

MELSEC iQ-R System Recorder Use Case



MELSEC *iQ*-R series

GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

"Changes for the Better" represents the Mitsubishi Electric Group's attitude to "always strive to achieve something better", as we continue to change and grow. Each one of us shares a strong will and passion to continuously aim for change, reinforcing our commitment to creating "an even better tomorrow".

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems

A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices

A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance

Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems

Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems

Maximizing productivity and efficiency with cutting-edge automation technology.

Our advances in AI and IoT are adding new value to society in diverse areas from automation to information systems. The creation of game-changing solutions is helping to transform the world, which is why we are honored to be recognized in the 2019 'Forbes Digital 100' as one of world's most influential digital corporations.



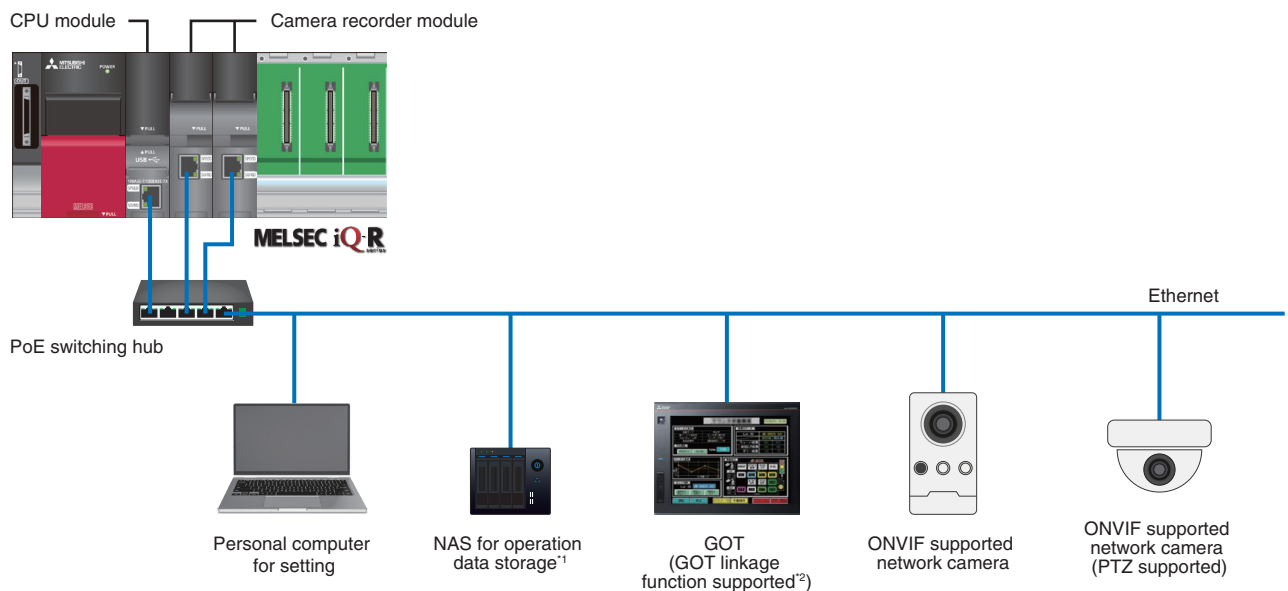


Operation status recording of a whole system and simple analysis

The system recorder is a breakdown maintenance solution for realizing a significant reduction in downtime by "recording operating status of a whole system" at an error occurrence and providing "simple analysis".

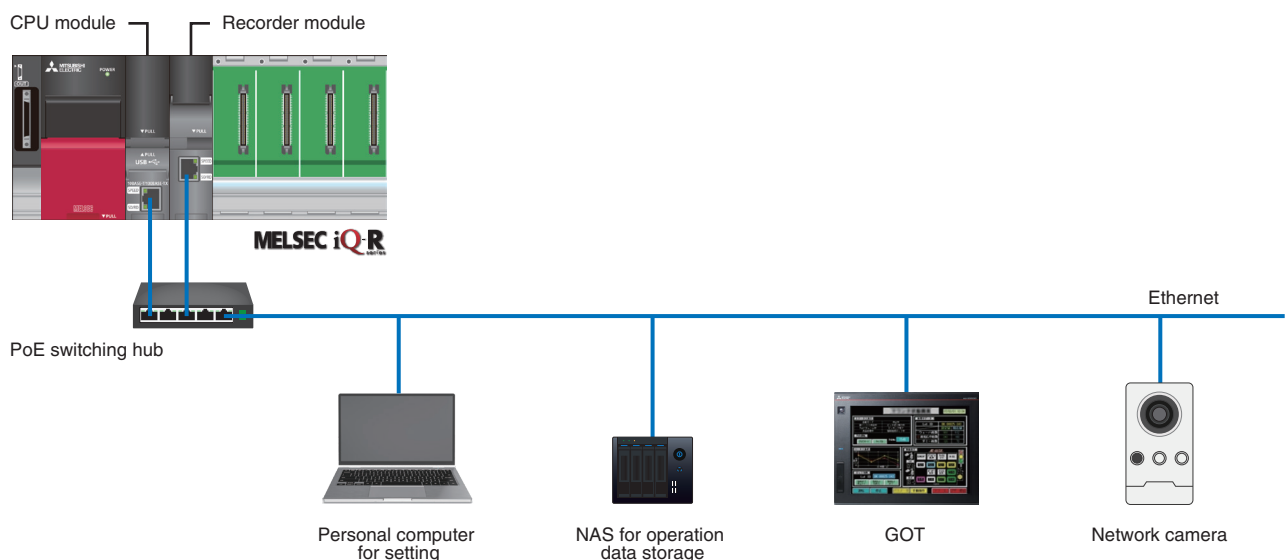
System configuration image

For the camera recorder module



^{*1} Not necessary because the device operation data can be saved in a SD memory card of the camera recorder module.
^{*2} It is possible to check the live video of the network camera and adjust PTZ.

For the recorder module



Troubleshooting cases utilizing the system recorder

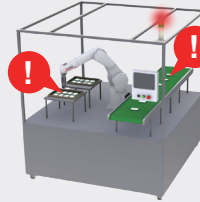
Case 1 Monitoring of entire line



Defective products were detected during inspection, but it is not clear which process is the cause.

[Page.5](#)

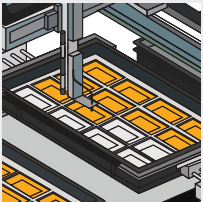
Case 2 Identification of abnormal areas



Abnormalities occur at multiple locations irregularly, making it impossible to identify the abnormal areas.

[Page.6](#)

Case 3 Workpiece drop due to a suction error



An error occurred in a workpiece transportation device using a suction mechanism, but the error cause cannot be identified.

[Page 7](#)

Case 4 Printing failure



A QR code printing failure was detected, but the cause cannot be identified.

[Page.8](#)

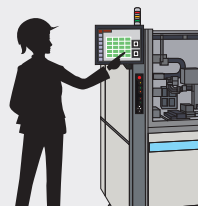
Case 5 Chuck error



Although the video was checked for identifying the cause, the conditions of the auto switches were unclear.

[Page.9](#)

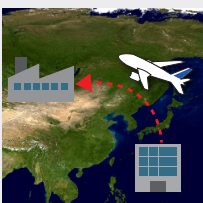
Case 6 Human error (Incorrect product type)



It is desirable to correctly understand the details of the erroneous operation for future guidance and consideration of improvement.

[Page.10](#)

Case 7 Handling errors from a remote place



It is desirable to correctly understand the situation and cause of the error without visiting the site.

[Page.11](#)

Function introduction

[Page.12, 13](#)

System configuration image, system recorder-related products

[Page. 14](#)

Case 1

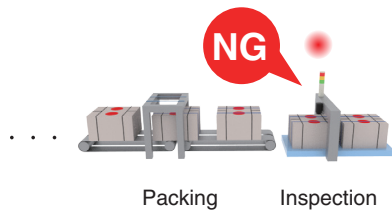
Monitoring of entire line

Camera recorder module

Recorder module

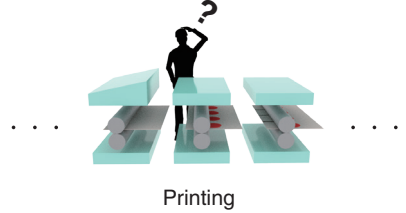
1

Defects are detected in the inspection process of the product line.



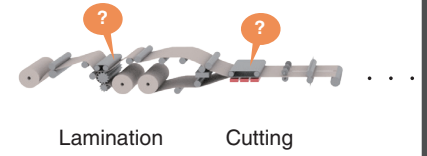
2

Defects occur even after adjusting the part that seems to be the problem.



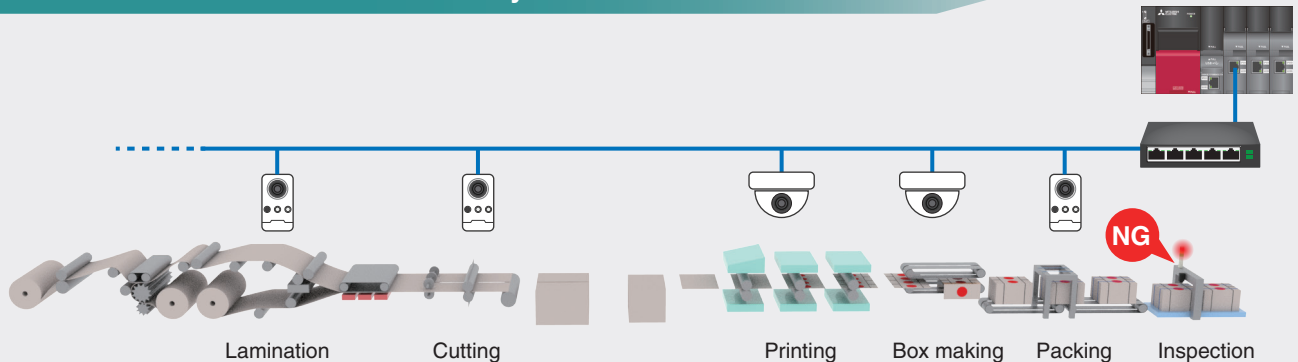
3

There may be the factors somewhere in the previous process, but it cannot be identified.



It is desirable to identify the cause in multiple processes...

Cause identification with the system recorder!

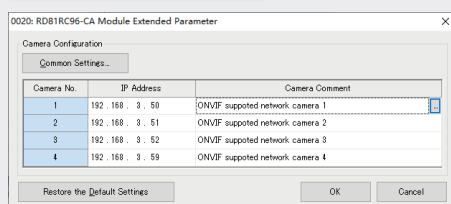


1

With a camera recorder unit, multiple network cameras can be connected to a single programmable controller.



GX Works3



2

It conforms to the network standard ONVIF Profile S, and can be connected to a wide variety of cameras.



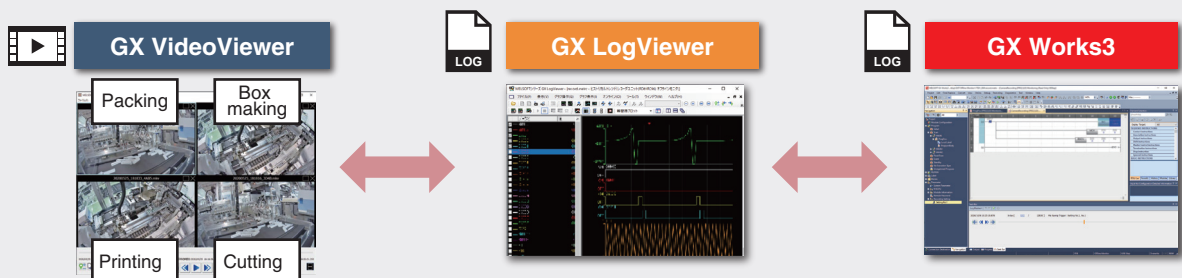
ONVIF supported network camera (PTZ supported)



ONVIF supported network camera

3

Acquire video and log data of the entire process, and use various tools to check and analyze the data against the video at once to identify the cause.



Monitoring of the entire production line with multiple cameras helps to determine the cause among multiple factors!

Case 2

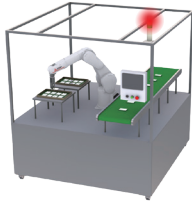
Identification of abnormal areas

Camera recorder module

Recorder module

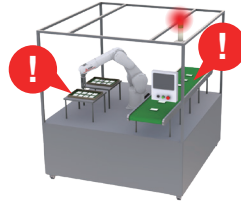
1

A short time breakdown occurs frequently in the assembly process using robots!



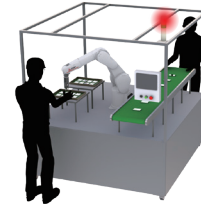
2

Abnormalities occur at multiple locations irregularly, making it impossible to identify the abnormal areas.



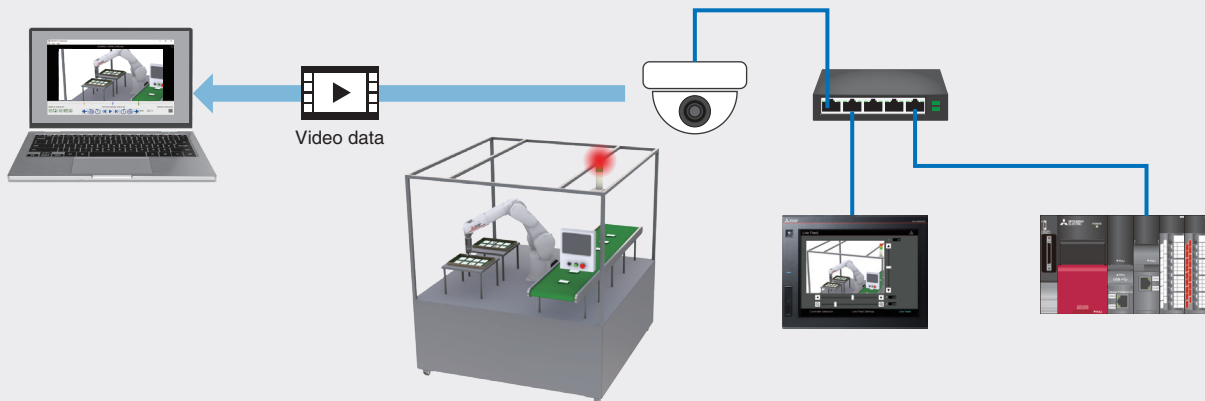
3

It is necessary to stop the machine and conduct a full inspection to determine the cause.



It is desirable to identify the error cause without stopping the machine...

Cause identification with the system recorder!



1

Move the camera and zoom in the area that seems to be the cause with **the pan-tilt-zoom (PTZ) function** of the camera recorder module.



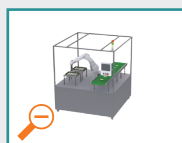
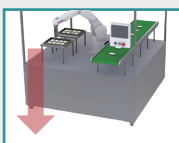
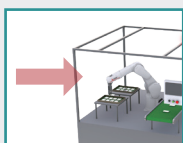
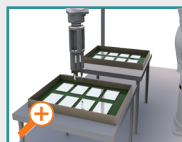
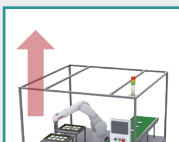
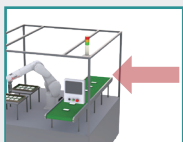
Horizontal movement



Vertical movement

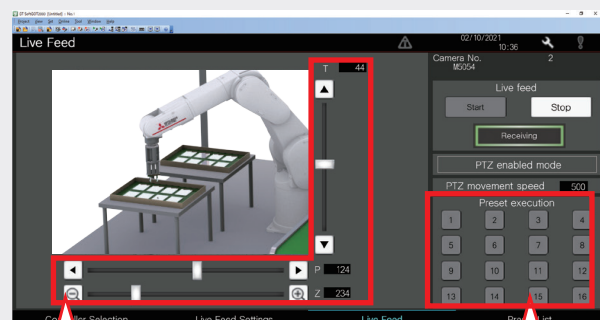


Zoom in/out



2

The recording status can be changed for each process by using the GOT operation screen and PTZ control commands from the programmable controller.



PTZ operation

Preset execution enables instantaneous switching to a preset recording position.

The camera adjustment function (PTZ) of ONVIF supported network cameras enables identification of the cause with the machine in operation!

Case 3

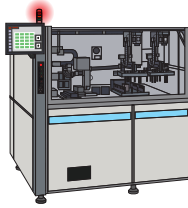
Workpiece drop due to a suction error

Camera recorder module

Recorder module

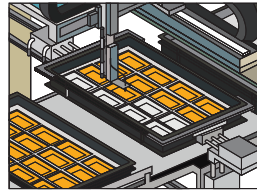
1

An error occurred in a workpiece transportation device using a suction mechanism!



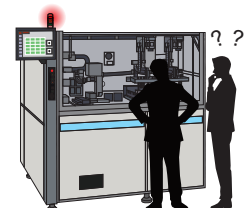
2

Although the device was checked, the workpiece was not mounted in the specified position, and no visible error was shown.



3

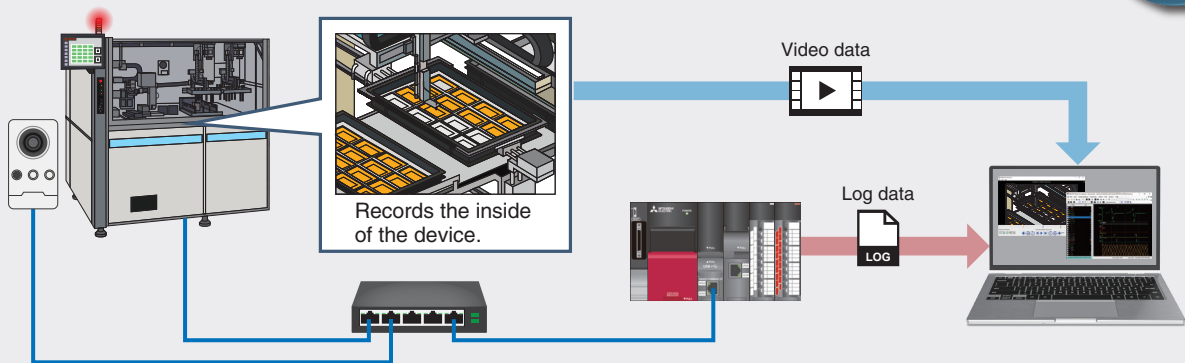
No one knows the condition of the device at the error occurrence since there is usually no operator around the device.



The cause of the device error cannot be identified...

Cause identification with the system recorder!

Log marker function
Page 12

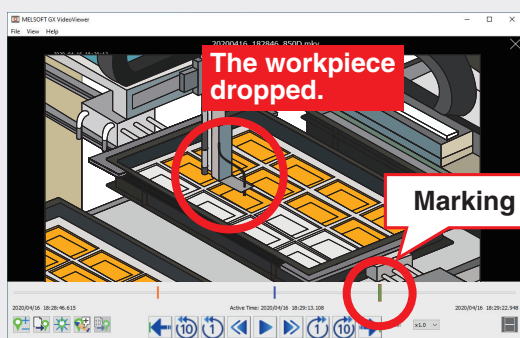


1

Checking the recorded video before the issue occurred has shown the moment that the workpiece was dropped from the suction part. Mark the corresponding position on the seek bar with the **log marker function**.



GX VideoViewer

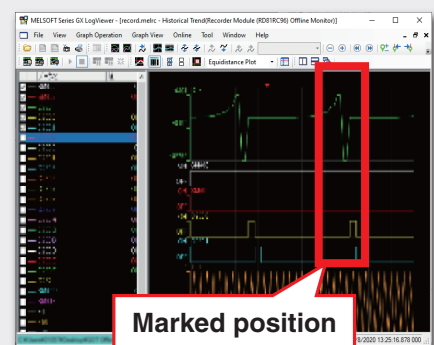


2

Checking the data around the marked time has shown that the vacuum pressure decreased before the "suction OFF" command was turned on.



GX LogViewer



Although the vacuum pressure error occurred in the suction part, the cause could not be identified since the dropped workpiece was **accidentally** mounted in the incorrect position without alignment.

The system recorder has determined that the cause was the vacuum pressure in the suction part!

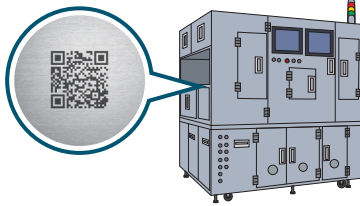
Case 4

Printing failure

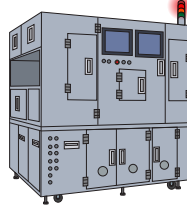
Camera
recorder
module

Recorder
module

- 1 QR code printing with a laser marking device



- 2 A QR code printing failure was detected in the finishing process!



- 3 Possible causes are...
The workpiece was misaligned from the specified position.
A control failure occurred in the laser marker.

Passed



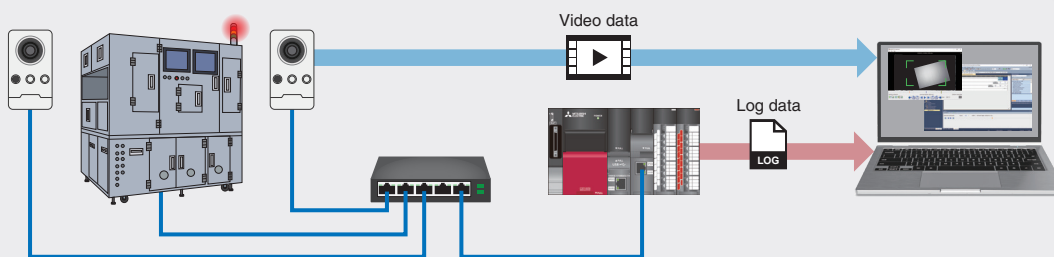
Failed



The cause of the printing failure cannot be identified...

Cause identification with the system recorder!

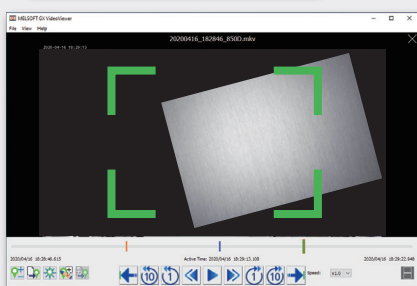
Offline
monitoring
Page 12



- 1 Checking the workpiece on which the printing failure occurred by rewinding the video has shown that the workpiece was misaligned significantly from the specified position.



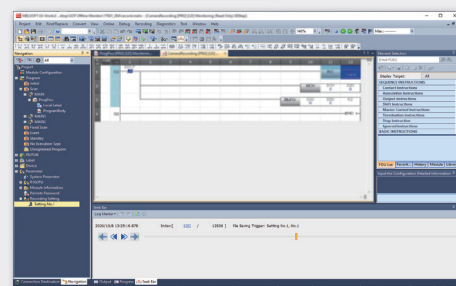
GX VideoViewer



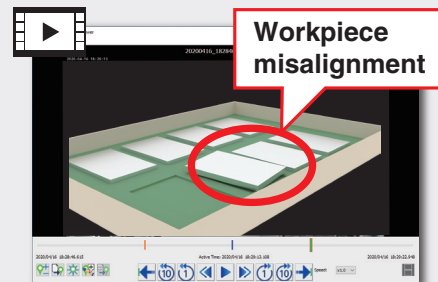
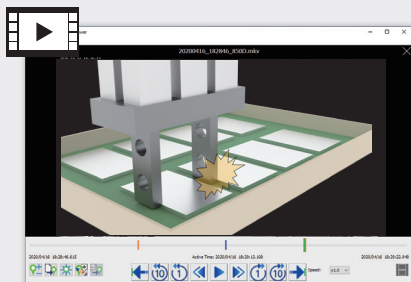
- 2 The offline monitoring function has shown that there was no problem in transportation since the auto switches of the air chuck cylinder operated normally.



GX Works3



- 3 Rewinding the video further has determined that the chuck contacted with the workpiece when picking up the previous workpiece, which caused the workpiece to be significantly misaligned from the specified position.



**Workpiece
misalignment**

The system recorder has determined that the cause of the printing failure was the workpiece misalignment!

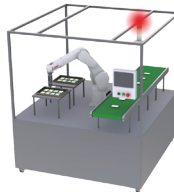
1

An error occurred in the auto switches of the air chuck on edge of the robot.



2

Although all the auto switches were checked, they were ON in the normal states, and the error cause could not be identified.



3

Checking the video could not identify the cause since the conditions of the auto switches were not recorded.



Where the error has occurred in the device cannot be identified....

Cause identification with the system recorder!

Offline
monitoring
Page 12

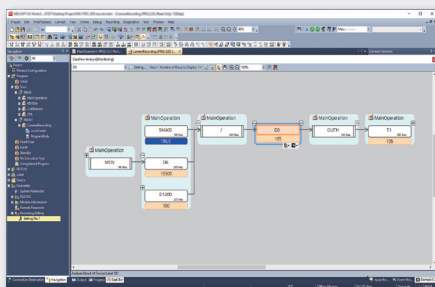
Data flow
analysis
function
Page 12

1

Check the item that can be an error cause by using the **data flow analysis function**.



GX Works3

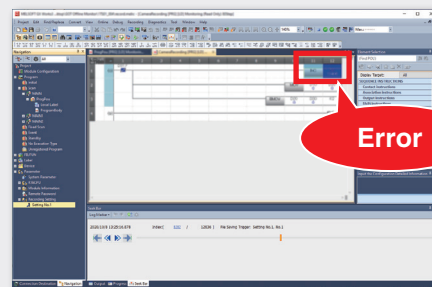


2

When the operation at the error occurrence was reproduced by **the offline monitoring function**, an auto switch did not turn on, and an error occurred.



GX Works3



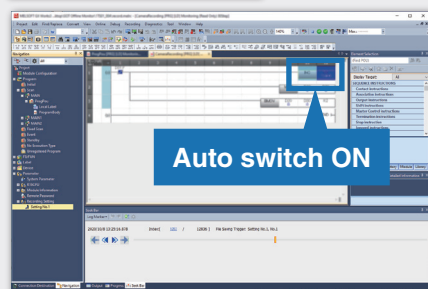
Error

3

An auto switch turned on a few seconds after the error occurred. Checking the condition of the corresponding chuck in GX LogViewer has determined that the trigger of the auto switch was OFF (timed out) when the workpiece was gripped.



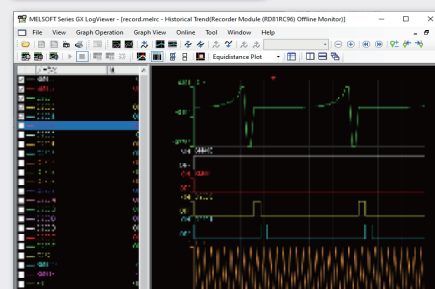
GX Works3



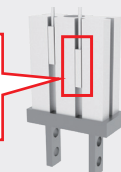
Auto switch ON



GX LogViewer



Adjust the ON
position of the
auto switch



It has been determined that the error can be avoided by finely adjusting the ON position of the auto switch attached to the chuck.

The system recorder has determined that the cause was the ON position of the auto switch!

Case 6

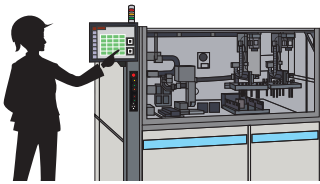
Human error (Incorrect product type)

Camera
recorder
module

Recorder
module

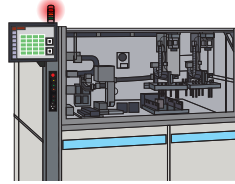
1

An operator inputs the workpiece machining conditions.



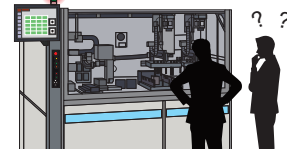
2

An error was found in the finishing check!



3

It is desirable to correctly understand the details of the erroneous operation for future guidance and consideration of improvement.

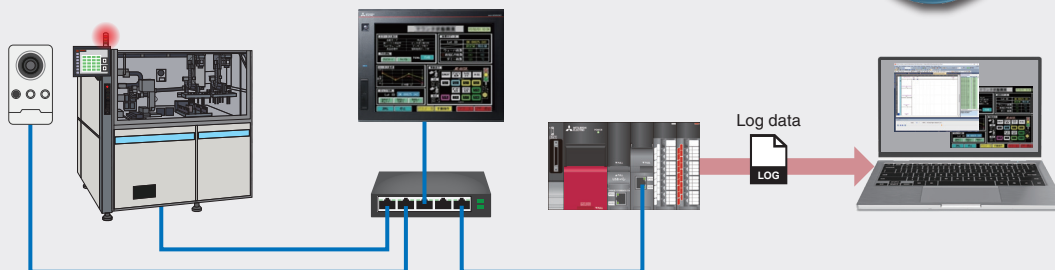


It is desirable to correctly understand what the cause was...

Cause identification with the system recorder!

Offline
monitoring
Page 12

Event history
Page 13

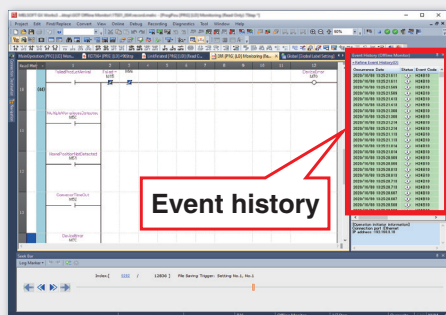


1

The operation before the error occurrence was checked in the **event history**.



GX Works3



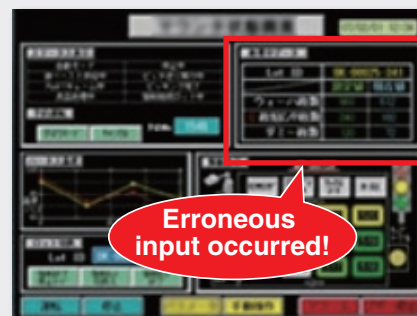
Event history

2

The GOT **offline monitor function** was linked to the event history to reproduce the GOT operation.



GT Designer3



Erroneous
input occurred!

When the error actually occurred, reviewing the operation details to prevent recurrence and others were considered.

Changing manual input
to barcode input



Reviewing the layout
on the GOT screen

The cause can be identified with the system recorder, and the appropriate preventive measures against recurrence can be considered!

Case 7

Handling errors from a remote place

Camera recorder module

Recorder module

1

An error occurred on the site of another branch (overseas)!



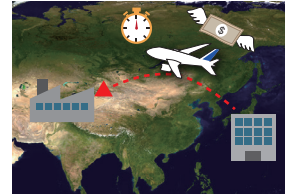
2

The error occurred at the site location could not be correctly understood over the phone.



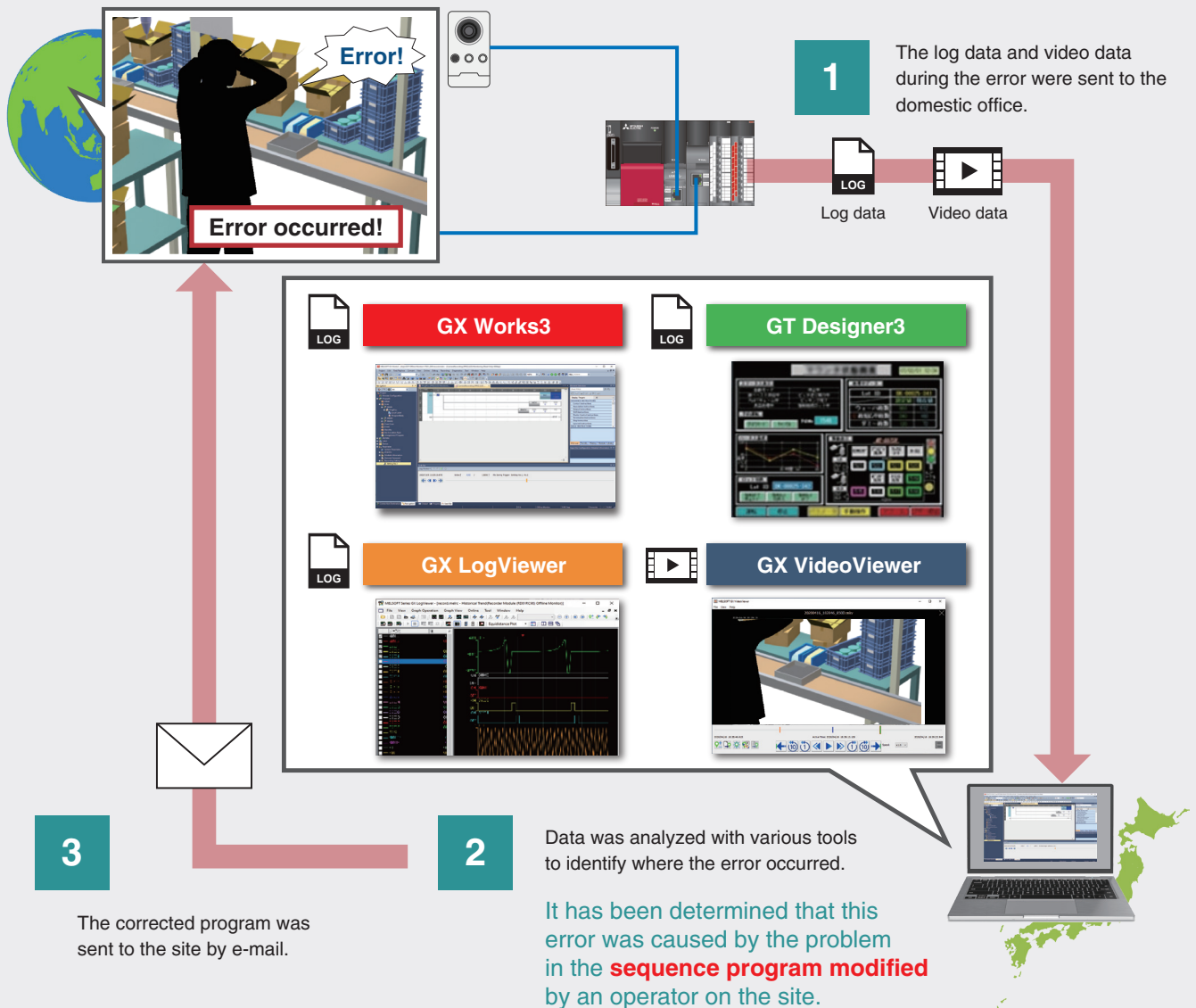
3

Since the cause cannot be identified without directly checking the hardware, traveling to the country, costs time and money.



It is desirable to identify the cause without visiting the site...

Cause identification with the system recorder!



The system recorder can significantly reduce the man-hours and costs for handling errors!

Function introduction



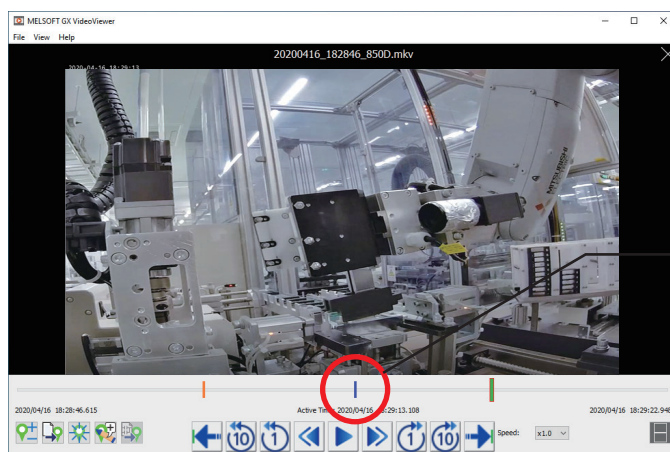
Log marker function

GX Works3

GX LogViewer

GX VideoViewer

- ✓ The recorded video when a issue occurred can be saved with marks (log markers) added to the positions to be focused.
- ✓ Within the offline monitor function; by replaying the saved data from the recorder module, the status of devices can be reproduced at the time of the fault.
- ✓ Log markers can be shared among related parties even when they are at distant locations each other.



GX VideoViewer



Offline monitoring

GX Works3

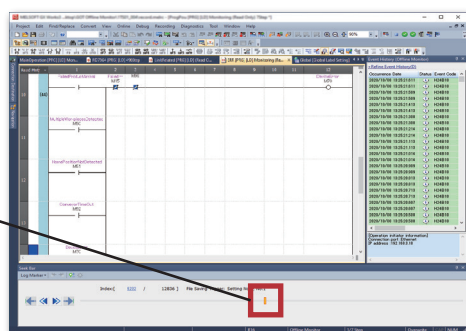
GX LogViewer

GT Designer3

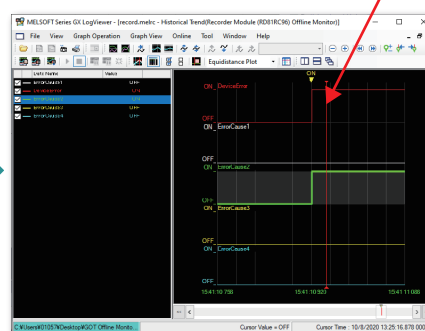
- ✓ By performing a replay on the offline monitor using each data saved in the recorder module, the status at the error can be reproduced on the engineering tool.
- ✓ The circuit (program transition) can be monitored in GX Works3, and the waveform data can be checked in GX LogViewer. By moving the slider on the seek bar in GX Works3, the program, waveform data, and operation history can be replayed in synchronization.

The red cursor is synchronized with the slider.

Slider



GX Works3



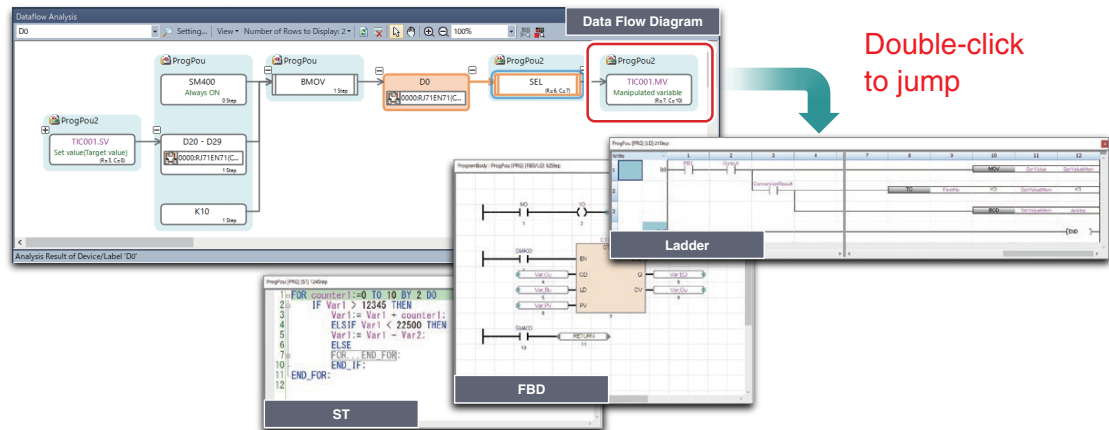
GX LogViewer



Data flow analysis function

GX Works3

- ✓ A device flowchart is automatically created from the program of GX Works3, and the related data is visually displayed.
- ✓ Comments and instruction diagrams are also displayed in the flowchart.
- ✓ Double-clicking an item in the flowchart jumps to the window for the corresponding device/label.



Event operation history

GX Works3

- ✓ Since device/label operations from external devices can be recorded as the event history, "when, where, how, and which device/label has been changed" can be accurately understood.

Event History (CPU No. 1) Start (I/O No. 3E00)

Refresh [F5] Number of Events: 15 Refresh [F5]

Refine: ☒ Match All the Conditions ☐ Match Any One of the Conditions

1. Event Type: Including Item:

2.

3.

Start Refine Clear Refine Conditions

No.	Occurrence Date	Event Type	Status	Event Code	Operation	Source	Start I/O No.
0006	2020/06/23 17:47:36.790	Operation	OK	K04353	Recording File Saving Completion	R068RC36	0080
0007	2020/06/23 17:47:36.799	Operation	OK	K04353	File Saving Trigger Establishment	R068RC36	0080
0008	2020/06/23 17:47:36.799	Operation	OK	K04353	Write Device in word unit(n points)	R068RC36	0080
0009	2020/06/23 17:47:36.799	Operation	OK	K04353	Recording File Saving Completion	R068RC36	0080
0010	2020/06/23 17:47:36.799	Operation	OK	K04353	File Saving Trigger Establishment	R068RC36	0080
0011	2020/06/23 17:47:36.799	Operation	OK	K04353	Write Device in word unit(n points)	R068RC36	0080
0012	2020/06/23 17:47:36.799	Operation	OK	K04353	Recording Operation Start	R068RC36	0080
0013	2020/06/23 17:47:36.799	Operation	OK	K04353	Recording Operation Start	R068RC36	0080

Legend: Major (Red triangle), Minor (Yellow triangle), Moderate (Green triangle), Minor (Blue triangle)

Recording Operation Status Information

Setting No. 13
Trigger Type Device
Trigger No. 12

Cause: Saving the recording file has been completed.

Corrective Action:

Create File... Close

Recording targets

- Operations from the engineering tool
- Data writing to device/label by SLMP
- Data writing to device with an instruction (Writing from another station or another CPU)
- Data writing to device by simple CPU communication (Writing from the communication target)

System recorder-related products

Camera recorder module RD81RC96-CA Recorder module RD81RC96



RD81RC96-CA/
RD81RC96

All the device/label data before and after an error has occurred is automatically sampled with timestamps per scan.

Motion module RD78GH, RD78G Servo amplifier MR-J5 series



MR-J5-G RD78G

At an error occurrence, information on all the actual driver axes is automatically sampled from the motion module and servo amplifier. The information based on the sampling results of the command and feedback values during the issue can be used for troubleshooting.

Camera recording package

When the recorder module is used, the camera recording package for instructing the network camera when to record video consists of function blocks (FBs) and a connection manual. It can be downloaded from the Mitsubishi Electric Factory Automation Global Website for free.

GX VideoViewer

The recorded video can be checked in GX VideoViewer or within a general-purpose video player software. GX VideoViewer is independent of the engineering tool. It can be downloaded from the Mitsubishi Electric Factory Automation Global Website for free.

GX Works3, GX LogViewer, GT Designer3

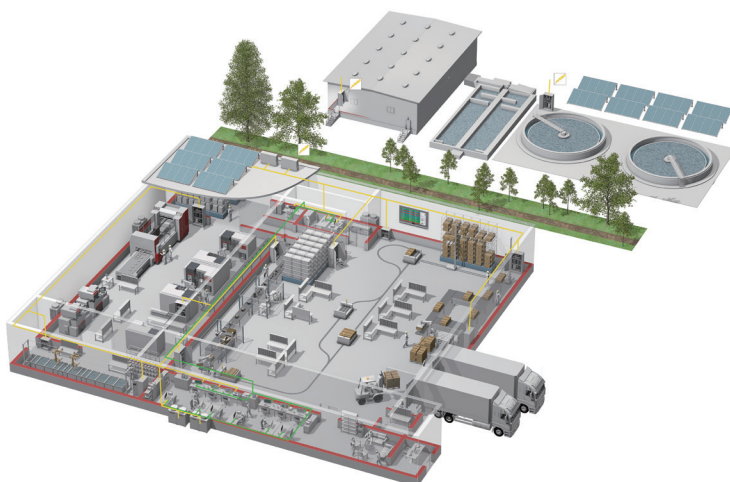
GX Works3 is a next-generation engineering software which contributes to reduction in development costs with its intuitive programming environment.

GX LogViewer is a dedicated viewer for displaying/analyzing the sampled logging files with simple operations.

GT Designer3 is screen design software for the Mitsubishi Electric Graphic Operation Terminal GOT2000 series.

For the specifications of each product, refer to the iQ Platform-compatible PAC System Recorder (L(NA)08736ENG) or Mitsubishi Electric Factory Automation Global Website.

YOUR SOLUTION PARTNER



Mitsubishi Electric provides a wide range of FA products from FA devices, such as programmable controllers and AC servos, to industrial mechatronics products, such as CNC and electrical discharge machines.

To be the most trusted brand in production sites

Mitsubishi Electric expands a wide range of FA (Factory Automation) business from components to processing machines. We support production systems in various fields, trying to improve the productivity and quality. With a consistent system from development to manufacturing and quality control, we are sensitive to our customers' needs and strive to produce products with which our customers will be satisfied.

In addition, by making full use of Mitsubishi Electric's original global network around the world, we provide proven technologies and reassuring support. Mitsubishi Electric's FA business always proposes leading-edge FA solutions based on close communications with our customers to contribute to the world's manufacturing.



Low-voltage power distribution products



High-voltage power distribution products



Power monitoring products



Programmable controllers, industrial PCs, FA sensors



Drive products



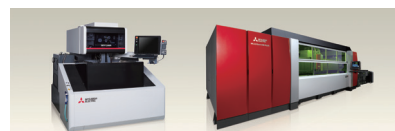
Display devices (HMI)



Computerized numerical controllers (CNC)



Industrial robots



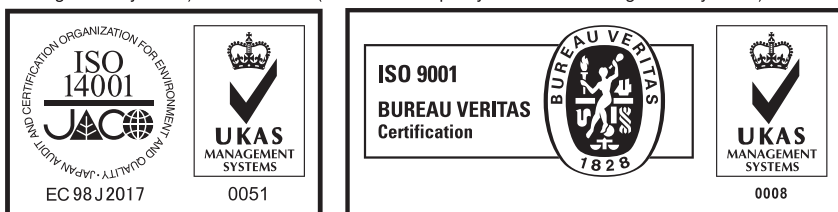
Processing machines



Transformers, solar power, EDS

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Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO 14001 (standards for environmental management systems) and ISO 9001 (standards for quality assurance management systems).



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