MITSUBISHI ELECTRIC
Changes for the Better

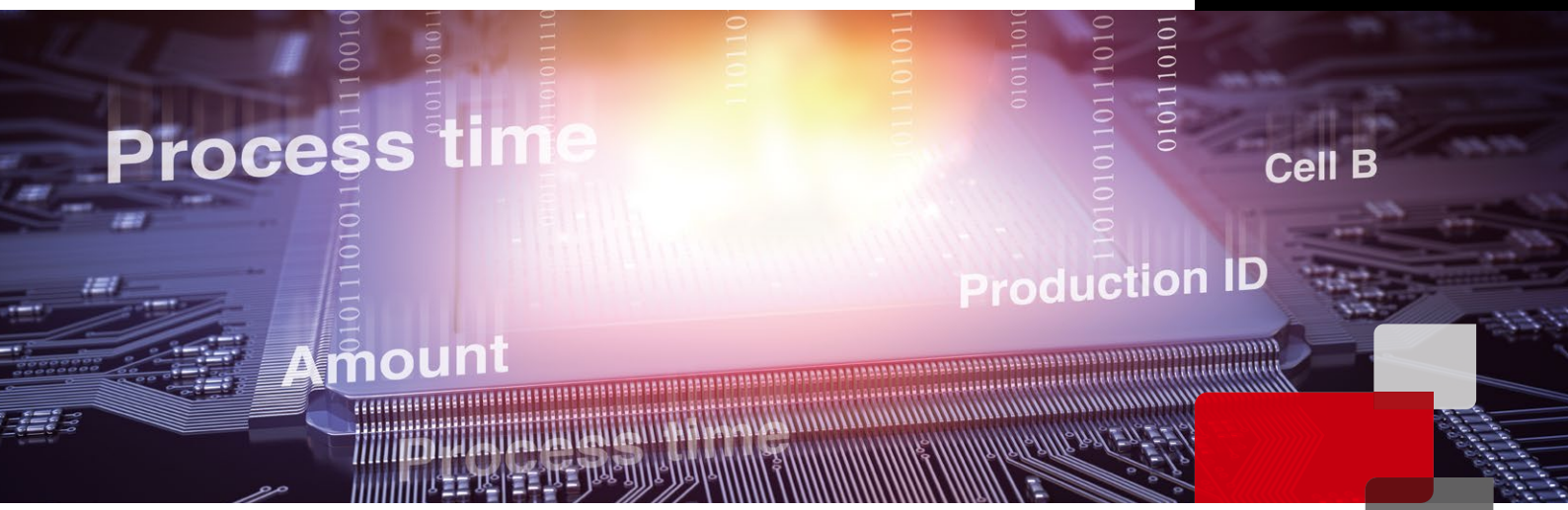
Automating the World

FACTORY AUTOMATION

MELSEC iQ-R series

iQ Platform-compatible PAC
e-F@ctory Advanced Information Modules

Broadcast



Extensive data handling from shop floor to business process systems

e-F@ctory is a solution from Mitsubishi Electric helping to optimize production systems through its direct connectivity between an IT system and the shop floor reducing cost over the entire product life cycle. Production data management, analysis and planning utilizing IIoT*1 can be realized, improving productivity through preventive maintenance, operations management, traceability, and energy management. The MELSEC iQ-R Series includes a range of products that fulfill these various needs as part of the “Intelligence” lineup of interconnected e-F@ctory advanced information products.

Direct access to IT system database

The MES interface module improves production management and reduce overall system costs through real-time direct access to IT system database servers without requiring additional programming and gateway computers.

Highlights

- Direct access to IT system database
- Utilizing standard communication protocols
- C/C++ based programming
- Linux® realizes integration of data processing technologies
- High-speed collection of shop floor data in real-time
- Ensure latest functional version with firmware update

*1. IIoT: Industrial Internet of Things

Utilizing standard communication protocols

The OPC UA server module realizes connections of machines supporting OPC UA (international standard IEC 62541) communication.

C/C++ based programming

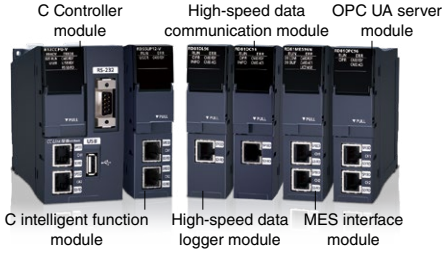
The C Controller and C intelligent function modules provide a robust and cost-efficient alternative from computer-based analytical and testing systems, enabling custom applications to be executed directly on the control system. In addition, various communications protocols can be installed directly.

Integration of data processing technologies

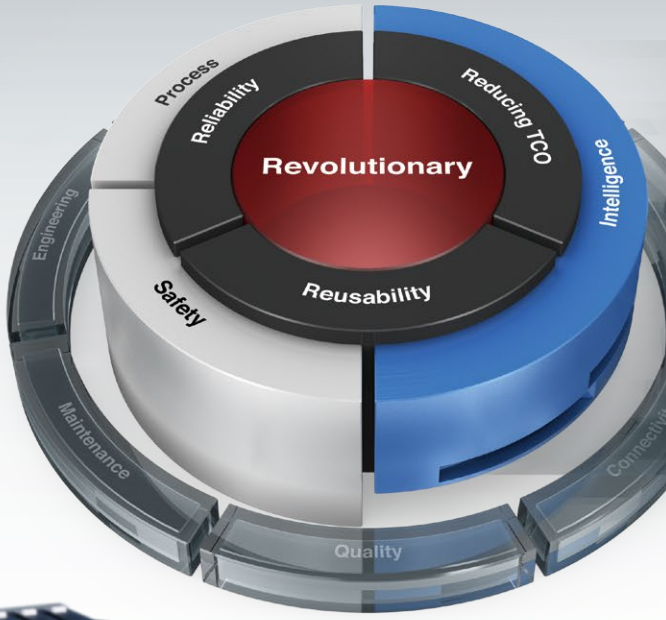
The C intelligent function module utilizes Debian GNU/Linux allowing machines to utilize the latest data processing technology (software package).

High-speed data collection and utilization

The high-speed data logger module and high-speed data communication module realize production process data collection in synchronization with control system scan time. Includes reporting feature for analysis.



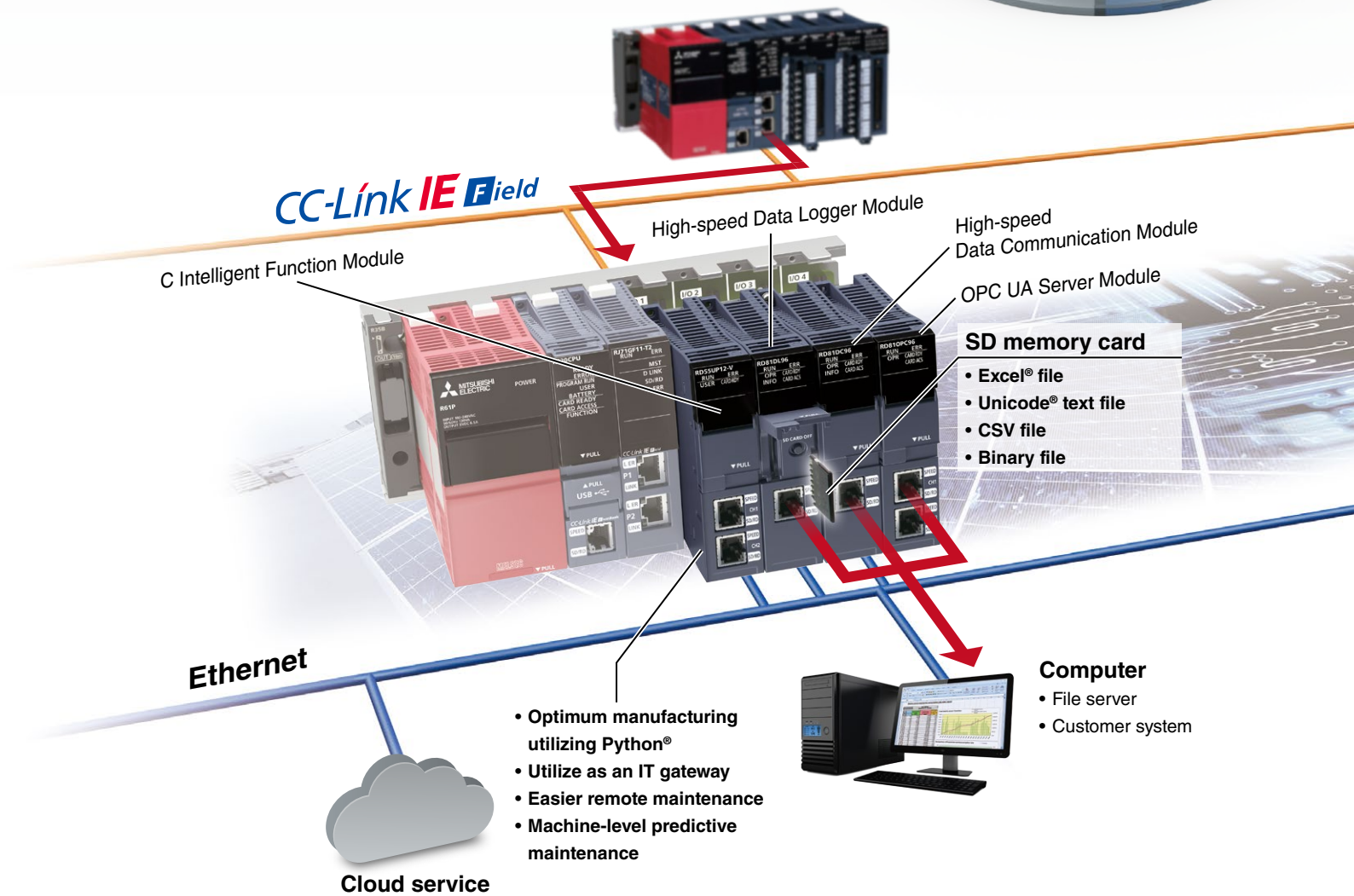
Mitsubishi Electric PAC MELSEC iQ-R
"Intelligence" Movie



Utilize various partner applications

Customization

A dedicated functions and communications library are provided, enabling access to the control system modules. In addition, various partner applications are available, helping to reduce development time and cost as the additional development of applications and drivers are not required.



Ideal for harsh industrial environments

Robust

Part of the MELSEC iQ-R Series, high-quality and reliability is ensured with fewer chances of product failure, as is associated with computer-based hardware. In addition, designed without an additional fan, the products can be used in clean fab-based applications.

High-speed production data collection

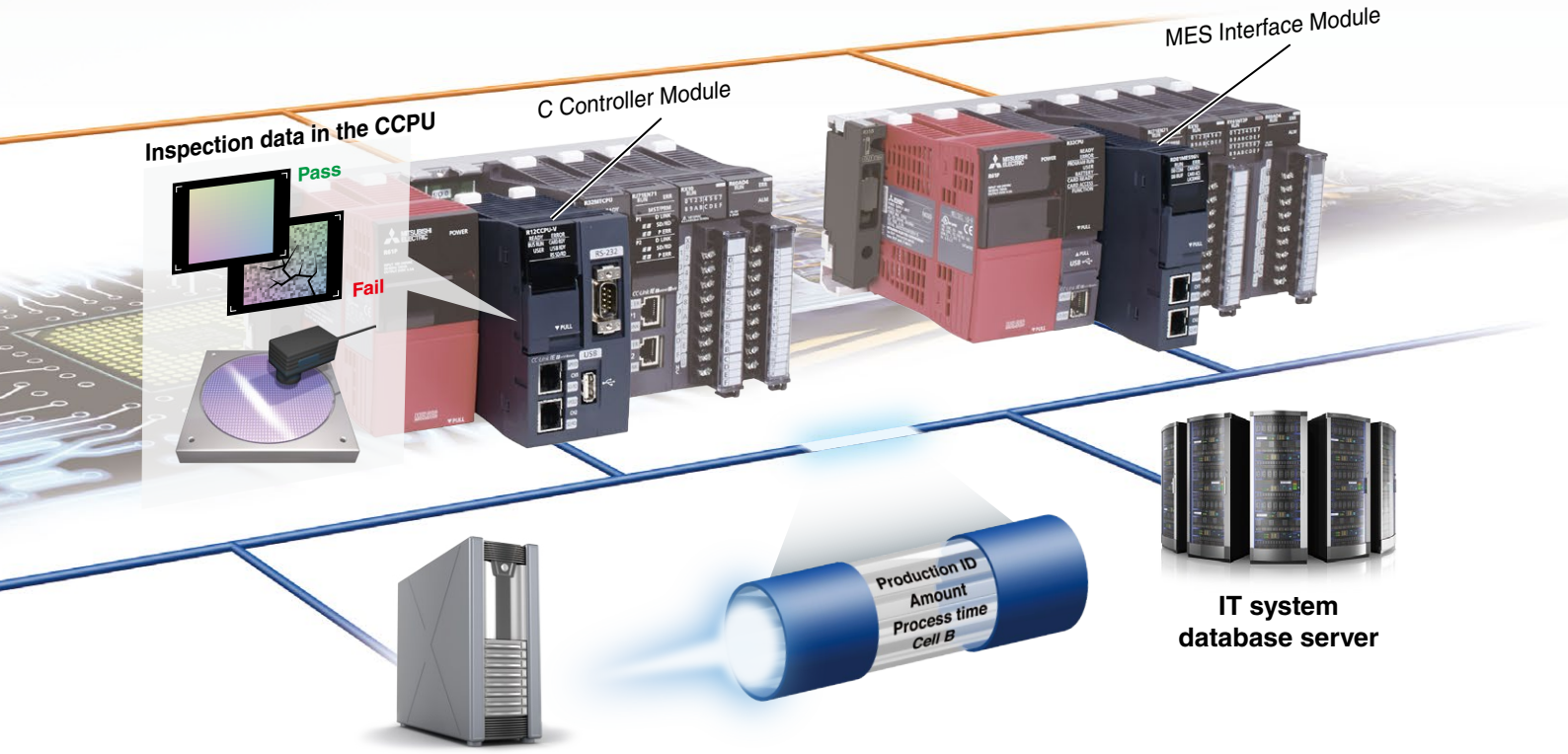
Data collection

The high-speed data logger module and high-speed data communication module enable high-speed data collection that can be synchronized with the control system scan time, allowing data to be converted for processing on a computer. Program development time can be minimized, thereby realizing data aggregation and analysis in a short time.

Intelligence

Extensive big data handling from shop floor to business process systems

The “Intelligence” lineup is comprised of interconnected advanced information products that handle, collect, and process various data, which improves productivity, maintainability, reduced system downtime and asset costs. The lineup includes direct IT system database connectivity via the MES interface module, C/C++ level programming for processes requiring high-level analytics such as in-process testing and application-specific communications protocols. In addition, the high-speed data logger module and high-speed data communication module simplify troubleshooting and promote low-cost maintenance solutions.



C/C++ based programming

Flexibility

Based on the Arm® Cortex®-A9 dual-core processor, the real-time OS VxWorks® C Controller CPU is ideal for high-end analytical requirements where raw data has to be processed, such as for in-line manufacturing quality testing. The C intelligent function module, based on the same processor, is a versatile programmable module that can be used for installing industry-specific communications protocols; for example, plant-wide monitoring of wind power generation farms, building automation and industrial open fieldbus networks.

Connectivity with database servers, OPC UA client, and cloud services

Information connection

The MES interface module realizes direct access to the IT system with easy setting. Overall system cost is reduced as the simple configuration does not require gateway computers. The C intelligent function module supports Debian GNU/Linux that realizes connectivity with third-party cloud services. Predictive and remote maintenance of machines are easily realized. The OPC UA server module supports secure and open communication protocols, seamlessly connects the IT system and the shop floor.

MES Interface Module

RD81MES96N

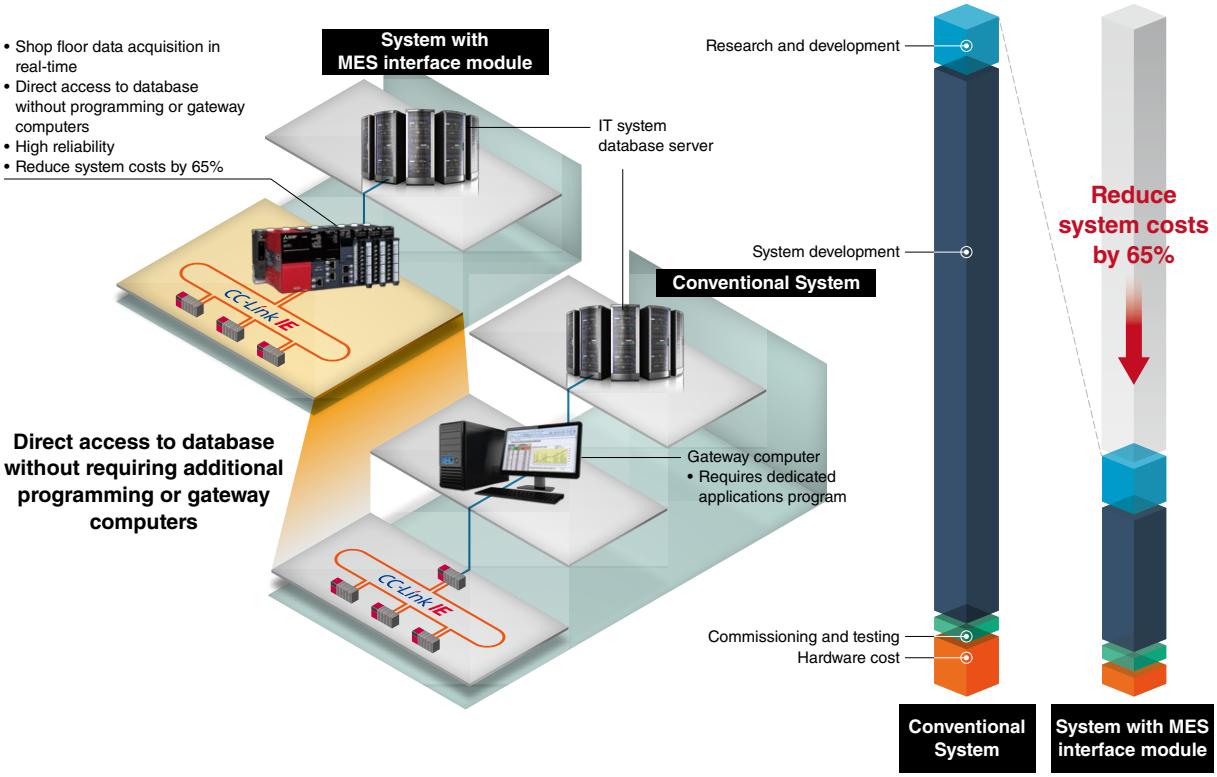
Along with ever-changing manufacturing trends, improving machine productivity and maintaining manufacturing quality through meticulous traceability have become a fundamental part of manufacturing. MES interface modules address these requirements by providing direct database connectivity for IT systems and facilitating automatic SQL*1 text generation using intuitive configuration setup software. Modules allow production data from the shop floor to be inserted into database records directly; for example, providing real-time production status that enables quicker response to production-related problems.

*1. Structured Query Language is a programming language designed for managing data in a relational database.

System configuration costs reduced by 65%*2

MES interface modules enable direct connectivity between IT database servers and programmable controllers on the shop floor, eliminating the need for gateway computers or specified programs. Being much more reliable than computers, MES interface modules save on maintenance costs typical of computers.

*2. Assumption based on a typical control architecture.



MES interface module specifications

Item	RD81MES96N
Database connection	
Supported database*3	Oracle® Database, Microsoft® SQL Server®, Microsoft® Access®, MySQL®, PostgreSQL®, MariaDB®
Database communication type	SELECT, INSERT, UPDATE, DELETE, Multi-SELECT, Multi-INSERT*4, STORED PROCEDURE*4
Number of field settings per project	65,536
Accessible CPU module*3	MELSEC iQ-R, MELSEC-Q, MELSEC-L, MELSEC iQ-F, MELSEC-F Series
Data sampling interval	
High speed data sampling	• Programmable controller scan time synchronization • 1...9 ms, 1...9 x 10 ms, 1...9 x 100 ms,1...60 s
General data sampling (s)	0.1…0.9, 1…3600
Function	
DB record read/write	Reads/writes data in the database of the host information system
Device memory read/write	Reads/writes device memory data of the CPU module
Trigger condition monitoring	Monitors values of the time or device tag components etc., and starts jobs when a trigger condition changes from false to true (the condition is satisfied)
Data operation and processing	Performs the substitution of a device tag component value, basic arithmetic operations, remainder, and string operation.
Program execution	Executes a program on an application server via DB Connection Service.
DB buffering	Buffers the data sent to the database, and resend it after recovery, when the data cannot be linked due to the disconnection of the network between MES interface module and the database or failure of the database etc.
REST server*5	Enables job-related operations and job information acquisition from the REST client (Also supports the XML process function for the MELSEC-Q Series MES interface module)
Setup software	
MES interface function configuration tool	SW1DND-RMESIF-E

*3. For details, please refer to the relevant manual (for support related to the database, please contact the relevant database software company).

*4. Supported when used with Oracle® Database, SQL Server®, MySQL®, PostgreSQL®, and MariaDB® database.

*5. REST: Representational state transfer

OPC UA Server Module

RD81OPC96

The MELSEC iQ-R Series OPC UA server module integrates the OPC UA server directly into the equipment, realizing a robust control system. OPC Unified Architecture (OPC UA) is a platform-independent communications standard developed by the OPC foundation that offers reliable and secure data communications between the manufacturing-level and IT-level systems.

OPC UA: Essential to stay ahead with data utilization

Today's manufacturing requires flexible, fast data utilization. The key is to add value to data by seamlessly connecting shop floor and IT systems.

▶OPC UA, anticipated as the standard for supporting digital transformation in manufacturing, is essential for success in data utilization

OPC UA Open Platform Communications Unified Architecture

International data exchange standard for safe, reliable, manufacturer- and platform-independent industrial communication

Integrate the strengths of OPC UA into programmable controller systems

Resolve your concerns about data utilization with the three key strengths of OPC UA!

Concern 01

Adapting to communication protocols for devices from various manufacturers and systems, both old and new, is **time-consuming and costly**

Connect

Unified communication protocol between systems

- OPC UA enables communication with a unified protocol between devices and IT systems, thereby creating an open, manufacturer-independent network

Connect devices and IT systems with minimal effort and cost

Concern 02

With large amounts of critical data being exchanged more frequently, **how can we prevent data leakage?**

Secure

Connection destination authentication, communication encryption

- OPC UA ensures highly reliable communication with its robust security features, including certificates, encryption, and signatures

Protect data from theft and tampering

Concern 03

The need for updates on the link application each time new equipment is added **complicates data sharing and system coordination**

Communicate

Communicating the meaning and relationships of data

- OPC UA enhances system interoperability by standardizing data structures and interfaces using information models
- Various information models provided by industry organizations and vendors are planned to be supported

Ensure smooth data sharing and coordination between systems

OPC UA server module software specifications

Item		RD81OPC96
Connected OPC UA clients		
Maximum number of sessions		15
Connectable Ethernet port		CH1
OPC UA communication specifications*1		
CreateMonitoredItems ModifyMonitoredItems	SamplingInterval (ms)	200…60000
	Max. number of MonitoredItems	Total for all sessions: 3000
CreateSubscription ModifySubscription	Max. number of Subscriptions	Per session: 10 Total for all sessions: 150
Read	MaxNodesPerRead Max. number of nodes per request	25000
Write	MaxNodesPerWrite Max. number of nodes per request	3000
Information models and mapping specifications*1		
Namespace	Number of Namespaces	10
Node	Number of Nodes	50000
	Number of mappable Variables (total)	25000

*1. Either tag mode or information model mode can be selected depending on the use. This specification refers to the information model mode.
For details on the tag mode, please refer to "MELSEC iQ-R OPC UA Server Module User's Manual (Startup) (SH-081693ENG)".
For details on the information model mode, please refer to "MELSEC iQ-R OPC UA Server Module User's Manual (Information Model) (SH-082679ENG)".

High-speed Data Logger Module

RD81DL96

High-speed Data Communication Module

RD81DC96

Data collection is a mandatory requirement for counting production volume and ensuring traceability of products. The following two modules are available according to applications.

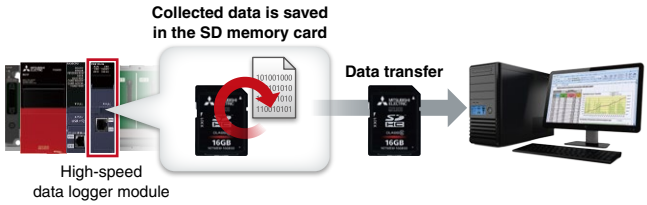
- High-speed data logger module that enables utilization of acquired data for spreadsheet reporting with general software
- High-speed communication module that enables data acquisition to customer programs

Both modules realize high-speed data collection in synchronization with the control system scan time and send data to an application on a computer.

Utilize logging data on general software

RD81DL96

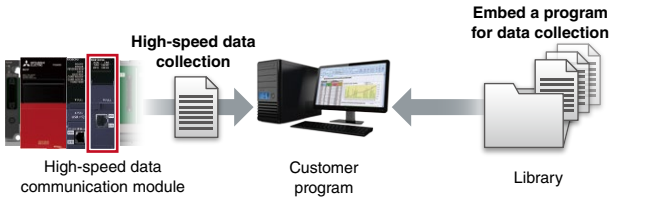
Logging data can be saved in the SD memory card and transferred to the computer. Data can be accessed using spreadsheet software such as Excel® and output as reports.



Utilize data in coordination with customer programs

RD81DC96

Production data collected at high speed can be transferred to customer programs. Utilizing available Visual C#® and Java® class libraries reduces programming time.



High-speed data logger module, high-speed data communication module specifications

Item	RD81DL96	RD81DC96
Accessible CPU module	MELSEC iQ-R Series (direct, remote), Q Series (remote), L Series (remote)	
Data sampling interval		
High-speed data sampling (ms)	• Programmable controller scan time synchronization • 0.5…0.9, 1…32,767 (for trigger logging) • 2…32,767 (for continuous logging)	• Programmable controller scan time synchronization • 0.5…0.9, 1…32,767
General data sampling (s)	• 0.1…0.9, 1…32,767 • Time interval specification (specify hour/minute/second)	• 0.1…0.9, 1…32,767
Amount of sampled data		
High-speed data sampling	• Overall amount of data: 32,768 (per setting: 1,024) • Overall number of device points: 32,768 (per setting: 4,096)	• Overall amount of data: 32,768
General data sampling	• Overall amount of data: 65,536 (per setting: 1,024) • Overall number of device points: 262,144 (per setting: 4,096)	• Overall number of device points: 262,144 (per connection: 65,536)
Function		
Main function	• Data logging function Logs CPU module device values at specified data sampling intervals • Event logging function Monitors sampled device values from the CPU module, and logs events that occur • Report function Outputs the data sampled by the high-speed data logger module as an Excel® file • Recipe function Transfers the device value written on the recipe files to devices in the CPU module using recipe files stored in the SD memory card. Or, transfers device values in the CPU module to the recipe files	• Label function Manages the device of the CPU module with a label name • Streaming transfer function Collects label data specified by the computer from the CPU module and continuously transfers to the host computer via Ethernet • Data read/write function Reads/writes device data in the target CPU module according to commands sent from the computer
Setup software*1		
English version	SW1DNN-RDLUTL-E	SW1DNN-RDCUTL-E

*1. For information on how to obtain the software, please contact your local Mitsubishi Electric sales office or representative.

C Controller Module

R12CCPU-V

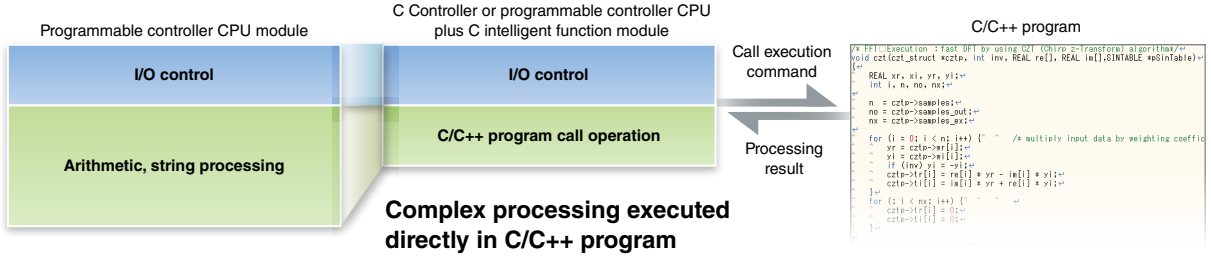
C Intelligent Function Module

RD55UP06-V RD55UP12-V

The C/C++ module series is available in two types, with both modules having a dual-core Arm®-based controller pre-installed with VxWorks® Version 6.9, which allows simultaneous execution of programs, thereby providing a robust and deterministic alternative to computer-based systems. Utilizing a fan-less hardware design, the C Controller and C intelligent function modules are ideal for clean fab-based environments, where dust circulation can be detrimental to the production environment, and can be used for applications such as in-line production quality testing or as a gateway for various industry-specific communications protocols.

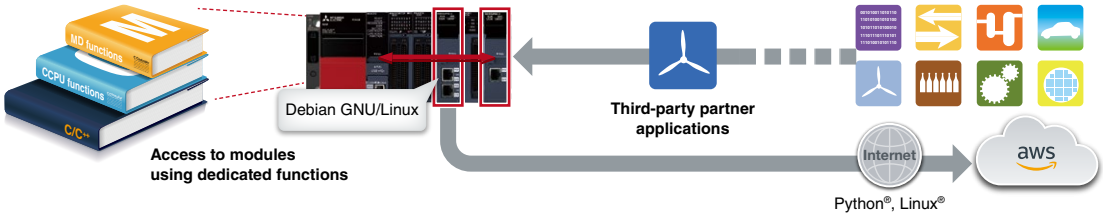
Realize complex arithmetic equations in C/C++

The C intelligent function module enables the execution of C/C++ programs when paired with a standard MELSEC iQ-R Series programmable controller CPU, emulating the same features as a standalone C Controller. Representing complex arithmetic and string equations in C/C++ programs is much easier than implementing in ladder form, thereby reducing overall development time and program size. Additionally, intellectual property is simplified as the result of separating it from the ladder program.



Linux®/VxWorks® realizes easier configuration of various control systems

Dedicated functions and communications libraries are provided, enabling access to the control system modules. In addition, various partner applications are available, supporting different manufacturing equipment features. By utilizing the information community of Debian GNU/Linux allows machines to adopt the latest data processing technology (software package). Key features such as remote operation, predictive maintenance, and remote maintenance of machines can be easily implemented through connection with third-party cloud services.



C Controller module/C intelligent function module specifications

C/C++ : C/C++

Item		R12CCPU-V	RD55UP06-V	RD55UP12-V
Hardware				
MPU		Arm® Cortex®-A9 Dual Core	Arm® Cortex®-A9 Dual Core	
RAM (byte)		256M	128M	1G
ROM (byte)		16M	12M	
Backup RAM (byte)		4096K*1	–	
Software				
OS		VxWorks® Version 6.9	VxWorks® Version 6.9 (pre-installed)/Debian GNU/Linux	
Programming language		C/C++		
Programming development environment	VxWorks® Version 6.9	CW Workbench/Wind River® Workbench 3.3		
	Debian GNU/Linux	-	TimeStorm®/Visual Studio®	
Setting/monitoring tool		CW Configurator (SW1DND-RCCPU)	GX Works3 (SW1DND-GXW3-E)*2	
Communication interface				
USB		●	–	
Ethernet (1000BASE-T/100BASE-TX/10BASE-T) (ch)		2	1	2
RS-232 (9600…115200 bps) (ch)		1	–	
SD memory card slot		●	●	

*1. File storage area of device/label memory: 3584 KB, for system: 512 KB

*2. Setting and monitoring of the module is integrated within the GX Works3 engineering software.

Big data handling across the plant

As production management, analysis and planning have become more mainstream, the MELSEC iQ-R Series advanced information modules enable large amounts of various key data to be handled easily across the manufacturing plant. MES interface modules help improve traceability and production planning by enabling manufacturing data to be processed directly in the IT server, thereby saving time in operations management and providing an overview of the entire factory.

Improves system reliability

The OPC UA server module enables mixing of various OPC UA client applications such as SCADA. In addition, OPC UA security functions provides a secure and reliable system.

Utilizing the power of C/C++ programming

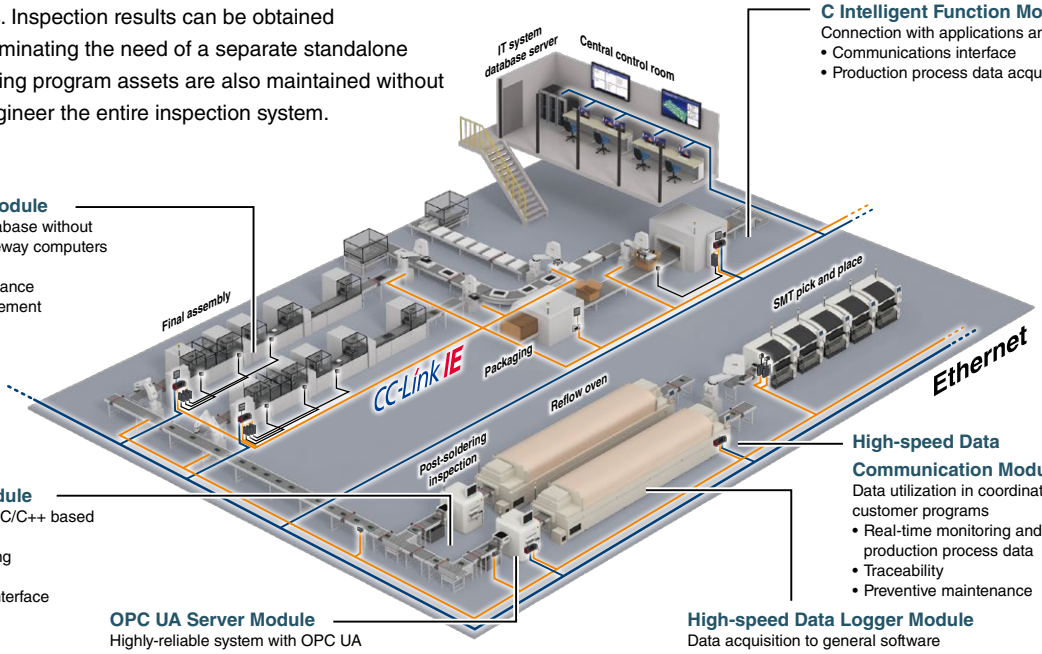
Improve quality in manufacturing processes by incorporating the C Controller or C intelligent function module in production control systems. Inspection results can be obtained immediately, eliminating the need of a separate standalone computer. Existing program assets are also maintained without having to re-engineer the entire inspection system.

High-speed collection of production data

Use high-speed data logger modules or high-speed data communication modules to collect high-resolution processing data, and visualize minor changes in processing parameters before a fault develops, thereby improving preventive maintenance and reducing system downtime.

Minimize overall cost of assets

Integrating these various advanced information modules will contribute to improving overall factory operations. Additionally, hardware costs can be reduced by eliminating the need for separate computers, which were previously required for high-speed, large-volume data processing.



C Intelligent Function Module
Connection with applications and cloud
- Communications interface
- Production process data acquisition

MES Interface Module
Direct access to database without programming or gateway computers
- Traceability
- Preventive maintenance
- Operations management
- Production control

High-speed Data Communication Module
Data utilization in coordination with customer programs
- Real-time monitoring and aggregating production process data
- Traceability
- Preventive maintenance

C Controller Module
Real-time control by C/C++ based programming
- In-line quality testing
- Traceability
- Communications interface

OPC UA Server Module
Highly-reliable system with OPC UA
- Production process data acquisition
- Operations management
- Production control

High-speed Data Logger Module
Data acquisition to general software
- Production process data acquisition
- Traceability
- Route-cause analysis
- Preventative/corrective maintenance

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