can be performed to improve system operating efficiency and productivity.
*1. The maximum Q120DCCPU-V communication speed is 100 Mbps.



■ Application example 1: Real-time communication with MES and EES servers



■ Application example 2: Enhanced network security



* Implement SECS communication easily, without user programs, by using "CIMOPERATOR® SECS+" by NIPPON DENNO Co., LTD.

Features

Designed for ease of use with high performance capabilities

Device function

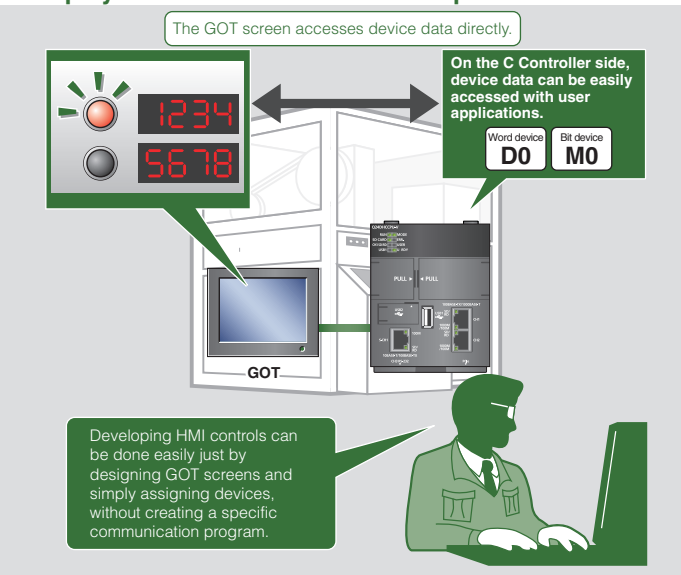
Q24-V ★★★ Q12-V ★★★ Q24-LS ★★☆

Quickly and easily establish communications without a program using the device function.

Create virtual devices, similar to those used by MELSEC programmable controllers, in the memory of the C Controller CPU using the device function.
These devices can be accessed from the Mitsubishi display GOT without a communication program in the similar way as the programmable controller CPU, and the data can be read or written.
Reduce engineering costs by simplifying the implementation of HMIs and other devices by removing the need to write communication programs.

For more information about compatible HMIs, refer to the Mitsubishi Graphic Operation Terminal GOT1000 General Catalog [L(NA)08054].

■ Application example: Easily create a GOT screen to display device values and control operations.



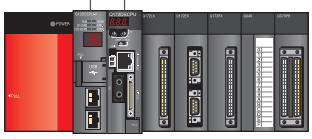
Enhanced motion integration

Q24-V ★☆☆ Q12-V ★★★ Q24-LS ☆☆☆

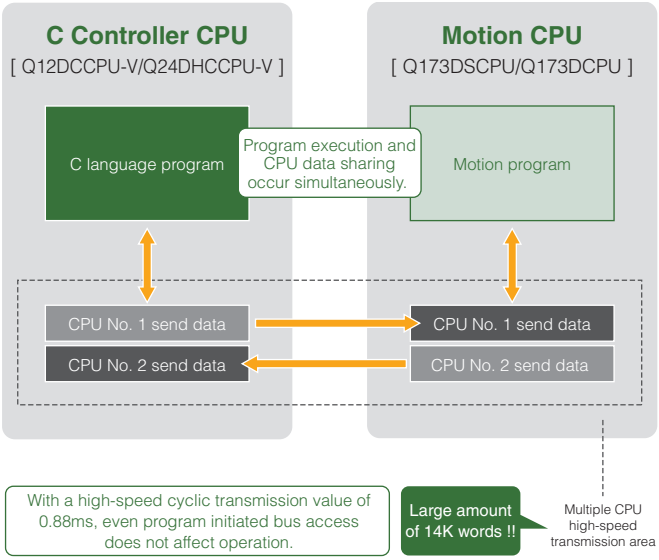
Shorten system cycle time

In a multiple CPU system large volumes of data can be shared between CPUs (14K words/0.88ms), independently of the programs, resulting in faster cycle times.

Multiple CPU system = C Controller CPU + Motion CPU



Advanced control with shorter cycle times

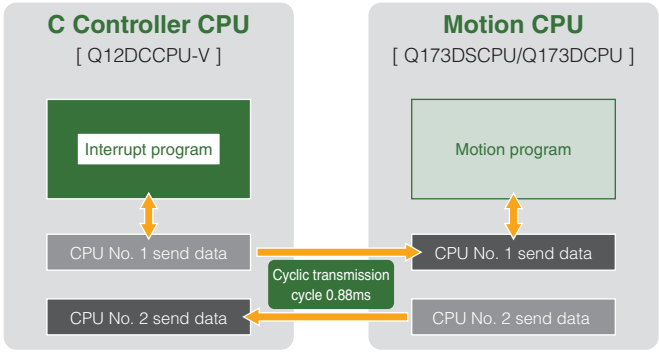


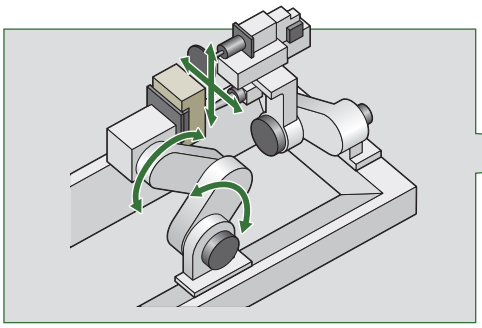
Motion synchronization

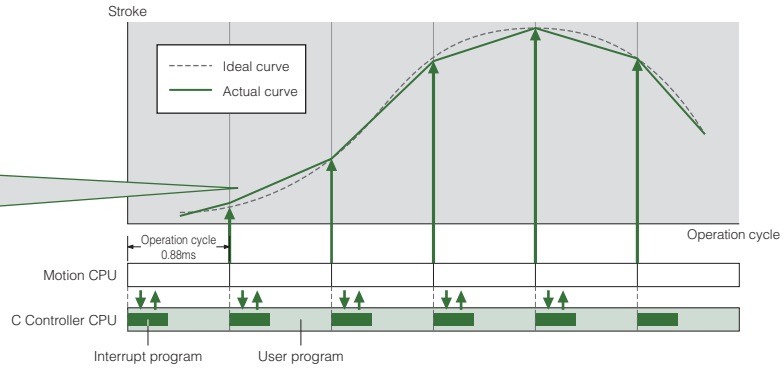
Q24-V ☆☆☆ Q12-V ★★★ Q24-LS ☆☆☆

High-performance, high-precision sequential control and tracking control

The C Controller CPU Q12DCCPU-V can execute an interrupt program synchronized to the multiple CPU high-speed communication cycle.
This allows high-speed retrieval of the motion CPU and a high-speed response. In addition, interrupt programs are not delayed by program execution cycle or priority levels for multiple tasks, allowing real-time sequential control to synchronize with motion control, and tracking control to keep up with the constant changes in target value.







Real-time interrupt events

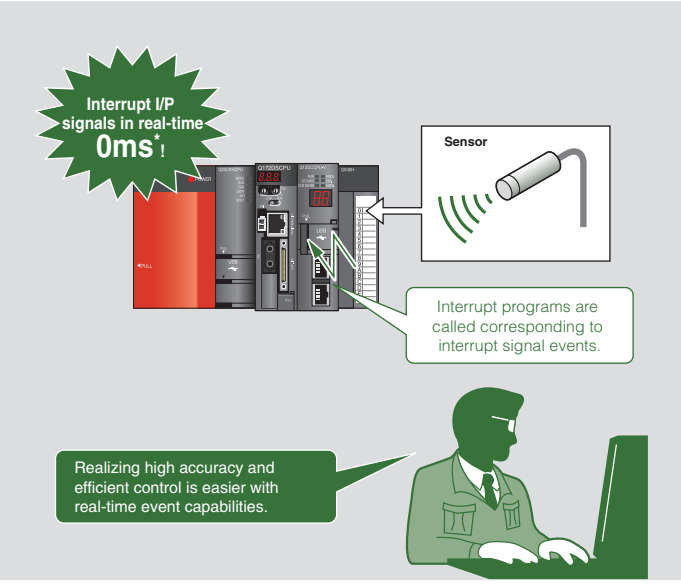
Q24-V ☆☆☆ Q12-V ★★★ Q24-LS ☆☆☆

Real-time interrupt processing from intelligent function and interrupt I/P modules

Real-time interrupt program events can be executed instantly by the C Controller directly from various intelligent function and interrupt I/P modules without being affected by user program overhead fluctuations that may influence the overall system process performance.

Real-time response capabilities is functionality expected in precision control systems and is incorporated into the C Controller to enable high accurate and ultra high performance capabilities for applications that require such stringent control such as with microcomputer and computer based control solutions.

■ Application example: Use a high-speed DC input module to start an interrupt program



* The response time can be changed via settings.

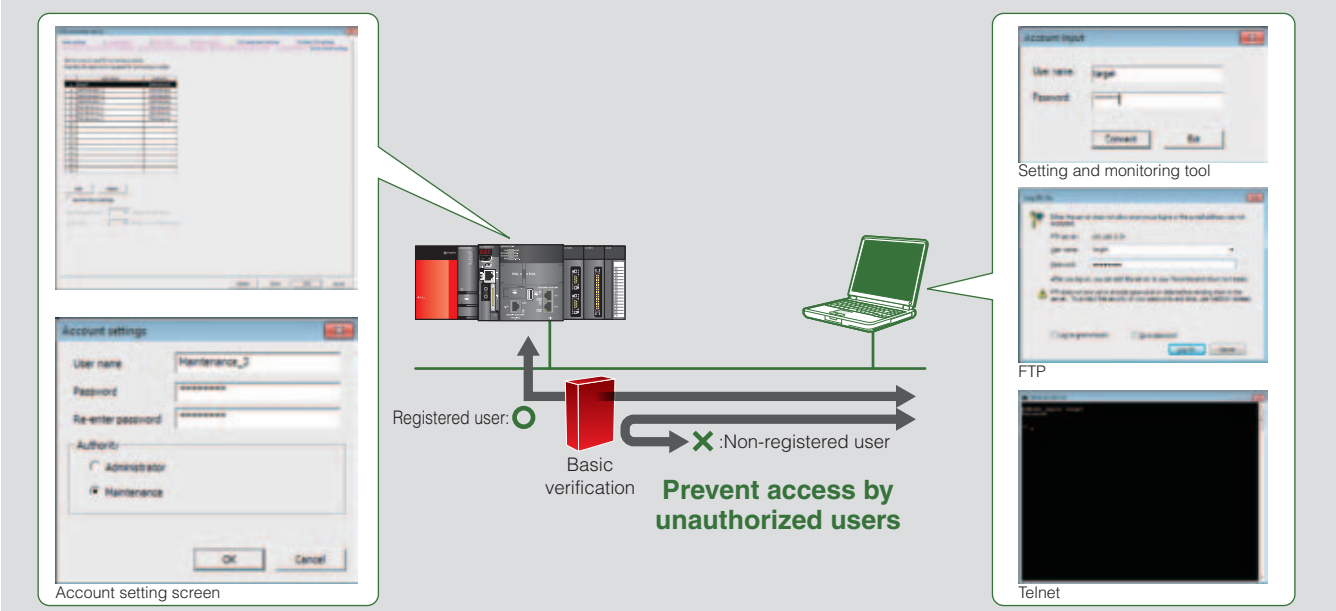
Access level hierarchy

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Set the log-in user restrictions and lockout to prevent unauthorized access

Set the log-in user and account lockout* settings when accessing by the C Controller software, FTP, and Telnet.
Unauthorized access can be prevented by having different access levels (administrator, field operator, etc) corresponding to accessible functions (read, write, execute).

* Setting to limit number of times account verification mistaken in succession.
If the account verification successively fails more than the set number of times, the verification will be denied (locked out) for a set time.

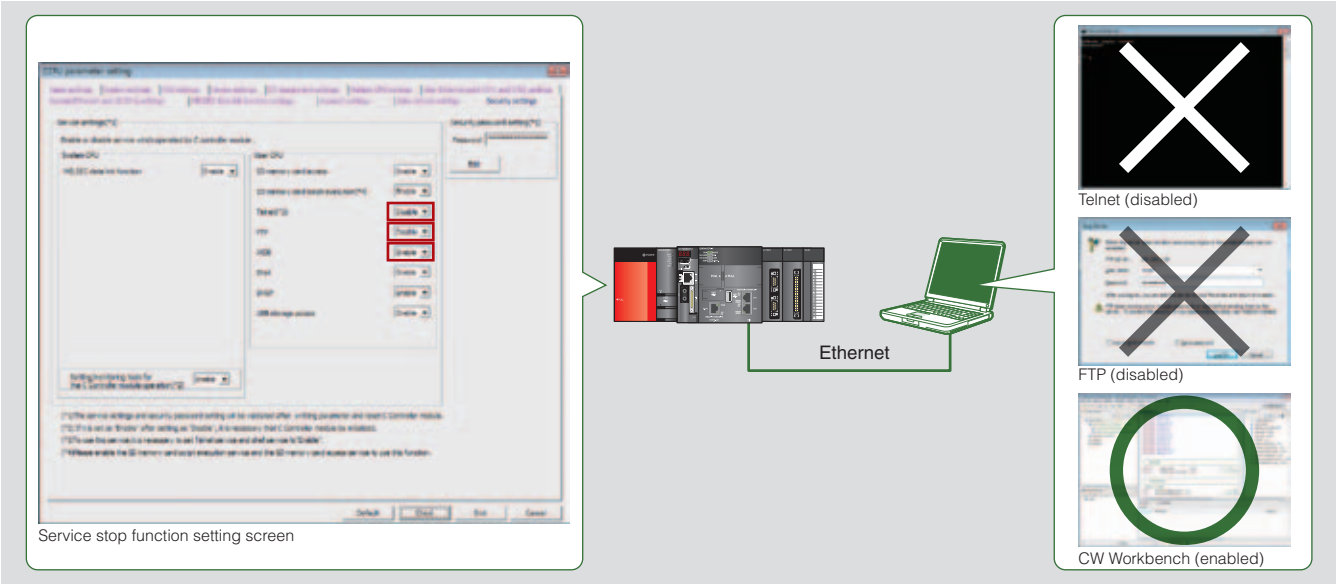


Service Setting Function

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Further increase security by stopping of various connection services

Services that are executing inside the C Controller can be individually set. To increase security, the following service status can be enabled/disabled in the C Controller setting and monitor tool parameter settings, for example.

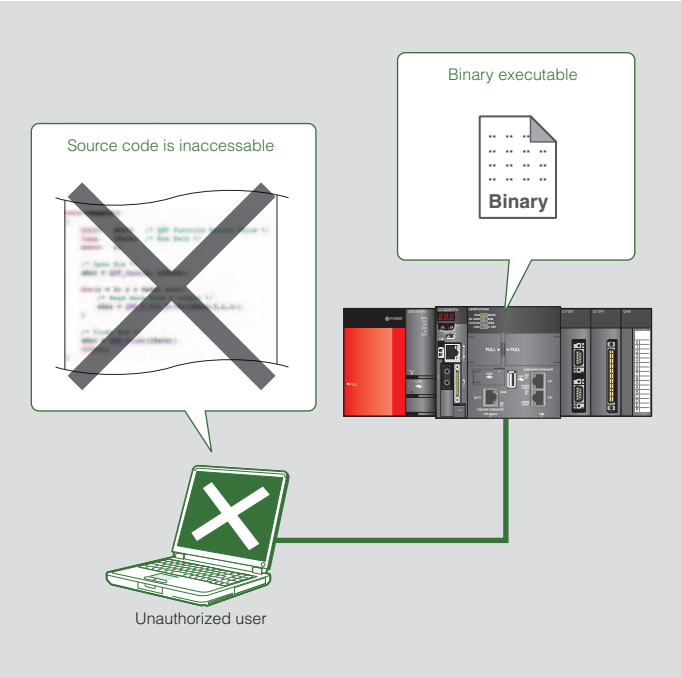


Intellectual property protection

Q24-V ★★★ Q12-V ★★★ Q24-LS ★★★

Prevent IP theft of source code, etc.

By having the source code stored in binary format unauthorized access to user applications can be prevented. This is very important when machine makers, for example, are are shipping there products overseas and they want to maintain there intellectual property from being exploited. Also, it prevents key systems in the process from being altered without the required consent of the manufacturer.

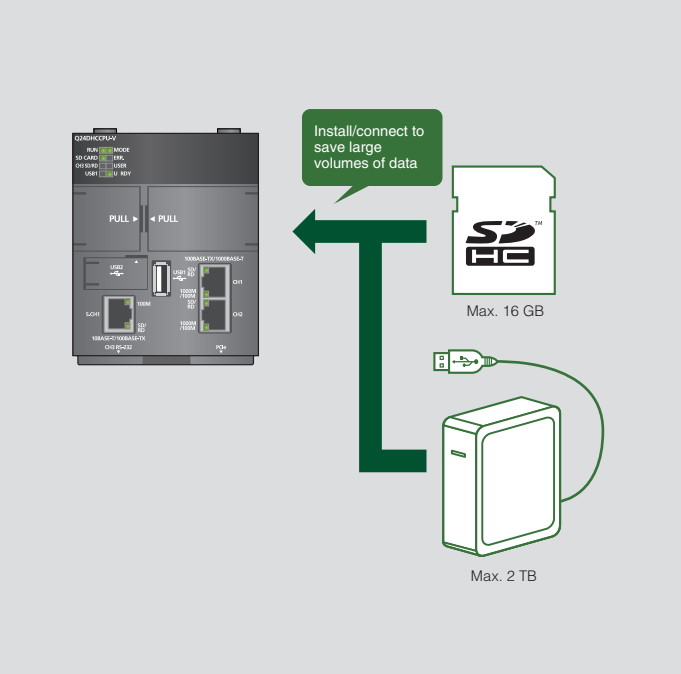


Large-volume data handling

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Utilize large volume data handling for various processes

The C Controller supports large data volumes similar to PC control systems. Designed into the module is a SD memory card slot with up to 16GB SDHC memory capability, and a USB 2.0 interface supporting up to 2TB external storage.



Features

Designed for ease of use with high performance capabilities

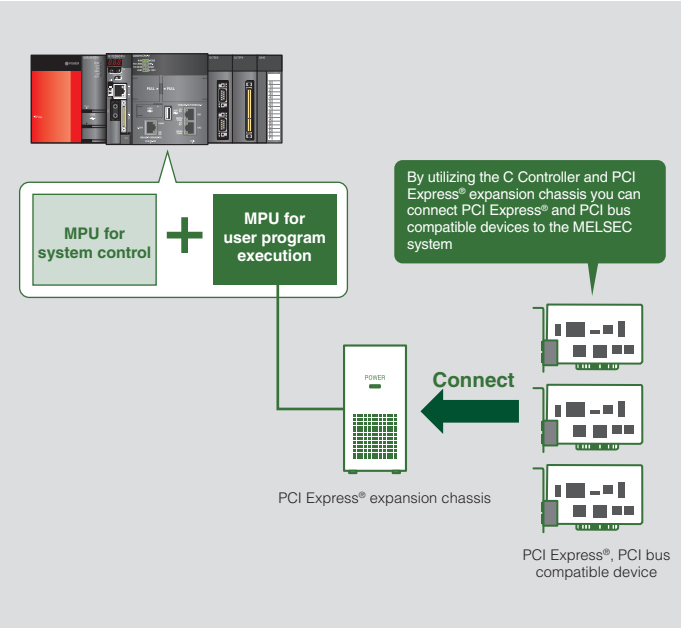
PCI Express® *1 extension connector

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Utilize PCI Express® and PCI bus compatible devices

A PCI Express® type expansion chassis can be connected to the built-in PCI Express® extension connector. By connecting a PCI Express® or PCI bus compatible device to this expansion chassis, your valuable assets can be incorporated into various system configurations.
The MELSEC-Q series can replace PCI Express® or PCI bus compatible devices, having ample program assets, or even systems using dedicated devices with special functions.

*1 Supporting PCI Express base specification Rev. 1.0a x1.



*2 Consult with your nearest Mitsubishi sales office or representative for more information when considering using the PCI Express® expansion connector.

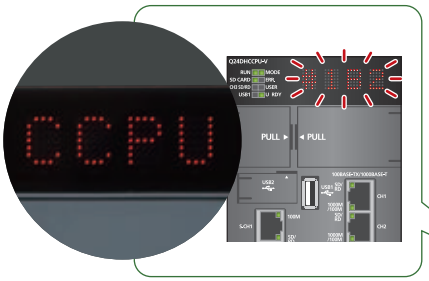
User programmable display

Q24-V ★★★ Q12-V ★★★ Q24-LS ★★★

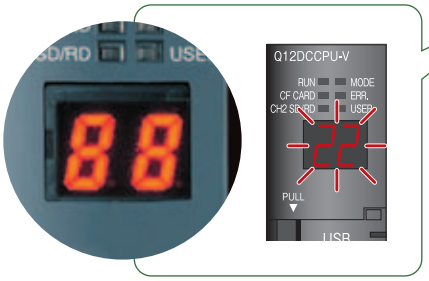
Easily view the system status and improve maintenance with the embedded LED display

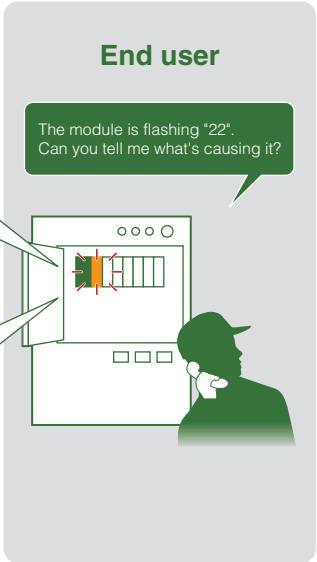
Maintenance operations and downtime responses are improved by allowing system status information to be viewed easily on the fly or remotely from a PC using the dedicated monitoring tool. Also status codes can be customized directly from within the user program, which is very helpful during debugging and commissioning of the equipment.

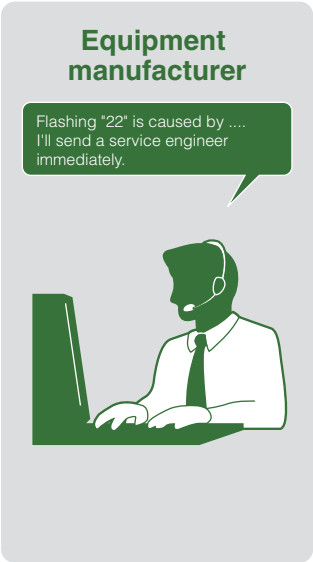
LED display (Dot-matrix)
Q24DHCCPU-V
Q24DHCCPU-LS
Display alphabetic characters and symbols in addition to numbers.



LED display (7-segment)
Q12DCCPU-V
Display numeric and simple alphabetic characters.







High Speed Data Logger Module compatibility

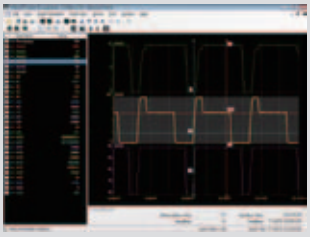
Q24-V ★★★ Q12-V ★★★ Q24-LS ★★★

High speed data logging with no PC

C Controller CPUs are now compatible with the High Speed Data Logger Module.
Just by making some simple settings, device values from the C Controller module can be captured and saved in Excel®, CSV, or binary format. Additionally, the system can be monitored using a real-time view mode. To allow for ease of preventive maintenance or hasten the response to machine trouble, e-mail messages can be sent automatically when user defined conditions are met.

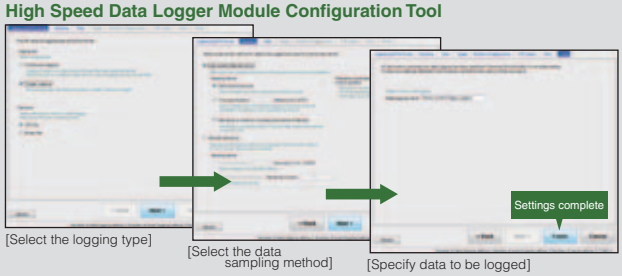
■ GX LogViewer & High Speed Data Logger Module setting tool

Logging data display and analysis tool "GX LogViewer"



[Trend graph display]
View a list of events or a trend graph [pictured left] either in real-time (online) or historical (saved file) modes. Helpful features ensure key information is immediately visible.

High Speed Data Logger Module Configuration Tool

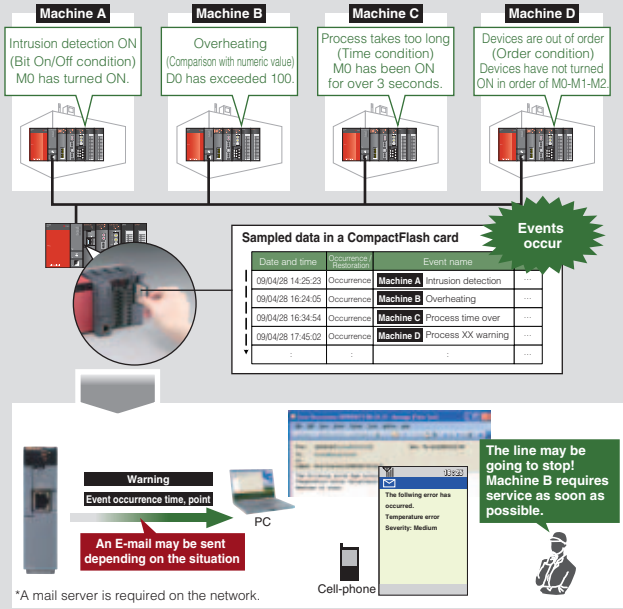


Even making sophisticated data collection rules is easy to do using the intuitive step-by-step configuration process.

* GX LogViewer and the High Speed Data Logger Module Configuration Tool can be downloaded from the Mitsubishi Electric FA website (FA membership required (free)).

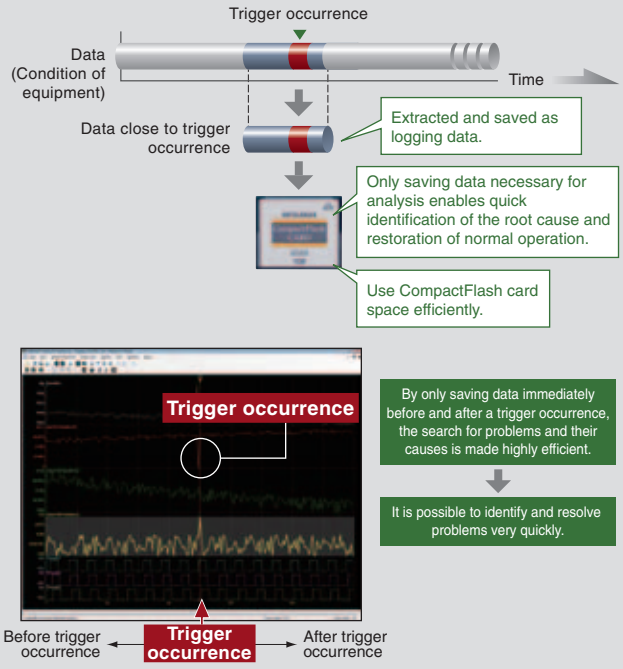
■ Event logging function

Superior event condition detection and time-line of events facilitates the detection of failures before they happen

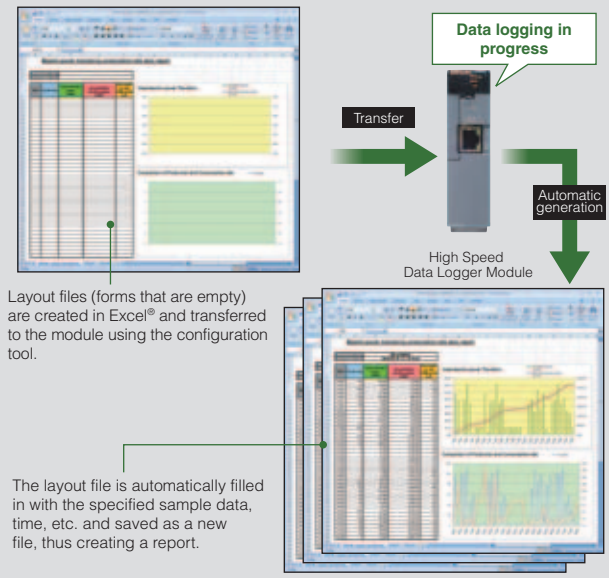


*A mail server is required on the network.

■ Trigger logging function



■ Automatic generation of forms and reports as Excel® files



C Controller setting and monitoring tool (parameter setting)

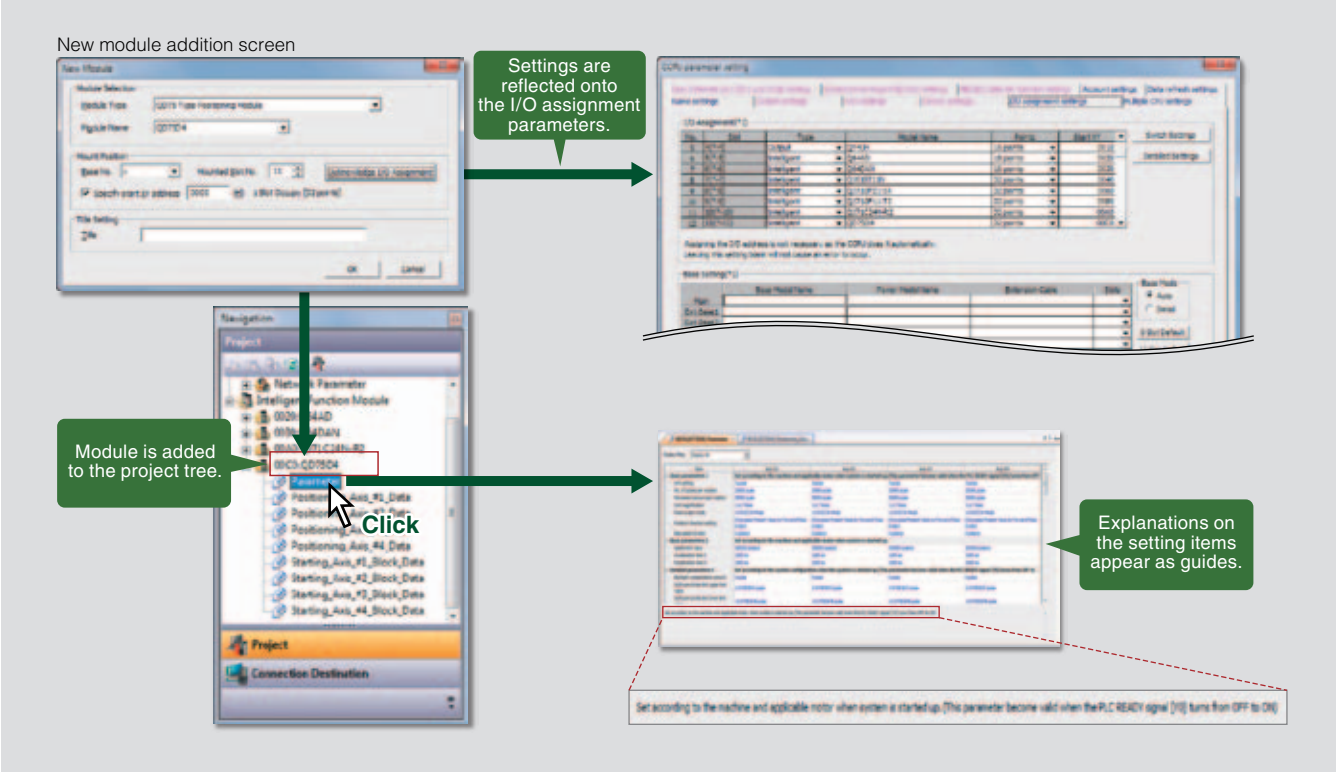
Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Setup intelligent function module parameters directly from the C Controller

The C Controller software includes parameter setting functionality that enables easy setup of intelligent function modules within the control system. Rather than working with complicated driver software for interfacing to intelligent I/O, the software provides a quick and intuitive method for setting up the parameters.

This is ideal for:
- Performing maintenance tasks
- Easier to conduct commissioning of equipment
- Debugging and troubleshooting is quicker
- Less resources needed which results in lower project costs

Setting parameters are no longer a burden with laborious driver code modifications required. With more and more programmers preferring intuitive GUI based software, overall training of maintenance and commissioning engineers can be kept to a minimum as setup can be performed very easily which in turn reduces the total investment needed.

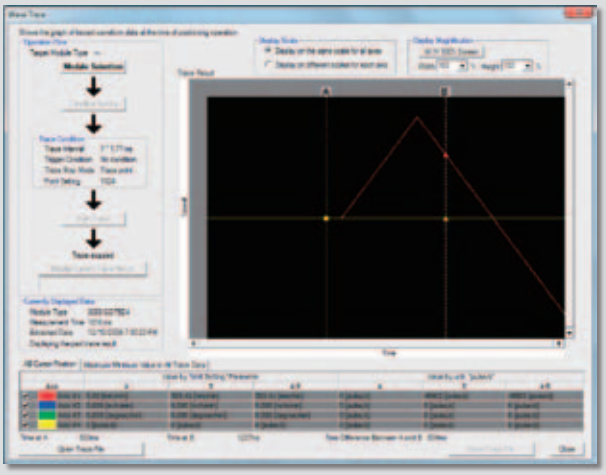


C Controller setting and monitoring tool (debug)

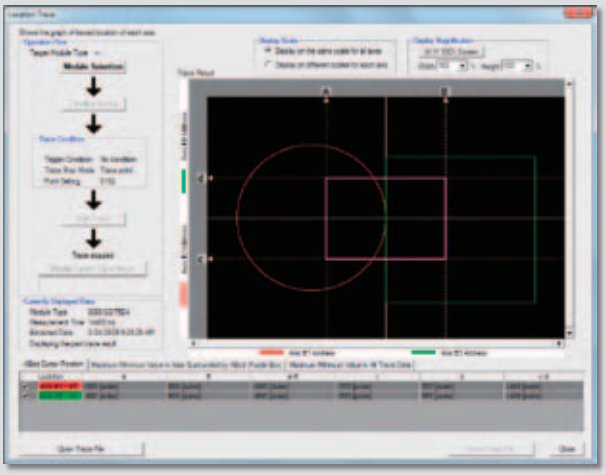
Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Visible positioning trace

The speed command (axis speed), 2-axis interpolation, and simultaneous start (2-axis) status are traced and displayed as a graph.
The value of each axis can be visually checked during the online operation of the positioning module.



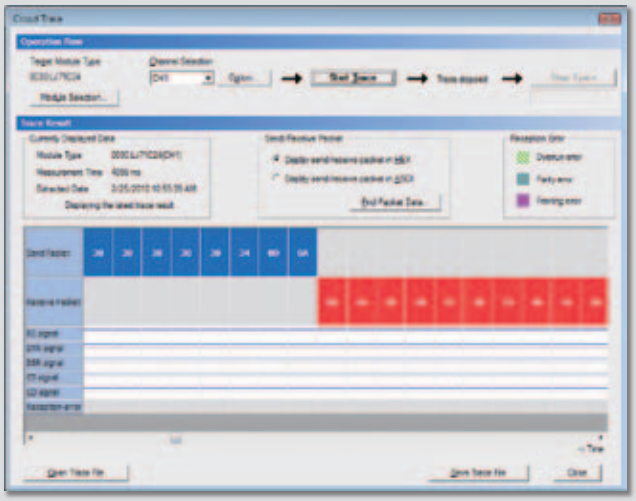
Trace function screen (Wave Trace)



Trace function screen (Location Trace)

Serial communication line data capture

The line data, communication signal and status monitor, etc., can be confirmed even without a line analyzer so debugging can be carried out easily.



Circuit Trace

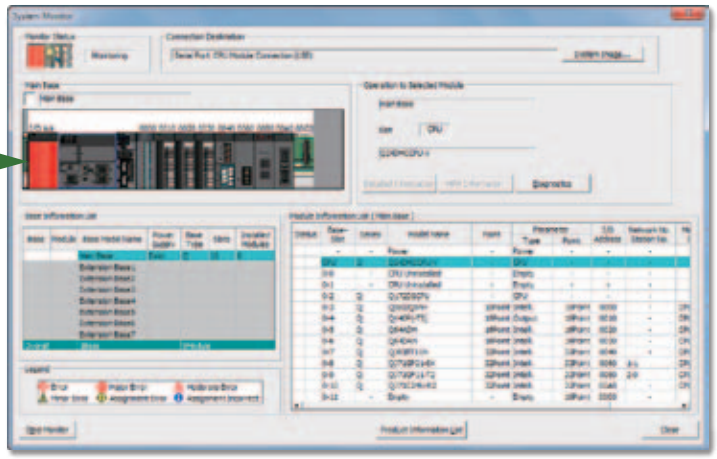
Transmission data running through the line can be recorded in the modules data area, eliminating the need for a line analyzer., etc.

C Controller setting and monitoring tool (commissioning & maintenance)

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

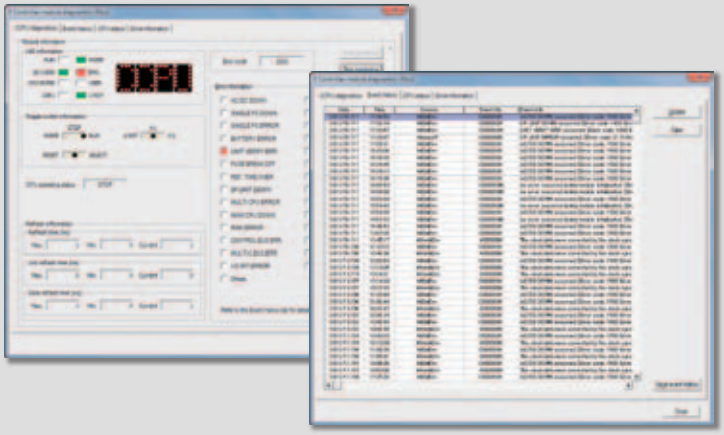
Extensive system diagnostics via intuitive graphic interface

The C Controller system can be easily monitored at system level due to the system wide monitoring graphic interface. Detailed diagnostic information that is required for trouble shooting during commissioning and maintenance cycles are made easier.



See the operation state of each module in a glance.

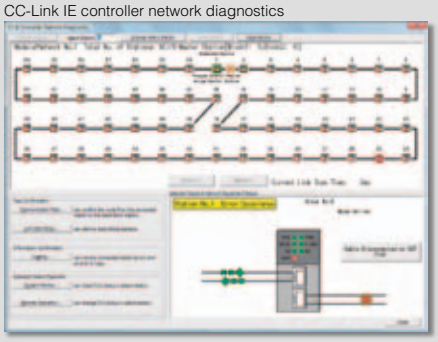
[C Controller diagnostics]
Quickly check errors and view historical events on the C Controller.



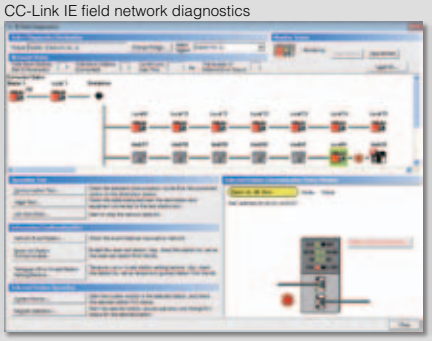
[Detailed module information]
View detailed module errors and status with troubleshooting methods for quick response situations.

[Network diagnostics]
By having the entire networks operation status viewable makes it easier to identify root causes of errors on the network line. In addition to monitoring other network stations within the network and controlling there master control programmable controllers operation.

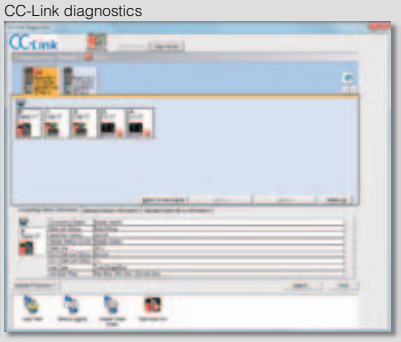
CC-Link IE controller network diagnostics



CC-Link IE field network diagnostics



CC-Link diagnostics

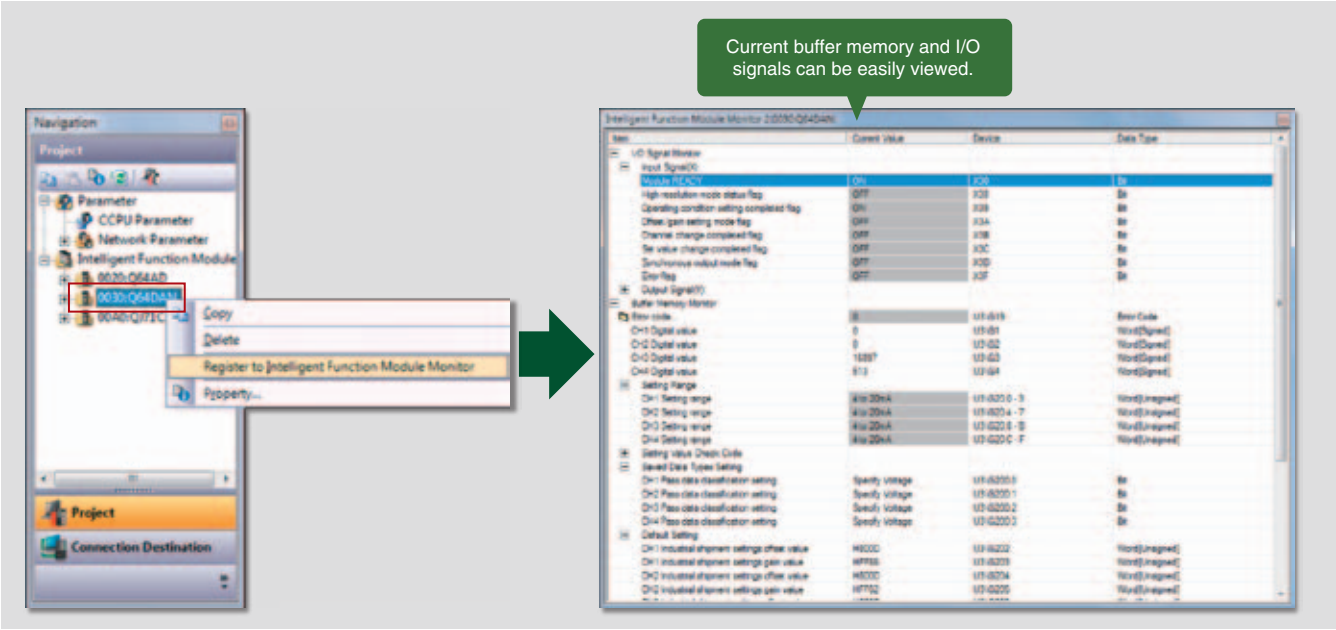


C Controller setting and monitoring tool (commissioning & maintenance)

Q24-V ★★★ Q12-V ☆☆☆ Q24-LS ★★★

Dedicated intelligent function module monitor

When monitoring the ladder program, the intelligent function modules buffer memory can also be monitored in the docking window. Also, as each buffer memory address name is displayed, there is no need to refer to the users manual to check for more information regarding the buffer memory. Multiple module monitor windows can also be switched simply by using the tabs on the bottom of the window.



Dedicated library functions

Simpler programming by using a dedicated library suite for access to MELSEC platform hardware.

Do away with issues relating to PC control systems by having a dedicated library for access to the MELSEC system platform. Various libraries exist, including C Controller dedicated library (CCPU function), QBUS interface library (QBF function), and MELSEC communication library to directly access the C Controller, I/O modules, intelligent function modules, network modules, and other multi-CPU modules such as the programmable controller and motion CPU.

CCPU functions*1

This dedicated library is used to read the C Controller status, control the LED, and access resources such as the clock and battery backed-up RAM, etc.

Category	Function (some excerpts)	Feature
Data refresh memory access	CCPU_ReadDataRefreshMemory	Reads data from the C Controller module's data refresh memory.
	CCPU_WriteDataRefreshMemory	Writes data to the C Controller module's data refresh memory.
User MPU operation status control	CCPU_Restart	Restarts the system in the C Controller module.
LED access	CCPU_GetDotMatrixLED	Gets value displayed on the C Controller module's dot matrix LED.
	CCPU_SetDotMatrixLED	Sets value displayed on the C Controller module's dot matrix LED.
Interrupt event control	CCPU_EntryCyclicTimerInt	Registers a routine in the C Controller module's cyclic timer interrupt.
	CCPU_EntryWDTInt	Registers a routine in the C Controller module's user WDT error interrupt.
	CCPU_WaitDataRefreshEvent	Waits for the C Controller module's data refresh interrupt event.
	CCPU_WaitSwitchEvent	Waits for the C Controller module's switch interrupt event.
Battery backed-up RAM access	CCPU_ReadSRAM	Reads data from the C Controller module's battery backed-up RAM.
	CCPU_WriteSRAM	Writes data to the C Controller module's battery backed-up RAM.
Event history registration	CCPU_RegistEventLog	Registers an event log in the C Controller module's event history.
Memory card access	CCPU_MountMemoryCard	Mounts the memory card mounted in the C Controller module.
	CCPU_UnmountMemoryCard	Unmounts the memory card mounted in the C Controller module.
Acquisition of module status information	CCPU_GetCpuStatus	Retrieves the C Controller module's operation status.
	CCPU_GetSwitchStatus	Retrieves the status of the C Controller module's switch.
Error information control	CCPU_GetErrInfo	Retrieves the C Controller module's error information.
	CCPU_ClearError	Resets the C Controller module's error.
Clock data control	CCPU_GetRTC	Retrieves the C Controller module's RTC time.
	CCPU_SetRTC	Sets the C Controller module's RTC time.

*1 Only supported by Q24DHCCPU-V.

QBF functions

This dedicated library enables the C Controller to access I/O modules and intelligent function modules.

Category	Function (some excerpts)	Feature
Open/close	QBF_Open	Open a bus.
	QBF_Close	Close a bus.
I/O access	QBF_X_In_BitEx	Reads a single point in the input signal (X).
	QBF_X_In_WordEx	Reads input signal (X) in 1-word units.
	QBF_Y_Out_BitEx	Outputs a single point in the output signal (Y).
	QBF_Y_Out_WordEx	Outputs output signal (Y) in 1-word units.
	QBF_Y_In_BitEx	Reads a single point in the output signal (Y).
	QBF_Y_In_WordEx	Reads output signal (Y) in 1-word units.
CPU shared memory/ buffer memory access	QBF_ToBuf	Writes data to the CPU shared memory of the specified module and the buffer memory of the intelligent function module.
	QBF_FromBuf	Reads data from the CPU shared memory of the specified module and the buffer memory of the intelligent function module.
Acquisition of module status information	QBF_ReadStatusEx*1	Reads the status information (LED, error, etc.) of C Controller module.
User LED control	QBF_Control7SegLED*1	Controls the 7-segment LED of C Controller module.
CPU operating status control	QBF_Reset	Resets the bus master CPU (CPU No.1).
	QBF_ControlEx	Controls remote operations (RUN/STOP/PAUSE) for specified CPU.
Event registration	QBF_RegistEventLog*1	Registers event logs in the event history file.
Battery backed-up RAM access	QBF_WriteSRAM*1	Writes data to the battery-backed-up RAM.
	QBF_ReadSRAM*1	Reads data from the battery-backed-up RAM.
Interrupt event control	QBF_GINT	Issues an interrupt to another CPU.
	QBF_EntryMultiCPUSyncInt*1	Registers a routine so that it can be called when a multiple CPU synchronization interrupt occurs.
	QBF_EntryCpuInt*2	Registers an interrupt so that the routine can be called when the interrupt is issued from another CPU.
	QBF_EntryUnitInt*2	Registers an interrupt so that the routine can be called when the interrupt is issued from an intelligent function module or an interrupt module.
Motion CPU control	QBF_MotionSFCS	Requests to start the specified Motion SFC program.
	QBF_MotionSVST	Requests to start the specified servo program.
	QBF_MotionCHGA	Requests to change the current value of the specified axis.
	QBF_MotionCHGV	Requests to change the speed of the specified axis.
	QBF_MotionCHGT	Requests to change the torque limit value of the specified axis.
	QBF_MotionDDWR	Writes data to the Motion CPU devices.
	QBF_MotionDDRD	Reads data from the Motion CPU devices.
C Controller module's internal user or system device access	QBF_WriteDevice*3	Writes data to the internal user or system devices of the C Controller module.
	QBF_ReadDevice*3	Reads data from the internal user or system devices of the C Controller module.
	QBF_SetDevice*3	Sets the internal user or system devices (bit devices) of the C Controller module.
	QBF_ResetDevice*3	Resets the internal user or system devices (bit devices) of the C Controller module.

*1 Only supported by Q12DCCPU-V.
*2 Only supported by Q12DCCPU-V where the first 5 digits of serial number are "12042" or later.
*3 For Q12DCCPU-V, supported with modules where the first 5 digits of serial number are "12042" or later.

Q24-V ★★★ Q12-V ★★★ Q24-LS ★★★

QBF functions for ISR (Interrupt Service Routine)*1

This QBF library can be used in interrupt programs that are called by multiple CPU synchronous interrupts, interrupts from intelligent function modules/interrupt modules, or other programmable controller CPUs.

Category	Function (some excerpts)	Feature
I/O access	QBF_X_In_Word_ISR	Reads input signal (X) in 1-word units.
	QBF_Y_Out_Word_ISR	Outputs output signal (Y) in 1-word units.
CPU shared memory	QBF_ToBuf_ISR	Writes data to the CPU shared memory of the specified module.
	QBF_FromBuf_ISR	Reads data from the CPU shared memory of the specified module.
Battery-backedup RAM access	QBF_WriteSRAM_ISR	Writes data to the battery-backed-up RAM.
	QBF_ReadSRAM_ISR	Reads data from the battery-backed-up RAM.
C Controller's internal user or system device access	QBF_WriteDevice_ISR*2	Writes data to the internal user or system devices of the C Controller module.*1
	QBF_ReadDevice_ISR*2	Reads data from the internal user or system devices of the C Controller module.*1
	QBF_SetDevice_ISR*2	Sets the internal user or system devices (bit devices) of the C Controller module.*1
	QBF_ResetDevice_ISR*2	Resets the internal user or system devices (bit devices) of the C Controller module.*1

*1 Only supported by Q12DCCPU-V
*2 Only supported by Q12DCCPU-V CPUs where the first 5 digits of serial number are "12042" or later.

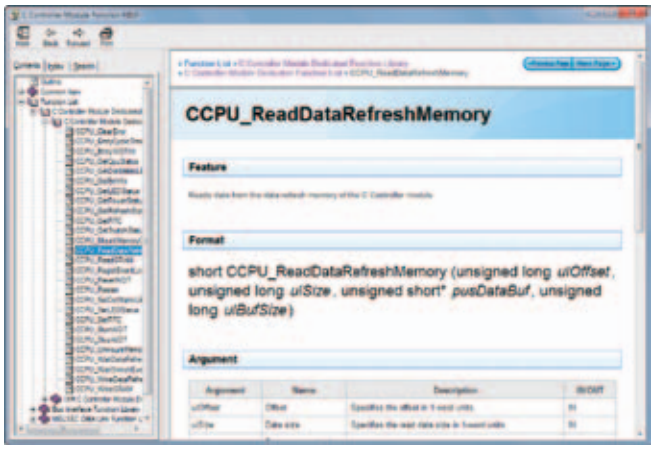
MD functions

These dedicated library functions are allow easy access other programmable controller CPUs.

Category	Function (some excerpts)	Feature
Open/close	mdOpen	Opens a communication line
	mdClose	Closes a communication line.
Device access	mdSendEx	Batch writes devices. (Extended function)
	mdReceiveEx	Batch reads devices.
	mdDevSetEx	Sets bit devices.
	mdDevRstEx	Resets bit devices.
	mdRandREx	Reads devices randomly.
	mdRandWEx	Writes devices randomly.
Remote control	mdControl	Perform remote operations.
CPU model read	mdTypeRead	Reads model.

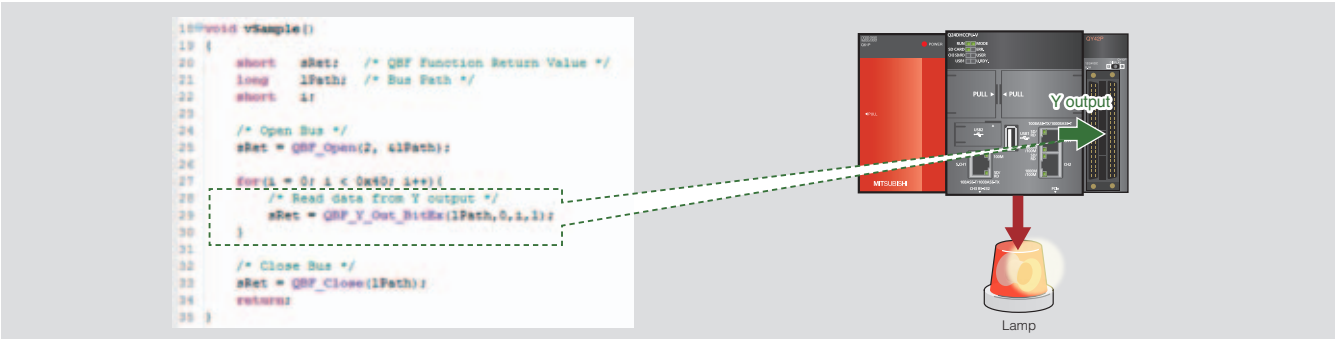
Function help - easy to understand, view and search.

The function help gives easy-to-understand explanations on how to use the various dedicated library functions.



* The screens show the function help for Q24DHCCPU-V.

■ Programming example: Y output



Cyber Operator™

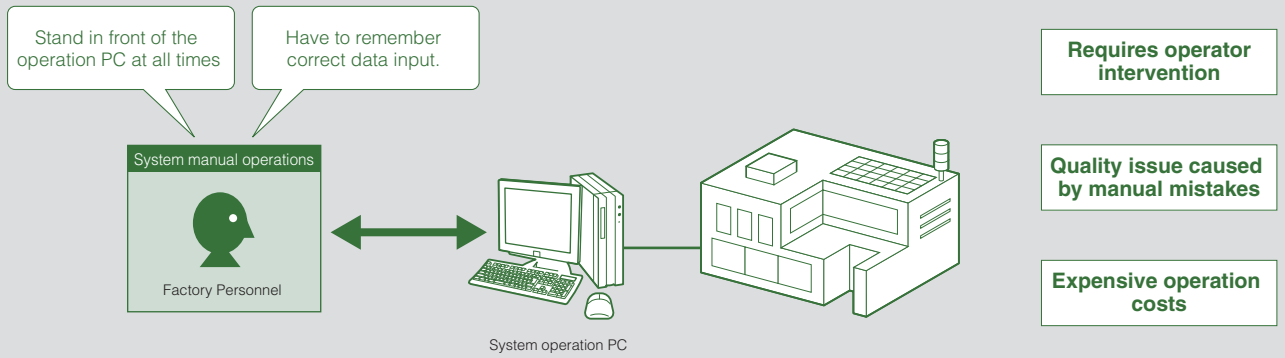
Q24-V NIPPON DENNO Co., Ltd.

Realize automated manufacturing with the C Controller without any system modifications

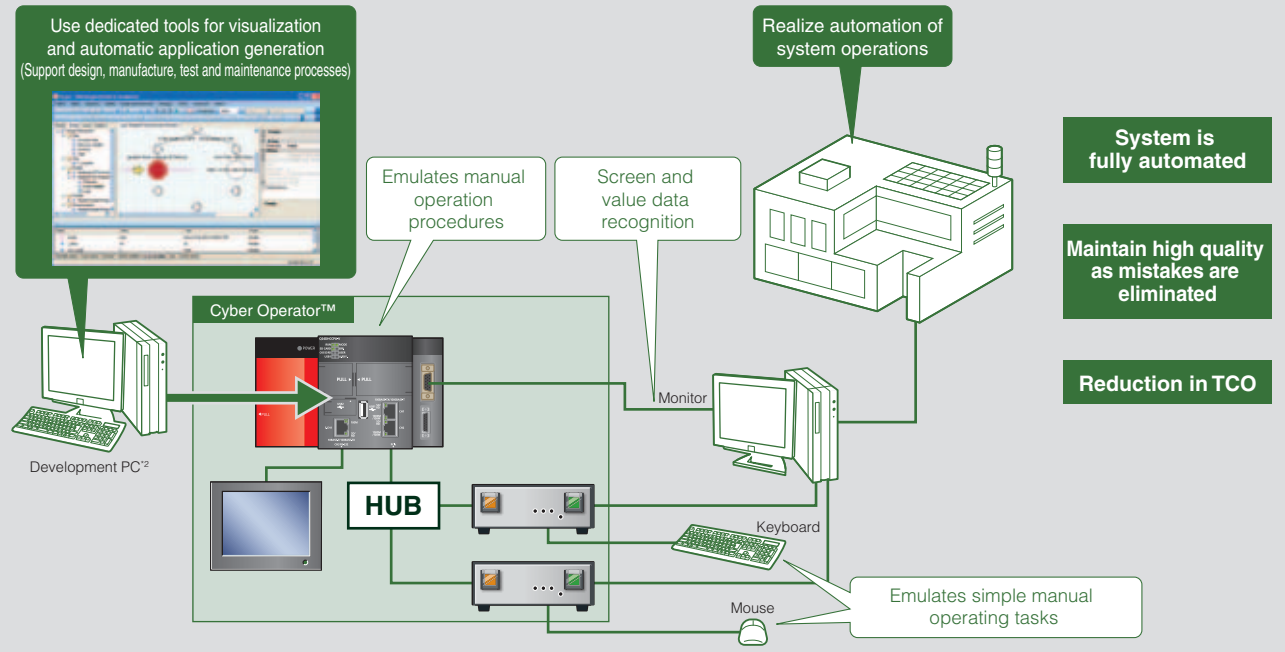
Cyber Operator™ emulates manual operation tasks such as “keyboard input”, “mouse operations”, “screen recognition” and “reading of values on the screen" etc., realizing automated manufacturing without having to drastically change the existing control system.
By using the dedicated tool enclosed with Cyber Operator™, system operation procedures can be easily developed*1 using the visual based GUI that creates applications to run directly in the C Controller.

*1 Easy to use such as pasting parts into a flow chart and setting the task properties.

Conventional systems



With Cyber Operator™



*2 CW Workbench and the C Controller setting and monitoring tool must be installed.

CIMOPERATOR®

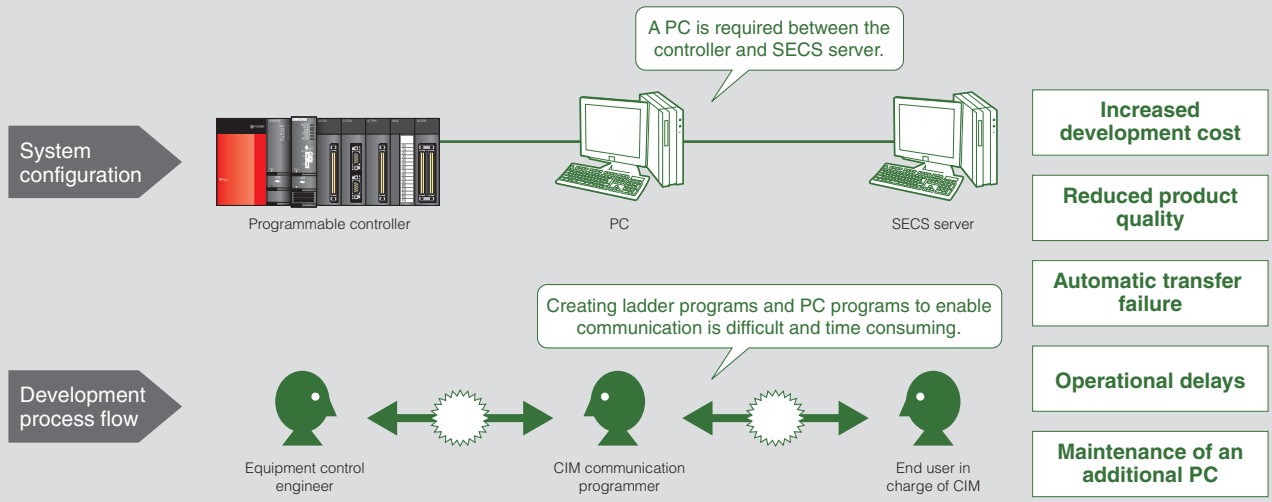
Q24-V Q12-V NIPPON DENNO Co., Ltd.

Implement SECS communication (GEM/non-GEM) through an easy setup process that doesn't require programming

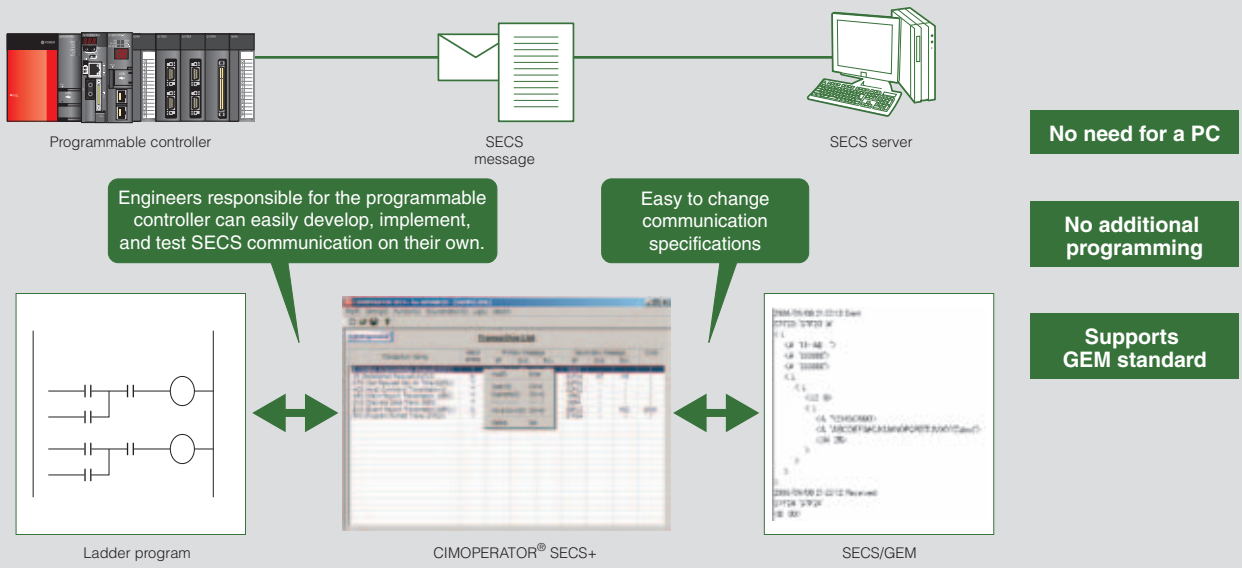
Using CIMOPERATOR®, it is possible to perform GEM (Generic Equipment Model) compatible functions that do not require an additional PC or programmable controller program.Engineering costs can be substantially reduced utilizing the SECS (SEMI*1 Equipment Communications Standard) communication directly to existing servers.

*1 SEMI (Semiconductor Equipment and Materials International)

Conventional systems



With CIMOPERATOR®

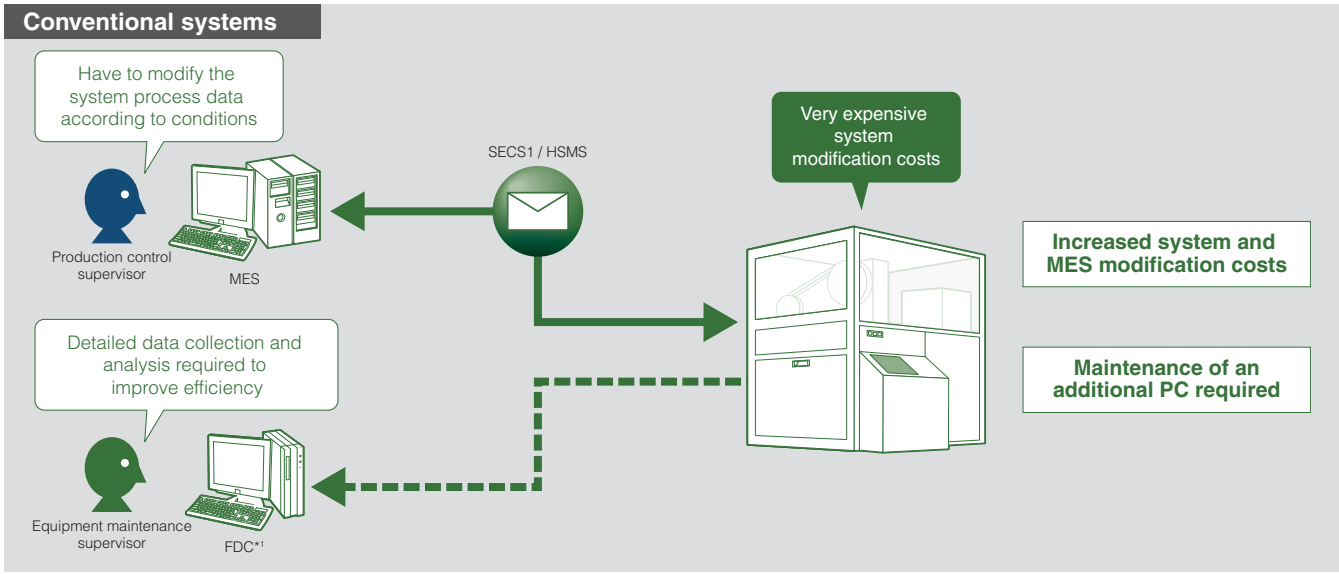


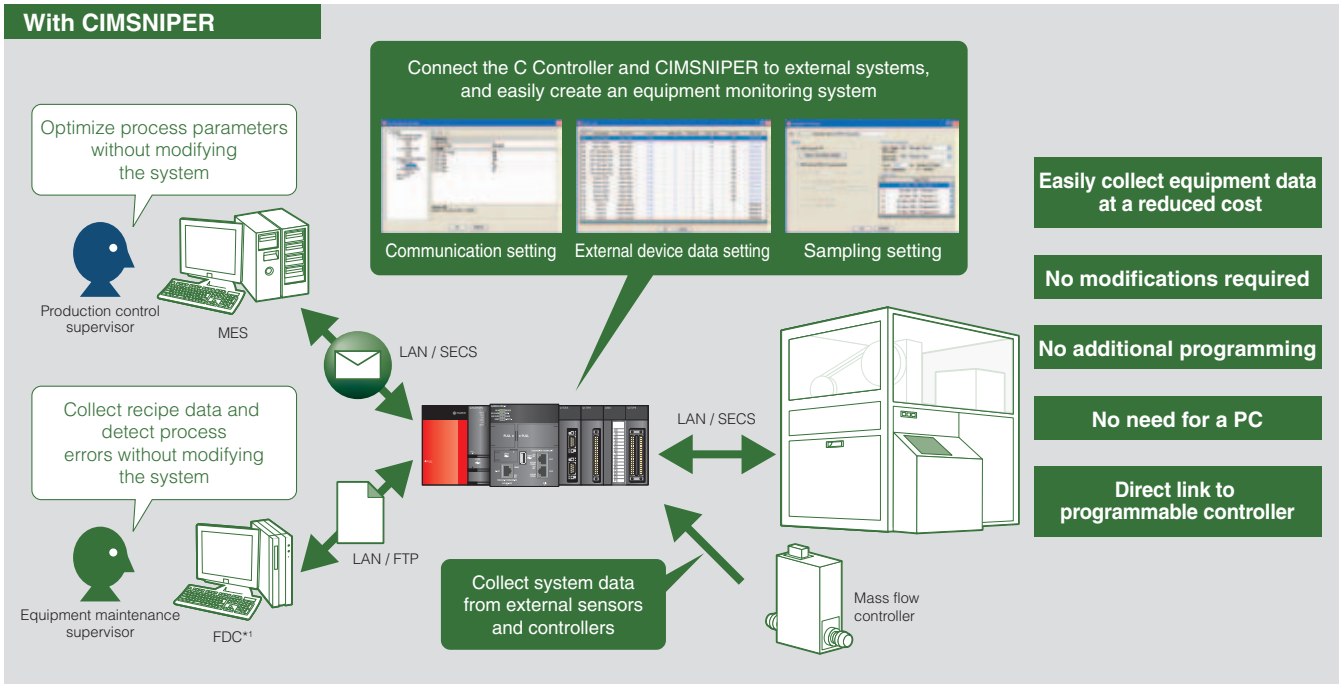
CIMSNIPER

Q24-V Q12-V NIPPON DENNO Co., Ltd.

Easy monitoring of process data and system errors at a reduced cost
Optimization of equipment control and efficiency

By implementing CIMSNIPER, a system to monitor the process data and manufacturing equipment errors can be inexpensively and easily implemented without modifying the existing system or MES (Manufacturing Execution System).





*1 FDC (Fault Detection and Classification)

NIPPON DENNO Co., Ltd.

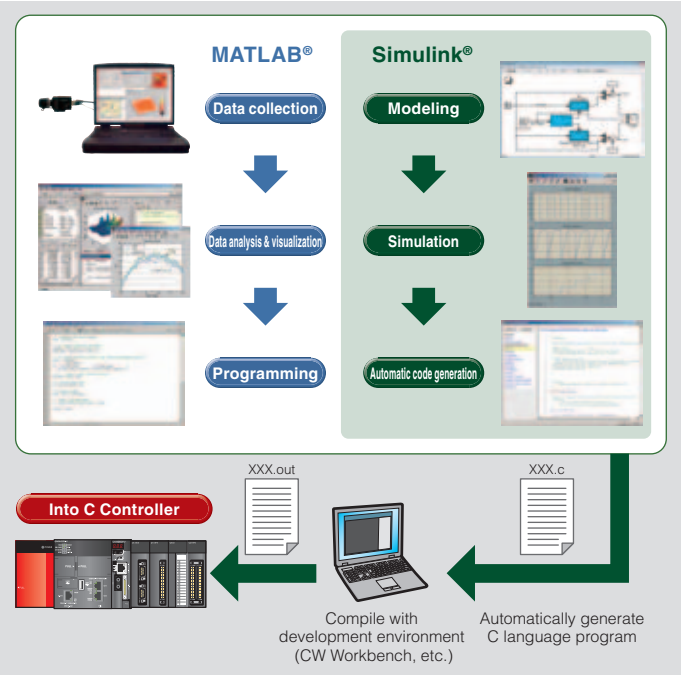
URL http://www.den.co.jp
For more information on this product,
please contact your local Nippon Denno representative.

MATLAB®/Simulink®

Q24-V Q12-V Q24-LS MathWorks, Inc.

Automatic program generation directly from MATLAB®/Simulink® to C Controller

By using MATLAB®/Simulink®, applications can be developed using high-level language for numerical computation, such as linear algebra, statistics, and Fourier analysis, together with visualization based product development. Simulation using Simulink®, simulation and model based design can be achieved to root out problems and errors at the design stage before commissioning.
Overall a far more efficient C Language program can be automatically generated reducing overall code size and also reducing the possibility of human induced errors being introduced.



MathWorks, Inc.

URL **http://www.mathworks.com**
For more information on this product,
please contact your local MathWorks representative.

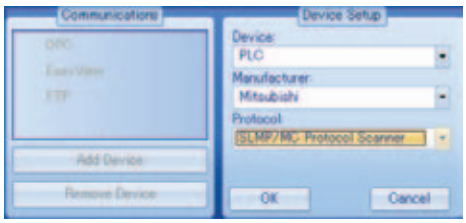
In-Sight vision system

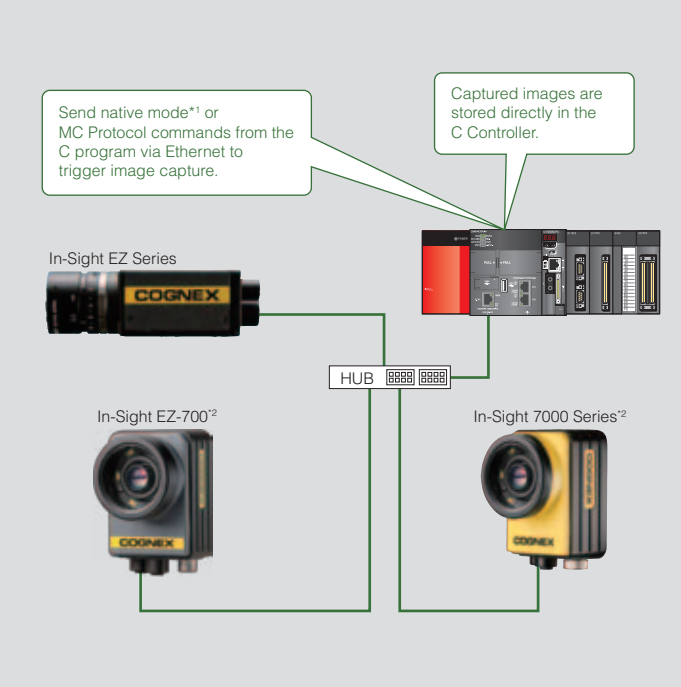
Q24-V Q24-LS Cognex Corp.

Create a machine vision system with COGNEX In-Sight EZ, In-Sight 7000 Series and the C Controller

Easily realize a machine vision control system based on the C Controller with the integration of COGNEX compact smart camera. Machine vision system control can be executed directly from the C language program simplifying various automation processes realizing a simple and cost efficient solution.

Simple communication with MC protocol
The "In-Sight EZ" supports MC protocol (communication protocol for programmable controller), enabling easy data communication between the vision and controller system. The communication is simply done using "EasyBuilder", just by selecting the target device and MC Protocol as the communications protocol. In addition, event driven image capture is realized via the MC Protocol when in scanner mode.





*1 Native mode is a dedicated communication protocol for the COGNEX vision system.
*2 An external power supply (24 V) is required for In-Sight EZ-700 and In-Sight 7000.

Cognex Corporation

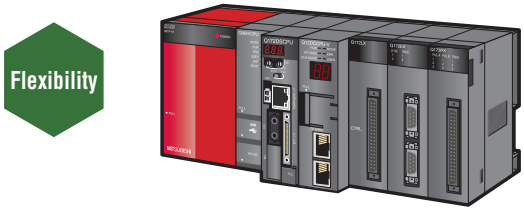
URL **http://www.cognex.com**
For more information on this product,
please contact your local Cognex representative.

Total control

Take complete control of an application using multiple

The Q series platform provides outstanding flexibility by scaling to match the needs of the system.

■ A multiple CPU configuration can be used to divide control tasks among the CPU types best suited to the application. Perform information system and data processing tasks, sequence control, and motion control on the same high-speed main base unit using a C Controller CPU, Universal series CPU, and Motion CPU respectively.



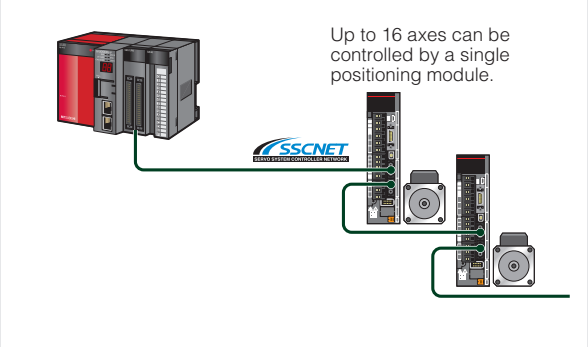
■ Create the optimum configuration according to the control application and system scale.

Simultaneously perform data processing tasks and simple positioning using a C Controller CPU.

C Controller CPU

Single CPU system

- Create a control system using only C language programming.

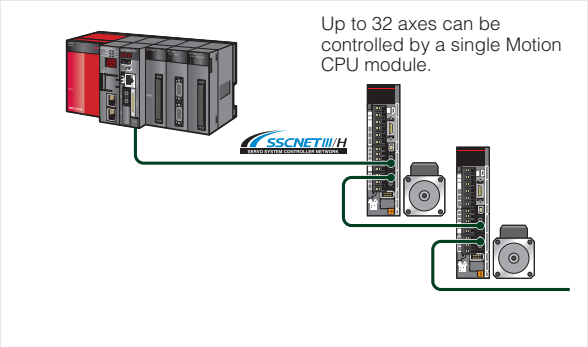


Implement high-speed precision control of multiple axes for medium/large applications.

C Controller CPU + Motion CPU

Multiple CPU system

- Reduce takt time by using an operation cycle of 0.44ms (fastest possible).
- A wide array of motion functions can be implemented (interpolation control, speed control, electronic cam, excursion control, etc.)
- High-speed communication network SSCNET Ⅲ/H supported (bi-directional 150 Mbps high-speed communication using optical communication).

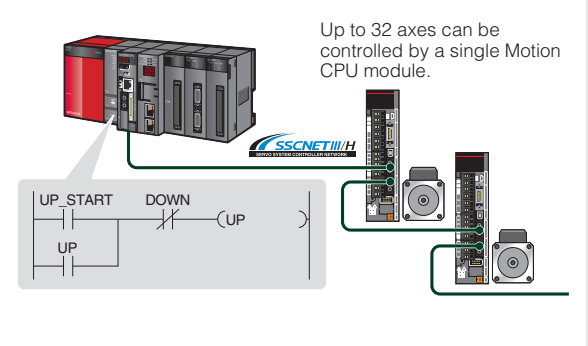


Simultaneous sequence control (machine interlock, etc)

Programmable controller CPU + Motion CPU + C Controller CPU

Multiple CPU system

- A powerful system can be constructed by taking full advantage of each CPU's features.

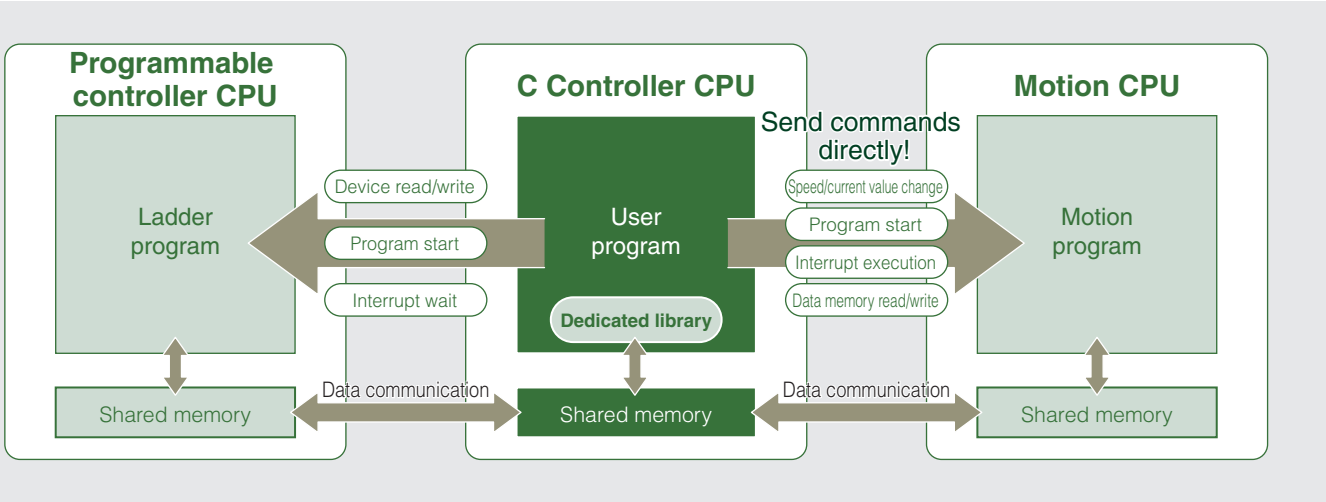


Easily communicate with Programmable Controller and Motion CPUs using dedicated library.

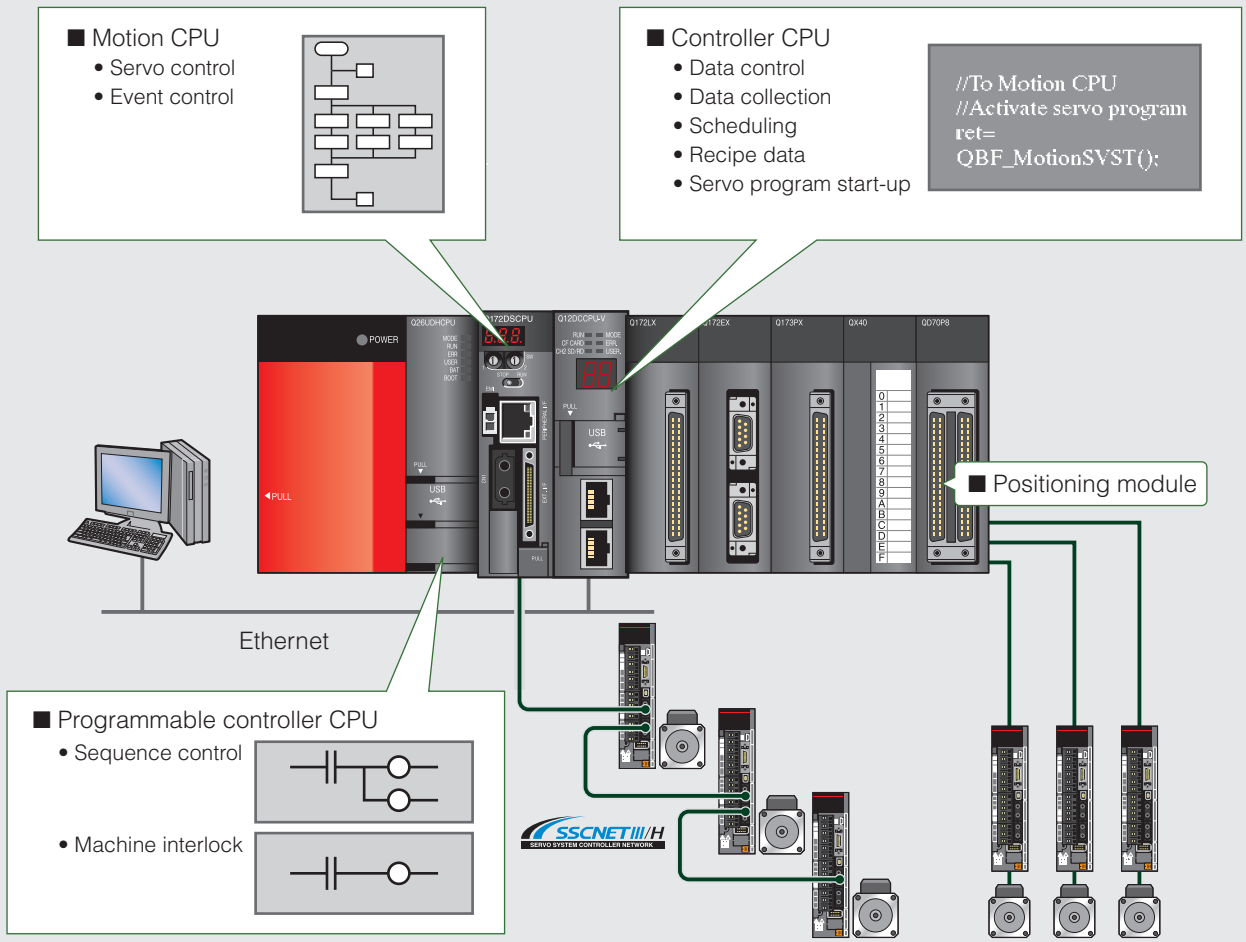
■ Function libraries are included with the C Controller CPU. By simply calling these functions, it is possible to execute instructions or issue interrupt requests directly from the C Controller CPU to sequence and motion CPUs.

Easy to implement

Results in highly efficient control

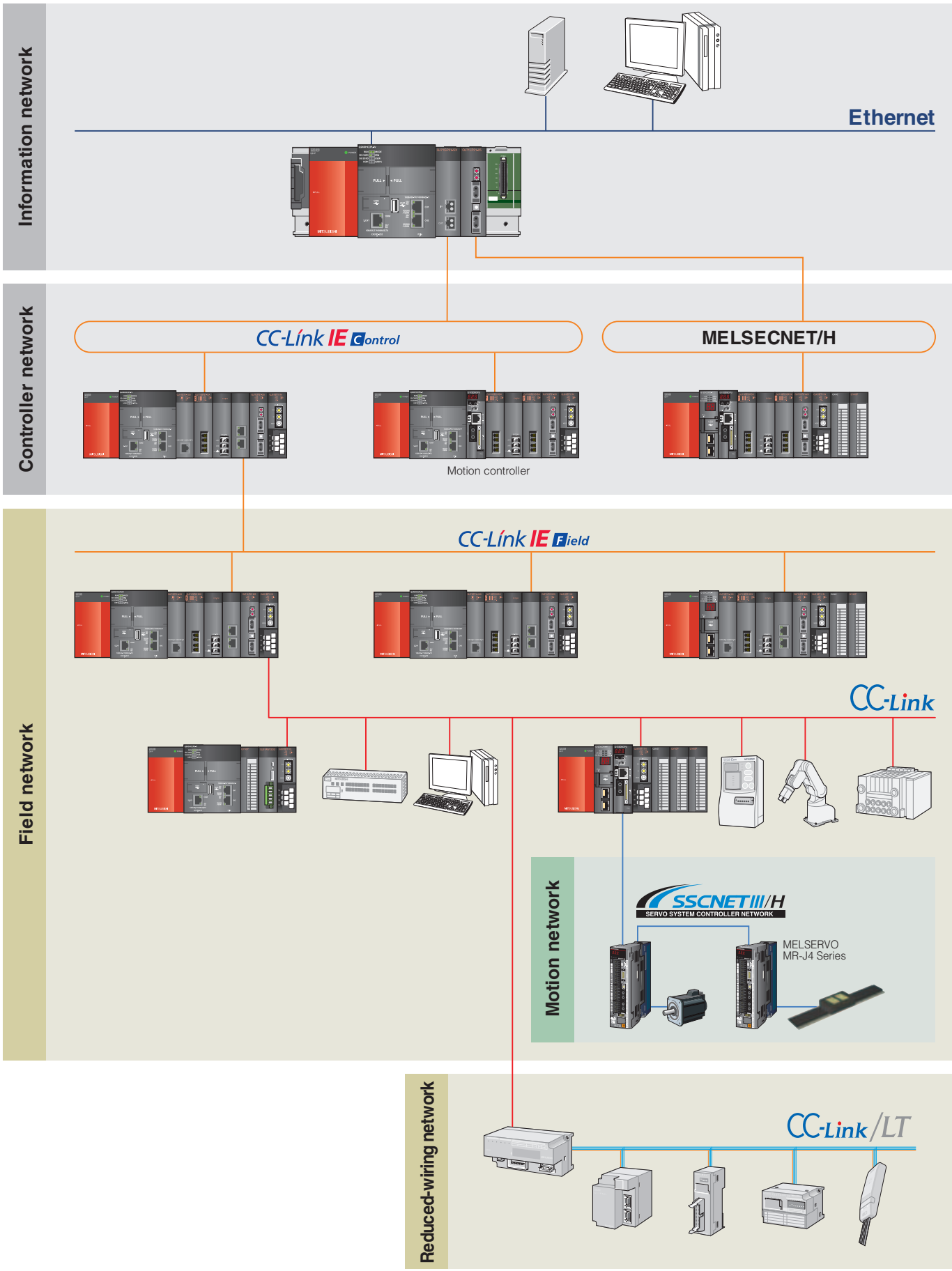


System configuration



Network

Seamless communication from the top floor to the shop



Enterprise level network

Ethernet

Industrial Ethernet is typically the top layer of the manufacturing network hierarchy and is used to transfer information between factories and offices, and around the factory. These networks may be used for MES, ERP, SCADA, and other production and quality control management systems.

• Maximum 1 Gbps high-speed communication. • Convenient connection path for programming, terminal access, and FTP services.

Controller level network

CC-Link IE Control · MELSECNET/H

These highly-reliable control networks are designed to transfer large amounts of data at real-time speeds between PLCs. The CC-Link IE Control network includes a variety of functions and allows seamless communications among other CC-Link networks.

- The CC-Link IE controller network and MELSECNET/H network have a maximum speed of 1Gbps and 25Mbps respectively.
- Using the network shared memory (16K points each for bit and word), programs can be created without considering the network. This helps to make modular, independent design and production for each system easier.
- Reliability is ensured through dual fiber optic loop connections and extensive RAS functions.

Field network

CC-Link IE Field

This field network provides 1 Gbps gigabit transmission and uses real-time protocol for remote I/O control with little transmission delay. Exchange control data and information for device control applications without stress.

- 1 Gbps high-speed communication.
- Maximum number of points per network … Remote input/output (RX, RY): 16384 points each Remote register (RWw): 8192 points, (RWr): 8192 points.
- Maximum number of connectable stations per network: Max. 121stations

Field network

CC-Link

Field network is a high-speed network capable of controlling the system and simultaneously handle information.
The network's high-speed communication, steady input/output responses, and flexible expendability are recognized by SEMI.
Originating in Japan, the steadfast achievements of this network has proven to be reliable as a world-standard open field network.

- Communication speeds up to 10 Mbps
- Full lineup of partner maker products. [Multi-vendors] 1,696 companies in Japan and overseas, 1,234 types of supported products (as of July 2012)

Motion network

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Greatly improve machine performance using synchronous communication.

- In standard solutions using pulse train command, servo amplifiers and controllers are operated asynchronously. Synchronous start and high-precision two axes interpolation is difficult. The SSCNET motion network paves the path for accurate synchronization and has set the standard for performance improvement in machines such as those being use for printing, food, and processing for instance. Moreover, users find the motion controller's flexible software camming functionality not just intelligent but superior to use.

Advantages of centralized network management.

- Share large volumes of data between controllers and servo amplifiers in real time.
- Directly set servo parameters using the motion controller from a PC connected to the controller.
- Monitor and sample various axis data using the digital oscilloscope,such as rotational speed, current position, and current value of each axis.

Easy setup of an absolute positioning (ABS) system

- In constructing an ABS system with SSCNET, wiring to connect the I/O module to the servo amplifier is not required unlike an ABS system using pulse train control. This not only reduces system engineering time and complexity, but also diminishes stress and need for maintenance.
- Even multi-axis machines can begin operation quickly after power ON as a home positioning routine is made unnecessary.

Wire-saving network

CC-Link/LT

This wire-saving network for inside panels and systems frees the site from complicated wiring work and wiring mistakes.
The CC-Link family provides an openness, high-speed and noise resistance while greatly reducing wiring steps with simple settings and easy wiring work.

- Dedicated connectors simplify wiring work. • Use T-branch connections. • No need for power cable. (Power is supplied from one communication cable.)
- Use a universal VCTF cable.

I/O Modules

Choose from a wide range of I/O modules to fit any

Input modules

Points	DC input					DC/AC input	AC input	
	DC5V		DC5/12V	DC24V		DC/AC 48V	AC100 to 120V	AC100 to 240V
	positive common	negative common	positive/ negative common	positive common	negative common	positive/ negative common		
8	—	—	—	QX48Y57*1	—	—	—	QX28
16	QX70H	QX90H	QX70	QX40 QX40-TS QX40-S1 QX40H QI60	QX80 QX80H QX80-TS	QX50	QX10 QX10-TS	—
32	—	—	QX71	QX41 QX41-S1 QX41-S2 QH42P*1 QX41Y41P*1	QX81 QX81-S2	—	—	—
64	—	—	QX72	QX42 QX42-S1	QX82 QX82-S1	—	—	—

*1: I/O combined module's input specification

Output modules

Points	Contact	TRIAC	Transistor			
	24VDC 240VAC	100 to 240VAC	5to12VDC	5to24VDC	12to24VDC	
			Sink	Sink/ Source	Sink	Source
7	—	—	—	—	QX48Y57*2	—
8	QY18A	—	—	QY68A	—	—
16	QY10 QY10-TS	QY22	QY70	—	QY40P QY40P-TS QY50	QY80 QY80-TS
32	—	—	QY71	QY41H	QY41P QH42P*2 QX41Y41P*2	QY81P
64	—	—	—	—	QY42P	QY82P

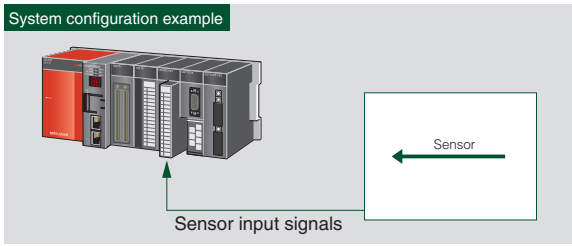
*2: I/O combined module's output specification

High-speed I/O modules

- DC high-speed input module (positive common type) QX40H
- DC high-speed input module (positive common type) QX70H
- DC high-speed input module (negative common type) QX80H
- DC high-speed input module (negative common type) QX90H
- Transistor high-speed output module (sink type) QY41H

Reduce takt time by taking advantage of a 0ms* response time to input signals. More than one power supply can be used to supply connected devices thanks to the 8 points per common wiring layout.
Input and interrupt functions are configurable via switch settings.

System configuration example

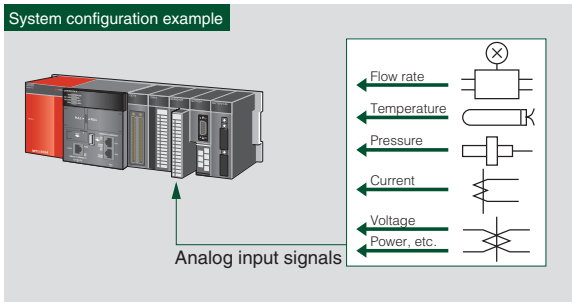


Isolated analog modules

- Channel-isolated high resolution A/D module Q64AD-GH
- Channel-isolated high resolution A/D module (with signal conditioning function) Q62AD-DGH
- Channel-isolated high resolution D/A module Q62DA-FG
- Channel-isolated A/D conversion module Q68AD-G
- Channel-isolated distributor Q66AD-DG
- Channel-isolated D/A conversion module Q66DA-G

The channel isolated analog modules are designed to support even the most demanding applications by offering high accuracy conversion combined with high isolation voltage. Flow meters, pressure gauges, etc. can be directly connected to the analog input, and control valves to analog outputs. Hardware and installation costs can be substantially reduced because external isolation amplifiers are not required. When used with the C Controller, a low cost process control solution can be created.

System configuration example

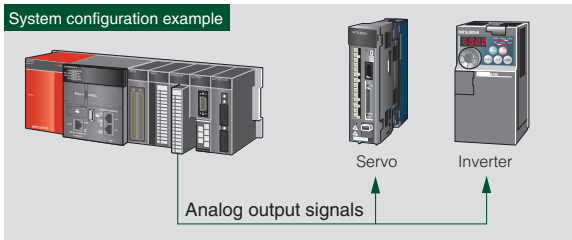


Analog modules

- High-speed A/D conversion module Q64ADH
- A/D modules Q64AD, Q68ADV, Q68ADI
- High-speed D/A conversion module Q64DAH
- D/A modules Q62DAN, Q64DAN, Q68DAVN, Q68DAIN
- A/D - D/A module Q64AD2DA

Many high-speed A/D and D/A conversion (analog) modules are available. These modules are feature packed to allow maximum flexibility when connecting to devices. Both speed and accuracy are great enough to control sensitive motion applications using servos or inverters.

System configuration example

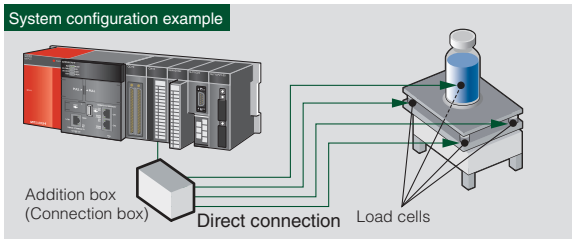


Load cell input module

- Load cell input module Q61LD

The need for a signal converter is eliminated when utilizing a direct connection to the load cell input module. The module achieves rock solid accuracy thanks to a steady data conversion speed that guarantees the accuracy of load cell measurements.

System configuration example

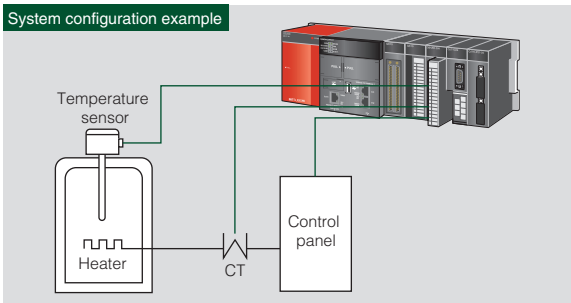


Temperature control modules

• Temperature control modules ····· Q64TCTT(BW), Q64TCRT(BW)

Just by setting PID constants or SV values, these modules perform temperature control independent of any controller CPU. This leaves the controller CPU(s) free to process other tasks and increases performance. The auto-tuning feature allows PID constants to be set automatically. The lineup includes the Q64TCRT (BW)N that can be connected to platinum RTDs (Pt100, JPt100), and the Q64TCCT (BW)N that can be connected to thermocouples compatible with various standards. BW features broken wire detection

System configuration example



Temperature input modules

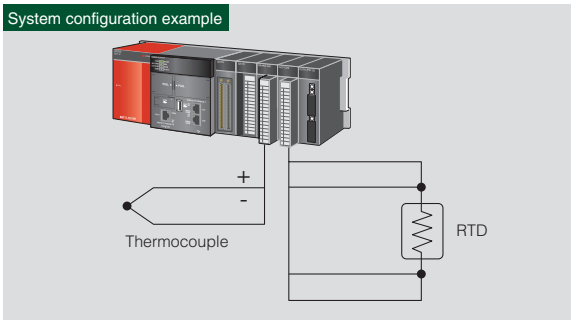
• Channel-isolated temperature input modules ····· Q64TDV-GH
(Thermocouple input, micro voltage input)
Q64TD, Q68TD-G-H01, Q68TD-G-H02
(Thermocouple input)

• Channel-isolated RTD input modules ····· Q64RD-G, Q68RD3-G
(Platinum RTD input, nickel RTD input)

• RTD input module ····· Q64RD
(Platinum RTD input)

Thermocouple, platinum RTD, and/or nickel RTD temperature sensors can be used.

System configuration example



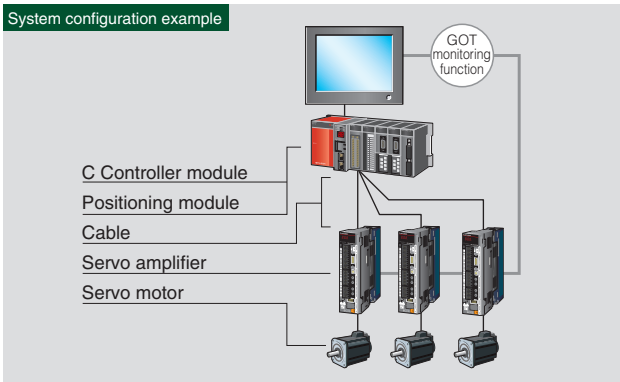
Positioning modules

Various types of motion control are supported including 2 to 4-axes linear interpolation, 2-axes circular interpolation, speed control, speed/position changeover, path control and constant speed control. For servo control, Q series leverages the benefits of SSCNET, a Mitsubishi high performance motion control network. This allows Mitsubishi intelligent digital servos to be connected by a simple daisy chain cable that reduces cost and increases performance.

[Pulse train output types]

• Differential driver pulse train output type ····· QD75D□ , QD70D□
• Open collector pulse train output type ····· QD75P□ , QD70P□

System configuration example

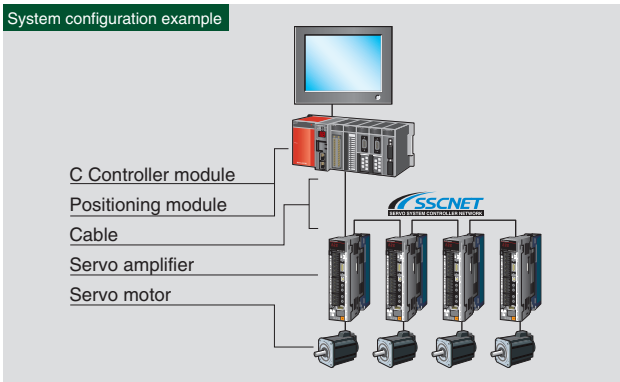


For compatibility with the widest range of motion hardware, both open collector and differential driver type positioning modules are available. Transmission of high-speed pulses, up to 1Mpps, to a servo amplifier can be made reliably up to 10 meters away. These pulse train output positioning modules can provide a high level of speed and accuracy for practically any application.
(Open collector method command pulses are maximum 200 kpps.)

[SSCNET connection types]

• SSCNET connection type ····· QD75M□ , QD75MH□

System configuration example



High-speed and wire-saving are realized with the SSCNET cable connection. Absolute position systems that establish the zero point position with data set type zero point return are easily supported, This eliminates the need to wire the near-point dog, etc.

Pulse input module

• Channel-isolated pulse input module ····· QD60P8-G

This module measures the number of input pulses for speed, revolutions and instantaneous flow rate, and measures the quantity, length and cumulative flow rate. The input pulse value is updated every 10 ms. The cumulative count value and the number of pulses (number of sampling pulses) after the moving average process, etc., are updated for each count cycle setting value.

		QD60P8-G
Number of channels		8 channels
Count input signal	Phase	1-phase input
	Signal level	5 V DC/12 to 24 V DC 4 mA or more
	Pulse input	1-phase pulse input
Counting speed		30k/10k/1k/100/50/10/1/0.1pps

iQ Platform

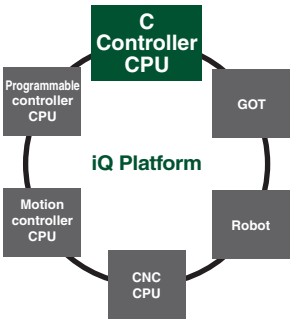
Integrated FA Solution

Expand on the built-in capabilities of the C Controller

System optimization and integration through advanced technologies effectively reduce the total cost of operation. The iQ Platform is key to achieving effective communication between controllers and HMIs in the production environment

Advanced high-speed control using multiple CPU high-speed transmission

iQ Platform compatible controllers include the high-speed and large capacity programmable controller CPUs, high-speed and high-precision Motion CPUs, and C Controller CPUs. By using a multiple CPU high speed main base unit, it is possible to drastically improve CPU-to-CPU data transfer speed and capacity. The combination of sequence and motion controllers enables complex machine control to be performed easily and at high speed. Additionally, feature rich graphic operation terminals are available for interfacing with iQ Platform compatible controllers and assembly line robots.



The iQ revolution is in the collection of high-performance controllers.

Reduced development cost	■ Designing equipment is faster and easier ■ More efficient start-up and debugging
Reduced production cost	■ Takt time is minimized ■ Enterprise database connectivity
Reduced maintenance cost	■ Using the advantages of MELSEC-Q ■ Down time is minimized

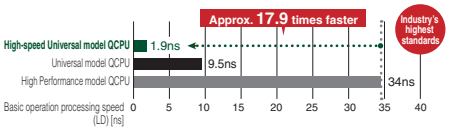
Create a state-of-the-art system using building blocks.

iQ Platform compatible programmable controllers

Advancing the state-of-the-art in high speed, precision control.

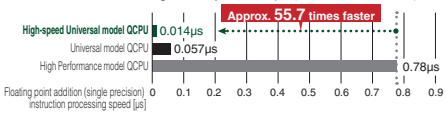
• Improved processing accuracy and shorter operation cycle times

Basic operation processing speed (LD instruction) of 1.9ns.



• Perform calculations with high-precision real number data at high speed.

The processing speed of real number (floating point) operations has been increased significantly to 0.014μs (addition instruction).



		High-speed Universal model QCPU	Universal model QCPU	High Performance model QCPU
Addition (E+)	Single precision(μs)*1	0.014	0.057	0.78
	Double precision(μs)*1	1.8	4.3	87*2

*1: Minimum value *2: Indicates internal double precision operation processing speed

• Handle large volumes of data.

Store large amounts of data with an increased standard RAM memory size.

◎Standard RAM memory capacity (file register capacity)

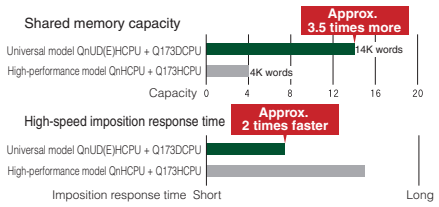
Q03UDVCPU, Q03UDECPU, Q03UDCPU	192KB(96K words)
Q04UDVCPU, Q04UDEHCPU, Q04UDHCPU	256KB(128K words)
Q06UDVCPU, Q06UDEHCPU, Q06UDHCPU	768KB(384K words)
Q10UDEHCPU, Q10UDHCPU Q13UDVCPU, Q13UDEHCPU, Q13UDHCPU	1024KB(512K words)
Q20UDEHCPU, Q20UDHCPU Q26UDVCPU, Q26UDEHCPU, Q26UDHCPU	1280KB(640K words)
Q50UDEHCPU	1536KB(768K words)
Q100UDEHCPU	1792KB(896K words)

iQ Platform compatible motion controllers

New algorithms have been implemented for greater speed and accuracy

• Multiple CPU high-speed bus

Continuously share up to 14K words of data with a transfer period of 0.88ms. The Multiple CPU high speed transmission cycle can be synchronized with the motion control cycle, thus optimizing the entire control system.



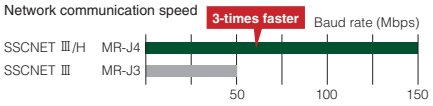
• Motion operation cycle 0.22 ms/4 axes

A motion operation cycle of 0.22 ms/4 cycles has been realized to respond to needs for further takt time reductions.
High-response control is supported since up to 10 axes can be controlled even with the 0.44 ms operation cycle.

	Operation cycle	
	0.22ms	0.44ms
Q173DSCPU	4 axes	10 axes
Q173DCPU	—	6 axes

• High-response system using SSCNET Ⅲ/H

Bi-directional 150 Mbps (uni-direction 300 Mbps, or equivalent) data communication is three times faster than conventional systems and will dramatically increase your system's responsiveness.



iQ Platform iQ Platform compatible processing line CNC

Introducing a processing line CNC for iQ Platform compatible automobile industries

• Multiple CPU high-speed communication

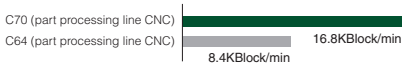
Shorten takt time with high-speed data exchange between multiple CPUs.
Traditional modules are also supported.

Realize high-speed data communication between programmable controller CPU and CNC CPU.

• High-performance CNC CPU

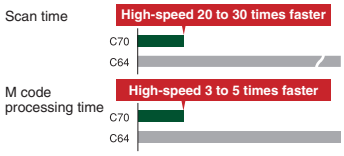
The CNC CPU's performance has been approximately doubled. High-speed collaboration is realized from NC control processing to ladders and host communication.

Block processing capacity is double traditional models.



• Greatly reduce cycle time

The shorter scan time and M code processing time greatly contribute to reducing the cycle time.



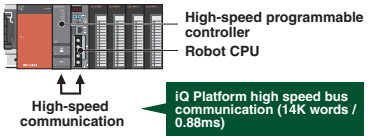
Graph shows performance comparison with C70 as 1.

iQ Platform compatible robot controller

Directly connect programmable controllers and robot controllers

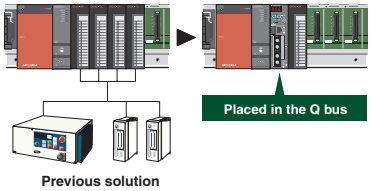
• Improved control performance

I/O processing time is shortened significantly by the high-speed communication function between the programmable controller and robot controller.



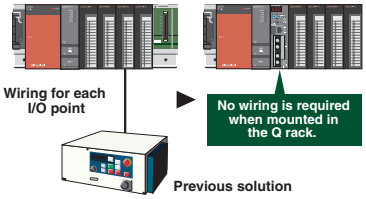
• Reduced system cost

1024 words of I/O points are shared between the programmable controller and robot controller, reducing the need for additional peripheral devices.



• Reduced wiring through direct connection

The amount of wiring and I/O modules necessary are reduced by placing the robot controller directly on the Q bus.



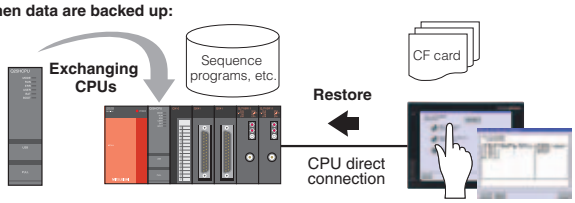
iQ Platform compatible HMIs

Improve production efficiency using iQ Platform compatible products.

• Deal with unexpected issues using the backup and restore functions.

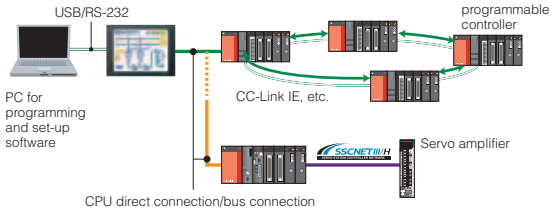
Backup programs, parameters, and other data from the programmable controller CPU to the GOT's CF card.

When data are backed up:



• The FA transparent function allows for easy on-site adjustments

Programming, start-up, and maintenance duties are made easier by using a GOT in the system.



Performance specifications *1

Item			Specification				
			Q12DCCPU-V	Q24DHCCPU-V		Q24DHCCPU-LS NEW	
Hardware specifications	Endian format (memory assignment)		Little endian				
	Microprocessor		SH-4A	User CPU	Intel® ATOM™ Processor	User CPU	Intel® ATOM™ Processor (OS Independent)
				System CPU	SH-4A	System CPU	SH-4A
	User file capacity (For user file storage)	Standard RAM	3MB	Maximum 4MB (total 5MB with battery backup)		-	
		Standard ROM	-	382MB		-	
		Built-in SSD	-			512MB (including OS)	
		Memory card	Depends on the CompactFlash card used. (Maximum 8GB)	Depends on mounted SD memory card/ SDHC memory card (Maximum 16GB)			
	Working RAM (For OS, driver, user program execution)		128MB	512MB			
	Battery backed-up RAM		512KB*2	Maximum 5MB (total 5MB with standard RAM)		5MB	
Software specifications	Operating system		VxWorks® 6.4*3 (Installed at product shipment)	VxWorks® 6.8.1*3 (Installed at product shipment)		Lineo uLinux*4 : kernel2.6.35 (Not installed at shipment)	
	Development environment	Programming development environment	CW Workbench Wind River Workbench 2.6.1*3	CW Workbench Wind River Workbench 3.2*3		Lineo uLinux ELITE*4	
		Programming language	C language (C/C++)			C language (C/C++) Script language (Ruby, PHP, Parl, Python)*5	
Communication interfaces	Ethernet/RS-232/USB		2CH/1CH/1CH	3CH/1CH/2CH			
Ethernet*6	Interface		10BASE-T/100BASE-TX	User Ethernet port (CH1, CH2): 10BASE-T/100BASE-TX/1000BASE-T System Ethernet port (S CH1): 10BASE-T/100BASE-TX			
	Communication method		Full-duplex/half-duplex				
	Data transmission speed		10Mbps(10BASE-T)/100Mbps(100BASE-TX)	User Ethernet port (CH1, CH2): 10Mbps(10BASE-T)/100Mbps(100BASE-TX) /1000Mbps(1000BASE-T) System Ethernet port (S CH1): 10Mbps(10BASE-T)/100Mbps(100BASE-TX)			
	Transmission method		Base band				
	Maximum segment length		100m				
	Connector applicable to external wiring		RJ45				
	Supported function		Auto negotiation function (automatic recognition of communication speed/communication method)				
			Auto MDIX function (Automatically recognizes straight cable/cross cable)				
USB	Transmission speed		12Mbps(FULL Speed Mode: FS)	USB1: 480Mbps(High Speed) USB2: 12Mbps(Full Speed)			
	Power supply		Self powered	USB1: Bus power DC+5V; Up to 500mA*7 USB2: Self-Powered			
	Connector		USB series miniB connector	USB1: Connector type A USB2: Connector type mini-B			
RS-232	Interface		Compliance with RS-232				
	Communication method		Full-duplex/half-duplex communication method				
	Synchronization method		Start-stop synchronization method				
	Transmission speed		9600, 14400, 19200, 28800, 38400, 57600, 115200bps				
	Transmission distance		Maximum 15m				
	Data format	Start bit	1				
		Data bit	7/8				
		Parity bit	1/None				
		Stop bit	1/2				
	Parity check		Parity check performed (odd/even)				
	Sum check code		Sum check performed/Not performed				
	Transmission control		Flow control (RS/CS control) performed/Not performed				
	Recommended cable		7/0.127_P HRV-SV Outer diameter 8.5mm or more				
	Connector applicable to external wiring		Round type miniature connector (10-pin plug)*8				
Display interface			-			Analog RGB D-Sub15pin	
Memory card			CompactFlash card (1 slot)*9	SD memory card specifications (1 slot)			
	Power supply		3.3V±5%, Maximum 150mA	DC+3.3V; Up to 200mA			
	Number of loadable cards		1				
PCI Express® extension connector	Interface		-	PCI Express®			
	Link width		-	×1			
	Transmission speed		-	2.5Gbps			
Number of I/O points (Number of points accessible to actual I/O modules)			4096 points (X/Y0 to FFF)				
Clock function			Year, month, day, hour, minute, second, day of week (Automatic leap year detection) Clock accuracy: Daily error -10.89 to +8.64 seconds (0 to 55 degrees)*10 Daily error -4.32 to +5.25 seconds (25 degrees)*10				
Permissible momentary stop time			Depends on the power supply module				
5VDC internal current consumption			0.93A	2.8A			
External dimensions			98(H)×27.4(W)×115(D)[mm]	98(H)×83(W)×115(D)[mm]			
Weight			0.24kg	0.63kg		0.64kg	

*1 The performance specifications may be modified without notice.
*2 128KB for Q12DCCPU-V C Controllers whose first five serial number digits are 12041 or later.
*3 VxWorks® 6.8.1, VxWorks® 6.4, Wind River Workbench 3.2 and Wind River Workbench 2.6.1 are products of Wind River Systems, Inc.
Refer to the Wind River Systems, Inc. product manuals or contact Wind River Co., Ltd. (Japan office) for service and specifications of Wind River Systems products.
Refer to the following web site for contact information of Wind River Co., Ltd.
http://www.windriver.com
*4 Must be separately purchased from Lineo Solutions, Inc.
*5 When Lineo uLinux is used. The program language depends on the specifications of the 3rd Party partner OS.
*6 Please refer to the relevant manufacturer for details on the number of connectable stages when using a switching hub.
*7 Select appropriate USB connected devices to observe the current consumption limit.
*8 Attach the RS232 connector cable (Q12DCCPU-CBL) [option], and connect the 9-pin D-sub (male) type RS232 connector.
An RS-232 cable with the same specifications as Q06CCPU-V can be used.
*9 TYPE I cards are supported. A TYPE II card cannot be used. I/O cards such as modem cards cannot be used.
*10 An additional error between -0.5 to +0.5 seconds may occur when the module is powered ON.

General Specifications

General specifications indicate the environmental specifications in which this product can be installed and operated. Unless otherwise specified, the general specifications apply to all products of the Q series.
Install and operate the Q series products in the environment indicated in the general specifications.
* The general specifications for double brand products will differ. Contact the respective company or refer to the respective product manual.

Item	Specification*1					
Operating ambient temperature	0 to 55℃					
Storage ambient temperature	-25 to 75℃*2					
Operating ambient humidity	5 to 95%RH*3, non-condensing					
Storage ambient humidity						
Vibration resistance	Compliant with JIS B 3502 and IEC 61131-2		Frequency	Acceleration	Amplitude	Sweep count
		Under intermittent vibration	5 to 8.4Hz	–	3.5mm (0.14 inches)	10 times each in X, Y, Z directions
			8.4 to 150Hz	9.8 m/s²	–	
		Under continuous vibration	5 to 8.4Hz	–	1.75 mm (0.069 inches)	–
			8.4 to 150Hz	4.9 m/s²	–	
Shock resistance	Compliant with JIS B 3502, IEC 61131-2 (147 m/s², 3 times in each of 3 directions X, Y, Z)					
Operating ambience	No corrosive gases					
Operating altitude*4	2000m (6562 feet) max.					
Installation location	Inside control panel					
Overvoltage category*5	Ⅱ max.					
Pollution level*6	2 max.					
Equipment category	Class Ⅰ					

*1 When installing a commercially available SD memory card/CompactFlash card into the C Controller module, follow the lower specifications of either the C Controller module or SD memory card/CompactFlash card.
*2 The storage ambient temperature is -20 to 75℃ if the system includes the AnS/A series modules.
*3 The operating ambient humidity and storage ambient humidity are 10 to 90%RH if the system includes the AnS/A series modules.
*4 Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m.
Doing so can cause a malfunction.
When using the programmable controller under pressure, please contact your sales representative.
*5 This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises. Category Ⅱ applies to equipment for which electrical power is supplied from fixed facilities.
The surge voltage withstand level for up to the rated voltage of 300 V is 2500 V.
*6 This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.
Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

List of C Controller CPU functions

Item			Q12DCCPU-V	Q24DHCCPU-V	Q24DHCCPU-LS NEW
Applicable modules	General I/O modules	Input	Yes		
		Output	Yes		
		Input/Output	Yes		
		Interrupt input	Yes		
	Analog I/O modules	Analog input	Yes		
		Analog output	Yes		
		Analog input/output	Yes		
		Load cell input	Yes		
		Temperature input	Yes		
		Temperature control	Yes		
		Loop control	Yes		
	Pulse I/O and positioning modules	Channel isolated pulse input	Yes		
		High-speed counter	Yes		
		Positioning	Yes		
	Information modules	MES interface *1	Yes *3	Yes	
		High-speed data logger *2	Yes *3	Yes	
		Web server *4 *5 *6	Yes		
		Serial communication	Yes		
	Network modules	CC-Link IE controller network	Yes		
		MELSECNET/H	Yes		
		CC-Link IE field network	Yes *7	Yes *8	
		CC-Link	Yes		
		CC-Link/LT	Yes		
		AnyWire DB A20	Yes		
		FL-net (OCPN-2)	Yes		
		AS-i	Yes		
Multiple CPU function		Multiple control system can be configured by combining C Controller module with Motion CPUs and programmable controller CPUs.			
	Communications by dedicated library functions	Data access and control command can be performed from user programs on the C Controller module to Motion CPUs and programmable controller CPUs using dedicated library functions.	Yes		No
	Control command to Motion CPU	Programs on the Motion CPU can be activated, or servo setting value/current value can be read and changed from the C Controller module.	Yes		No
	Interrupt issue to Motion CPU	Interruption can be issued to Motion CPU from C Controller module.	Yes		No
	Data communications by CPU shared memory	Data can be transmitted through CPU shared memory between C Controller module and other CPUs (programmable controller CPU, Motion CPU).	Yes		
	Programmable controller control	Execution status of programmable controller CPU or execution type of sequence (ladder) program can be controlled from user programs on the C controller module.	Yes		No
	Synchronized event notification	By registering processes as synchronized events, programs to be executed in synchrony with the iQ platform compatible Motion CPU module can be created.	Yes	No	
	Multiple CPU high speed transmission	Multiple CPU high speed transmission can be performed by using the multiple CPU high speed main base unit (Q38DB, Q312DB).	Yes		
Interrupt from intelligent function module		The interrupt routine can be started with an interrupt request from the intelligent function module.	Yes *3	No	
Device function		Devices similar to those used in MELSEC Sequence CPUs are created in the RAM of the C Controller.	Yes *3	Yes	
HMI access function	Connection with device function	Data can be exchanged with the GOT by reading and writing C Controller devices via the bus or other network connections.	Yes *3 *9	Yes *9	
Self-diagnostic function	Self-diagnostic function	Operating status of each module controlled by the C Controller is monitored and error status are detected.	Yes		
	H/W self-diagnostic function	H/W diagnostic of C Controller module is performed according to the diagnostic items.	Yes		
Watchdog timer (WDT) function		An internal timer to detect errors on a C Controller module, H/W and user program errors are detected by the watchdog timer.	Yes		
Restarting User CPU function		This function allows just the user CPU to be restarted without restarting the entire programmable controller system.	No	Yes	
Data refresh function		The MELSEC system's data is automatically refreshed in the C Controller module's memory area at the timing designated with the C Controller setting and monitor tool.	No	Yes	
Access authority setting function		Restricts operations from Setting/monitoring tools for the C Controller module, Telnet function and FTP function by setting (adding/deleting) user(s) to the C Controller module.	No	Yes	
Intelligent Function Module Access		The intelligent function module's parameters can be set/monitored from the C Controller setting and monitor tool.	No	Yes	
System monitor function		Monitors the system configuration.	No	Yes	
Security Function		Reads the C Controller module's unique identification information by accessing a specified address.	No	Yes	
Battery Less Drive		Operates the C Controller module without battery.	No	Yes	

*1 Use in combination with a QJ71MES96 (first five serial number digits 12092 or later).
*2 Use in combination with a QD81DL96 (first five serial number digits 12062 or later).
*3 Use a product whose first five serial number digits are 12042 or later.
*4 Use in combination with a Q12DCCPU-V (first five serial number digits 12042 or later), or QJ71WS96 (first five serial number digits 14022 or later).
*5 GX RemoteService-I cannot be used.
*6 MX MESInterface-WS Version 1 cannot be used.
*7 Use in combination with a Q12DCCPU-V (first five serial number digits 12042 or later), or QJ71GF11-T2 (first five serial number digits 12062 or later).
*8 Use in combination with a QJ71GF11-T2 (first five serial number digits 14082 or later).
*9 For details about configuring the connection, refer to the GOT1000 Series Handbook and GOT1000 Series Connection Manual.

Programming development environment

Item				Q12DCCPU-V	Q24DHCCPU-V	Q24DHCCPU-VS NEW
C Controller module engineering tool CW Workbench	Q24DHCCPU-V license (SW1DND-CWWLQ24-E, SW1DND-CWWLQ24-EZ, SW1DND-CWWLQ24-EVZ)	Program development/ debugging function	C Controller dedicated development environment based on Wind River Workbench 3.2 and limited to basic functions required for application development. Various activities, from program editing to debugging (step/break execution, variables, memory watch) via Ethernet can be performed with the CW Workbench engineering tool for C Controller.	No	Yes	No
	Q12DCCPU-V license (SW1DND-CWWLQ12-E, SW1DND-CWWLQ12-EZ, SW1DND-CWWLQ12-EVZ)			Yes	No	No
VxWorks® Simulator CW-Sim	license set product (SW1DNC-CWSIM-E, SW1DNC-CWSIM-EZ)	Program simulation / debugging	CW-Sim and CW-Sim Standalone are products that simulate the C Controller module program on a PC. Programs can be simulated and debugged with a PC installed with CW Workbench.	Yes	Yes	No
VxWorks® Simulator CW-Sim Standalone	Standalone product (SW1DNC-CWSIMSA-E)	Program simulation	Programs can be simulated with a PC not installed with CW Workbench. Debugging is not supported.	Yes	Yes	No
C Controller setting/ monitor tools	SW4PVC-CCPU	Parameter setting / monitor and testing	C Controller parameters can be set and diagnosed, parameters for the intelligent function module and network module mounted on the base can be set and monitored, and the device values can be monitored and tested.	No	Yes	
	SW3PVC-CCPU		C Controller parameters can be set and diagnosed, parameters for the various network modules mounted on the base can be set and monitored, and the device values can be monitored and tested.	Yes	No	No
Wind River Systems, Inc. product Wind River Workbench*1	Wind River Workbench 3.2	Program development/ debugging function	All development activities, starting from editing to debugging of programs (step/break execution, variables, memory watch, etc), can be performed via Ethernet by using the integrated development environment Workbench. Real-time monitoring of the task transition, memory usage state, variables and data structure, etc., is possible using a runtime analysis tool such as System Viewer.	No	Yes	No
	Wind River Workbench 2.6.1			Yes	No	No
Lineo Solutions, Inc. product Lineo uLinux ELITE*2	Lineo uLinux ELITE	Embedded Linux® development	Develop Linux® compatible with various CPU architectures.	No	No	Yes

*1 Must be separately purchased from Wind River Systems, Inc.
*2 Must be separately purchased from Lineo Solutions, Inc. Please contact Lineo Solutions, Inc. for further product details.

Compatible operating systems

	C Controller module engineering tool CW Workbench*1		VxWorks® Simulator *1		C Controller setting/ monitor tools SW4PVC-CCPU/ SW3PVC-CCPU	Wind River Workbench*1	
	Q24DHCCPU-V license SW1DND-CWWLQ24-E/ -EZ/-EVZ	Q12DCCPU-V license SW1DND-CWWLQ12-E/ -EZ/-EVZ	CW-Sim SW1DNC-CWSIM-E/ SW1DNC-CWSIM-EZ	CW-Sim Standalone SW1DNC-CWSIMSA-E		3.2	2.6.1
Windows® XP Professional Operationg System SP3 or higher	Yes		Yes		Yes	Yes	Yes
Windows Vista® Business Operating System	Yes		Yes		Yes	Yes	No
Windows Vista® Enterprise Operating System	Yes		Yes		Yes	Yes	No
Windows Vista® Ultimate Operating System	Yes		Yes		Yes	Yes	No
Windows® 7 Professional Operating System	Yes		Yes		Yes	Yes	No
Windows® 7 Enterprise Operating System	Yes		Yes		Yes	Yes	No
Windows® 7 Ultimate Operating System	Yes		Yes		Yes	Yes	No

*1 Only 32-bit version supported.

Comparison of CW Workbench / Wind River Workbench specifications and functions

Item		C Controller module engineering tool CW Workbench		Wind River Workbench		Overview
		Q24DHCCPU-V license SW1DND-CWWLQ24-E/ -EZ/-EVZ	Q12DCCPU-V license SW1DND-CWWLQ12-E/ -EZ/-EVZ	3.2	2.6.1	
Compiler	PENTIUM4gnu (GCC for Intel Atom Z5xx complier)	Yes	No	Yes	No	A compiler for the C Controller module Q24DHCCPU-V
	SH7750gnule (GCC for SH-4A Little Endian complier)	No	Yes	No	Yes	A compiler for the C Controller module Q12DCCPU-V
	SIMNTgnu (GCC for VxWorks® Simulator Windows complier)	No	No	Yes	Yes	A compiler for VxSim
Framework	Eclipse	Ver.3.5	Ver.3.5	Ver.3.5	Ver.3.2	Basic functions of Workbench
Debugger	Agent for target connections	Yes	Yes	Yes	Yes	Function for establishing connection with C Controller module for debugging
	Debug operation	Yes	Yes	Yes	Yes	Function to download debugging target file to C Controller module, and prepare for start of debugging
	Download	Yes	Yes	Yes	Yes	Function to debug source code with operations such as debugging start and stop, and step execution
	Dynamic Printf	Yes	No	Yes	No	Function to dynamically insert or cancel a print statement without embedding a print function in the source code. The same methods as inserting a break point during debugging are employed
	Wind River VxWorks® Simulator	No	No	Yes	Yes	Simulation functions to enable a debug function by operating Wind River VxWorks® applications on the operating system of a computer without the C Controller module
Runtime analysis tool	MemScope	No	No	Yes	Yes	A tool for specifying memory leak locations by monitoring memories
	ProfileScope	No	No	Yes	Yes	A tool for analyzing a bottleneck part of a task by analyzing code executing situation statistically
	StethoScope	No	No	Yes	Yes	A tool for analyzing memory leaks by monitoring variables and data structures in real time
	System Viewer	No	No	Yes	Yes	A tool for analyzing task execution orders and a deadlock by monitoring information such as an interrupting task situation and CPU utilization

Support

1. Technical support assistance service regarding the C Controller module

For technical support assistance service regarding the C Controller module, refer to the table below.
If you are not sure which type the inquiry belongs to, please contact your local Mitsubishi Electric sales office or representative. (Please note that inquiries other than MELSEC-related inquiries may not be able to be answered.)

Type	Inquiry	Where to contact
MELSEC-related	• Functions and specifications of the C Controller module • Specifications and usage of the dedicated function library provided by Mitsubishi Electric Corporation • C controller setting and monitoring tool, and functions and specifications of CW Workbench • Functions and specifications of the Mitsubishi products to be used with the C Controller module (such as units and MELSOFT)	local Mitsubishi representative
Operating system-related	• Functions and specifications of VxWorks®, API functions provided by VxWorks®, and general inquiries regarding programming related to VxWorks® • Functions and specifications of Wind River Workbench and Tornado™	Wind River Systems, Inc. URL: http://www.windriver.com
	• Details regarding Lineo uLinux ELITE • Board Support Package dedicated developers support website.	Lineo Solutions, Inc. URL: http://www.lineo.co.jp/modules/english/ E-mail: sales@lineo.co.jp Dedicated support website: http://eldmicc.lineo.co.jp Provides technical information for installing Linux OS on the Q24DHCCPU-LS in addition to the uLinux ELITE development software.
3rd Party partner product-related	• Functions and specifications of 3rd Party partner products	3rd Party partner product manufacturer
Plug-in software-related	• Inquiries regarding the plug-in software to be used with CW Workbench or Wind River Workbench	Plug-in software manufacturer

MEMO

Extensive global support coverage providing expert

Global FA centers

"Mitsubishi Electric Global FA centers" have been established in various countries around the world to cover the Americas, Europe, and Asia. FA centers help to ensure compliance with the certifications and regulations of different regions, initiate product development in response to local demands, and provide full-time, professional customer service.

German FA Center

Mitsubishi Electric Europe B.V. German Branch
Gothaer Strasse 8, D-40880 Ratingen, Germany
Tel: +49-2102-486-0 / Fax: +49-2102-486-1120
Area covered: Mainly Western Europe

Russian FA Center

Mitsubishi Electric Europe B.V. Russian Branch St.Petersburg office
Piskarevsky pr. 2, bld 2, lit "Sch", BC "Benua", office 720; 195027, St. Petersburg, Russia
Tel: +7-812-633-3497 / Fax: +7-812-633-3499
Area covered: Russia

Taiwan FA Center

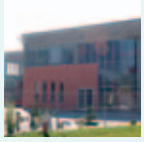
L : Setsuyo Enterprise Co., Ltd.
6F., No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan, R.O.C.
Tel: +886-2-2299-2499 / Fax: +886-2-2299-2509
R : Mitsubishi Electric Taiwan Co.,Ltd.
No.8-1.Industrial 16th Road,Taichung Industrial Park ,Taichung, Taiwan 407, R.O.C.
Tel: +886-(0)4-2359-0688 / Fax: +886-(0)4-2359-0689
Area covered: Taiwan

UK FA Center

Mitsubishi Electric Europe B.V. UK Branch
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, UK.
Tel: +44-1707-28-8780 / Fax: +44-1707-27-8695
Area covered: UK, Ireland

Czech republic FA Center

Mitsubishi Electric Europe B.V. Czech Branch
Avenir Business Park, Radicka 751/113e, 158 00 Praha5, Czech Republic
Tel: +420-251-551-470 / Fax: +420-251-551-471
Area covered: Czech, Slovakia



European FA Center

Mitsubishi Electric Europe B.V. Polish Branch
32-083 Balice ul. Krakowska 50, Poland
Tel: +48-12-630-47-00 / Fax: +48-12-630-47-01
Area covered: Central and Eastern Europe

India FA Center

Mitsubishi Electric India Pvt. Ltd. India Factory Automation Centre
Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune, 411026, Maharastra State, India
Tel: +91-20-2710-2000 / Fax: +91-20-2710-2100
Area covered: India

Thailand FA Center

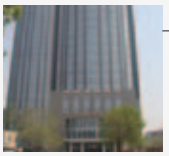
Mitsubishi Electric Automation (Thailand) Co., Ltd.
Bang-Chan Industrial Estate No.111 Soi Serithai 54, T.Kannayao, A.Kannayao, Bangkok 10230 Thailand
Tel: +66-2906-3238 / Fax: +66-2906-3239
Area covered: Thailand

Nagoya,Japan

China (including Hong Kong area)

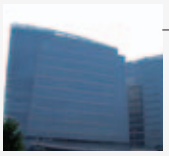
Beijing FA Center

Mitsubishi Electric Automation (CHINA) Ltd. Beijing Office
Unit 908, Office Tower 1, Henderson Centre, 18 Jianguomennei Avenue, Dongcheng District, Beijing, China
Tel: +86-10-6518-8830 / Fax: +86-10-6518-3907
Area covered: China



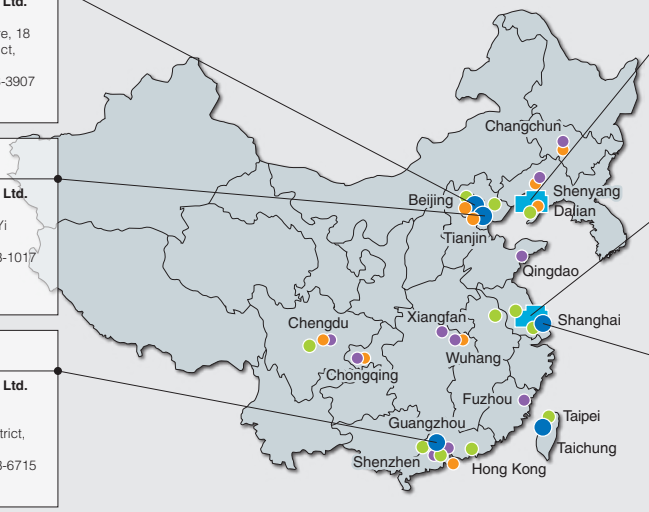
Tianjin FA Center

Mitsubishi Electric Automation (CHINA) Ltd. Tianjin Office
Unit 2003, Tianjin City Tower, No.35, You Yi Road, Hexi District, Tianjin, China
Tel: +86-22-2813-1015 / Fax: +86-22-2813-1017
Area covered: China



Guangzhou FA Center

Mitsubishi Electric Automation (CHINA) Ltd. Guangzhou Office
Rm.1609, North Tower, The Hub Center, No.1068, Xin Gang East Road, Haizhu District, Guangzhou, China
Tel: +86-20-8923-6730 / Fax: +86-20-8923-6715
Area covered: China



Local factory in China

Mitsubishi Electric Dalian Industrial Products Co., Ltd.

Local factory in China

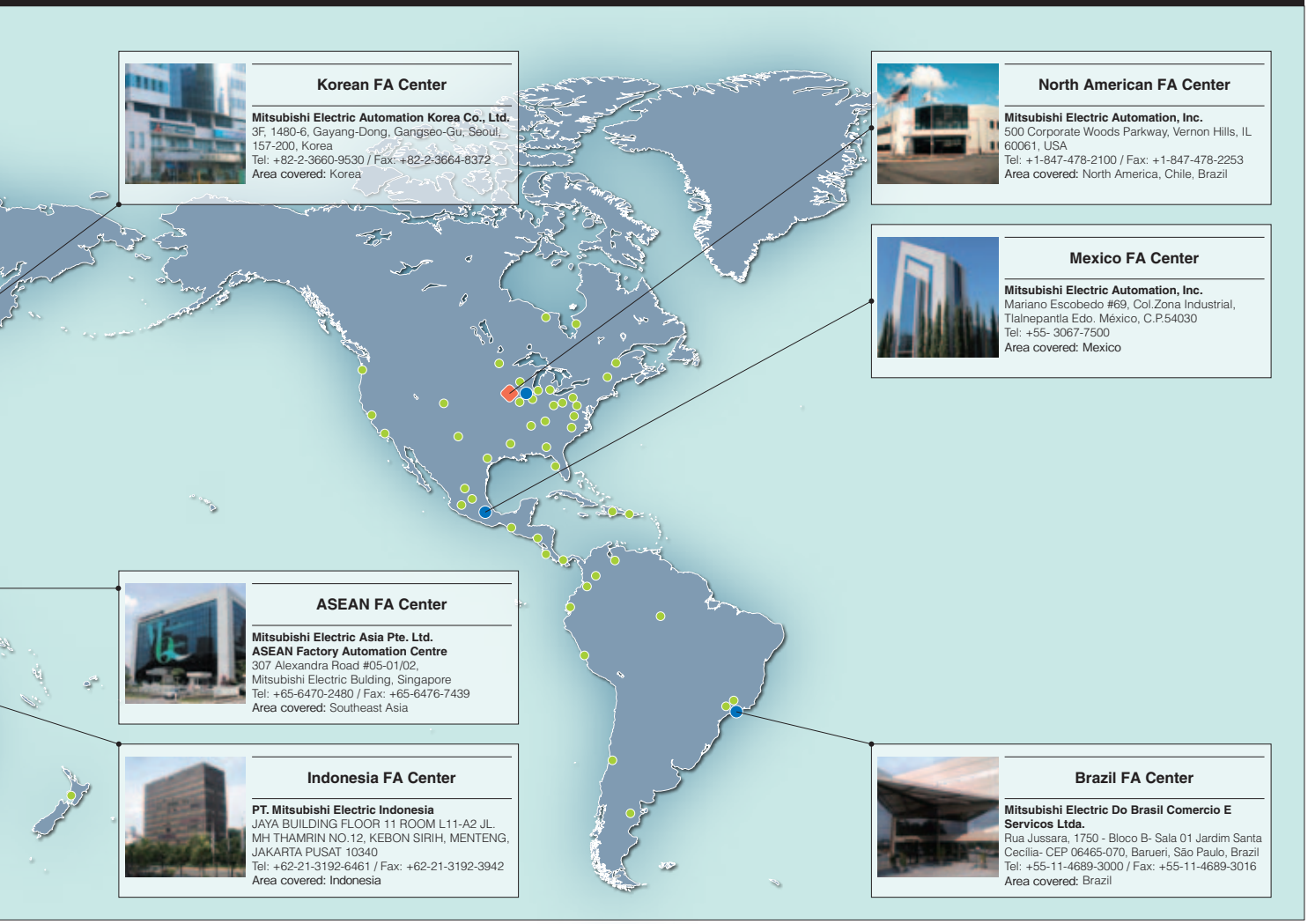
Mitsubishi Electric Automation Manufacturing (Changshu) Co.,Ltd.
No.706 Southeast Building,Chengahu Southeast Economic Development Zone of Jiangsu,215500 China
Tel: 86-512-5213-3077 / Fax: 86-512-5213-3088

Shanghai FA Center

Mitsubishi Electric Automaiton (China) Ltd.
10F, Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Changning District, Shanghai, China
Tel: 86-21-2322-3030 / Fax: 86-21-2322-3000
Area covered: China

help whenever needed.

FA center | FA center satellite (China) | Mechatronics service center (China) | Sales and Service office | Factory location | Development center



Korean FA Center

Mitsubishi Electric Automation Korea Co., Ltd.
3F, 1480-6, Gayang-Dong, Gangseo-Gu, Seoul, 157-200, Korea
Tel: +82-2-3660-9530 / Fax: +82-2-3664-8372
Area covered: Korea

North American FA Center

Mitsubishi Electric Automation, Inc.
500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA
Tel: +1-847-478-2100 / Fax: +1-847-478-2253
Area covered: North America, Chile, Brazil

Mexico FA Center

Mitsubishi Electric Automation, Inc.
Mariano Escobedo #69, Col.Zona Industrial, Tlalnepantla Edo. México, C.P.54030
Tel: +55- 3067-7500
Area covered: Mexico

ASEAN FA Center

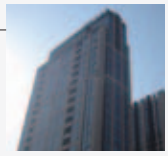
Mitsubishi Electric Asia Pte. Ltd.
ASEAN Factory Automation Centre
307 Alexandra Road #05-01/02, Mitsubishi Electric Bulding, Singapore
Tel: +65-6470-2480 / Fax: +65-6476-7439
Area covered: Southeast Asia

Indonesia FA Center

PT. Mitsubishi Electric Indonesia
JAYA BUILDING FLOOR 11 ROOM L11-A2 JL. MH THAMRIN NO.12, KEBON SIRIH, MENTENG, JAKARTA PUSAT 10340
Tel: +62-21-3192-6461 / Fax: +62-21-3192-3942
Area covered: Indonesia

Brazil FA Center

Mitsubishi Electric Do Brasil Comercio E Servicos Ltda.
Rua Jussara, 1750 - Bloco B- Sala 01 Jardim Santa Cecília- CEP 06465-070, Barueri, São Paulo, Brazil
Tel: +55-11-4689-3000 / Fax: +55-11-4689-3016
Area covered: Brazil



Complying with international quality assurance standards.

All of Mitsubishi Electric's FA component products have acquired the international quality assurance "ISO9001" and environment management system standard "ISO14001" certification. Mitsubishi Electric's products also comply with various safety standards, including UL standards.
*For jointly developed and partner products, guaranteed quality standards may differ. Please refer to the product manuals for details.

Safety Standards

CE	CE : Council Directive of the European Communities
c UL us	UL : Underwriters Laboratories Listing

Product List

*Always refer to user's manuals for information on usable modules, restrictions, etc. before using.
*Contact your local Mitsubishi sales office or representative for the latest information on the MELSOFT versions and compatible OS.

CPU

[Legend] DB : Double brand product*1 NEW : Recently released product SOON : Product available soon

Product		Model	Outline
C Controller CPU		Q24DHCCPU-V	No. of I/O points: 4096 points, endian format: little endian, removable storage: SD memory card, OS:VxWorks® Version 6.8.1
		Q12DCCPU-V	No. of I/O points: 4096 points, endian format: little endian, removable storage: CompactFlash card, OS:VxWorks® Version 6.4
		Q24DHCCPU-LS NEW	No. of I/O points: 4096 points, endian format: little endian, removable storage: SD memory card, OS: No pre-installed operating system (Operating system installed by user)
		Q06CCPU-V	No. of I/O points: 4096 points, endian format: little endian, removable storage: CompactFlash card, OS:VxWorks® Version 5.4
	Option	Q12DCCPU-CBL*1*2*3	RS-232 connection converter cable (custom mini-DIN to 9-pin D-sub connector)
		Q6BAT	Battery, Replacement battery
		Q7BAT*1*2*3	Battery, Replacement large-capacity battery
		Q7BAT-SET*1*2*3	Battery, Large-capacity battery with holder for mounting CPU
		L1MEM-2GBSD*1*2*4	SD memory card, capacity: 2 GB
		L1MEM-4GBSD*1*2*4	SDHC memory card, capacity: 4 GB
		GT05-MEM-128MC*5	CompactFlash card, capacity: 128 MB
		GT05-MEM-256MC*5	CompactFlash card, capacity: 256 MB
		QD81MEM-512MBC*3*6	CompactFlash card, capacity: 512 MB
		QD81MEM-1GBC*3*6	CompactFlash card, capacity: 1 GB
		QD81MEM-2GBC*3	CompactFlash card, capacity: 2 GB
		QD81MEM-4GBC*3	CompactFlash card, capacity: 4 GB
		QD81MEM-8GBC*3	CompactFlash card, capacity: 8 GB
High-Speed Universal model QCPU		Q03UDVCPU NEW	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 30 K steps, basic operation processing speed (LD instruction): 1.9 ns, program memory capacity: 120 KB, multiple CPU high-speed communication, peripheral connection ports: USB, Ethernet, and Extended SRAM cassette
		Q04UDVCPU NEW	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 40 K steps, basic operation processing speed (LD instruction): 1.9 ns, program memory capacity: 160 KB, multiple CPU high-speed communication, peripheral connection ports: USB, Ethernet, and Extended SRAM cassette
		Q06UDVCPU NEW	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 60 K steps, basic operation processing speed (LD instruction): 1.9 ns, program memory capacity: 240 KB, multiple CPU high-speed communication, peripheral connection ports: USB, Ethernet, and Extended SRAM cassette
		Q13UDVCPU NEW	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 130 K steps, basic operation processing speed (LD instruction): 1.9 ns, program memory capacity: 520 KB, multiple CPU high-speed communication, peripheral connection ports: USB, Ethernet, and Extended SRAM cassette
		Q26UDVCPU NEW	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 260 K steps, basic operation processing speed (LD instruction): 1.9 ns, program memory capacity: 1040 KB, multiple CPU high-speed communication, peripheral connection ports: USB, Ethernet, and Extended SRAM cassette

*1 General specifications and product guarantee conditions of jointly developed products are different from those of MELSEC products.
For more information, please refer to the product manuals or contact your local Mitsubishi representative for details.

CPU

[Legend] DB : Double brand product NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Universal model QCPU		Q00UCPU	No. of I/O points: 1024 points, no. of I/O device points: 8192 points, program capacity: 10 K steps, basic operation processing speed (LD instruction): 0.08 μs, program memory capacity: 40 KB, peripheral connection ports: USB and RS232, no memory card I/F
		Q01UCPU	No. of I/O points: 1024 points, no. of I/O device points: 8192 points, program capacity: 15 K steps, basic operation processing speed (LD instruction): 0.06 μs, program memory capacity: 60 KB, peripheral connection ports: USB and RS232, no memory card I/F
		Q02UCPU	No. of I/O points: 2048 points, no. of I/O device points: 8192 points, program capacity: 20 K steps, basic operation processing speed (LD instruction): 0.04 μs, program memory capacity: 80 KB, peripheral connection ports: USB and RS232, with memory card I/F
		Q03UDCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 30 K steps, basic operation processing speed (LD instruction): 0.02 μs, program memory capacity: 120 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q04UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 40 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 160 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q06UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 60 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 240 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q10UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 100 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 400 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q13UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 130 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 520 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q20UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 200 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 800 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
		Q26UDHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 260 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 1040 KB, multiple CPU high-speed communication, peripheral connection ports: USB and RS232, with memory card I/F
	Built-in Ethernet type	Q03UDECPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 30 K steps, basic operation processing speed (LD instruction): 0.02 μs, program memory capacity: 120 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q04UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 40 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 160 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q06UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 60 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 240 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q10UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 100 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 400 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q13UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 130 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 520 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q20UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 200 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 800 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q26UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 260 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 1040 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q50UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 500 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 2000 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
		Q100UDEHCPU*7	No. of I/O points: 4096 points, no. of I/O device points: 8192 points, program capacity: 1000 K steps, basic operation processing speed (LD instruction): 0.0095 μs, program memory capacity: 4000 KB, multiple CPU high-speed communication, peripheral connection ports: USB and Ethernet, with memory card I/F
Motion CPU		Q173DSCPU*1*2*3*5	SSCNET Ⅲ/H compatible, iQ Platform compatible, for max. 32-axis control, operation cycle: 0.22 ms and higher, built-in Ethernet, motion CPU built-in I/F (interface for INC synchronization encoder 1ch, general-purpose input signal/mark detection input signal 4 points)
		Q172DSCPU*1*2*3*5	SSCNET Ⅲ/H compatible, iQ Platform compatible, for max. 16-axis control, operation cycle: 0.22 ms and higher, built-in Ethernet, motion CPU built-in I/F (interface for INC synchronization encoder 1ch, general-purpose input signal/mark detection input signal 4 points)
		Q173DCPU*1*2*3*7	For 32-axis control, operation cycle: 0.44ms, SSCNET Ⅲ: 2ch, iQ Platform compatible
		Q173DCPU-S1*1*2*3*5	For 32-axis control, operation cycle: 0.44ms, SSCNET Ⅲ: 2ch, iQ Platform compatible, built-in Ethernet
		Q172DCPU*1*2*3*5	For 8-axis control, operation cycle: 0.44ms, SSCNET Ⅲ: 1ch, iQ Platform compatible
		Q172DCPU-S1*1*2*3*5	For 8-axis control, operation cycle: 0.44ms, SSCNET Ⅲ: 1ch, iQ Platform compatible, built-in Ethernet

*1 For use with Q24DHCCPU-V
*2 For use with Q24DHCCPU-LS
*3 For use with Q12DCCPU-V
*4 Operations other than Mitsubishi products are not guaranteed.
*5 Mountable only onto Multiple CPU high speed main base.
*6 Use with Q06CCPU-V supported.
*7 For Multiple CPU high speed bus communication, please combine with the Q12DCCPU-V or the Q24DHCCPU-V CPU module.

Base

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product	Model	Outline
Main base	Q33B	3 slots, 1 power supply module required, for Q series modules
	Q35B	5 slots, 1 power supply module required, for Q series modules
	Q38B	8 slots, 1 power supply module required, for Q series modules
	Q312B	12 slots, 1 power supply module required, for Q series modules
Multiple CPU high speed main base	Q35DB	5 slots, power supply module required, for Q series modules
	Q38DB	8 slots, 1 power supply module required, for Q series modules
	Q312DB	12 slots, 1 power supply module required, for Q series modules
Slim type main base	Q32SB	2 slots, 1 slim type power supply module required, for Q series modules
	Q33SB	3 slots, 1 slim type power supply module required, for Q series modules
	Q35SB	5 slots, 1 slim type power supply module required, for Q series modules
Extension base	Q63B	3 slots, 1 power supply module required, for Q series modules
	Q65B	5 slots, 1 power supply module required, for Q series modules
	Q68B	8 slots, 1 power supply module required, for Q series modules
	Q612B	12 slots, 1 power supply module required, for Q series modules
	Q52B	2 slots, power supply module not required, for Q series modules
	Q55B	5 slots, power supply module not required, for Q series modules
Extension cable	QC05B	0.45 m cable for connecting extension base unit
	QC06B	0.6 m cable for connecting extension base unit
	QC12B	1.2 m cable for connecting extension base unit
	QC30B	3 m cable for connecting extension base unit
	QC50B	5 m cable for connecting extension base unit
	QC100B	10 m cable for connecting extension base unit

Power supply

Power supply	Q61P	Input voltage: 100 to 240 V AC, output voltage: 5 V DC, output current: 6 A
	Q62P	Input voltage: 100 to 240 V AC, output voltage: 5/24 V DC, output current: 3/0.6 A
	Q63P	Input voltage: 24 V DC, output voltage: 5 V DC, output current: 6 A
	Q64PN	Input voltage: 100 to 240 V AC, output voltage: 5 V DC, output current: 8.5 A
Power Supply with Life Detection	Q61P-D	Input voltage: 100 to 240 V AC, output voltage: 5 V DC, output current: 6A
Slim type power supply	Q61SP	Input voltage: 100 to 240 V AC, output voltage: 5 V DC, output current: 2 A

* Refer to the Technical News FAD-D-0006 or contact your nearest Sales Office for the latest information on GMP validation compatible models and requirements for ordering.

I/O module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Input	AC	QX10	16 points, 100 to 120 V AC, response time: 20 ms, 16 points/common, 18-point terminal block
		QX10-TS	16 points, 100 to 120 V AC, response time: 20 ms, 16 points/common, 18-point spring clamp terminal block
		QX28	8 points, 100 to 240 V AC, response time: 20 ms, 8 points/common, 18-point terminal block
	DC (Positive common)*1	QX40	16 points, 24 V DC, response time: 1/5/10/20/70 ms, 16 points/common, positive common, 18-point terminal block
		QX40-TS	16 points, 24 V DC, response time: 1/5/10/20/70 ms, 16 points/common, positive common, 18-point spring clamp terminal block
		QX40-S1	16 points, 24 V DC, response time: 0.1/0.2/0.4/0.6/1 ms, 16 points/common, positive common, 18-point terminal block
		QX40H	16 points, 24 V DC, response time: 0/0.1/0.2/0.4/0.6/1 ms, 8 points/common, positive common, 18-point terminal block
		QX41*2 *3	32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive common, 40-pin connector
		QX41-S1*2	32 points, 24 V DC, response time: 0.1/0.2/0.4/0.6/1 ms, 32 points/common, positive common, 40-pin connector
		QX41-S2*2 *3	32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive common, 40-pin connector
		QX42*2	64 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive common, 40-pin connector
		QX42-S1*2	64 points, 24 V DC, response time: 0.1/0.2/0.4/0.6/1 ms, 32 points/common, positive common, 40-pin connector
	DC/AC	QX50	16 points, 48 V AC/DC, response time: 20 ms, 16 points/common, positive/negative common, 18-point terminal block
	DC sensor	QX70	16 points, 5/12 V DC, response time: 1/5/10/20/70 ms, 16 points/common, positive/negative common, 18-point terminal block
		QX70H	16 points, 5 V DC, response time: 0/0.1/0.2/0.4/0.6/1 ms, 8 points/common, positive common, 18-point terminal block
		QX71*2	32 points, 5/12 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive/negative common, 40-pin connector
		QX72*2	64 points, 5/12 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive/negative common, 40-pin connector
	DC (Negative common) *1	QX80	16 points, 24 V DC, response time: 1/5/10/20/70 ms, 16 points/common, negative common, 18-point terminal block
		QX80-TS	16 points, 24 V DC, response time: 1/5/10/20/70 ms, 16 points/common, negative common, 18-point spring clamp terminal block
		QX80H	16 points, 24 V DC, response time: 0/0.1/0.2/0.4/0.6/1 ms, 8 points/common, negative common, 18-point terminal block
		QX81*3 *4	32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, negative common, 37-pin D-sub connector
		QX81-S2*3 *4	32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, negative common, 37-pin D-sub connector
		QX82*2	64 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, negative common, 40-pin connector
		QX82-S1*2	64 points, 24 V DC, response time: 0.1/0.2/0.4/0.6/1 ms, 32 points/common, negative common, 40-pin connector
		QX90H	16 points, 5 V DC, response time: 0/0.1/0.2/0.4/0.6/1 ms, 8 points/common, negative common, 18-point terminal block
Output	Relay	QY10	16 points, 24 V DC/240 V AC, 2 A/point, 8 A/common, response time: 12 ms, 16 points/common, 18-point terminal block
		QY10-TS	16 points, 24 V DC/240 V AC, 2 A/point, 8 A/common, response time: 12 ms, 16 points/common, 18-point spring clamp terminal block
		QY18A	8 points, 24 V DC/240 V AC, 2 A/point, response time: 12 ms, 18-point terminal block, all points independent
	Triac	QY22	16 points, 100 to 240 V AC, 0.6 A/point, 4.8 A/common, response time: 1 ms + 0.5 cycle, 16 points/common, 18-point terminal block, with surge suppression
	Transistor (Sink)	QY40P	16 points, 12 to 24 V DC, 0.1 A/point, 1.6 A/common, response time: 1 ms, 16 points/common, sink type, 18-point terminal block, overload protection function, overheat protection function, surge suppression
		QY40P-TS	16 points, 12 to 24 V DC, 0.1 A/point, 1.6 A/common, response time: 1 ms, 16 points/common, sink type, 18-point spring clamp terminal block, overload protection function, overheat protection function, surge suppression
		QY41H	32 points, 5 to 24 V DC, 0.2 A/point, 2 A/common, response time: 2 us, 32 points/common, sink type, 40-pin connector, with surge suppression
		QY41P*2	32 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, sink type, 40-pin connector, overload protection function, overheat protection function, surge suppressionand surge suppression
		QY42P*2	64 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, sink type, 40-pin connector, overload protection function, overheat protection function, surge suppression
		QY50	16 points, 12 to 24 V DC, 0.5 A/point, 4 A/common, response time: 1 ms, 16 points/common, sink type, 18-point terminal block, with surge suppression and fuse
	Transistor (Independent)	QY68A	8 points, 5 to 24 V DC, 2 A/point, 8 A/module, response time: 10 ms, sink/source type, 18-point terminal block, with surge suppression, all points independent
	TTL CMOS	QY70	16 points, 5 to 12 V DC, 16 mA/point, 256 mA/common, response time: 0.5 ms, 16 points/common, sink type, 18-point terminal block, with fuse
		QY71*2	32 points, 5 to 12 V DC, 16 mA/point, 512 mA/common, response time: 0.5 ms, 32 points/common, sink type, 40-pin connector, with fuse
	Transistor (Source)	QY80	16 points, 12 to 24 V DC, 0.5 A/point, 4 A/common, response time: 1 ms, 16 points/common, source type, 18-point terminal block, with surge suppression and fuse
		QY80-TS	16 points, 12 to 24 V DC, 0.5 A/point, 4 A/common, response time: 1 ms, 16 points/common, source type, 18-point spring clamp terminal block, with surge suppression and fuse
		QY81P*4	32 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, source type, 37-pin D-sub connector, overload protection function, overheat protection function, surge suppression
		QY82P*2	64 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, source type, 40-pin connector, overload protection function, overheat protection function, surge suppression
I/O	DC input/ transistor output	QH42P*2*5	Input: 32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive common, output: 32 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, sink type, 40-pin connector, overload protection function, overheat protection function, surge suppression
		QX48Y57	Input: 8 points, 24 V DC, response time: 1/5/10/20/70 ms, 8 points/common, positive common, output: 7 points, 12 to 24 V DC, 0.5 A/point, 2 A/common, response time: 1 ms, 7 points/common, sink type, 18-point terminal block, with surge suppression and fuse
		QX41Y41P*2*5	Input: 32 points, 24 V DC, response time: 1/5/10/20/70 ms, 32 points/common, positive common, output: 32 points, 12 to 24 V DC, 0.1 A/point, 2 A/common, response time: 1 ms, 32 points/common, sink type, 40-pin connector, overload protection function, overheat protection function, surge suppression
Interrupt module		QI60	16 point, 24 V DC, response time: 0.1/0.2/0.4/0.6/1 ms, 16 points/common, 18-point terminal block

*1 "Positive common" indicates that the positive lead of a DC power supply must be connected to the common terminal. Accordingly, "Negative common" indicates that the negative lead must be connected to the common terminal.
*2 Connector is not provided. Separately order one of the following: A6CON1/A6CON2/A6CON3/A6CON4.
*3 The rated input currents are different. [QX41: approx. 4 mA, QX41-S2: approx. 6 mA, QX81: approx. 4 mA, QX81-S2: approx. 6 mA]
*4 Connector is not provided. Separately order one of the following: A6CON1E/A6CON2E/A6CON3E.
*5 The number of occupied input/output points is different. [QH42P: 32 points; QX41Y41P: 64 points (first 32 points: input / second 32 points: output)]

Analog I/O module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Analog input	Voltage input	Q68ADV	8 channels, input: -10 to 10 V DC, output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000, conversion speed: 80 μs/channel, 18-point terminal block
	Current input	Q62AD-DGH	2 channels; input, 4 to 20 mA DC, output (resolution): 0 to 32000, 0 to 64000, conversion speed: 10 ms/2 channels, 18-point terminal block, channel isolated, supplies power to 2-wire transmitter
		Q66AD-DG*1	6 channels, input: 4 to 20 mA DC (when 2-wire transmitter is connected), 0 to 20 mA DC, output (resolution): 0 to 4000, 0 to 12000, conversion speed: 10 ms/channel, 40-pin connector, channel isolated, supplies power to 2-wire transmitter
		Q68ADI	8 channels, input: 0 to 20 mA DC, output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000, conversion speed: 80 μs/channel, 18-point terminal block
	Voltage/ current input	Q64ADH	4 channels; input -10 to 10 V DC, 0 to 20 mA DC, output (resolution): 0 to 20000, -20000 to 20000, -5000 to 22500, conversion speed: 20 μs/channel, 18-point terminal block
		Q64AD	4 channels; input -10 to 10 V DC, 0 to 20 mA DC, output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000, conversion speed: 80 μs/channel, 18-point terminal block
		Q64AD-GH	4 channels, input: -10 to 10 V DC, 0 to 20 mA DC, output (resolution): 0 to 32000, -32000 to 32000, 0 to 64000, -64000 to 64000, conversion speed: 10 ms/4 channels, 18-point terminal block, channel isolated
		Q68AD-G*1	8 channels, input: -10 to 10 V DC, 0 to 20 mA DC, output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000, conversion speed: 10 ms/channel, 40-pin connector, channel isolated
Analog output	Voltage output	Q68DAVN	8 channels, input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000, output: -10 to 10 V DC, conversion speed: 80 μs/channel, 18-point terminal block
	Current output	Q68DAIN	8 channels, input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000; output: 0 to 20 mA DC, conversion speed: 80 μs/channel, 18-point terminal block
	Voltage/ current output	Q64DAH NEW	4 channels, input (resolution): 0 to 20000, -20000 to 20000 output: -10 to 10V DC, 0 to 20 mA DC, conversion speed: 20 μs/channel, 18-point terminal block
		Q62DAN	2 channels, input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000, output: -10 to 10 V DC, 0 to 20 mA DC, conversion speed: 80 μs/channel, 18-point terminal block
		Q62DA-FG	2 channels, input (resolution): 0 to 12000, -12000 to 12000, -16000 to 16000, output: -12 to 12 V DC, 0 to 22 mA DC, conversion speed: 10 ms/2 channels, 18-point terminal block
		Q64DAN	4 channels, input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000, output: -10 to 10 V DC, 0 to 20 mA DC, conversion speed: 80 μs/channel, 18-point terminal block
		Q66DA-G*1	6 channels, input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000, output: -12 to 12 V DC, 0 to 22 mA DC, conversion speed: 6 ms/channel, 40-pin connector, channel isolated
Analog input/ output	Voltage and current input/ output	Q64AD2DA	Input: 4 channels Input: -10 to 10 V DC, 0 to 20 mA DC Output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000 Conversion speed: 500 μs/channel Output: 2 channels Input (resolution): 0 to 4000,-4000 to 4000,0 to 12000,-16000 to 16000 Output: -10 to 10 V DC, 0 to 20 mA DC Conversion speed: 500 μs/channel 18-point terminal block
Load cell input		Q61LD	1 channel, input (load cell output): 0.0 to 3.3 mV/V, output (resolution): 0 to 10000, conversion speed: 10 ms, 18-point terminal block
CT input		Q68CT	8 channel, input: 0 to 5 A AC, 0 to 50 A AC, 0 to 100 A AC, 0 to 200 A AC, 0 to 400 A AC, 0 to 600 A AC, Output: 0 to 12000 18-point terminal block

*1 A connector is not provided. The A6CON4 connector must be ordered separately.

Analog I/O module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Temperature input	RTD	Q64RD	4 channels, platinum RTD (Pt100, JPt100), disconnection detection function, conversion speed: 40 ms/channel, 18-point terminal block
		Q64RD-G	4 channels, platinum RTD (Pt100, JPt100), nickel RTD (Ni100), disconnection detection function, conversion speed: 40 ms/channel, disconnection detection function, isolation between channels, 18-point terminal block
		Q68RD3-G*1	8 channels, platinum RTD (Pt100, JPt100), nickel RTD (Ni100), disconnection detection function, conversion speed: 320 ms/8 channels, isolation between channels, 40-pin connector
	Thermocouple	Q64TD	4 channels, thermocouple (B, R, S, K, E, J, T, N), disconnection detection function, conversion speed: 40 ms/channel, isolation between channels, 18-point terminal block
		Q64TDV-GH	4 channels, thermocouple (B, R, S, K, E, J, T, N), disconnection detection function, conversion speed: sampling cycle × 3, sampling cycle: 20 ms/channel, isolation between channels, 18-point terminal block
		Q68TD-G-H01*1*2	8 channels, thermocouple (B, R, S, K, E, J, T, N), disconnection monitor function, conversion speed: 320 ms/8 channels, isolation between channels, 40-pin connector
		Q68TD-G-H02*1	8 channels, thermocouple (B, R, S, K, E, J, T, N), disconnection detection function, conversion speed: 640 ms/8 channels, isolation between channels, 40-pin connector
Temperature control	RTD	Q64TCRTN*3	4 channels, platinum RTD (Pt100, JPt100), heating control/cooling control/heating-cooling control, sampling cycle: 500 ms/4 channels, isolation between channels, 18-point terminal block
		Q64TCRT	4 channels, platinum RTD (Pt100, JPt100), heating control/cooling control, sampling cycle: 500 ms/4 channels, isolation between channels, 18-point terminal block
		Q64TCRTBWN*3	4 channels, platinum RTD (Pt100, JPt100), heating control/cooling control/heating-cooling control, heater disconnection detection function, sampling cycle: 500 ms/4 channels, isolation between channels, two 18-point terminal blocks
		Q64TCRTBW	4 channels, platinum RTD (Pt100, JPt100), heating control/cooling control, heater disconnection detection function, sampling cycle: 500 ms/4 channels, isolation between channels, two 18-point terminal blocks
	Thermocouple	Q64TCTTN	4 channels, thermocouple (K, J, T, B, S, E, R, N, U, L, PLⅡ, W5Re/W26Re), heating control/cooling control/heating-cooling control, sampling cycle: 500 ms/4 channels, isolation between channels, 18-point terminal block
		Q64TCTT	4 channels, thermocouple (K, J, T, B, S, E, R, N, U, L, PLⅡ, W5Re/W26Re), heating control/cooling control, sampling cycle: 500 ms/4 channels, isolation between channels, 18-point terminal block
		Q64TCTTBWN	4 channels, thermocouple (K, J, T, B, S, E, R, N, U, L, PLⅡ, W5Re/W26Re), heating control/cooling control/heating-cooling control, heater disconnection detection function, sampling cycle: 500 ms/4 channels, isolation between channels, two 18-point terminal blocks
		Q64TCTTBW	4 channels, thermocouple (K, J, T, B, S, E, R, N, U, L, PLⅡ, W5Re/W26Re), heating control/cooling control, heater disconnection detection function, sampling cycle: 500 ms/4 channels, isolation between channels, two 18-point terminal blocks
Loop control		Q62HLC	2 channels, input: thermocouple/micro voltage/voltage/current, conversion speed (input): 25 ms/2 channels, sampling cycle: 25 ms/2 channels; output: 4 to 20 mA DC, conversion speed (output): 25 ms/2 channels, 18-point terminal block, with 5 PID control modes

*1 A connector is not provided. The A6CON4 connector must be ordered separately.
*2 The number of modules that can be installed is restricted based on the combination of power supply and base unit.
*3 When fitting the spring clamp terminal block, use Q6TE-18SN. The conventional model, Q6TE-18S, cannot be used with it.

Pulse I/O and positioning module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Positioning	Open collector output	QD75P1*1	1-axis, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 200 kpps, 40-pin connector
		QD75P2*1	2-axes, 2-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 200 kpps, 40-pin connector
		QD75P4*1	4-axes, 2-/3-/4-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 200 kpps, 40-pin connector
		QD70P4*1	4-axes, control unit: pulse, no. of positioning data: 10/axis, max. output pulse: 200 kpps, 40-pin connector
		QD70P8*1	8-axes, control unit: pulse, no. of positioning data: 10/axis, max. output pulse: 200 kpps, 40-pin connector
	Differential output	QD75D1*1	1-axis, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 1 Mpps, 40-pin connector
		QD75D2*1	2-axes, 2-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 1 Mpps, 40-pin connector
		QD75D4*1	4-axes, 2-/3-/4-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, max. output pulse: 1 Mpps, 40-pin connector
		QD70D4*1	4-axes, control unit: pulse, no. of positioning data: 10/axis, max. output pulse: 4 Mpps, 40-pin connector
		QD70D8*1	8-axes, control unit: pulse, no. of positioning data: 10/axis, max. output pulse: 4 Mpps, 40-pin connector
	With SSCNET connectivity	QD75M1*2	1-axis, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET connectivity
		QD75M2*2	2-axes, 2-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET connectivity
		QD75M4*2	4-axes, 2-/3-/4-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET connectivity
	With SSCNET Ⅲ connectivity	QD75MH1*2	1-axis, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET Ⅲ connectivity
		QD75MH2*2	2-axes, 2-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET Ⅲ connectivity
		QD75MH4*2	4-axes, 2-/3-/4-axis linear interpolation, 2-axis circular interpolation, control unit: mm, inch, degree, pulse, no. of positioning data: 600/axis, 40-pin connector, with SSCNET Ⅲ connectivity
		QD74MH8	8-axes, control unit: pulse, no. of positioning data: 32/axis, with SSCNET Ⅲ connectivity
		QD74MH16	16-axes, control unit: pulse, no. of positioning data: 32/axis, with SSCNET Ⅲ connectivity
	Open collector output with built-in counter function	QD72P3C3*1	Positioning: 3-axes, control unit: pulse, no. of positioning data: 1/axis, max. output pulse: 100 kpps, counter: 3 channels, 100 kpps, count input signal: 5/24 V DC, 40-pin connector
High-Speed Counter		QD62*2	2 channels, 200/100/10 kpps, count input signal: 5/12/24 V DC, external input: 5/12/24 V DC, coincidence output: transistor (sink), 12/24 V DC, 0.5 A/point, 2 A/common, 40-pin connector
		QD62E*2	2 channels, 200/100/10 kpps, count input signal: 5/12/24 V DC, external input: 5/12/24 V DC, coincidence output: transistor (source), 12/24 V DC, 0.1 A/point, 0.4 A/common, 40-pin connector
		QD62D*2	2 channels, 500/200/100/10 kpps, count input signal: EIA standards RS-422-A (differential line driver), external input: 5/12/24 V DC; coincidence output: transistor (sink), 12/24 V DC, 0.5 A/point, 2 A/common, 40-pin connector
		QD63P6*1	6 channels, 200/100/10 kpps, count input signal: 5 V DC, 40-pin connector
		QD64D2*1	2 channels, 4 Mpps, count input signal: EIA standards RS-422-A (differential line driver), external input: 24 V DC, coincidence output: transistor (sink), 12/24 V DC, 0.5 A/point, 2 A/common, 40-pin connector
		QD65PD2*1	2 Channels Differential input: 40 kpps/400 kpps/800 kpps/2 Mpps/4 Mpps/8 Mpps Count input signal level: EIA Standards RS-422-A, differential line driver level DC Input: 10 kpps/100 kpps/200 kpps Count input signal level: 5/12/24 V DC, 7 to 10mA External outputs: Transistor (sink type) output, 12/24 V DC 0.1 A/point, 0.8 A/common
Channel isolated pulse input		QD60P8-G	8 channels, 30 kpps/10 kpps/1 kpps/100 pps/50 pps/10 pps/1 pps/0.1 pps, count input signal: 5/12 to 24 V DC

*1 A connector is not provided. The A6CON1/A6CON2/A6CON4 connector must be ordered separately.
*2 A connector is not provided. The A6CON1/A6CON2/A6CON3/A6CON4 connector must be ordered separately.

Energy Measuring Module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
Energy Measuring		QE81WH *1	3-phase 3-wire type, Number of measurement circuits: 1 circuit, Measured items: power rate (consumption, regenerative), current, voltage, power, power factor, etc.
		QE84WH *1*2 NEW	3-phase 3-wire type, Number of measurement circuits: 4 circuits, Measured items: power rate (consumption, regenerative), current, voltage, power, power factor, etc.
		QE81WH4W *1*3	3-phase 4-wire type, Number of measurement circuits: 1 circuit, Measured items: power rate (consumption, regenerative), current, voltage, power, power factor, etc.
		QE83WH4W *1*2 NEW	3-phase 4-wire type, Number of measurement circuits: 3 circuits, Measured items: power rate (consumption, regenerative), current, voltage, power, power factor, etc.
	Option	QE8WH4VT	QE81WH4W, QE83WH4W dedicated voltage transformer (63.5/110 VAC to 227/480 VAC)
Isolation monitoring		QE82LG *4	Measured items: leakage current (Io), resistive component leakage current (Ior), number of measured circuits: 2 circuits

*1 Dedicated current sensors are required for operation.
*2 Current measurement mode is provided. The current for up to eight circuits can be measured in the current measurement mode.
*3 The separate voltage transformer (QE8WH4VT) is required for the three-phase 4-wire compatible products.
*4 Dedicated residual current transformers are required for operation.

Information module

MES interface		QJ71MES96 *1	MES interface module *MX MESInterface and CompactFlash card are required.
	Option	GT05-MEM-128MC	CompactFlash card, capacity: 128 MB
		GT05-MEM-256MC	CompactFlash card, capacity: 256 MB
		QD81MEM-512MBC	CompactFlash card, capacity: 512 MB
		QD81MEM-1GBC	CompactFlash card, capacity: 1 GB
High-Speed Data Logger		QD81DL96 *1	High-Speed Data Logger module *CompactFlash card are required
	Option	QD81MEM-512MBC	CompactFlash card, capacity: 512 MB
		QD81MEM-1GBC	CompactFlash card, capacity: 1 GB
		QD81MEM-2GBC	CompactFlash card, capacity: 2 GB
		QD81MEM-4GBC	CompactFlash card, capacity: 4 GB
		QD81MEM-8GBC	CompactFlash card, capacity: 8 GB
Web server		QJ71WS96 *1	Web server module 10BASE-T/100BASE-TX: 1 channel, RS-232: 1 channel
	Option	GT05-MEM-128MC	128 MB CompactFlash card
		GT05-MEM-256MC	256 MB CompactFlash card
		QD81MEM-512MBC	512 MB CompactFlash card
		QD81MEM-1GBC	1 GB CompactFlash card
Serial communication		QJ71C24N	RS-232: 1 channel, RS-422/485: 1 channel, total transmission speed of 2 channels: 230.4 kbps
		QJ71C24N-R2	RS-232: 2 channels, total transmission speed of 2 channels: 230.4 kbps
		QJ71C24N-R4	RS-422/485: 2 channels, total transmission speed of 2 channels: 230.4 kbps

*1 For use with Q24DHCCPU-V and Q12DCCPU-V

Control network module

[Legend] DB : Double brand product (Note) NEW : Recently released product SOON : Product available soon

Product		Model	Outline
CC-Link IE Controller Network		QJ71GP21-SX	Multi-mode fiber optic cable, dual loop, controller network (control/normal station)
		QJ71GP21S-SX	Multi-mode fiber optic cable, dual loop, controller network (control/normal station), with external power supply function
MELSEC NET/H	Optical loop (SI)	QJ71LP21-25	SI/QSI/H-PCF/ broadband H-PCF fiber optic cable, dual loop, controller network (control/normal station) or remote I/O network (remote mater station)
		QJ71LP21S-25	SI/QSI/H-PCF/ broadband H-PCF fiber optic cable, dual loop, controller network (control/normal station) or remote I/O network (remote mater station), with external power supply function
	Optical loop (GI)	QJ71LP21G	GI-50/125 fiber optic cable, dual loop, controller network (control/normal station) or remote I/O network (remote master station)
	Coaxial bus	QJ71BR11	3C-2V/5C-2V coaxial cable, single bus, controller network (control/normal station) or remote I/O network (remote master station)
CC-Link IE Field Network		QJ71GF11-T2*1	Master/local station, CC-Link IE Field Network compatible
CC-Link		QJ61BT11N	Master/local station, CC-Link Ver. 2 compatible
CC-Link/LT		QJ61CL12	Master station
AnyWire DB A20		QJ51AW12D2 DB	Master station AnyWire DB A20 system compatible
FL-net (OPCN-2)	Ver. 2.00	QJ71FL71-T-F01	10BASE-T 100BASE-TX
		QJ71FL71-B2-F01	10BASE2
		QJ71FL71-B5-F01	10BASE5
	Ver. 1.00	QJ71FL71-T	10BASE-T
		QJ71FL71-B2	10BASE2
		QJ71FL71-B5	10BASE5
AS-i		QJ71AS92	Master station, AS-Interface Specification Version 2.11 compatible

*1 Only cyclic transmission is supported with the Q12DCCPU-V. Parameters are set from the program.

Ethernet related products

Wireless LAN adapter	Japan	Access point	NZ2WL-JPA*1 DB	IEEE802.11a(W52/W53)/IEEE802.11b/IEEE802.11g compliant
		Station	NZ2WL-JPS*1 DB	IEEE802.11a(J52/W52/W53)/IEEE802.11b/IEEE802.11g compliant
	America		NZ2WL-US*1*2 DB	IEEE802.11a/IEEE802.11b/IEEE802.11g compliant
	Europe		NZ2WL-EU*1*2 DB	IEEE802.11a/IEEE802.11b/IEEE802.11g compliant
	China		NZ2WL-CN*1*2 DB	IEEE802.11a/IEEE802.11b/IEEE802.11g compliant
	Korea		NZ2WL-KR*1*2 DB	IEEE802.11a/IEEE802.11b/IEEE802.11g compliant
	Taiwan		NZ2WL-TW*1*2 DB	IEEE802.11a/IEEE802.11b/IEEE802.11g compliant
Industrial switching HUB			NZ2EHG-T8 DB	10 Mbps/100 Mbps/1 Gbps AUTO-MDIX, DIN rail mountable, 8 ports
			NZ2EHF-T8 DB	10 Mbps/100 Mbps AUTO-MDIX, DIN rail mountable, 8 ports
CC-Link IE Field Network Ethernet adapter			NZ2GF-ETB	For CC-Link IE field network expansion, 100 Mbps/1 Gbps

*1 Each product can be used only in the respective country.
*2 Both access point and station are supported. Select between each with settings.

Engineering tool for C Controller module

CW Workbench *1	SW1DND-CWWLQ24-E	C Controller engineering tool software package, product with license for Q24DHCCPU-V
	SW1DND-CWWLQ24-EZ	Additional license product for Q24DHCCPU-V
	SW1DND-CWWLQ24-EVZ	Update license product for Q24DHCCPU-V
	SW1DND-CWWLQ12-E	C Controller engineering tool software package, product with license for Q12DCCPU-V
	SW1DND-CWWLQ12-EZ	Additional license product for Q12DCCPU-V
	SW1DND-CWWLQ12-EVZ	Update license product for Q12DCCPU-V
CW-Sim *2	SW1DNC-CWSIM-E NEW	CW Worbench simulation evironment, license product
	SW1DNC-CWSIM-EZ NEW	CW Workbench simulation environment, additional license product*3
	SW1DNC-CWSIMSA-E NEW	CW Workbench simulation environment, standalone product

*1 CW Workbench is available as a one month trial version. For more information, please contact your local Mitsubishi Electric office or sales representative.
*2 CW-Sim standalone does not require a license file.
*3 This product is an additional license for SW1DNC-CWSIM-E.

Setting/monitoring tools for C Controller module

Setting/monitoring tools for C Controller module	SW4PVC-CCPU-E	A tool for setting/monitoring C Controller module, CC-Link, MELSECNET/H, CC-Link IE Controller network, CC-Link IE Field network
	SW3PVC-CCPU-E	A tool for setting/monitoring C Controller module, CC-Link, MELSECNET/H, CC-Link IE Controller network

Software selection (for Q24DHCCPU-V, Q12DCCPU-V)

Refer to the following table and select the software.

		C Controller setting and monitoring tool		C Controller engineering tool CW Workbench		Wind River Workbench 3.2	Wind River Workbench 2.6.1
		SW4PVC-CCPU	SW3PVC-CCPU	Q24DHCCPU-V license*1	Q12DCCPU-V license*2		
Use Q24DHCCPU-V	To suppress implementation costs and easily develop applications	○	–	○	–	–	–
	To use a tool that provides advanced analysis of tasks and interrupt process execution order, etc.			Use as necessary.	–	○	–
Use both Q24DHCCPU-V and Q12DCCPU-V	To suppress implementation costs and easily develop applications	○	○	○*3	○*4	–	–
	To use a tool that provides advanced analysis of tasks and interrupt process execution order, etc.			Use as necessary.	Use as necessary.	○*5	○*6
Use Q12DCCPU-V	To suppress implementation costs and easily develop applications	–	○	–	○	–	–
	To use a tool that provides advanced analysis of tasks and interrupt process execution order, etc.			–	Use as necessary.	–	○

*1 Q24DHCCPU-V license set product SW1DND-CWWLQ24-E, additional license product SW1DND-CWWLQ24-EZ.
*2 Q12DCCPU-V license set product SW1DND-CWWLQ12-E, additional license product SW1DND-CWWLQ12-EZ.
*3 Update license product SW1DND-CWWLQ24-EVZ is available to add Q24DHCCPU-V license to computer equipped Q12DCCPU-V license
*4 Update license product SW1DND-CWWLQ12-EVZ is available to add Q12DHCCPU-V license to computer equipped Q24DCCPU-V license
*5 Q12DCPPU-V not supported.
*6 Q24DHCCPU-V not supported.

Software selection (for Q24DHCCPU-LS)

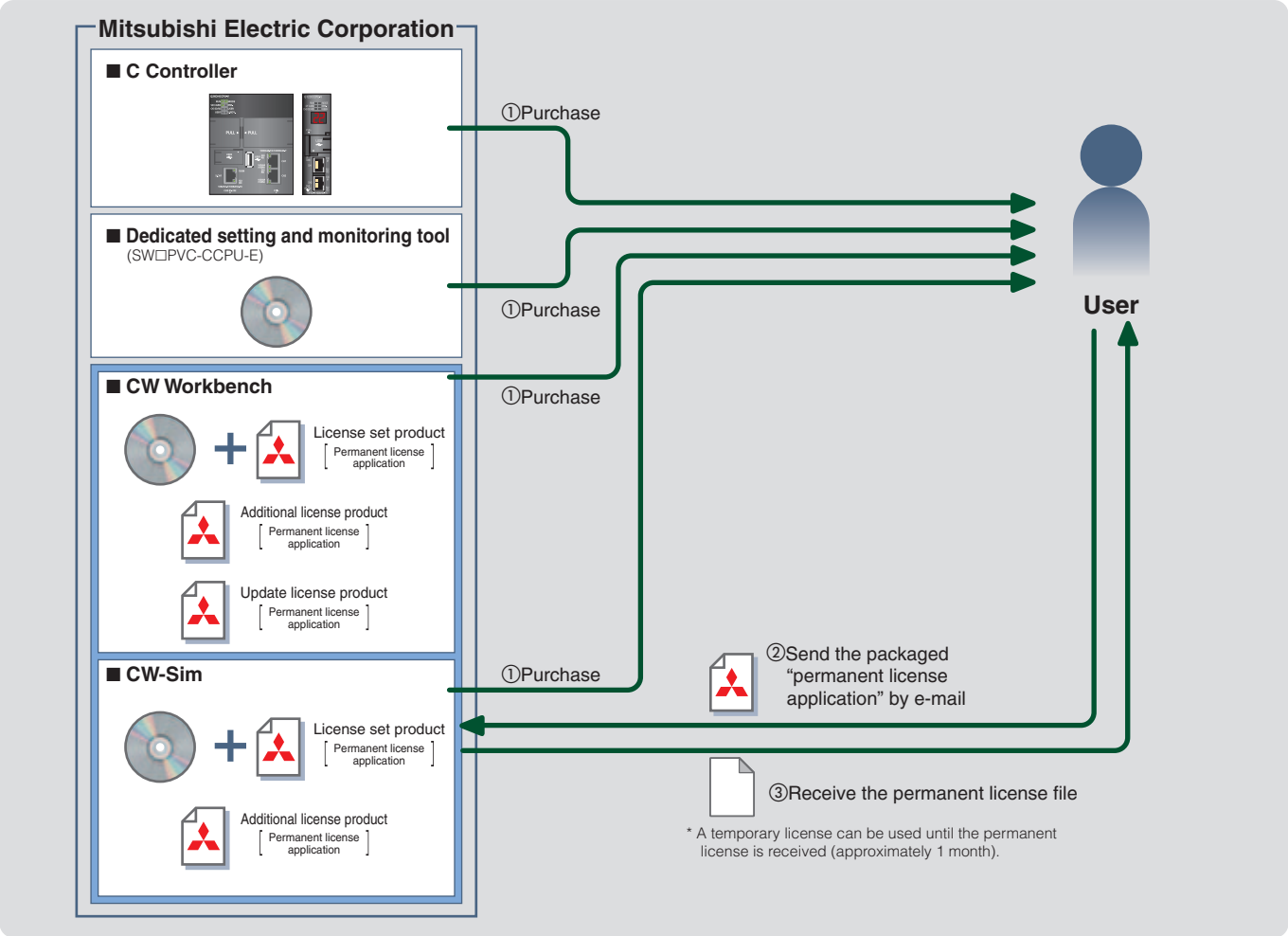
Refer to the following table.

Item	Specification
OS	Lineo uLinux*1: kernel2.6.35
Required software	Lineo uLinux ELITE*1

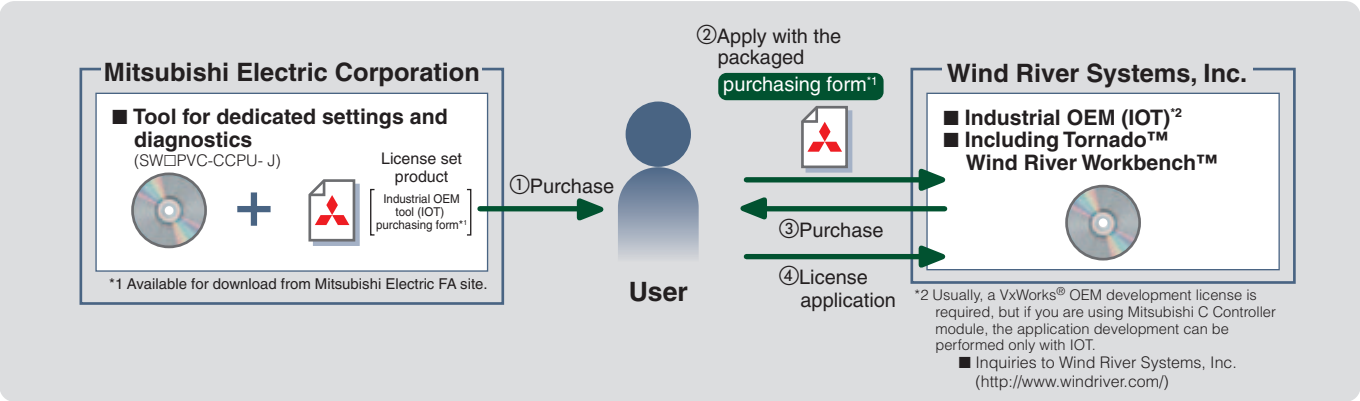
*1 Lineo uLinux and Lineo uLinux ELITE are Lineo Solutions, Inc. products. Please contact Lineo Solutions, Inc. for further product details.

Product purchasing information

■ Necessary interactions for using CW Workbench



■ Necessary interactions for using Wind River Workbench 3.2/2.6.1



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Mitsubishi Electric iQ Platform
C Controller

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Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA	Tel : +1-847-478-2100 Fax : +1-847-478-2253
Brazil	Mitsubishi Electric do Brasil Comércio e Serviços Ltda. Rua Jussara, 1750- Bloco B Anexo, Jardim Santa Cecilia, CEP 06465-070, Barueri, San Paulo, Brazil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8, D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780 Fax : +44-1707-27-8695
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Direzionale Colleoni - Palazzo Sirio Viale Colleoni 7, 20864 Agrate Brianza(Milano) Italy	Tel : +39-039-60531 Fax : +39-039-6053-312
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubí 76-80-AC.420, E-08190 Sant Cugat del Vallés (Barcelona), Spain	Tel : +34-93-565-3131 Fax : +34-93-589-1579
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, F-92741 Nanterre Cedex, France	Tel : +33-1-5568-5568 Fax : +33-1-5568-5757
Czech Republic	Mitsubishi Electric Europe B.V. Czech Branch Avenir Business Park, Radicka 751/113e, 158 00 Praha5, Czech Republic	Tel : +420-251-551-470 Fax : +420-251-551-471
Poland	Mitsubishi Electric Europe B.V. Polish Branch 32-083 Balice ul. Krakowska 50, Poland	Tel : +48-12-630-47-00 Fax : +48-12-630-47-01
Russia	Mitsubishi Electric Europe B.V. Russian Branch St. Petersburg office Piskarevsky pr. 2, bld 2, lit “Sch”, BC “Benua”, office 720; 195027, St. Petersburg, Russia	Tel : +7-812-633-3497 Fax : +7-812-633-3499
South Africa	CBI-Electric. Private Bag 2016, ZA-1600 Isando, South Africa	Tel : +27-11-977-0770 Fax : +27-11-977-0761
China	Mitsubishi Electric Automaiton (China) Ltd. No.1386 Hongqiao Road, Mitsubishi Electric Automation Center, Changning District, Shanghai, China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F., No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan, R.O.C.	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 1480-6, Gayang-Dong, Gangseo-Gu, Seoul, 157-200, Korea	Tel : +82-2-3660-9530 Fax : +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307, Alexandra Road, Mitsubishi Electric Building, Singapore, 159943	Tel : +65-6470-2308 Fax : +65-6476-7439
Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111 Soi Serithai 54, T.Kannayao, A.Kannayao, Bangkok 10230, Thailand	Tel : +66-2906-3238 Fax : +66-2906-3239
Vietnam	Mitsubishi Electric Vietnam Company Limited Hanoi Branch Suite 9-05, 9th Floor, Hanoi Central Office Building 44B Ly Thuong Kiet District, Hanoi City, Vietnam	Tel : +84-4-3937-8075 Fax : +84-4-3937-8076
Indonesia	PT. Mitsubishi Electric Indonesia Gedung Jaya 11th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461 Fax : +62-21-3192-3942
India	Mitsubishi Electric India Pvt. Ltd. Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune, 411026, Maharashtra State, India	Tel : +91-20-2710-2000 Fax : +91-20-2710-2100
Australia	Mitsubishi Electric Australia Pty.Ltd. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN

L(NA)08165E-E 1307(MDOC)

New publication, effective Jul. 2013.
Specifications are subject to change without notice.