MITSUBISHI ELECTRIC

Changes for the Better

iQ Platform-compatible PAC
System Recorder

e-F@ctory

Total maintenance solution

Bringing maintenance data management to the next level

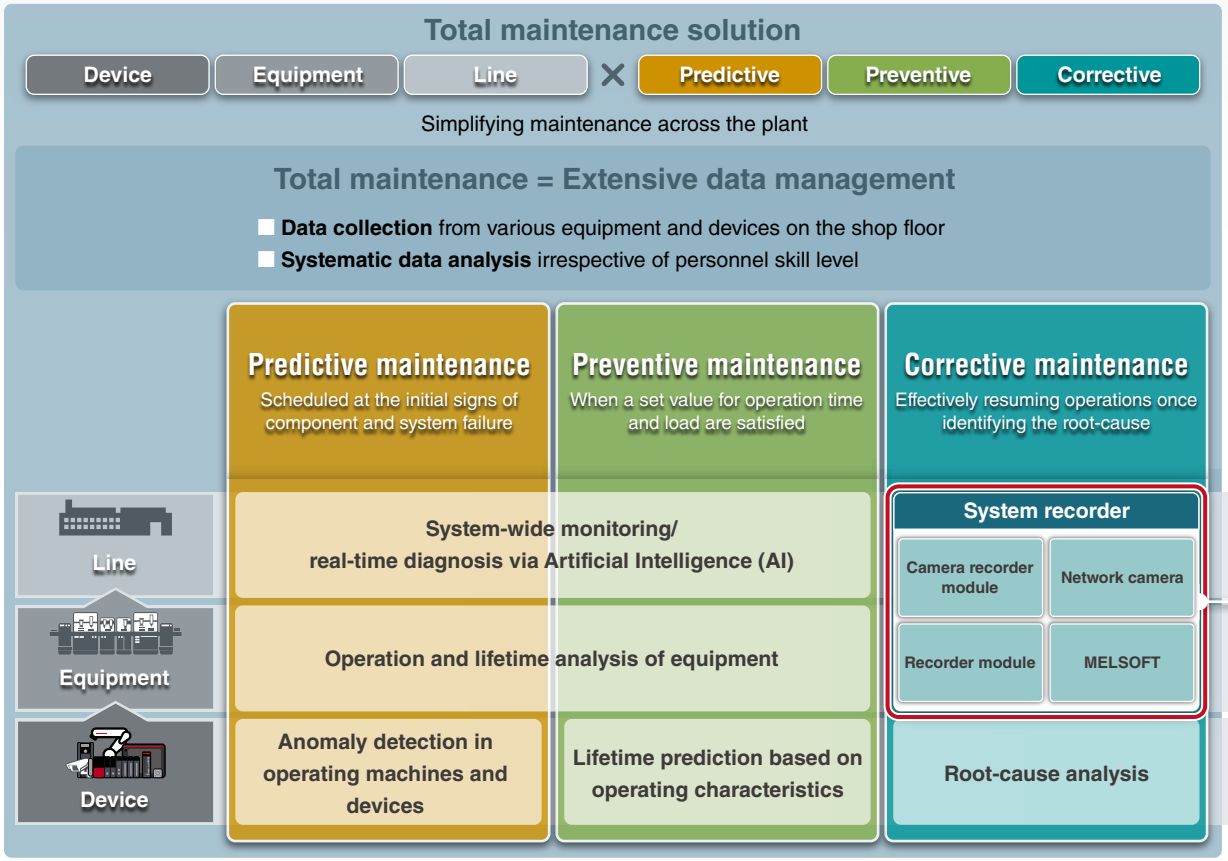
MELSEC iQ-R series

NEW GX VideoViewer Pro Maisart

Mitsubishi Electric's solution for improving productivity through easier data management

Maintenance is critical for ensuring continuous production. Maintenance includes ❶**predictive maintenance** to detect signs of error, periodical ❷**preventive maintenance**, and ❸**corrective maintenance** for **prompt troubleshooting** at the time of failure. Mitsubishi Electric proposes an enhanced maintenance solution by recording and sampling production and machine operating data and utilizing this data within various stages of maintenance.

The system recorder is a ❸**corrective maintenance** solution that ensures prompt troubleshooting and error prevention.



System recorder

The system recorder is a corrective maintenance solution that ensures effective resumption of operations reducing downtime through its extensive system-wide data recording and simplified analysis software features.

System-wide recording and simplified analysis

System-wide recording

Extensive recording ensures simpler cause analysis

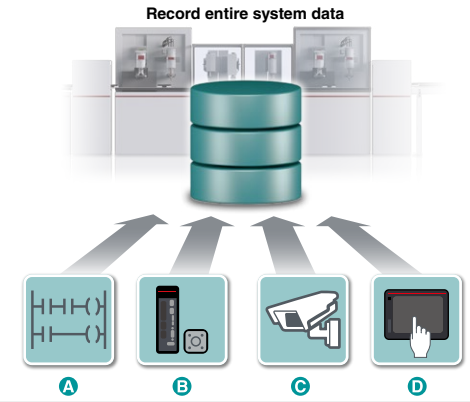
Error cause identification is made simpler by the extensive recording of various equipment and device data together with a real-time video feed reducing the need for multiple retesting due to insufficient data.

System-wide

Irregularities between various equipment including control and drive systems together with operations are all linked.

Automatic system-wide recording

Recording of errors that can occur outside standard operating shifts.



AProgrammable controller CPU (entire bit, word data, project data)
BServo status (command position, actual position, speed, torque)
CNetwork camera video feed
DDisplay and operation log of GOT (HMI)

Simplified analysis

Extensive data shown in the same timeline

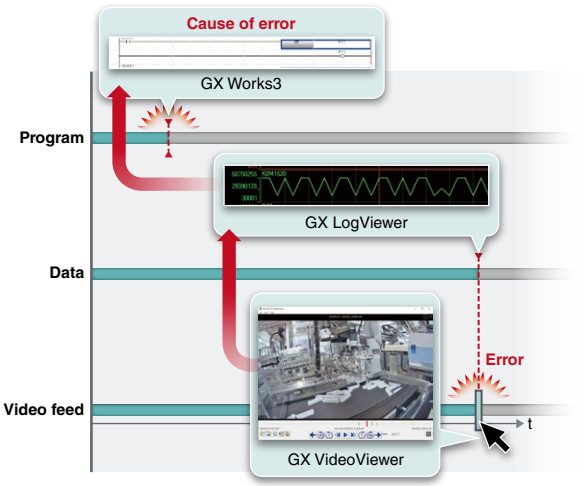
Waveform, data, program, operations log, and video feeds are shown in sequence ready for analysis.

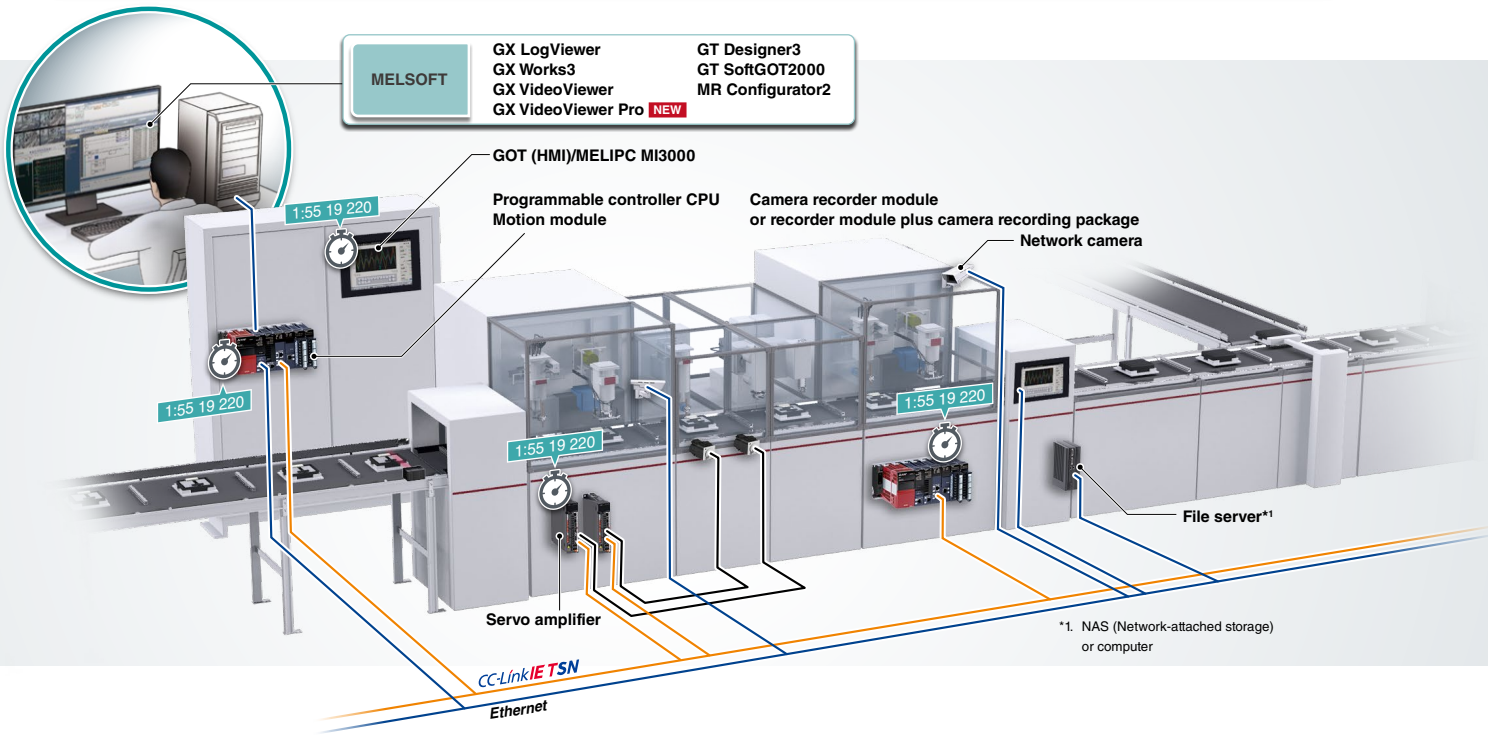
Easier cause identification

Data flow analysis makes understanding the root-cause of failures easier by showing the relationship between failed and normal devices.

Structured program ensures easier troubleshooting

Supports structured programs and device labels enabling easier resolution of problems.

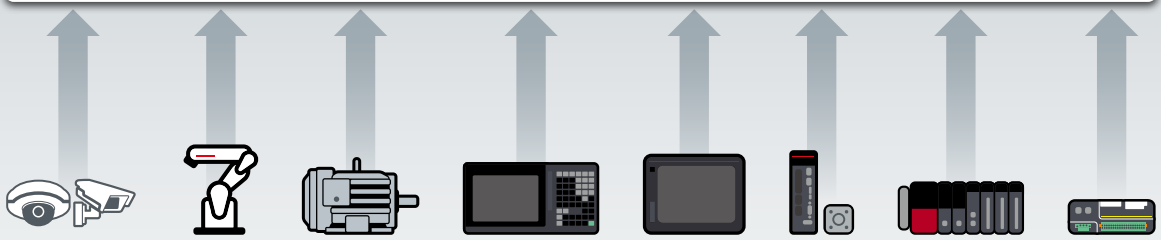




*1. NAS (Network-attached storage) or computer

System-wide recording

System-wide total data recording

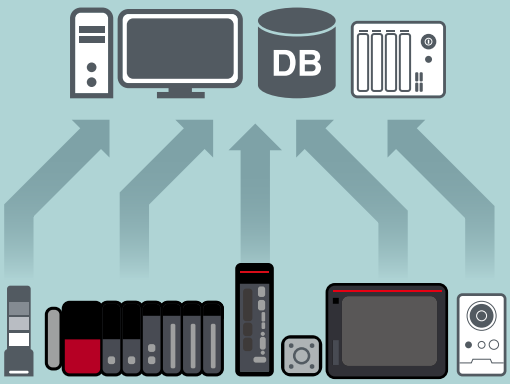


Without the system recorder

- Difficult to identify the error cause from data after an error event. Need to collect as much data as possible for evidence
- Unable to stay to wait for an anomaly that rarely occurs
- Record camera images only when an error occurs
- One programmable controller CPU data is not enough to solve problems in large and expanding systems

With the system recorder

- Record all device/label per programmable controller scan
- Camera images can be also recorded with easy and extensive trigger settings
- In addition to devices/labels; motion module/ motion CPU control data, event history from the programmable controller, GOT (HMI) operation history can also be recorded



System-wide recording Control data

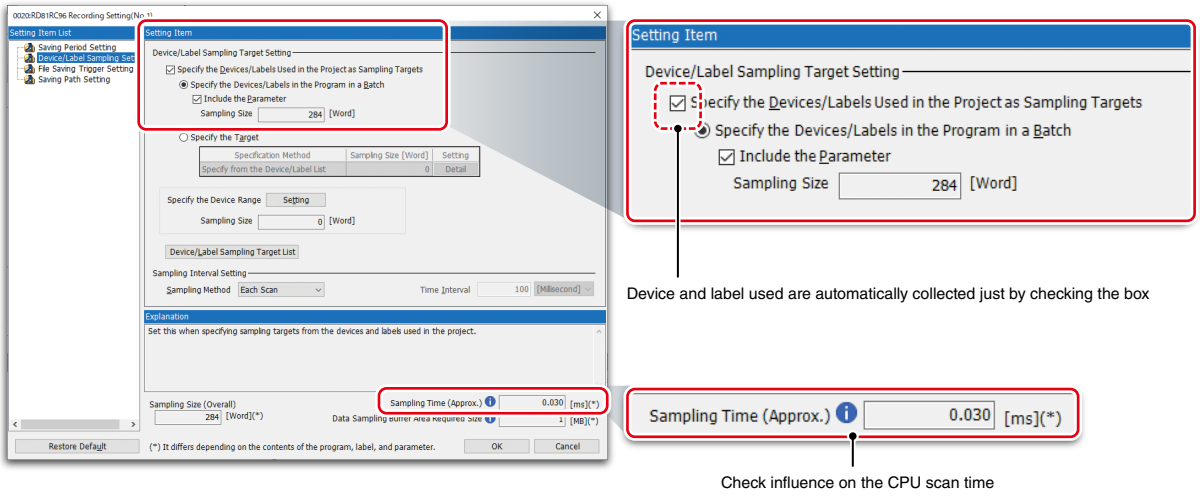
Device/label collection every (programmable controller) scan

❶Collecting of all device and label data

- The MELSEC iQ-R Series recorder module and camera recorder module can automatically collect all device and label data per programmable controller scan prior to and after an error event (together with a time-stamp)
- Extensive recording ensures simpler error analysis, reducing the recovery time of the control system
- Safety device and label collection are also supported

❷Easy setting

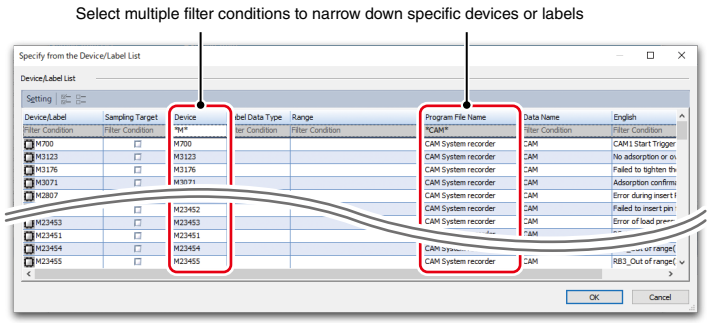
- The recorder module and camera recorder module can be set within the intuitive engineering software GX Works3
- Target device and labels to be recorded are automatically set by checking the box
- Influence on the CPU scan time can be checked



❸Minimal impact on the scan time

- Influence on the CPU scan time is minimal as the execution load is separated
- Influence on the CPU scan time is further minimized by filtering of devices and labels
- Collecting targets can be quickly selected by narrowing down with multiple filter conditions

Specifying the collection target
Device/label
Sampling target
Label data type
Range
Program file name
Data name
Comment



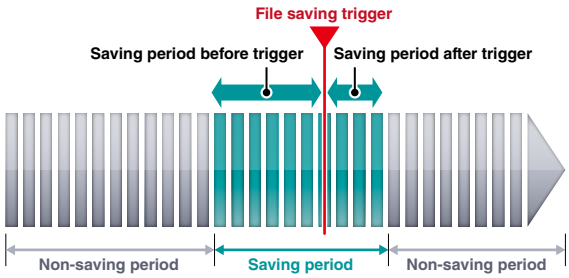
Extensive recording trigger settings

❶Recording of data prior to and after an error event

- Two saving period settings are available with the recorder module. In addition to recording of data prior to and after the event, data can be recorded starting from the beginning of the equipment cycle

Record prior to and after an error event (file saving trigger only)

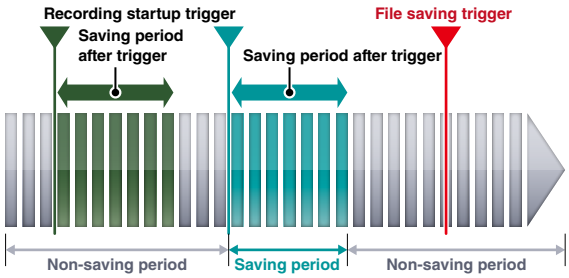
Record data prior to and after a file saving trigger for a specified time. Setting equipment alarm relay as a file saving trigger enables recording of data prior to and after the error event.



- The total of the saving periods before and after trigger can be set within a range from 1 to 86400 seconds
- When the recording buffer capacity is exceeded, the old data is overwritten

Record equipment cycle (recording startup trigger + file saving trigger)

Record data after a recording startup trigger for a specified time. Setting starting relay of equipment cycle as a recording startup trigger enables recording from cycle start.

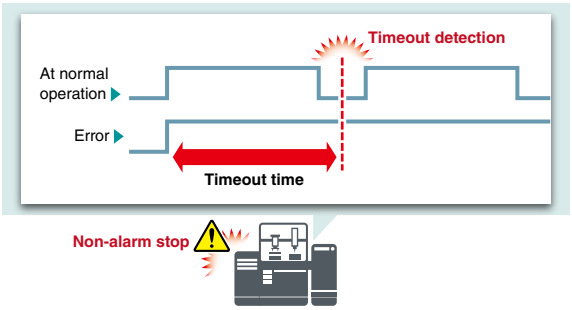


- If recording startup trigger and such are set, data is saved without a file saving trigger
- The previous recording buffer is overwritten per recording startup trigger
- If the data exceeds the recording buffer capacity in a single recording, old data is prioritized and the data exceeding the capacity is discarded

❷Setting extensive triggers according to applications

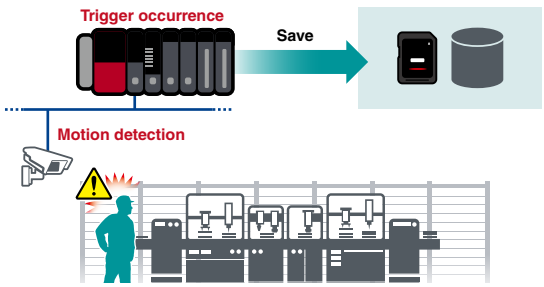
- MELSEC iQ-R Series recorder module/camera recorder module are available with extensive triggers for recording which can be used according to requirements
- Non-alarm stop detection and motion detection can be set as a trigger. Errors previously undetectable can now be detected

Non-alarm stop detection NEW



- Active signals are monitored periodically to detect a signal which remains unchanged for a certain period as timeout
- Used to detect a machine that stops without alarm

Motion detection NEW

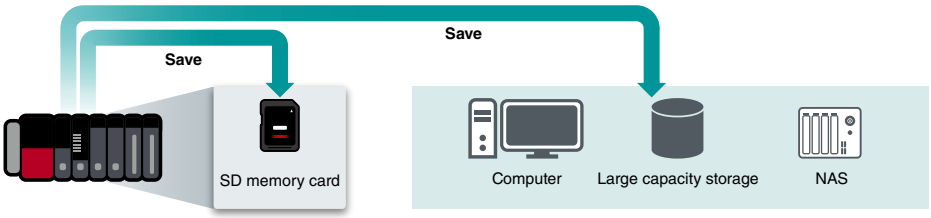


- Monitor equipment and operators with network cameras to trigger when motions are detected

* Motion detection is supported by the camera recorder module only.
* For details of compatible camera, please refer to the technical bulletin.

Automatic saving to file server

- As a recording file storage, an SD memory card for the system recorder modules or a file server (such as a NAS or computer) can be selected
- A file server (such as a NAS or computer) can be used as storage for a large capacity data. Remote retrieval of collected data directly from the file server is supported without requiring access on the shop floor



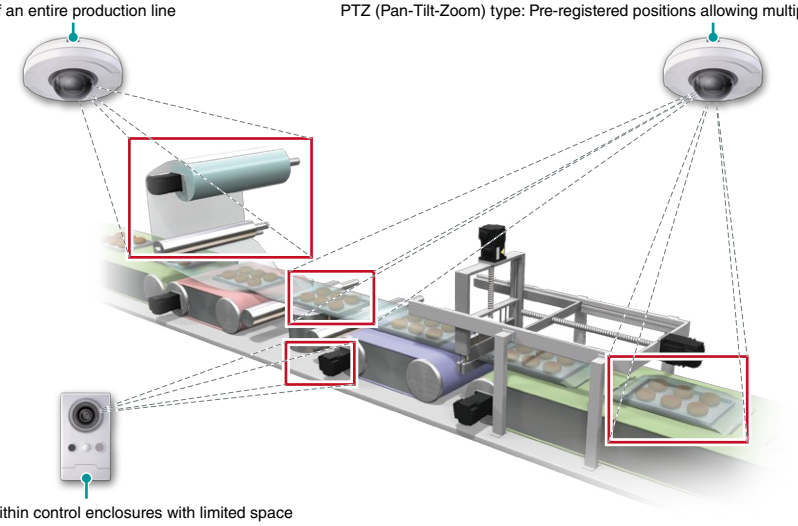
Utilize available network cameras

Select network cameras according to applications

- By supporting available network cameras offers a broad choice of functions that maybe specific to an application, such as for process speed and environment (ambient temperature, humidity, and installation space)
- Network cameras (such as image resolution, frame rate) can be set within GX Works3
- Network cameras can be installed around equipment and/or processes enabling quick identification of a specific error from a video feed

Wide angle/fish-eye lens type:
Enables panoramic view of an entire production line

Optical zoom type: Provides detailed and vivid images
PTZ (Pan-Tilt-Zoom) type: Pre-registered positions allowing multiple areas with a single camera.



Modular type: Installable within control enclosures with limited space
Wireless type: Greater installation flexibility as communication cables are not required

Installation environment	Applicable cameras
• Wide-area coverage capturing entire process area • Recording personnel operations	Wide angle/fish-eye lens type
• Detailed view • Multiple viewing positions	Optical zoom type PTZ (Pan-Tilt-Zoom) type
• Limited installation space • Difficulty installing communications cabling	Modular type Wireless type

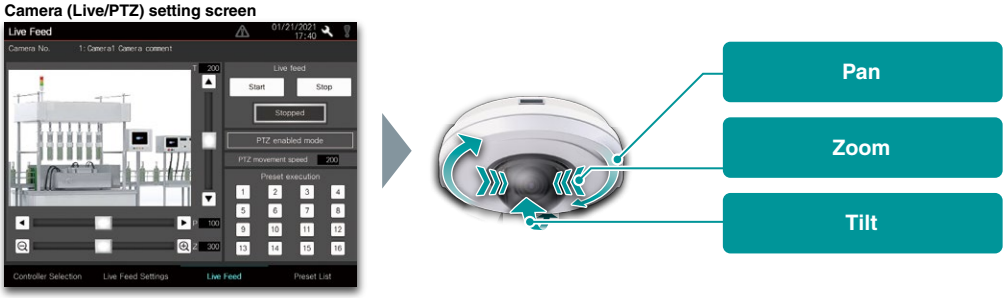
* For details of compatible camera, please refer to the technical bulletin.

System-wide recording Camera images

Optimized focusing on camera subject

- Live image streaming of the network camera on the GOT (HMI) and MELIPC MI3000 and also PTZ (Pan-Tilt-Zoom) control are possible
- Machine movement can be checked from the GOT (HMI) and MELIPC MI3000
- Fine adjustments are supported while monitoring the live video feed on the shop floor

Camera (Live/PTZ) setting screen



Support high resolution and long-duration recording

- The system recorder stores high-definition video feeds for a long time using the H.264 codec which compresses the data, making space utilization more efficient
- Since it uses a general-purpose video format, there is no need to move or process the storage location of the video file. In addition, recorded camera image can be checked instantly by a general video replay software as well as dedicated GX VideoViewer and GX VideoViewer Pro

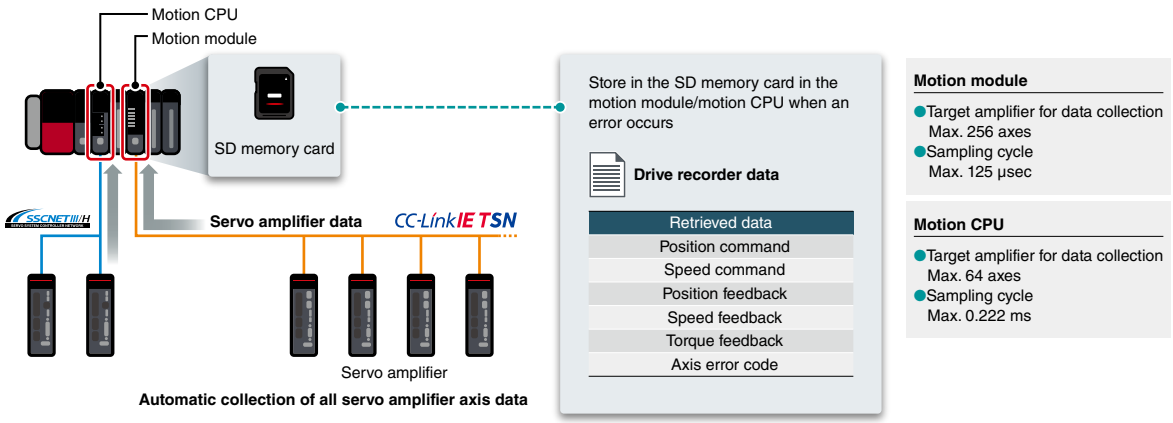
Collecting all servo axis data in real-time

❶Recording of positional data from servo

- Servo systems tend to operate at a much faster cycle time compared with a programmable controller making it difficult to capture. Control data of the motion CPU and motion module can be recorded with a time-stamp
- Detailed positional data from the servo can be recorded

❷Automatic collection without requiring a program

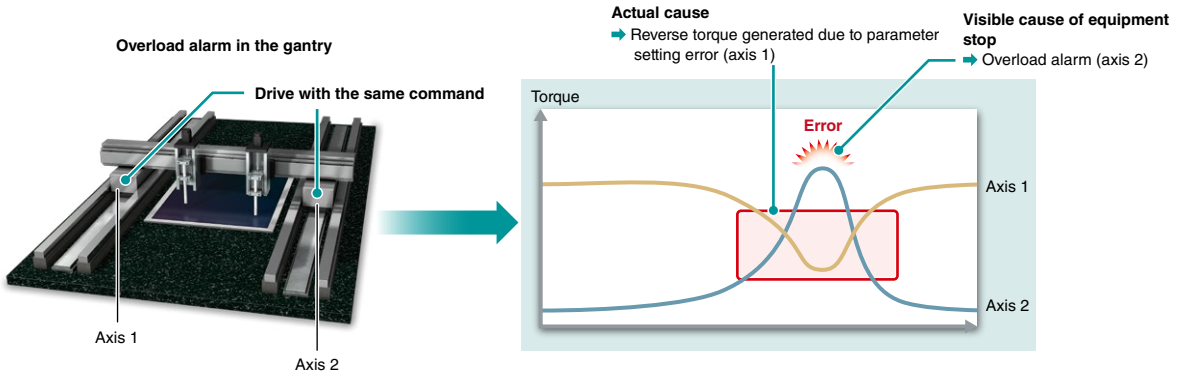
- Simple parameter settings enable the data collection without programming
- Speed/torque/positional data of the MELSERVO-J5/MELSERVO-J4 Series servo amplifier connected with the MELSEC iQ-R Series motion module/motion CPU are automatically collected as logging data when an error occurs
- Data with a time-stamp is saved in the SD memory card of the motion module/motion CPU



Automatic collection of all servo amplifier axis data

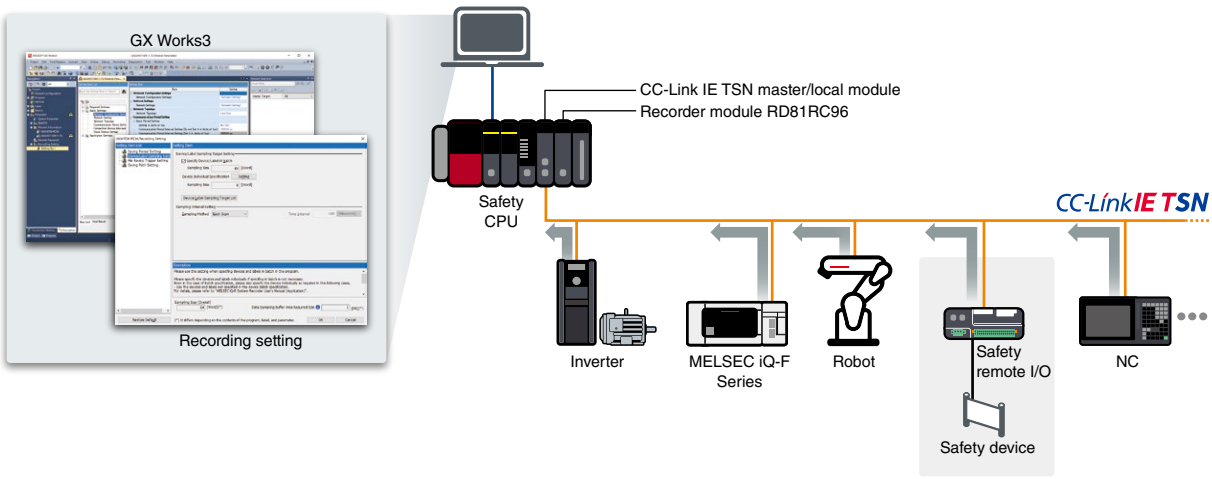
❸Troubleshooting utilizing entire system data

- Troubleshooting is easier by collecting the entire systems servo axis data instead of just concentrating on one servo
- In the gantry below, when the equipment stops from an overload alarm in axis 2, an error cause can be found by checking the axis 1 data. It is apparent that the equipment stops due to reverse torque generated because of parameter setting error of axis 1



Logging device data of CC-Link IE TSN networked devices

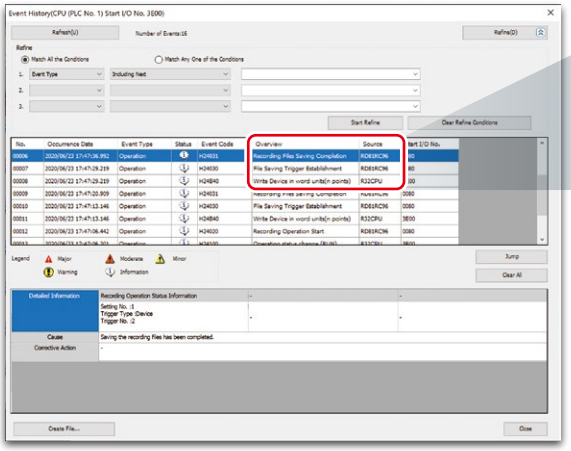
- Device data of servos, robots, inverters and remote devices connected via CC-Link IE TSN can be collected per scan
- Data (device data and labels) can be reproduced or played back in sequence by including a time-stamp, making it easier to check the situation of these devices and identify the error cause



System-wide recording Event history

Record event history

- Operation from engineering software and device/label operation from external devices can be recorded as historical events
- By analyzing event history with records of device/label changes when an error occurs, an error due to data write from an external device or a mistake with operator's procedure can be checked
- Recorded



Overview	Source
Recording Files Saving Completion	RD81RC96
File Saving Trigger Establishment	RD81RC96
Write Device in word units(n points)	R32CPU

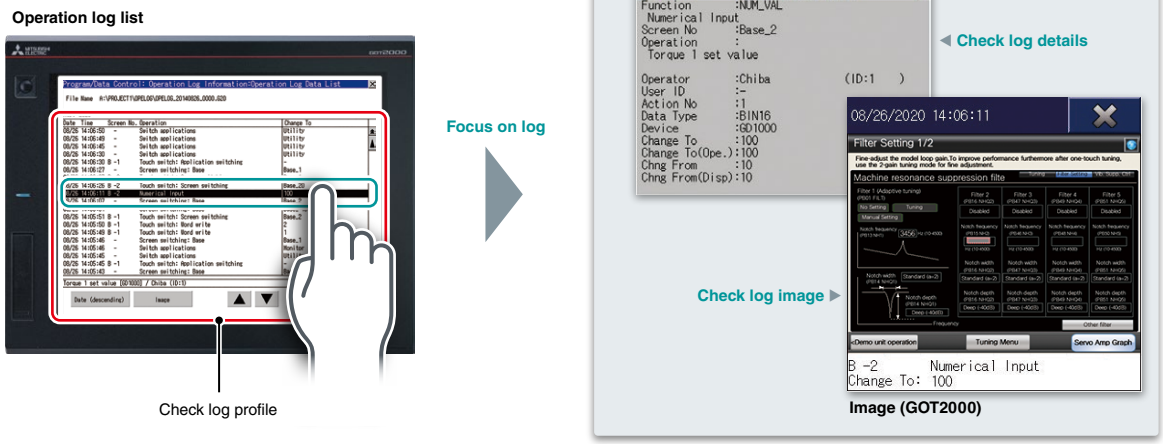
Recorded items
Operation from engineering software
Device and label data registration via SLMP*1 Ethernet protocol
Device and label data registration using instructions (from other stations or machines)
Device and label registration using "Simple CPU communications" (from external device)

*1. SLMP: Seamless Message Protocol

Record operation log and alarm history

❶Easier to identify error cause from operation log

- Operation logs can be recorded as operation log in a SD memory card or USB memory and can be confirmed in the GOT (HMI) or MELIPC MI3000 on the shop floor
- Data such as operation logs and alarm history can be checked on a computer in time-series
- In addition to operator authentication, recording of specific operator logs can be identified easily

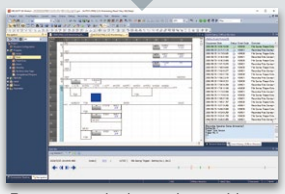


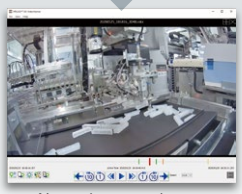
❷Recording of system alarm history

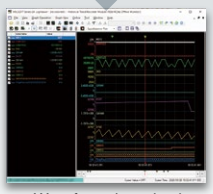
System errors that have occurred are logged in the GOT (HMI) situated on the shop floor. Alarms related to each device with detailed logs showing specific network station number are supported. These features are ideal for large-scale systems.

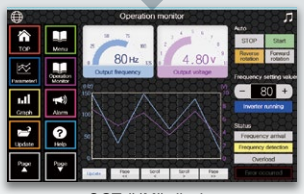
Simplified analysis

Analysis of recorded data


Program monitoring and event history


Network camera image


Waveform data check



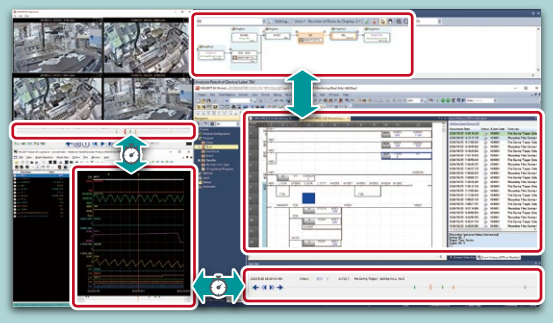
GOT (HMI) display

Without a system recorder

- A lot of data when an error occurs is recorded, but linking data is troublesome
- Difficult to trace a program with varying outputs
- Takes time to understand programs created by others
- Troublesome to find reference points for concerns from camera images

With a system recorder

- The related camera images, programs, and devices can be linked to check in the same timeline, allowing easier reproduction of the process at an error
- Analysis of programs created by others is easy as relationships of device values and program can be visualized within the flowchart
- As unusual motion is extracted from camera image and automatically marked, the reference points for concerns can be narrowed down



GX VideoViewer Pro | GX VideoViewer | GX LogViewer | GX Works3

Log marker function

Faster cause analysis by synchronized video feed, program and waveform monitoring

❶Register milestone points on the timeline

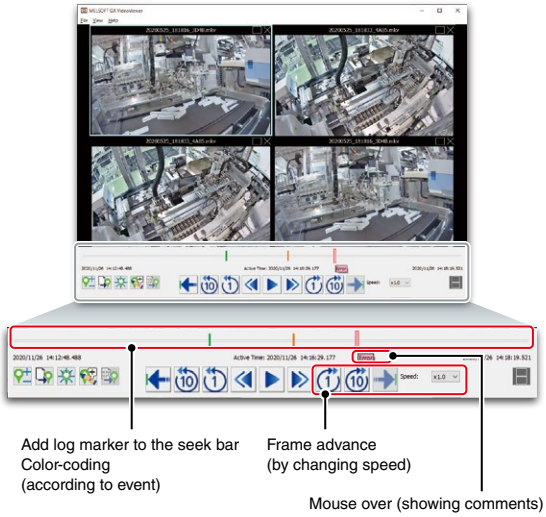
Milestone points (log marker) can be added to the main video at an error. These points can be saved for later use or for distributing amongst other support personnel enabling multiple people to analyze the problem area of the application.

❷Categorize registered milestone points

Log markers can be color-coded according to importance and event type with support of commenting, realizing efficient analysis.

❸Confirming video feed with collected data

After checking the video feed, outputs causing an error and related devices can be tracked as well as programs that change devices. The milestone points (log markers) are synchronized with each software and reproduced at different playback speeds offering a realistic view of the process together with the control data collected.



GX VideoViewer Pro

Difference extraction function NEW

Maisart

Industry's first*1

AI technology that extracts differences from the target video by comparing "appearance" and "operation" without deep learning

In addition to the GX VideoViewer functions, differences in images are extracted and marked just with simple setting.

*1. Based on Mitsubishi Electric research as of April 28, 2022

❶Automatically mark differences in the recorded images

- Extracts differences in the video that differ from normal patterns and adds a mark in the image and on the seek bar
- AI analyzes differences of appearance and operation with unique algorithm, enabling easier error analysis
- Significantly reduce the time to find errors and such occurring at a high-speed which can not follow with the human eye

❷Easy 2-step setting

Automatic extraction by unique algorithms can be set up in 2 simple steps:

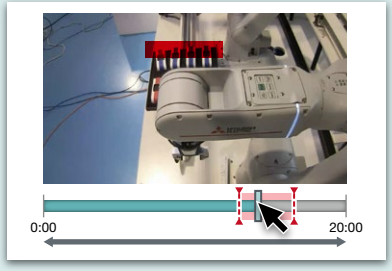
STEP ❶ Set camera images of normal operation. (generation of normal pattern)

STEP ❷ Execute difference extraction.

Differences are extracted according to changes in "appearance" and "operation", then marked on the video feed automatically. The log markers can be synchronized with other software.

Conventionally Differences from normal patterns are checked by an operator

NEW Possible differences from normal patterns are automatically extracted



User benefits Differences are automatically extracted from recorded images, saving labor time in identifying the cause of abnormalities

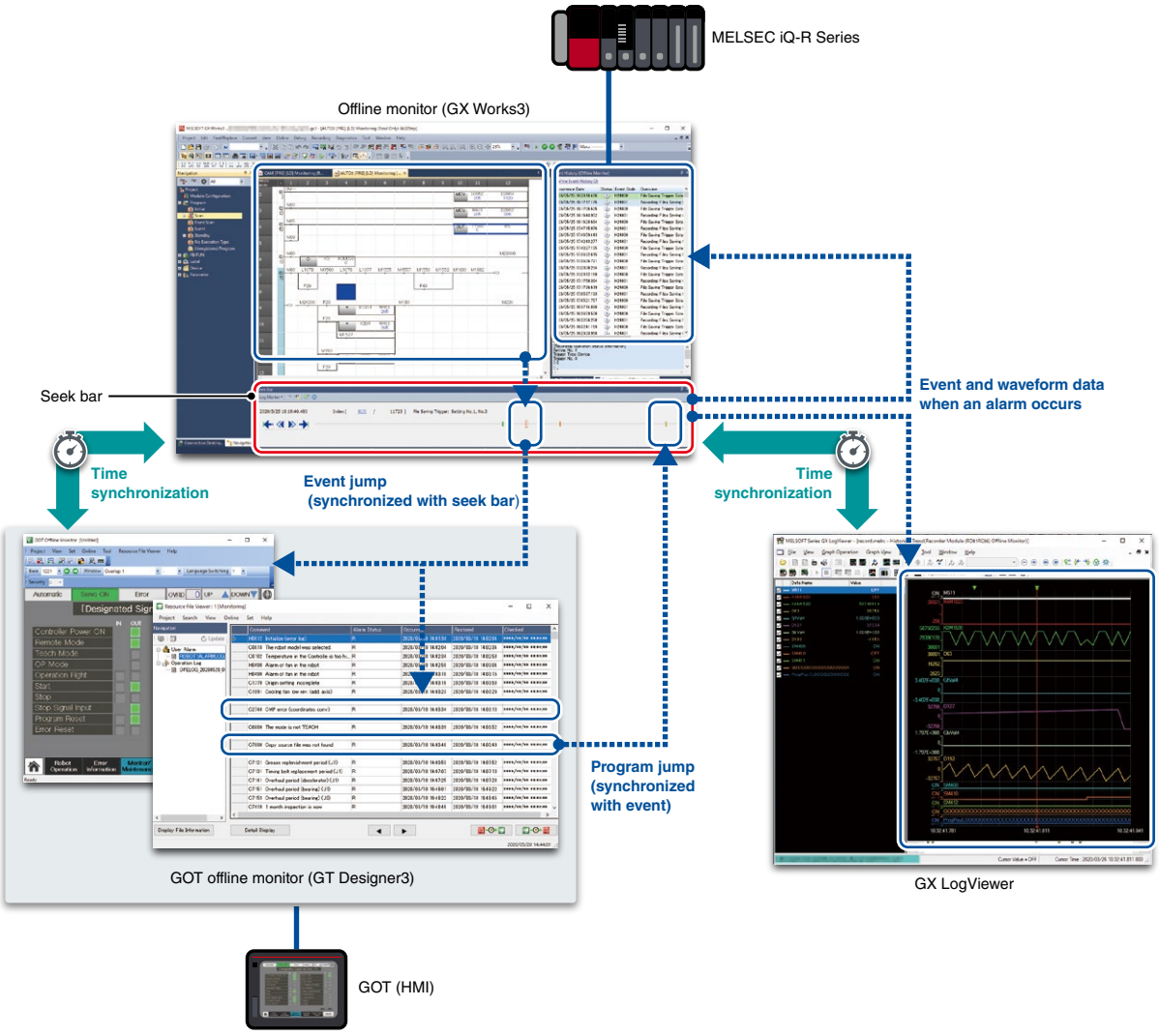
Maisart: Mitsubishi Electric's AI creates the State-of-the-ART in technology
Mitsubishi Electric's brand of AI technology aiming to make all devices smarter

GX LogViewer | GX Works3 | GT Designer3

Offline monitoring

Synchronized playback of program, waveform data, GOT (HMI) (screens, operation logs, alarm history)

Playback of data can be done very simply just by loading the recorded data into GX Works3, automatically executing all other necessary tools. Using the “seek bar” enables to jump back and forth within the timeline synchronizing data between GX Works3 program monitoring (circuit monitor), GX LogViewer (waveform display), and GOT (HMI) "screens, operation logs, alarm history".



GX Works3

Data flow analysis function

❶Visualize affected area of device/label

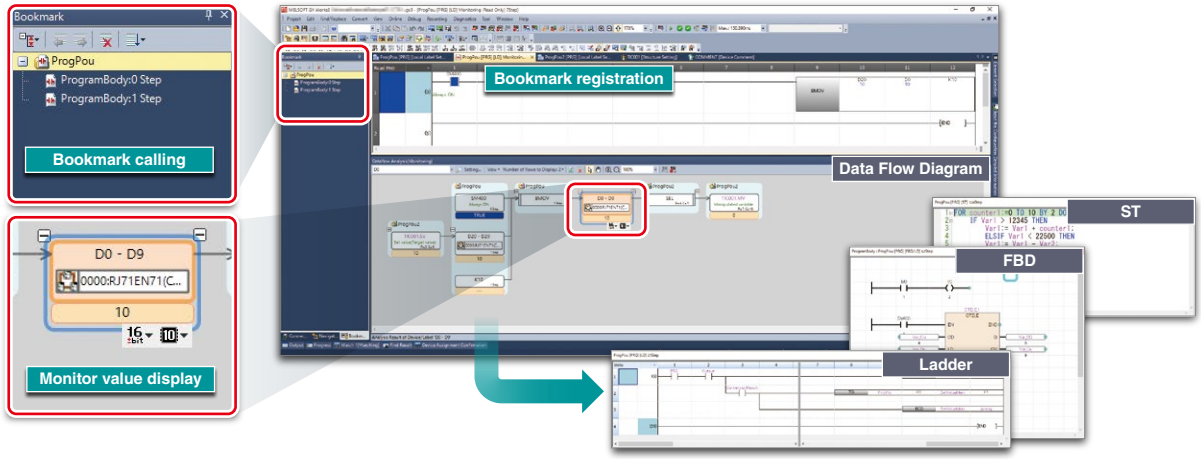
Device and labels together with the affected area can be visualized within the flowchart. The process flow from comments, instruction names, event history, and monitored values can be checked easily identifying the cause of an error.

❷Bookmark milestone points

Easily bookmark reference points for areas of concern.

❸Main program languages supported

Analysis can be done for ladder programs, function block diagram (FBD), SFC (within Zoom) and ST language programs.

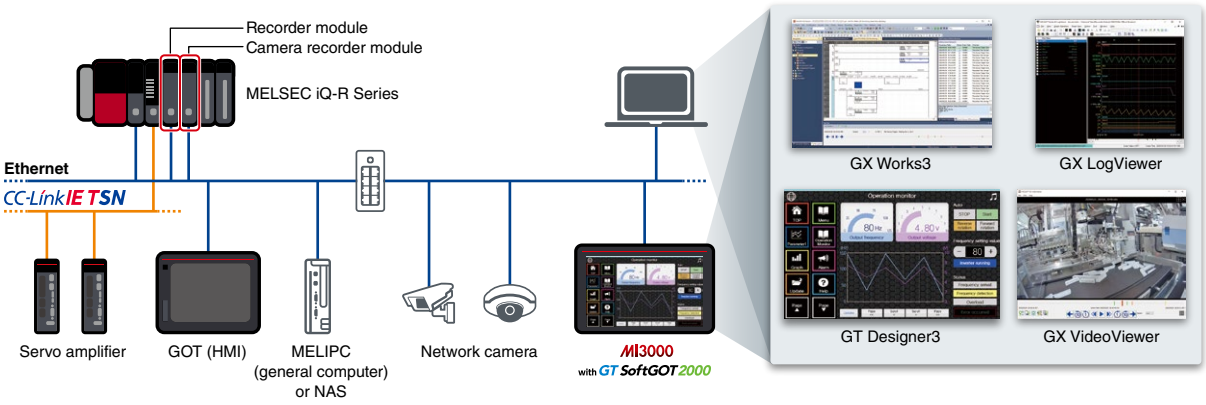


Simplified analysis of motion control

By loading the motion module/motion CPU data to GX LogViewer, the axis data shown as a waveform can be easily compared with the programmable controller device data for analysis.

Simplified analysis using panel computer

Multiple data can be reproduced on a panel computer such as the MELIPC MI3000 (embedded Windows® OS). Considering the panel computer is situated on the shop floor, various historical alarms and operation logs can be confirmed efficiently at the point where a problem occurs.



System recorder related products specifications

System-wide recording Recording function (device and label collection, image recording)

Recorder module RD81RC96

Camera recorder module RD81RC96-CA

Automatic collection of all device changes per controller scan time (with time-stamp) prior to and after an error occurs.

- Collect all device/label and event history data
- Easily register device trigger and recording time before and after the event
- Network camera image recording (RD81RC96-CA only)

RD81RC96 RD81RC96-CA

Recorder module, camera recorder module specifications

Item		RD81RC96	RD81RC96-CA
Recording target		Device/label, event history	Device/label, event history, camera image
Number of settings		Up to 4	
Recording method		File saving trigger only, recording startup trigger + file saving trigger	
File saving trigger		Device of the control CPU (rise, fall, timeout), control CPU stop error detection, elapsed time after completion of data collection (max.16 per recording setting)	Device of the control CPU (rise, fall, timeout), camera event, control CPU stop error detection, elapsed time after completion of data collection (max.16 per recording setting)
Recording startup trigger		Rise/fall accumulation period (1 per recording setting)	
Sampling method		Each scan, time specification, trigger instruction, safety cycle time	
Number of connectable modules		One recorder module per control CPU	Four camera recorder modules per control CPU*2
Applicable cameras*1	Camera type	-	ONVIF® Profile S compliant network camera
	Number of cameras	-	Max. 4 per module*3
Storage type		SD memory card, file server	
Compatible CPU module		R04/08/16/32/120(EN)CPU, R08/16/32/120SFCPU*4	

*1. For details of compatible camera, please refer to the technical bulletin (FA-A-0326).
*2. Maximum of 4 camera recorder modules (RD81RC96-CA) can be used per control CPU according to the number of connected cameras. To use device/label collection, set recording operation setting of either RD81RC96 or RD81RC96-CA to "main". When the recording operation setting of RD81RC96-CA is set to "sub", only image recording is possible.
*3. Up to two modules when the recording operation setting is "main" and four modules when the recording operation setting is "sub".
*4. Compatible CPU modules can be checked from product information. Please refer to System recorder device configuration on P.18, relevant manual, or technical news.

System-wide recording Image recording

Camera recording package*5

Dedicated function blocks (FB) used in combination with the recording module.

Camera recording package specifications

Item		Camera recording package
Applicable cameras	Camera	AXIS® COMMUNICATIONS (AXIS®) Network camera*6
	Amount (max.)	RnCPU:16, RnENCPU:64, RJ71EN71:112*7
Save destination		File server
Included item	FB	Time setting, recording direction, virtual input port control
	Connection guideline	Commercially available network camera and connection and setup guideline for included FBs
Compatible module	CPU embedded Ethernet port	R00/01/02CPU*8, R04/08/16/32/120(EN)CPU
	Ethernet interface module	RJ71EN71

*5. For information on obtaining the package, please contact your local Mitsubishi Electric sales office or representative.
*6. For details of compatible camera, please refer to the technical bulletin (FA-A-0306).
*7. The maximum number of cameras depends on the amount of available connections not used by other devices. For more information, please refer to "MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup) (SH-081256ENG)".
*8. R00/01/02CPU do not support recording function of the RD81RC96 or RD81RC96-CA, therefore linkage with the camera recording images is not supported.

System-wide recording Network camera (Live/PTZ) setting screen

Camera adjustment on the operation panel*1
MI3000
GOT2000 (GT27, GT25)

Sample screens supporting live image streaming and PTZ adjustment of the network camera via the MELSEC iQ-R camera recorder module are available.

*1. For information on obtaining the sample screens, please contact your local Mitsubishi Electric sales office or representative.

System-wide recording Servo system recorder Supported models added

Motion module
RD78GH
RD78G

Motion CPU
R16MTCPU
R32MTCPU
R64MTCPU

Automatic collection of all servo control system drive axes data from the motion module and motion CPU when an error occurs. Can be used for easy troubleshooting based on command and feedback values.

- Collect servo system recorder data without programming
- Data collection of all drive system axes
- Compare axis data with other logged data on GX LogViewer

RD78G R64MTCPU

■System recorder related software

GX VideoViewer

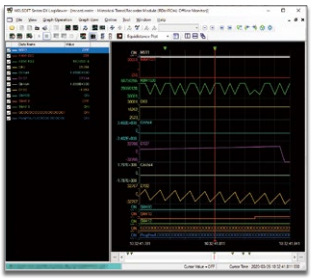
Playback of recorded video up to four screens, while freely playing forward one frame, fast-forwarding, and rewinding. Each video can be linked to check in the same timeline. Color-coded log markers can be added to the video timeline, which is useful for inspection and analyzing among multiple personnel. Log markers are synchronized with related software.

GX VideoViewer Pro NEW

In addition to the GX VideoViewer functions, GX VideoViewer Pro extracts areas of concern in the video that differ from normal patterns and automatically adds a log marker. Even a long-duration video, log markers are automatically added to the scenes that differ from the normal ones as reference points by comparing with the preset normal scenes on behalf of the operator.

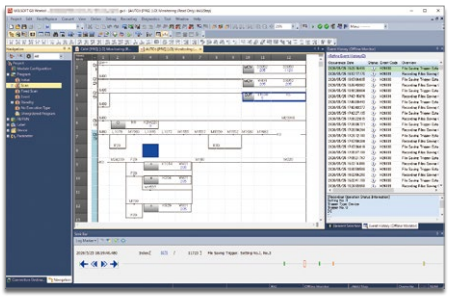
GX LogViewer

GX LogViewer allows observation of device values, which represent quantities that change over time, by zooming in and out of waveforms similar to an oscilloscope. Difference can be checked by superimposing multiple waveforms and observed from repeated patterns.



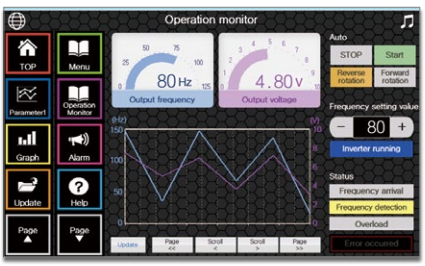
GX Works3

A must-have engineering software for engineers and maintenance personnel. Program steps can be followed and device value changes can be checked by synchronizing the recorded system recorder data with log markers. Data flow analysis visualizes device values and programs affecting the data value change, helping to identify the cause of faults. This can reduce analysis time. Supported programs which synchronize with log markers include not only ladder programs but also function blocks that are easy to follow from the program.



GT Designer3

Screen creation software for GOT (HMI).
GOT (HMI) display/operation log/alarm history can be displayed offline by synchronizing with other applications, making it easier to visualize an error.



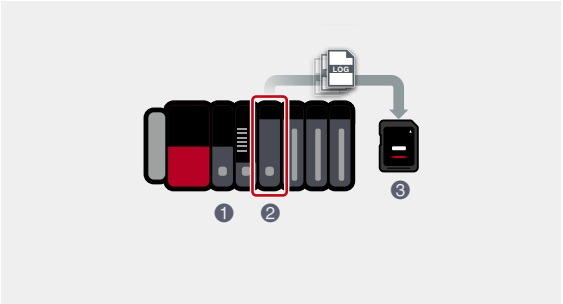
* For details on how to obtain the above software, please contact your local Mitsubishi Electric sales office or representative.

■System recorder device configuration

Basic configuration

Collecting of all device and label data

❶MELSEC iQ-R Series CPU module*1
❷**Recorder module***2
❸SD memory card



*1. CPU modules with product information (3rd and 4th digits) stated below support collecting of all device and label data.

Model	Product information	Model	Product information	Model	Product information
R04CPU	"19" or later	R04ENCPU	"32" or later	R08SFCPU	"05" or later
R08CPU	"20" or later	R08ENCPU	"30" or later	R16SFCPU	
R16CPU	"20" or later	R16ENCPU	"27" or later	R32SFCPU	
R32CPU	"17" or later	R32ENCPU	"30" or later	R120SFCPU	
R120CPU	"17" or later	R120ENCPU	"22" or later		

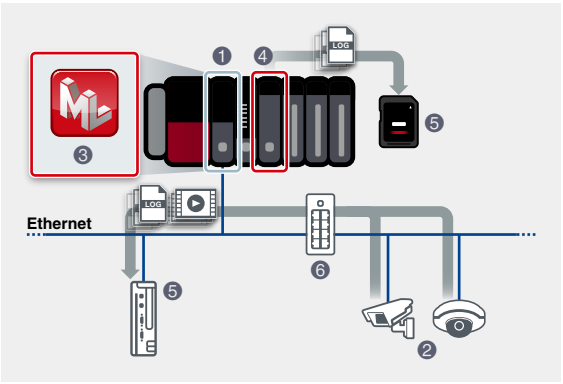
For how to check product information, please refer to the "MELSEC iQ-R Module Configuration Manual (SH-081262ENG)". Module firmware update may be required depending on modules.

*2. GX Works3 (Ver.1.065T or later) is necessary for recording setting and module setting.
GX Works3 (Ver.1.070Y or later) is necessary when using RnSFCPU.

Basic configuration + Camera recording package

Collecting of all device and label data and recording instructions to network camera from software

❶MELSEC iQ-R Series CPU module*3
❷Network camera*4
❸**Camera recording package (FB and guideline)**
❹**Recorder module***5
❺SD memory card or file server (NAS or computer)
❻PoE switching hub (IEEE802.3at (PoE+) compliant)*6



*3. CPU modules with product information (3rd and 4th digits) stated below support collecting of all device and label data.

Model	Product information	Model	Product information
R04CPU	"19" or later	R04ENCPU	"32" or later
R08CPU	"20" or later	R08ENCPU	"30" or later
R16CPU	"20" or later	R16ENCPU	"27" or later
R32CPU	"17" or later	R32ENCPU	"30" or later
R120CPU	"17" or later	R120ENCPU	"22" or later

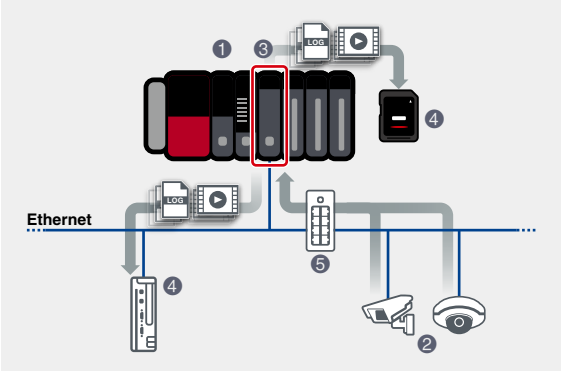
For how to check product information, please refer to the "MELSEC iQ-R Module Configuration Manual (SH-081262ENG)". Module firmware update may be required depending on modules.
To use camera image recording only, below CPU modules can be used.
- R00/01/02/04/08/16/32/120CPU, R04/08/16/32/120ENCPU (no restriction to product information)
- In addition to the above CPU Ethernet ports, the Ethernet interface module (RJ71EN71) can also be used

*4. For details of compatible AXIS® COMMUNICATIONS (AXIS®) Network cameras, please refer to the technical bulletin (FA-A-0306).
*5. GX Works3 (Ver.1.065T or later) is necessary for recording setting and module setting. GX Works3 (Ver.1.070Y or later) is necessary when using RnSFCPU.
*6. PoE: Power over Ethernet

Basic configuration + Camera recorder module

Collecting of all device and label data, storage of video data from network camera

❶MELSEC iQ-R Series CPU module*7*8
❷Network camera*9
❸**Camera recorder module***8
❹SD memory card or file server (NAS or computer)
❺PoE switching hub (IEEE802.3at (PoE+) compliant)



*7. CPU modules with product information (3rd and 4th digits) stated below support collecting of all device and label data.

Model	Product information	Model	Product information	Model	Product information
R04CPU	"19" or later	R04ENCPU	"32" or later	R08SFCPU	"05" or later
R08CPU	"20" or later	R08ENCPU	"30" or later	R16SFCPU	
R16CPU	"20" or later	R16ENCPU	"27" or later	R32SFCPU	
R32CPU	"17" or later	R32ENCPU	"30" or later	R120SFCPU	
R120CPU	"17" or later	R120ENCPU	"22" or later		

For how to check product information, please refer to the "MELSEC iQ-R Module Configuration Manual (SH-081262ENG)". Module firmware update may be required depending on modules.

*8. GX Works3 (Ver.1.072A or later) is necessary for recording setting and module and camera setting (not yet supported).
*9. For details of ONVIF® Profile S compatible network camera and other compatible cameras, please refer to the technical bulletin (FA-A-0326).

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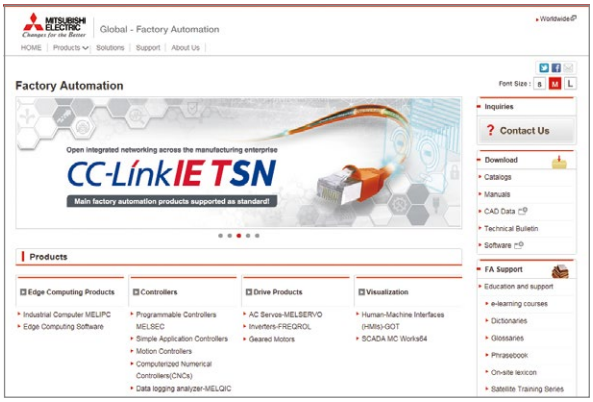

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