MITSUBISHI ELECTRIC

Mitsubishi Electric Industrial Robot

CR800-D/R/Q Series Controller

Industrial Robot Supporting Service
iQ Care MELFA Support
Instruction Manual

RA-1W00M**
RA-2W00M**
RA-0W11M**
RA-0W21M**
RA-1W11M**
RA-1W21M**

MELFA
BFP-A3804-B

⚠ Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

A. These show precautions based on the Ordinance on Industrial Safety and Health (Articles 36, 104, 150, 151).

⚠CAUTION All teaching work must be carried out by an operator who has received special training.
(This also applies to maintenance work with the power source turned ON.)
→Enforcement of safety training

⚠CAUTION For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan.
(This also applies to maintenance work with the power source turned ON.)
➞Preparation of work plan

⚠WARNING Prepare a device that allows operation to be stopped immediately during teaching work.
(This also applies to maintenance work with the power source turned ON.)
→Setting of emergency stop switch

⚠CAUTION During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc.
(This also applies to maintenance work with the power source turned ON.)
→Indication of teaching work in progress

⚠DANGER Provide a fence or enclosure during operation to prevent contact of the operator and robot.
→Installation of safety fence

⚠CAUTION Establish a set signaling method to the related operators for starting work, and follow this method.
→Signaling of operation start

⚠CAUTION As a principle, turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc.
→Indication of maintenance work in progress

⚠CAUTION Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors.
→Inspection before starting work

B. This shows precaution points given in the separate "Safety Manual".
For details, please read the text of the "Safety Manual".

⚠DANGER When automatic operation of the robot is performed using multiple control devices (GOT, programmable controller, push-button switch), the interlocking of operation rights of the devices, etc. must be designed by the customer.

⚠CAUTION Use the robot within the environment given in the specifications. Failure to do so could lead to faults or reduce reliability.
(Temperature, humidity, atmosphere, noise environment, etc.)

⚠CAUTION Transport the robot with the designated transportation posture.
Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.

⚠CAUTION Always use the robot installed on a secure table.
Use of an instable posture could lead to positional deviation and vibration.

⚠CAUTION Wire the cable as far away from noise sources as possible.
If placed near a noise source, positional deviation or malfunction could occur.

⚠CAUTION Do not apply excessive force on the connector or excessively bend the cable.
Failure to observe this could lead to contact defects or wire breakage.

⚠CAUTION Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque. Exceeding these values could lead to errors or faults.

⚠WARNING Securely install the hand and tool, and securely grasp the workpiece.
Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.

⚠WARNING Securely ground the robot and controller.
Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.

⚠CAUTION Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.

⚠WARNING When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control.
Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.

⚠CAUTION Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.

⚠CAUTION After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.

⚠CAUTION Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.

⚠CAUTION Never carry out modifications based on personal judgments, non-designated maintenance parts. Failure to observe this could lead to faults or failures.

⚠WARNING When the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers getting caught in the robot depending on its posture.

⚠CAUTION Do not stop the robot or apply emergency stop by turning OFF the controller's main power. If the controller's main power is turned OFF during automatic operation, the robot accuracy could be adversely affected.
Moreover, it may interfere with the peripheral device by drop or move by inertia of the arm.

⚠CAUTION Do not turn OFF the main power to the controller while rewriting the internal information of the controller such as the program or parameters. If the main power to the controller is turned OFF while in automatic operation or rewriting the program or parameters, the internal information of the controller may be damaged.

⚠DANGER Do not connect the Handy GOT when using the GOT direct connection function of this product. Failure to observe this may result in property damage or bodily injury because the Handy GOT can automatically operate the robot regardless of whether operation rights are enabled or not.

⚠DANGER Do not connect the Handy GOT to a programmable controller when using an iQ Platform compatible product with the CR800-R/CR800-Q controller. Failure to observe this may result in property damage or bodily injury because the Handy GOT can automatically operate the robot regardless of whether operation rights are enabled or not.

⚠DANGER Do not remove the SSCNET III cable while power is supplied to the multiple CPU system or the servo amplifier when using an iQ Platform compatible product with the CR800-R/CR800-Q controller. Do not look directly at light emitted from the tip of SSCNET III connectors or SSCNET III cables of the Motion CPU or the servo amplifier.
Eye discomfort may be felt if exposed to the light. (Reference: SSCNET III employs a Class 1 or equivalent light source as specified in JIS C 6802 and IEC 60825-1 (domestic standards in Japan).)

⚠DANGER Do not remove the SSCNET III cable while power is supplied to the controller. Do not look directly at light emitted from the tip of SSCNET III connectors or SSCNET III cables.
Eye discomfort may be felt if exposed to the light.
(Reference: SSCNET III employs a Class 1 or equivalent light source as specified in JIS C 6802 and IEC 60825-1 (domestic standards in Japan).)

⚠DANGER Attach the cap to the SSCNET III connector after disconnecting the SSCNET III cable. If the cap is not attached, dirt or dust may adhere to the connector pins, resulting in deterioration connector properties, and leading to malfunction.

⚠CAUTION Make sure there are no mistakes in the wiring. Connecting differently in the way specified in the manual can result in errors, such as the emergency stop not being released.
In order to prevent errors occurring, be sure to check that all functions (such as the teaching pendant, emergency stop, customer emergency stop, and door switch) are working properly after wiring is complete.

⚠CAUTION Connecting the USB port on the controller to commercially available devices such as computers and LAN hubs may not be compatible with our equipment or the temperature and electrical noise of some FA environments.
If using commercially available devices, check the operation carefully to determine if protection against EMI or the addition of a ferrite core is required.
We cannot guarantee the operation of the product and perform maintenance if the product is connected to commercial devices.

⚠CAUTION To protect the robot and system security (availability, integrity, and confidentiality) against DoS[*1] attacks, computer viruses, cyber attacks, and unauthorized access from external devices through the network, take preventive measures such as setting up a firewall, using a VPN, and installing antivirus software on computers.
Mitsubishi Electric Corporation will not be held responsible for any robot or system problems arising from DoS attacks, unauthorized access, computer viruses, and cyber attacks.
*1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of service (DoS) state.

■ Revision History

Date	Manual No.	Revision Details
2022-07-14	BFP-A3804	・First edition
2023-03-20	BFP-A3804-A	・Software version C2k supported.
2024-05-08	BFP-A3804-B	・Corrected the operating environment of the computer. (Table 2-5) ・Added the following models: RV-35 series, RV-50 series, and RV-80FR series RV-12CRL series ・Added a method to check logs offline to "6.3.4.3. Log screen". ・Added "6.7 Maintenance history function". ・Corrected the solutions to error L6209. ・Added a backup data storage destination to "8.3 Backing up data on the iQ Care MELFA Support SD card". ・Added "8.7 Solutions if error L6209 occurs". ・Corrected other mistakes and changed some sections.

■ Introduction

Thank you for purchasing Mitsubishi Electric MELFA industrial robots.
This manual explains the industrial robot supporting service iQ Care MELFA Support.

Before using the iQ Care MELFA Support, make sure that you have read and fully understood the contents of this manual.
Information on special handling is also included in this manual as much as possible. However, do not handle the product in ways other than those described in the manual. Additionally, performing operations not described in this manual may cause an error or other problem.

This manual is described on the premise that basic operations and functions of Mitsubishi Electric Industrial Robots are understood. For information on basic operations, refer to the "Instruction Manual/Detailed explanations of functions and operations".

When using this product, accept the contract for the country in which the robot is installed before purchasing this product. The contract for Japan is described in the catalog. For the contract for other countries, contact our sales company or distributor located in the country of purchase.

■ Notation used in this manual

DANGER	Incorrect handling may result in imminent danger, leading to death or serious injury.
WARNING	Incorrect handling may lead to death or serious injury.
CAUTION	Incorrect handling may result in property damage, or danger leading to impairment of the user.

[CONTENTS]

1 Before use

This chapter explains check points and precautions before using the industrial robot supporting service iQ Care MELFA Support.

1.1 This document

This document explains the industrial robot supporting service iQ Care MELFA Support functions in the chapters shown in Table 1-1. For information on the functions and operations of standard robot controllers, refer to the instruction manual included with the robot controller.
Functions not described in Table 1-1 are explained in other manuals. Refer to the following manuals.

- CR800 Series Controller Detailed explanations of functions and operations (BFP-A3478)
- Predictive maintenance function (BFP-A3663)
- Ethernet function (BFP-A3379)
- RT ToolBox3/RT ToolBox3 mini (BFP-A3495)

Table 1-1 Contents of this manual

Chapter	Title	Description
1	Before use	This chapter explains how to use this manual (iQ Care MELFA Support Instruction Manual). Read this manual before using the iQ Care MELFA Support services.
2	Checking before use	When purchasing iQ Care MELFA Support, check that required products are present and check the versions of the robots and robot controllers you are using.
3	iQ Care MELFA Support SD card	This chapter describes the functions and how to mount the product on the robot controller.
4	Warranty extension service	This chapter describes the concept of period of warranty for warranty extension service and how to check the service validity period.
5	Inspection service	This chapter describes how to use inspection services and how to check the number of inspections.
6	Monitoring service	This chapter describes various software functions included in the monitoring service.
7	Error list	This chapter describes causes and solutions for iQ Care MELFA Support related errors.
8	Appendix	This chapter describes remedies for failure or setting change of the SD card.

2 Checking before use

2.1 Items in package

This product includes the following items as standard.

Table 2-1 Product standard configuration

No.	Item	Model	Quantity
1	iQ Care MELFA Support SD card	RA-1W00M** RA-2W00M** RA-0W11M** RA-0W21M** RA-1W11M** RA-1W21M** (one of the above)	1
2	Instruction Manual (included in the SD card)	BFP-A3803 BFP-A3804 BFP-A3805	-
3	Notification of iQ Care MELFA Support ID	BFP-A3814 BFP-A3815 BFP-A3816 BFP-A3817 (one of the above)	1
4	Startup guide	BFP-A3818	1

Product models correspond to types of iQ Care MELFA Support service packages. For details about functions of the service packages, refer to "3. iQ Care MELFA Support SD card".

Table 2-2 Models and corresponding service packages

Model	Service package		Remarks
RA-1W00M**	Additional warranty package	One year	** refers to the purchased region code (two alphabetic characters).
RA-2W00M**		Two years	
RA-0W11M**	Inspection service package	One simple inspection	
RA-0W21M**		One precise inspection	
RA-1W11M**	Additional warranty and inspection package	One year, one simple inspection	
RA-1W21M**		One year, one precise inspection	

○W: ○ indicates the extended warranty period.
□ΔM: □ indicates the inspection type (1: simple inspection, 2: precise inspection), and Δ indicates Δ the number of inspections.

2.2 Applicable models and software versions

iQ Care MELFA Support is not available for some models and some software versions of robot controllers and RT ToolBox3. Check the model and software version before use.

Table 2-3 iQ Care MELFA Support target system configuration

Item	Description		Remarks
Robot arm	Vertical articulated RV-FR series	RV-2FR series, RV-4FR series, RV-7FR series, RV-13FR series, RV-20FR series, RV-35/50/80FR series	Standard model *Contact us for information on special models.
	Vertical articulated RV-CR series	RV-8CRL series, RV-12CRL series	
	Horizontal articulated RH-FRH series	RH-3FRH series, RH-6FRH series, RH-12FRH series, RH-20FRH series, RH-3FRHR series	
	Horizontal articulated RH-CRH series	RH-3CRH series, RH-6CRH series	
	Collaborative robot ASSISTA	RV-5AS series	
Robot controller	CR800-D	Ver.C2k or later	
	CR800-R	Ver.C2k or later	
	CR800-Q	Ver.C2k or later	
RT ToolBox3	3F-15C-WINE	Ver.2.00A or later	
RT ToolBox3 mini	3F-14C-WINE	Ver.2.00A or later	
RT ToolBox3 Pro	3F-16D-WINE	Ver.2.00A or later	

2.3 System architecture

iQ Care MELFA Support can be used by inserting the dedicated SD card (iQ Care MELFA Support SD card) into the robot controller. The system architecture partially differs depending on the type of the robot controller. Refer to "2.5 Equipment prepared by the customer" to prepare items required for the system.

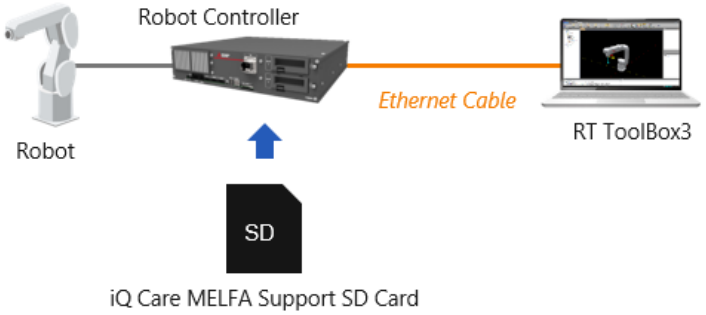


Fig. 2-1 System architecture when using the product with the CR800-D controller

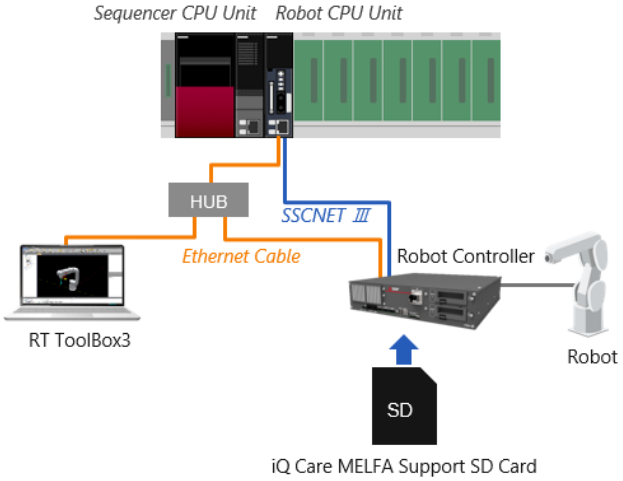


Fig. 2-2 System architecture when using the product with the CR800-R/CR800-Q controller

2.4 Product specifications

The SD card for iQ Care MELFA Support can be used as an SD card memory for recording data in addition to enabling various functions of iQ Care MELFA Support. The basic specifications of the iQ Care MELFA Support SD card are shown below.

Table 2-4 Product standard configuration

Item	Specifications	Remarks
External dimensions	32 x 24 x 2.1 [mm]	Not including case
Weight	Approx. 2g	Not including case
Memory capacity	8 GB	Instruction Manual data not included
Operating temperature	0°C to 40°C	
Storage temperature	-15°C to +70°C	
Humidity (Reliability)	RH 5% to 95%	

When the iQ Care MELFA Support SD card is used only for the iQ Care MELFA Support monitoring service, it is assumed that it will be used for several years. However, it may be shorter depending on the amount of data stored and the storage cycle. Periodic backups and data deletion are recommended. For details on how to back up data on the SD card, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".

When you use a model that includes warranty extension service, you will need to purchase an additional new iQ Care MELFA Support SD card and take over the data when you extend the period again after the period of warranty is finished. When you use a model that includes warranty extension service for a robot out of period of warranty, you will need to take over the data to a new iQ Care MELFA Support SD card after performing equipment inspection by the inspection service. For details about data transfer of the iQ Care MELFA Support SD card, refer to "3.2.4 Data transfer of the iQ Care MELFA Support SD card".

2.5 Equipment prepared by the customer

The standard configuration for using iQ Care MELFA Support is as follows. Depending on the type of robot controller, equipment to be prepared by the customer will differ. These devices must be ordered separately by the customer.

Table 2-5 Equipment prepared by the customer (when the robot controller is CR800-D)

No.	Item	Recommended specifications	Quantity
1	Network computer*1 (network interface required)	Computer with RT ToolBox3 installed	1 or more
2	Ethernet cable (for computer-to-robot controller connection) (Used to connect the robot CPU module and the robot controller*2) (Select a straight cable or cross cable depending on the connection method.)	Ethernet compliant product Category 5e or higher (STP cable)	1 or more (2 or more) *2
3	Our Windows compatible tool for supporting robot controller programming	(Optional) Computer supporting software	1

Prepare the following as necessary.

4	Hub (required in a LAN environment)	(commercially available)	1 *2
5	SD card reader/writer	(commercially available)	1

*1 If data I/O is restricted by the security settings of the computer, access to the SD card is restricted. If this is the case, note that data transfer and other operations cannot be performed.

*2 For the CR800-R and CR800-Q robot controllers, an Ethernet cable is required to connect between the robot CPU module and the robot controller. A hub is also required to connect the CPU module, robot controller, and the computer with the programming support tool installed.

2.6 Precautions

(1) When an optional SD card (model 2F-2GBSD) is used, the card cannot be used together with the iQ Care MELFA Support SD card. As for the log function that can be used with the SD card 2F-2GBSD, the iQ Care MELFA Support SD card can be used for the same purpose. If you are using an SD card 2F-2GBSD, replace it with this product.
(2) Once used, the iQ Care MELFA Support SD card is dedicated to the installed robot controller and cannot be used with other robot controllers. Before using the card, make sure that the robot controller is the target robot controller.
(3) Before using the iQ Care MELFA Support SD card, make sure that the time setting of the target robot controller is correct. If the time is incorrectly set, the normal usable period may not be maintained.
(4) For the CR800-R/CR800-Q controllers, the correct time setting is not applied if the parameter "TIMESYNC" is set to 0 (Time synchronization between the robot CPU and robot controller is disabled). When using the CR800-R/CR800-Q controllers, set the parameter "TIMESYNC" to 1 (Time synchronization between the robot CPU and robot controller is enabled).
(5) Do not erase, change, or rename files stored on the iQ Care MELFA Support SD card when you purchased the product. Doing so may cause the service not to run properly.
(6) The iQ Care MELFA Support service will become unavailable if the takeover operation for continued use of iQ Care MELFA Support is performed without a new SD card for takeover. Do not carry out data transfer work except when continuing to take over the service.
(7) iQ Care MELFA Support will not be enabled if the robot is in the following conditions. Before using iQ Care MELFA Support, make sure that none of the following conditions are met.
· The robot arm is not connected to the robot controller.
· The robot arm battery is dead.
· The serial number of the robot controller is different from the one when the function is enabled first.
· The serial number of the robot arm is not set.
· The cables required for system configuration are not connected.
· The iQ Care MELFA Support SD card is used after its function is taken over.
· An abnormal value is set in the time setting of the robot controller (for example, the set time is earlier than the robot controller manufacturing time). (Refer to "8.4 Solutions to take when the robot controller time setting is changed".)
· When the CR800-R/CR800-Q controller is used, DRVMODE is set to 1, or CPUMODE is set to 1.
(8) If it is unclear about which robot controller is combined with the iQ Care MELFA Support SD card that has enabled the iQ Care MELFA Support functions, the robot controller can be identified by checking the files or other data saved on the SD card. For information on the files on the SD card, refer to "3.3 SD card data structure".
(9) To use the iQ Care MELFA Support functions with RT ToolBox3, use online mode. The functions are disabled in offline mode or simulator mode.

3 iQ Care MELFA Support SD card

You can use the functions that correspond to the service package you purchased. For details on the functions, refer to "3.1 Function list".

Table 3-1 Functions supported by service package
(○: supported, □: not supported by some models, -: not supported)

Function		Additional warranty package		Inspection service package		Additional warranty and inspection package	
		One year	Two years	Simple inspection	Precise inspection	One year and simple inspection	One year and precise inspection
Warranty extension service		○ (1 year)	○ (2 years)	-	-	○ (1 year)	○ (1 year)
Inspection service	Simple inspection	-	-	○ (once)	-	○ (once)	-
	Precise inspection	-	-	-	○ (once)	-	○ (once)
Monitoring service	Recovery function	○	○	○	○	○	○
	Condition management function	○	○	○	○	○	○
	Predictive maintenance function*	□	□	□	□	□	□
	Oscillograph function	○	○	○	○	○	○

* The predictive maintenance function can only be used during period of warranty or for one year after the function is enabled by inserting the SD card.
If you intend to continue using this function, purchase a MELFA Smart Plus card, or purchase an additional iQ Care MELFA Support SD card after the availability period expires. This function is not available for the RV-5AS series.

3.1 Function list

Table 3-2 iQ Care MELFA Support function list

	Function name	Description	Remarks
1	Warranty extension service (Refer to Chapter 4.)	After the robot standard warranty period (free of charge), you can add an additional warranty period according to the package.	
2	Inspection service Simple inspection/precise inspection (Refer to Chapter 5.)	On-site inspection of the robot by a service engineer is available. Equipment inspection items differ according to the package.	
3	Monitoring service Recovery function (Refer to Section 6.2.)	Robot recovery data is automatically backed up to the SD card. The data is used to restore the status of the specified date.	
4	Monitoring service Condition management function (Refer to Section 6.3.)	Data related to the operation and maintenance of the robot is compiled into files. These files are stored regularly on the SD card. The saved data can be viewed graphically using RT ToolBox3.	
5	Monitoring service Predictive maintenance function (Refer to Section 6.4.)	The preventive and predictive maintenance functions that can be used with the MELFA Smart Plus card A/B type can be used. In addition, data related to the predictive maintenance function is stored in a file on the SD card.	Available during period of warranty or only for one year after the SD card is inserted.
6	Monitoring service Oscillograph function (Refer to Section 6.5.)	Time series data of devices that can be referenced by the real time monitor function of RT ToolBox3, such as motor current values and load ratios of individual axes, are compiled into files and stored periodically on the SD card. The saved data can be viewed in RT ToolBox3.	
7	Monitoring service Drive recorder function (Refer to Section 6.6.)	If a specified error occurs in the robot, the error will trigger the function to store logs of servo data for several seconds before and after the error occurrence. The saved data can be viewed in RT ToolBox3.	

In order to use the above functions, the functions must be enabled (the power of the robot controller must be turned on while the iQ Care MELFA Support SD card is installed in the robot controller).

3.2 How to start using iQ Care MELFA Support and various settings

3.2.1 Difference between using a new product and taking over

If you have already used one of the iQ Care MELFA Support packages, you can take over the conditions and accumulated data of the previous package. To use the product for the first time, read "3.2.2 Presetting by robot controller type" onward. To continue to use the product, read "3.2.4 Data transfer of the iQ Care MELFA Support SD card".

3.2.2 Presetting by robot controller type

Depending on the type of robot controller, additional networking is required to use iQ Care MELFA Support.

3.2.2.1 When the robot controller type is CR800-D

Check that the robot arm and the robot controller are connected and the time setting of the robot controller is correct. For details on how to check the time setting, refer to "Time setup" in "CR800 Series Controller Detailed explanations of functions and operations" when using the teaching pendant, and "Setting the time in the robot controller" in "RT ToolBox3/RT ToolBox3 mini User's Manual" when using RT ToolBox3.

⚠CAUTION If the time is incorrectly set for the robot controller when installing the iQ Care MELFA Support SD card, the normal usage period may not be maintained. Before installing the SD card, make sure that the robot controller time setting is correct.

3.2.2.2 When the robot controller type is CR800-R/CR800-Q

Use the teaching pendant or RT ToolBox3 to set the following network setting parameters according to your environment.

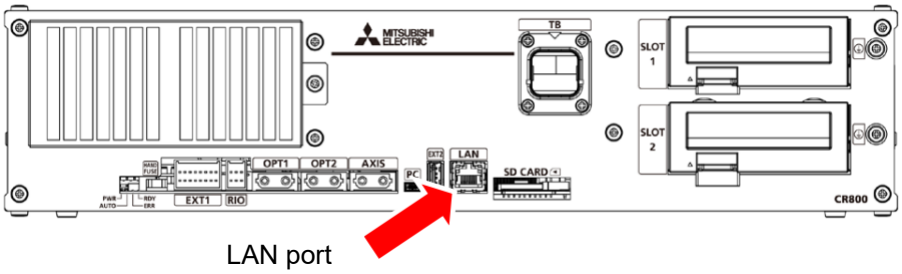
Table 3-3 iQ Care MELFA Support parameters for additional network configuration

Parameter	Parameter name	Number of elements	Description	Default setting value
Enabling/disabling of Ethernet communication between robot CPU module and robot controller	RCDUETH	Integer 1	This parameter enables the Ethernet communication function between the robot CPU module and the robot controller. 0: Disable CPU-DU communication 1: Enable CPU-DU communication	0
Robot controller IP address	RCDUIP	String 1	Robot controller IP address. It is enabled only when RCDUETH = 1. Set an IP address that differs from NETIP (IP address of the robot CPU module).	192.168.0.20

* RCDUETH and RCDUIP are enabled by turning off and on the robot controller power after the change.
* The subnet mask setting of the robot controller is the same as that of NETMSK.
  For more information on network settings, refer to the "BFP-A3379 Ethernet Function Instruction Manual".

Connect the Ethernet cable between the LAN ports of the robot CPU module and the robot controller.
* It is recommended to connect the devices via a hub because the computer with the controller programming support tool installed is also connected.

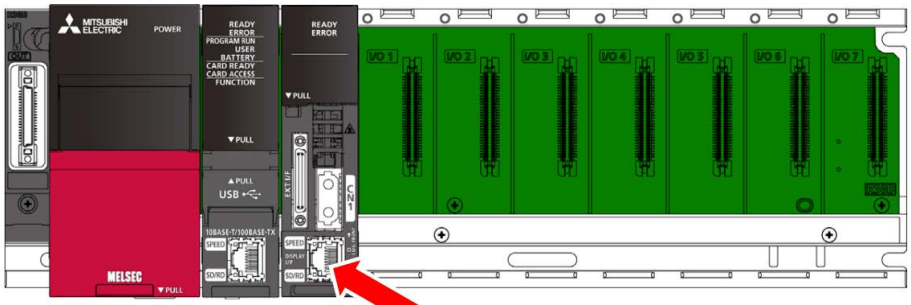
CR800 controller (front)



LAN port

<CR800-R controller>

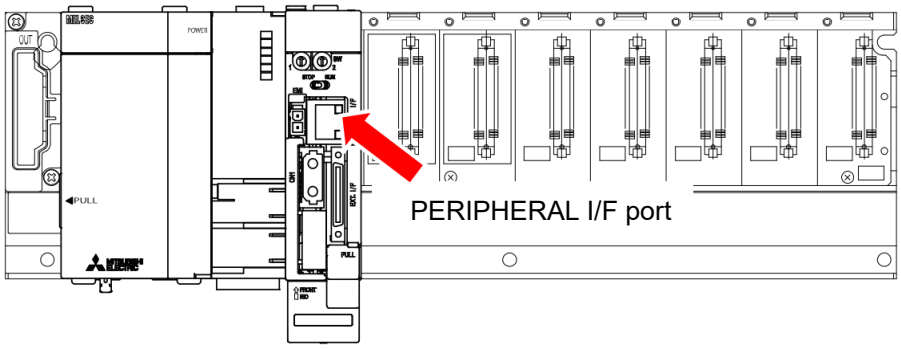
Robot CPU module (front)



<CR800-Q cont

LAN port

Robot CPU module (front)



PERIPHERAL I/F port

Check that the time setting of the robot controller is correct.
For details on how to check the time setting, refer to "Time setup" in "CR800 Series Controller Detailed explanations of functions and operations" when using the teaching pendant, and "Setting the time in the robot controller" in "RT ToolBox3/RT ToolBox3 mini User's Manual" when using RT ToolBox3.

⚠CAUTION If the time is incorrectly set for the robot controller when installing the iQ Care MELFA Support SD card, the normal usage period may not be maintained. Before installing the SD card, make sure that the robot controller time setting is correct.

⚠CAUTION Use a cross cable when connecting the robot controller and the robot CPU module directly with an Ethernet cable.

⚠CAUTION If using the product in an environment susceptible to noise, install a ferrite core (recommended model: E04SR301334 manufactured by SEIWA ELECTRIC MFG CO.Ltd) to the Ethernet cable. Ensure that the ferrite core is installed within 300mm of the connection terminal.

3.2.3 Installing/removing the iQ Care MELFA Support SD card

⚠CAUTION When installing or removing the iQ Care MELFA Support SD card, keep it straight against the robot controller.

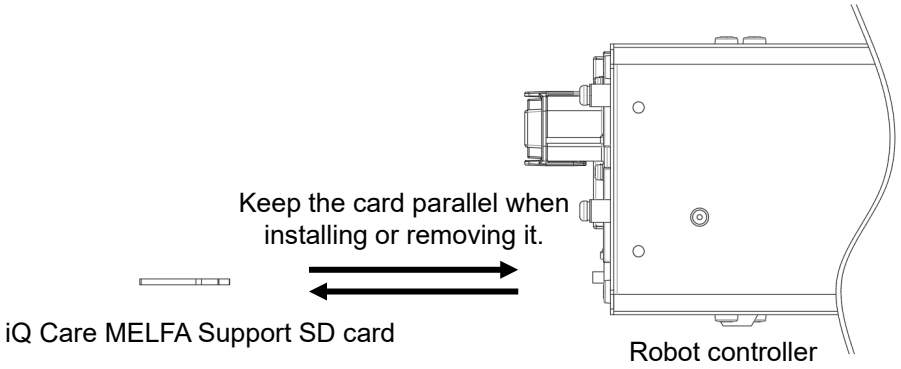


Fig. 3-1 Precautions for installing/removing the iQ Care MELFA Support SD card

3.2.3.1 Installing the iQ Care MELFA Support SD card

The installation procedure of the iQ Care MELFA Support SD card is shown below.

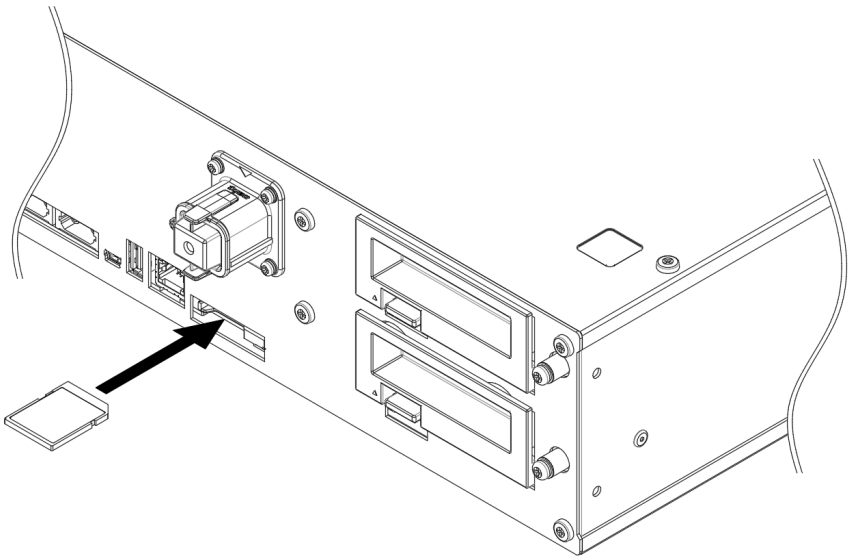


Fig. 3-2 Installing the iQ Care MELFA Support SD card

1) Power off the robot controller.
2) Insert the iQ Care MELFA Support SD card into the card slot.
   Insert the card straight without tilting it relative to the card slot.
   Insert the card as far as it will go until the lever is locked.
3) Turn on the power of the robot controller. The error C6201 "MELFA Support is enabled" will occur, and the iQ Care MELFA Support service will start.

If the predictive maintenance function is not used, Error C6214 "Please enable predictive maintenance function (PMENA)" will occur after power-on. To use the iQ Care MELFA Support predictive maintenance function, enable the function. (Refer to "6.4.3.1 Enabling the predictive maintenance function".)

3.2.3.2 Removing the iQ Care MELFA Support SD card

The removing procedure of the iQ Care MELFA Support SD card is shown below.

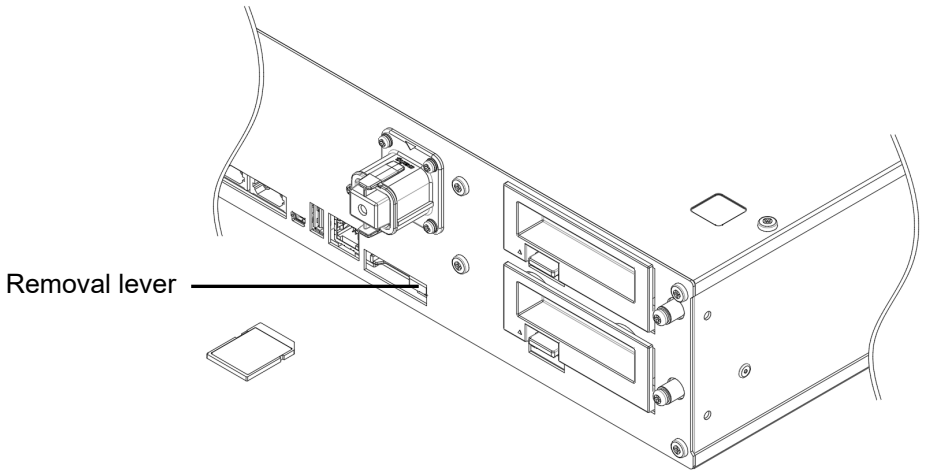


Fig. 3-3 Removing the iQ Care MELFA Support SD card

1) Power off the robot controller.
2) Slide the lever slightly to the right to eject the SD card from the card slot. Hold the edge of the SD card and pull the card straight out of the robot controller.

⚠CAUTION The SD card can be removed even when the robot controller power is on. However, if the SD card is removed while the data is being written, the data may get corrupted or the iQ Care MELFA Support service may be disabled. When removing the card with the power on, make sure that the LED (AUTO) is not blinking blue before removing the card. Re-insertion of the SD card should be done while the power is off.

3.2.4 Data transfer of the iQ Care MELFA Support SD card

This operation is not required for a robot controller for which the iQ Care MELFA Support service is started for the first time.

For a robot controller that has used the iQ Care MELFA Support service more than once, the iQ Care MELFA Support ID information registered in the iQ Care MELFA Support SD card in use must be taken over to the next SD card to be used. Using a new iQ Care MELFA Support SD card without takeover does not activate the service.

⚠CAUTION The data transfer work must be performed with a new SD card at the data transfer destination. As the service is disabled for an iQ Care MELFA Support SD card for which the takeover operation is performed, the service cannot be resumed even if it is re-installed in the robot controller.

⚠CAUTION During the data transfer work, the computer with RT ToolBox3 installed reads and writes data from and to the SD card. If you are using a computer that does not have an SD card drive to read/write data from/to the SD card, prepare an SD card reader/writer. In addition, perform the work without locking the iQ Care MELFA Support SD card with the write-protect (lock) switch or restricting the data input/output of the computer to/from the SD card.

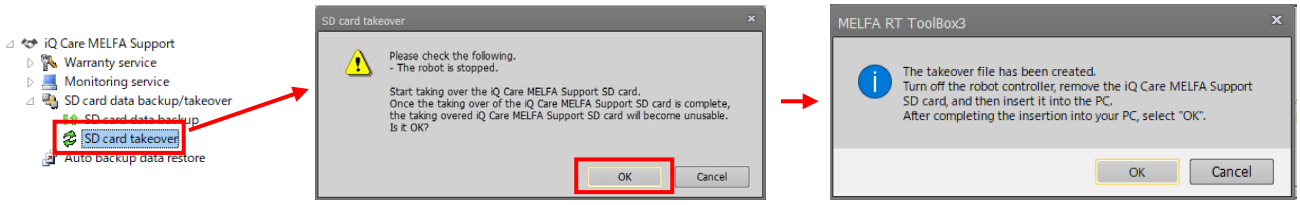
The data transfer work is shown below.

1) Check that the iQ Care MELFA Support SD card to be taken over is installed in the SD card slot of the robot controller and turn on the power of the robot controller.

2) Select "Online"-"iQ Care MELFA Support"-"SD card data backup/takeover"-"SD card takeover" from the project tree of RT ToolBox3.

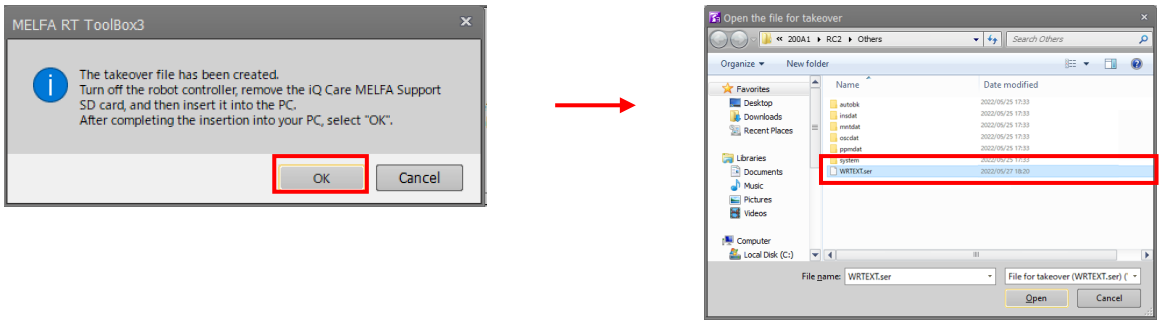
3) Confirmation before taking over is displayed. Select OK when taking over. A file for takeover (WRTEXT.ser) is generated with takeover data written.

* If a file for takeover (WRTEXT.ser) is not generated by causes such as turning off the power of the robot controller and removing the iQ Care MELFA Support SD card from the robot controller during this work, follow steps 1) to 3) again.

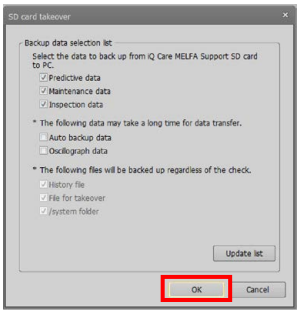


4) Turn off the power of the robot controller and remove the original iQ Care MELFA Support SD card from the SD card slot. Attach the original iQ Care MELFA Support SD card to the computer with RT ToolBox3.

5) If you select OK on the screen for creation of the file for takeover, the screen for selecting the file for takeover (WRTEXT.ser) to take over the original iQ Care MELFA Support SD card is displayed. Select the target file for takeover (WRTEXT.ser) to take over the original SD card.



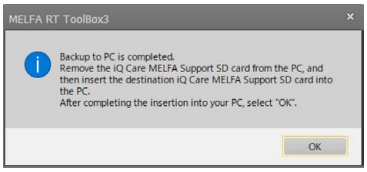
6) When you select the target file for takeover (WRTEXT.ser) to take over the original SD card, the screen for selecting the data to take over from the data stored on the SD card is displayed. Select the data you want to take over and select OK. The temporary saving of the takeover data will start.



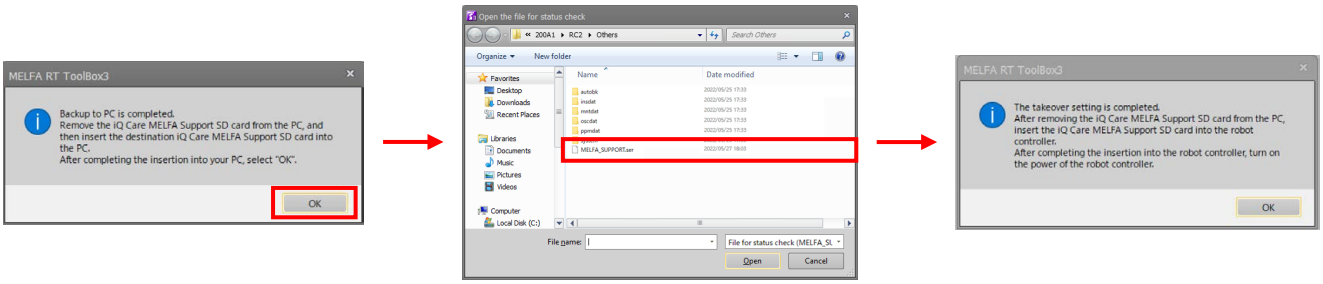
⚠CAUTION The time it takes to complete the backup of the data to be taken over depends on the data capacity in the SD card and the performance of the computer being used. In addition, if automatic backup data and oscillographic data are selected, the time until completion may be longer.

* If takeover data saving is interrupted by causes such as turning off the power of the computer or removing the iQ Care MELFA Support SD card from the computer, follow step 6) again. However, the data saved last time may be overwritten and deleted.

7) When the temporary saving of the takeover data is completed, the save complete screen is displayed. Remove the original iQ Care MELFA Support SD card and install a new iQ Care MELFA Support SD card to which the data will be taken over.



8) When OK is pressed after the new destination SD card is installed, a screen to select the file for checking the status of the new card (MELFA_SUPPORT.ser) is displayed. If you select the status check file (MELFA_SUPPORT.ser) in the destination SD card, the temporary saved takeover data will be migrated.



⚠CAUTION The time it takes to complete the data transfer depends on the capacity of the data to be taken over and the performance of the computer being used. In addition, if automatic backup data and oscillographic data are selected, the time until completion may be longer.

* If data transfer is interrupted by causes such as turning off the power of the computer or removing the iQ Care MELFA Support SD card from the computer, follow step 8) again. However, the data transferred last time may be overwritten and deleted.

9) After the completion of data transfer to the destination SD card is displayed, remove the destination SD card from the computer and attach it to the SD card slot of the robot controller. When the robot controller is turned on after installation, controller registration of the new iQ Care MELFA Support SD card will be automatically started.

3.3 SD card data structure

3.3.1 iQ Care MELFA Support SD card directory structure

Depending on the service type, the iQ Care MELFA Support SD card automatically generates certain folders and files in the memory area after the relevant function is enabled. Since files related to system operation are included, do not delete files other than the backup recommended data, or change the file name or file contents.

Table 3-4 iQ Care MELFA Support SD card directory structure

Folder/file name		Description	Backup recommended	Maximum number of files/folders	Remarks
autobk	autobk_[RCSERIAL]_yyyyMMdd	This is the folder to store the automatic backup data saved by the recovery function. Data files required for restore are stored in the folder.	✔	2048	
insdat	(any file name)	Files saved when inspected by the inspection service.	✔	256	Stored by service personnel during inspection
mntdat	mntdat_[RCSERIAL].csv	Files saved by the condition management function.	✔	1	
oscdat	[RCSERIAL]_yyyyMMdd-HHmmss.csv	Files saved by the oscillograph function.	✔	2048	
ppmdat	ppmdat_[RCSERIAL].csv	Files saved by the predictive maintenance function.	✔	1	
system	mntdat_backup.ser	Backup file for the condition management function.		-	
	ppmdat_backup.ser	Backup file for the predictive maintenance function.		-	
	mntdat_[RCSERIAL]_yyyyMMdd-HHmmss.csv	Backup file for the condition management function.		-	Generated only when a time setting error occurs
	ppmdat_[RCSERIAL]_yyyyMMdd-HHmmss.csv	Backup file for the predictive maintenance function.		-	Generated only when a time setting error occurs
HISTORY.ser		iQ Care MELFA Support system file. Used to check the card takeover history information.		1	
BFP-A3803(JP).pdf		iQ Care MELFA Support Instruction Manual (Japanese)		-	Stored at the time of shipment.
BFP-A3804(EN).pdf		iQ Care MELFA Support Instruction Manual (English)		-	
BFP-A3805(CN).pdf		iQ Care MELFA Support Instruction Manual (Chinese)		-	

Folder/file name	Description	Backup recommended	Maximum number of files/folders	Remarks
MELFA_SUPPORT.ser	File used to refer to the information on the iQ Care MELFA Support being used. * Refer to "3.3.2 Checking the status of the iQ Care MELFA Support registration".		1	Stored at the time of shipment. Updated every time the power is turned on.
WRTEXT.ser	File used to perform takeover operations.		-	Generated only during the takeover operation.

* [RCSERIAL]: Robot controller serial number of the robot to be serviced
* yyyyMMdd: Year (4 digits), month (2 digits), day (2 digits)
* yyyyMMdd-HHmmss : Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minute (2 digits), second (2 digits)
* The maximum number of files or folders that can be saved by the iQ Care MELFA Support function. The number is not the maximum number of files that can be saved on the SD card. If this value is exceeded, an error will occur and data output will not be performed.

3.3.2 Checking the status of the iQ Care MELFA Support registration

MELFA_SUPPORT.ser is a text file used to refer to the status of the iQ Care MELFA Support registration. The currently registered status can be checked by opening this file in text editor software, etc. This file is automatically edited in the system. Do not delete the file, or change the file name, or file contents.
RT ToolBox3 can also be used to check the same information on a dedicated screen. For information on how to check the information, refer to "8.1 Viewing iQ Care MELFA Support information".

Table 3-5 Contents in the MELFA_SUPPORT.ser file

File name	Information	Display example	Remarks
SERVICE_ID	Displays the model of the iQ Care MELFA Support registered in the target robot controller.	RA-*W**M**	
SUPPORT_ID	Displays the iQ Care MELFA Support ID registered in the target robot controller.	****-****-****-****	
PRE_SERVICE_ID	Displays the model of the iQ Care MELFA Support registered last time in the target robot controller.	RA-*W**M**	"-" appears when takeover has never been performed.
PRE_SUPPORT_ID	Displays the iQ Care MELFA Support ID registered last time in the target robot controller.	****-****-****-****	"-" appears when takeover has never been performed.
MANUFACTUREING_TIME	Displays the manufacturing time of the robot controller that the robot controller recognizes.	yyyy/MM/dd HH:mm:ss	
WARRANTY_START_TIME	Displays the start time of warranty period for the robot controller that the robot controller recognizes.	yyyy/MM/dd HH:mm:ss	
RBSERIAL	Displays the serial number of the robot arm using iQ Care MELFA Support	(10 alphanumeric characters).	
RCSERIAL	Displays the serial number of the robot controller using iQ Care MELFA Support	(10 alphanumeric characters).	

3.3.3 iQ Care MELFA Support SD card: assumed data usage

The data capacity of iQ Care MELFA Support SD card assumes continued use of the monitoring service for several years, but there is a possibility that the data capacity will be insufficient depending on the usage status and the operating status of the robot. Back up the data regularly in your computer and delete any unnecessary data. Alternatively, the capacity can be secured by decreasing the number of takeover data types when taking over data to another SD card.
For details on how to back up data using RT ToolBox3, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".

Table 3-6 iQ Care MELFA Support SD card: assumed data usage

Folder name	Assumed data usage per day	Assumed data usage per year	Backup recommended	Takeover	Remarks
autobk	Approx. 600 [KB]	Approx. 220 [MB]	✔		
insdat	-	Approx. 350 [MB]	✔	Mandatory	Only during inspection service
mntdat	-	Approx. 0.3 [MB]	✔	Mandatory	
oscdat	Approx. 2500 [KB]	Approx. 920 [MB]	✔		
ppmdat	-	Approx. 0.3 [MB]	✔	Mandatory	

⚠CAUTION If the iQ Care MELFA Support service continues while the memory capacity of the iQ Care MELFA Support SD card is insufficient, the warning error "C6222 Insufficient SD card memory" will occur. If the memory capacity is insufficient, not only the data is not saved, but also the service function may be stopped. Check the remaining data capacity on the SD card regularly using a computer, etc.

4 Warranty extension service

This chapter describes the conditions and items to be checked when using the warranty extension service.

4.1 Service overview

The warranty extension service extends the warranty period for a fee.
If a failure or defect (failure from herein) occurs within the period of additional warranty, and lies with our company, we will repair the product via your dealer or our service company for free. Mitsubishi Electric shall have no responsibility or liability for on-site re-adjustment, re-teaching, and test run involving the replacement of failing parts. The warranty shall not cover parts with service life.

Table 4-1 List of additional warranties

Name	Description
One-year additional warranty	The warranty period is for one year.
Two-year additional warranty	The warranty period is for two years.

Terms are defined as follows.
(1) The "period of standard warranty" is a period during which those who purchased our robot products can receive repair service for one year for free (for Japan).
(2) The "warranty extension service" extends the warranty period for the products included in the selected package.
(3) The "period of additional warranty" is a period extended by the warranty extension service.
(4) The "period of warranty" is a period during which users can receive repair service for free.

4.2 Concept of period of warranty

The concept of the warranty extension service is shown below.
For information on how to check the period of warranty, refer to "4.4 How to check the period of warranty".

4.2.1 Difference in start time between the period of standard warranty (free of charge) and period of additional warranty

(1) Period of standard warranty (free of charge)
The period of standard warranty (free of charge) is 12 months after the robot purchase or shipment to a specified place.

Fig. 4-1 Schematic diagram of start time of the period of standard warranty

(2) Period of additional warranty (charged)
After the period of standard warranty (free of charge) commences at the earliest of either the first power-on or time within six months after the robot purchase, the period of additional warranty continues until the specified number of days passes. (For Japan: 1 year ≒ 366 days * 365 days + cumulative error in calculation) After the period of standard warranty is finished, the period of one year (about 365 days) will be the additional period of warranty (charged period of warranty) for the additional 1-year warranty package, and two years (about 730 days) for the additional 2-year warranty package.

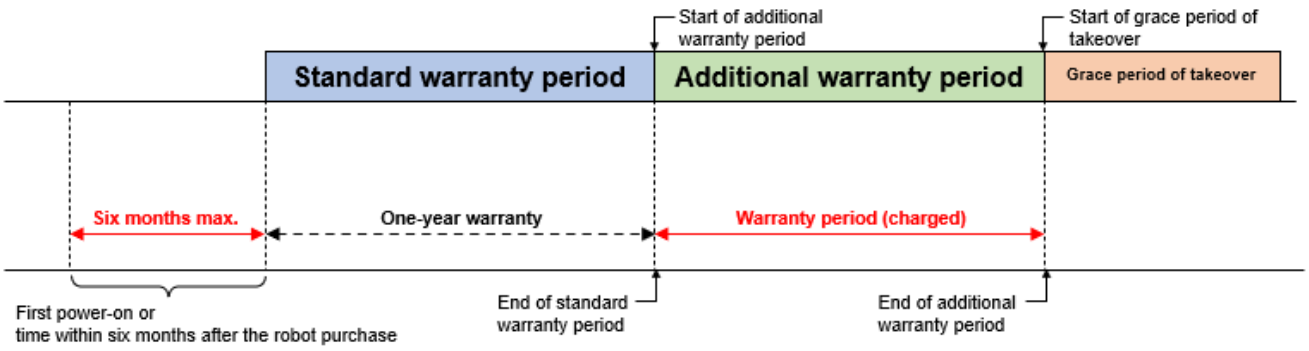


Fig. 4-2 Schematic diagram of start time of the period of additional warranty

4.2.2 When signing up for additional warranty again within the period of additional warranty

After the period of additional warranty, grace period of takeover is set for two months (60 days). The period of additional warranty can be extended again by signing up the warranty extension service again during this grace period of takeover. The start date of the extended period of warranty is the starting date of the grace period of takeover. If you take over prior to the grace period of takeover, the remaining period of the original warranty will be added to the service you take over.

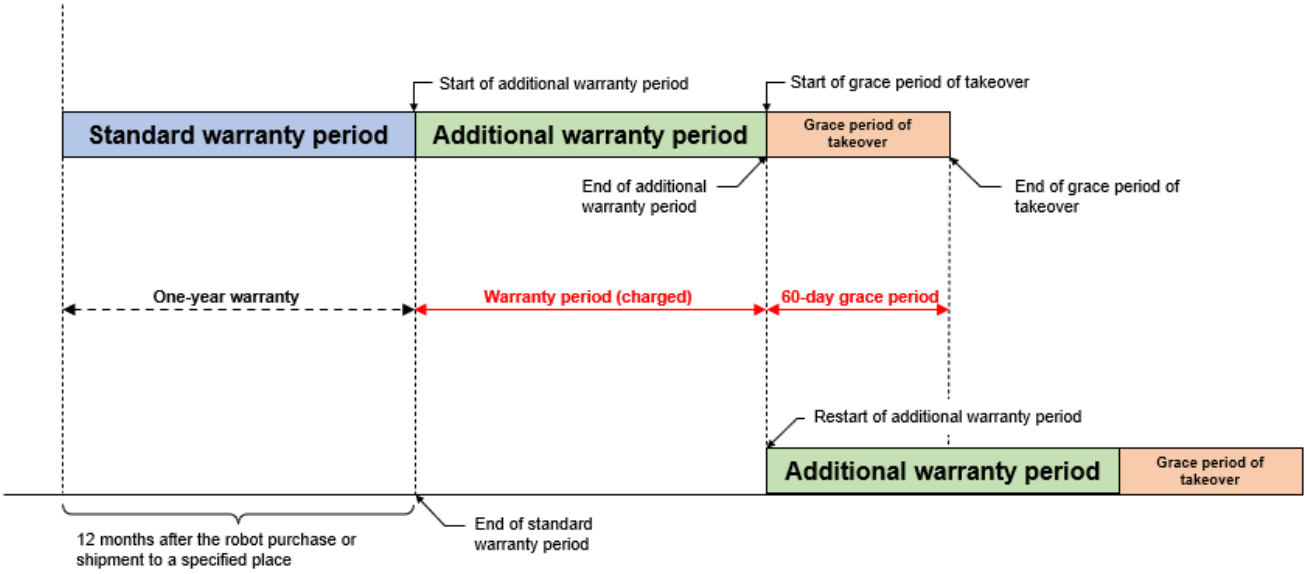


Fig. 4-3 Schematic diagram of signing up for additional warranty again within the period of additional warranty

4.2.3 When signing up for additional warranty again from the period out of the period of additional warranty

The period of warranty will automatically terminate if you do not sign up with the warranty extension service during the grace period of takeover after the termination of the additional warranty package, or during the grace period of sign up for warranty after the termination of the inspection package. To sign up with the additional warranty package again, you must have the robot equipment inspected by the inspection service.
Once the inspection service is complete, a grace period of sign up for warranty of two months (60 days) is set. Signing up the warranty extension service during this grace period of sign up for warranty will allow you to receive the warranty in the period of additional warranty (charged period of warranty). The extended period of warranty commences on the date of signing up with the additional warranty package.
Even when the period of warranty is terminated, robot controllers once signed up with the additional warranty package can continue to use the various functions of monitoring service except for the predictive maintenance function. (Refer to "6. Monitoring service" for information on the monitoring service.)

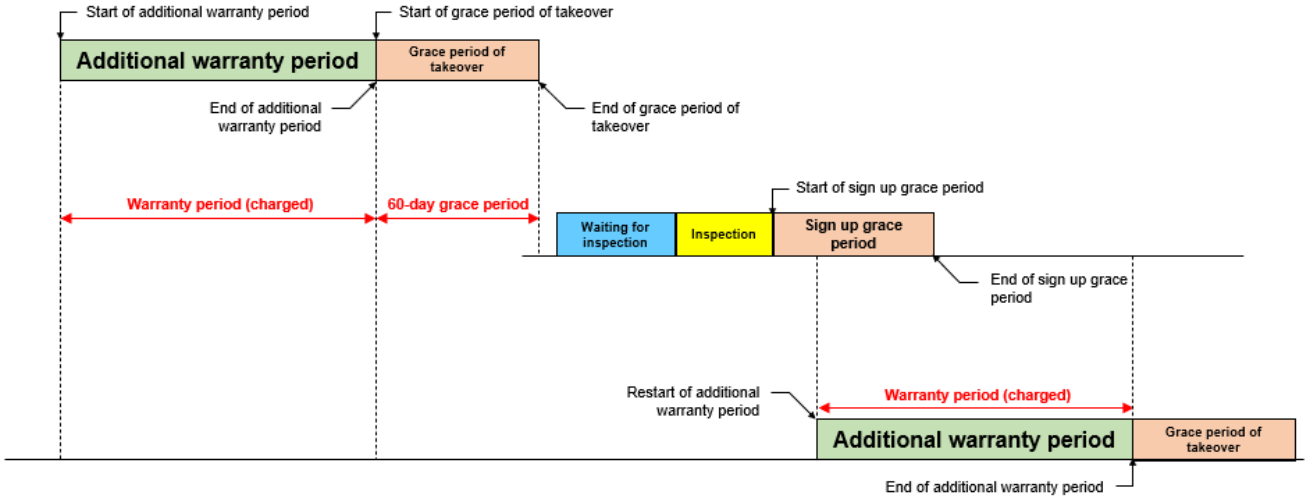


Fig. 4-4 Schematic diagram of signing up for additional warranty again from the period out of the period of additional warranty

4.2.4 When starting use additional warranty within the period of standard warranty (free of charge)

The period of additional warranty can be added after the period of standard warranty on the following condition: signing up for the additional warranty package and inserting the SD card into the robot controller within the period of standard warranty. The start date of the extended period of warranty is after the end of the period of standard warranty. After the SD card has been inserted, the robot controller will be available for various functions such as predictive maintenance and monitoring service. (Refer to "6. Monitoring service" for information on the monitoring service.)

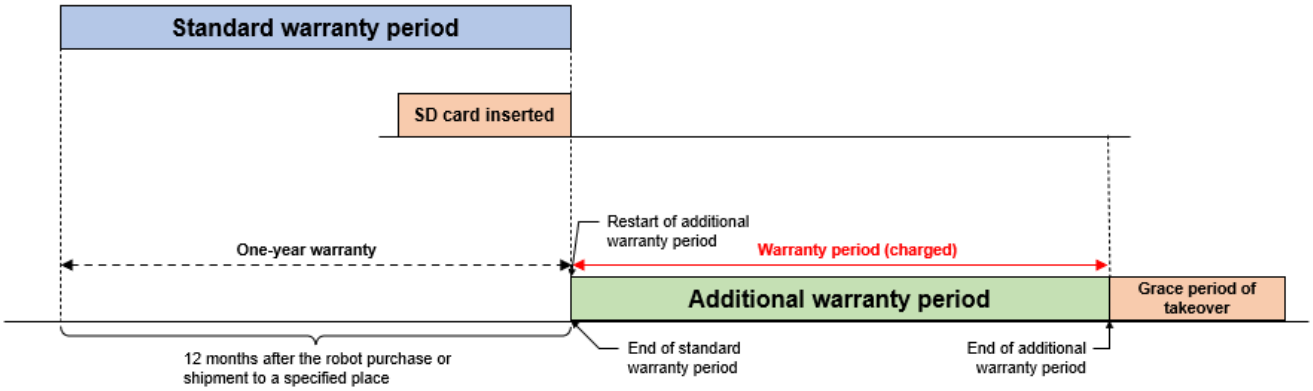


Fig. 4-5 Schematic diagram of using additional warranty within the period of standard warranty

4.2.5 When starting use additional warranty from the period out of the period of standard warranty (free of charge)

The additional warranty package is not available if you have not signed up the additional warranty package within the period of standard warranty. After the period of standard warranty is completed, the period requiring inspection will start and the robot equipment must be inspected by an inspection service. (Refer to "5. Inspection service" for information on the inspection service.)
Once the inspection service is complete, a grace period of sign up for warranty of two months (60 days) is set. Signing up the warranty extension service during this grace period of sign up for warranty will allow you to receive the warranty in the period of additional warranty (charged period of warranty). The extended period of warranty commences on the date of signing up with the additional warranty package.

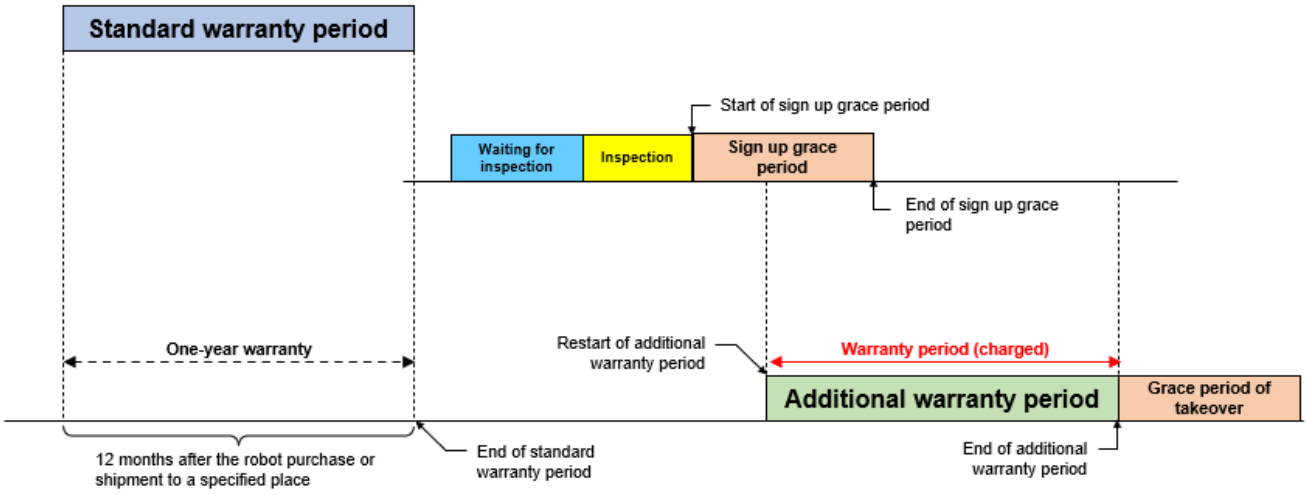


Fig. 4-6 Schematic diagram of using additional warranty from the period out of the period of standard warranty

4.3 Warranty contract details

For details on the warranty contract, check the contract for the country of purchase. The contract for Japan is described in the catalog.

4.4 How to check the period of warranty

This section explains how to check the warranty extension service contract status and the remaining period of warranty.
You can check the period of warranty using RT ToolBox3 or by referring to the parameters.

4.4.1 Checking the information using RT ToolBox3

You can view the warranty extension service information in RT ToolBox3.
When online, you can read information registered for iQ Care MELFA Support by clicking "iQ Care MELFA Support information" under "Warranty service" (accessed from "Online"-"iQ Care MELFA Support" in the tree structure on the workspace). To read history information, click "Warranty history".
Also, if you have taken over iQ Care MELFA Support, you can check the history of the warranty up to now.

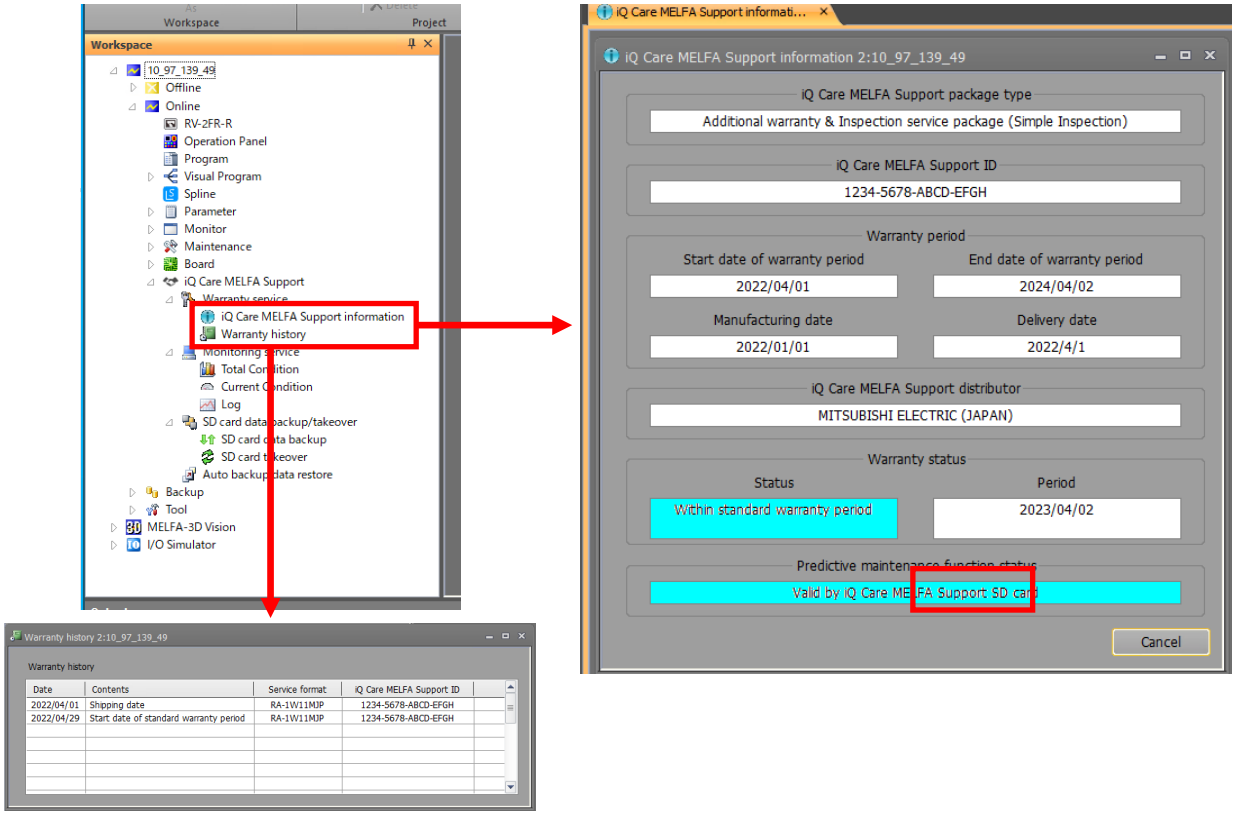


Fig. 4-7 Indication of warranty extension service information in RT ToolBox3

Table 4-2 Display items of the warranty/predictive maintenance function status screen

Display item		Display example	Description	Remarks
iQ Care MELFA Support package type		Additional warranty package (1 year)	Displays the name of the service package currently in use.	
		Additional warranty package (2 years)		
		Inspection service package (Simple Inspection)		
		Inspection service package (Precise Inspection)		
		Additional warranty & Inspection service package (Simple Inspection)		
		Additional warranty & Inspection service package (Precise Inspection)		
iQ Care MELFA Support ID		****-****-****-****	Displays the license ID granted for each SD card purchased.	
Warranty period	Start date of warranty period/ First power on date	yyyy/MM/dd	Displays the start date of the standard warranty period for the target robot.	If the delivery date is displayed in yellow, the display will show the first power on date.
	End date of warranty period/ Estimated end date of warranty period	yyyy/MM/dd	Displays the end date of additional warranty period.	When the delivery date is displayed in yellow, the display will show the estimated end date of warranty period.
	Manufacturing date	yyyy/MM/dd	Displays the manufacturing date of the robot controller.	
	Delivery date*	yyyy/MM/dd	Displays the delivery date of the robot controller to be serviced.	The background color is yellow when the period of warranty is not determined.
iQ Care MELFA Support distributor		MITSUBISHI ELECTRIC (JAPAN)	Displays the distributor of the iQ Care MELFA Support SD card.	
Warranty status	Status	Within standard warranty period	Displays the current status of the warranty extension service.	
		Within additional warranty period		
		Within takeover grace period		
		Out of warranty period		Indicates the period out of the period of warranty.
		Out of warranty period		
		Sign up grace period for warranty will be expired soon		
		Invalid (Takeoverd)		
		Invalid		
	Period	yyyy/MM/dd	Displays the end date of warranty period during the period of warranty.	
Predictive maintenance function status		Valid by iQ Care MELFA Support SD card	Displays the usage status of the predictive maintenance function.	For details, refer to "6.4 Predictive maintenance function".

* When the difference between the manufacturing date of the robot controller and the first power on date is large, the background color becomes yellow showing that the delivery date is unclear. There is no functional difference even if the background color is yellow.

Table 4-3 Display items of the warranty history screen

Display item	Display example	Description	Remarks
Date	yyyy/MM/dd	The date when the event in the "Contents" column occurred is displayed.	
Contents	Shipping date	Events related to the period of warranty are displayed.	
	Start date of standard warranty period		
	End date of standard warranty period		
	Start date of additional warranty period		
	End date of additional warranty period		
Service format	RA-*W**M**	The service status ID (model) corresponding to the event is displayed.	
iQ Care MELFA Support ID	****-****-****-****	The iQ Care MELFA Support ID corresponding to the event is displayed.	

4.4.2 Checking the information using robot parameters

When iQ Care MELFA Support is enabled, the parameters related to warranty period information can be checked by referring to the relevant parameters. Parameters related to this function are shown below.

Table 4-4 Parameters related to iQ Care MELFA Support warranty extension service

Parameter	Parameter name	Number of elements	Description	Remarks
Registered robot controller serial number	MSRCSER	String 1	Indicates the robot controller serial number registered as the target of the current service.	
Registered robot arm serial number	MSRBSER	String 1	Indicates the robot arm serial number registered as the target of the current service.	
Service status ID	MSMDL	String 1	Indicates the service status ID (model) of iQ Care MELFA Support currently in use.	
iQ Care MELFA Support ID	MSID	String 1	Indicates the iQ Care MELFA Support ID currently in use.	
Last service status ID	MSMDLP	String 1	Indicates the service status ID previously used when a takeover occurred.	
Last iQ Care MELFA Support ID	MSIDP	String 1	Indicates the iQ Care MELFA Support ID previously used when a takeover occurred.	
Support area	MSAREA	String 1	Indicates the supported region (two-letter country code) of iQ Care MELFA Support being used.	
iQ Care MELFA Support status	MSSTS	Integer 1	Indicates the status of the iQ Care MELFA Support function. 1: Before first power on of the R/C 2: Within standard warranty period 3: Within additional warranty period 4: Within takeover grace period 5: Out of warranty period 6: Not covered by warranty 7: Out of warranty period 8: Sign up grace period for warranty will be expired soon 9: Taken over 10: Invalid	1, 6, 9, and 10 indicate that the iQ Care MELFA Support function is disabled.

Parameter	Parameter name	Number of elements	Description	Remarks
Predictive maintenance function status	MSPMSTS	Integer 1	Indicates the status of the predictive maintenance function of iQ Care MELFA Support. 0: SD card not inserted 1: With SD card/function disabled 2: Do not use (manufacturer settings) 3, 4: With SD card/function enabled/within usage period 5: With SD card/function enabled/with MSP card 6: With SD card/function enabled/out of usage period	0, 1, and 6 indicate that the predictive maintenance function cannot be used.
Controller reset process	MECHRST	String 1	Resets the information saved in the robot controller to the default settings.	Do not use the process under any circumstances unless otherwise specified specifically. (Refer to 8.5.)
iQ Care MELFA Support controller reset process	MSRST	String 1	Resets the iQ Care MELFA Support information registered in the robot controller to the default settings.	Do not use the process under any circumstances unless otherwise specified specifically. (Refer to 8.5.)
iQ Care MELFA Support present time	MSTNOW	String 1	Indicates the present time that iQ Care MELFA Support recognizes.	yyyy/MM/dd HH:mm:ss notation
Robot controller manufacturing time	MSMFG	String 1	Indicates the manufacturing time of the robot controller that iQ Care MELFA Support recognizes.	yyyy/MM/dd HH:mm:ss notation
Start time of warranty period	MSWRTST	String 1	Indicates the start time of warranty period for the service currently in use.	yyyy/MM/dd HH:mm:ss notation
Start time of predictive maintenance function usage	MSPMTST	String 1	Indicates the start time of the usable period of the predictive maintenance function for the service currently in use.	yyyy/MM/dd HH:mm:ss notation
End time of standard warranty period	MSWRSTE	String 1	Indicates the end time of standard warranty period that iQ Care MELFA Support recognizes.	yyyy/MM/dd HH:mm:ss notation
End time of additional warranty period	MSWRATE	String 1	Indicates the end time of additional warranty period that iQ Care MELFA Support recognizes.	yyyy/MM/dd HH:mm:ss notation
End time of takeover grace period	MSGRTTE	String 1	Indicates the end time of takeover grace period for warranty extension for the present warranty extension service.	yyyy/MM/dd HH:mm:ss notation
End time of sign up grace period for warranty	MSGRJTE	String 1	Indicates the end time of sign up grace period for warranty extension service after the inspection service has been performed.	yyyy/MM/dd HH:mm:ss notation
iQ Care MELFA Support SD card: used space	MSSDMSZ	Integer 2	Indicates the used space and capacity of the iQ Care MELFA Support SD card. Element 1: used space of the SD card [GB] Element 2: capacity of the SD card [GB]	
Latest power off time	MSTPOF	String 1	Indicates the time when the robot controller was last powered off for calculation of the usable period.	yyyy/MM/dd HH:mm:ss notation
Latest power on time	MSTPON	String 1	Indicates the time when the robot controller power was turned on this time for calculation of the usable period.	yyyy/MM/dd HH:mm:ss notation

Parameter	Parameter name	Number of elements	Description	Remarks
Period of warranty [day]	MSWRT	Integer 1	Indicates the total number of days of warranty period in the service currently in use. (Total of the period of standard warranty and the period of additional warranty)	
Period of standard warranty [day]	MSWRS	Integer 1	Indicates the total number of days of standard warranty period in the service currently in use.	
Period of additional warranty [day]	MSWRA	Integer 1	Indicates the total number of days of additional warranty period in the service currently in use.	
Carryover period of standard warranty [day]	MSWRSCO	Integer 1	Indicates the total number of days of standard warranty period in the service currently in use, which was taken over from the previous service.	
Carryover period of additional warranty [day]	MSWRACO	Integer 1	Indicates the total number of days of additional warranty period in the service currently in use, which was taken over from the previous service.	
Standard warranty period with SD card installation [day]	MSWRSI	Integer 1	Indicates the period of standard warranty registered in the iQ Care MELFA Support SD card corresponding to the service currently in use.	
Additional warranty period with SD card installation [day]	MSWRAI	Integer 1	Indicates the period of additional warranty registered in the iQ Care MELFA Support SD card corresponding to the service currently in use.	
Standard warranty period in previous SD card [day]	MSWRSIP	Integer 1	When a takeover occurred, it indicates the period of standard warranty registered in the previously used iQ Care MELFA Support SD card.	
Valid period of warranty [day]	MSVWR	Integer 1	Indicates the number of days remaining for warranty period in the service currently in use. (Total of the period of standard warranty and the period of additional warranty)	
Valid period of standard warranty [day]	MSVWRS	Integer 1	Indicates the number of days remaining for standard warranty period in the service currently in use.	
Valid period of additional warranty [day]	MSVWRA	Integer 1	Indicates the number of days remaining for additional warranty period in the service currently in use.	
Valid period of takeover grace [day]	MSVGRTO	Integer 1	For the grace period of takeover, it indicates the number of days remaining to take over the warranty extension service.	
Valid period of sign up grace [day]	MSVGRJ	Integer 1	For the grace period of sign up for warranty, it indicates the number of days remaining to subscribe to the warranty extension service.	
Notice period of warranty expired [day]	MSWRTN	Integer 1	Set the number of days before the warranty expiring time (C6210_00000) to notify the expiration to the user.	Initial value "31"
Enabling or disabling the iQ Care MELFA Support notification	MSNTFY	Integer 5	Switches whether to generate errors related to the iQ Care MELFA Support notification.	For details, refer to Table 4-5.
Current elapsed time [day]	MSTOTAL	Integer 1	Indicates the number of days that have elapsed after starting the use of iQ Care MELFA Support.	

4.4.3 Notification setting before expiration of the warranty period

For iQ Care MELFA Support, it is possible to set the related parameters to provide a warning prior to expiration that the warranty period approaching due date. If you continue to use the warranty extension service, set the parameters using the teaching pendant or RT ToolBox3 so that you will be aware of termination of the warranty period prior to expiration.

Table 4-5 Setting for the notice period of warranty expired

Parameter	Parameter name	Number of elements	Description	Default setting value
Notice period of warranty expired [day]	MSWRTN	Integer 1	Set the number of days before the warranty expiring time (C6210_00000) to notify the expiration to the user.	31
Enabling or disabling the iQ Care MELFA Support notification	MSNTFY	Integer 5	Switches the output settings related to the iQ Care MELFA Support notification. * If enabled, notification may be given every time the power is turned on (depending on the item). Element 1: Whether to notify C6210 "Warranty period will be expired". 1 (notified), 0 (not notified) Element 2: Whether to notify C6211 "Warranty period was expired". 1 (notified), 0 (not notified) Element 3: Whether to notify C6212 "Warranty expansion expired soon". 1 (notified), 0 (not notified) Element 4: Whether to notify C6213 "Predictive maintenance expired". 1 (notified), 0 (not notified) Element 5: Whether to notify C6214 "Please enable predictive maintenance function (PMENA)". 1 (notified), 0 (not notified)	1, 1, 1, 1, 1

4.5 Precautions

This section describes precautions to be observed when using the warranty extension service.

(1) The warranty extension service may be extended by signing up with the warranty extension service again during the period of warranty or the grace period of takeover. However, after the grace period, you cannot sign up with the warranty extension service again without receiving the inspection service. If you continue to use the warranty extension service, make sure to sign up with the service before expiration of the warranty period.
(2) The warranty extension service is available in the country of purchase of the additional warranty package. When transporting the robot to other country, contact our sales company or distributor located in that country beforehand. The warranty contract may differ depending on which country the robot is to be installed.
(3) The warranty shall not cover parts with service life and options during the period of additional warranty (for Japan).

Table 4-6 Parts not covered by the warranty

Name	Description
Robot arm	Motors, reduction gears, bearings, cables, belts, ball screws, and other parts with service life
Options	Parts for teaching pendants, sensors, and our robot options

5 Inspection service

This chapter describes conditions and items to be checked when using the inspection service.

5.1 Service overview

To manage the condition of industrial robots, service engineers will visit customers' robot delivery points to perform inspection. In this service, work such as checking the robot conditions periodically, replacing consumable parts, performing preventive maintenance is performed in order to keep the robot in stable operation and prevent stop of the customer's system due to a sudden failure of robots.

5.1.1 Types of inspection works

There are two types of inspections.

1 Simple inspection: Checking the robot's basic functions, appearance, cables and connectors, etc. and performing diagnosis on the robot conditions based on saved data. It includes replacement of some consumable parts such as batteries.

2 Precise inspection: Performing simple inspection and conducting internal inspection on the robot and controller, replacing consumable parts used for a long time (such as grease), performing quantitative measurement diagnosis using a measuring device.

Table 5-1 Types of inspection works

Name	Estimated time for work	Inspection details				
		Replacement of consumables	Storage data diagnosis	Operation diagnosis	Measurement diagnosis	Preventive work
Simple inspection	1 to 1.5 hours	Δ	○	○	×	Δ
Precise inspection	4 to 5 hours	○	○	○	○	○

○: Performed. Δ: Partially performed. ×: Not performed.

* For details on the simple and precise inspections, refer to the catalog (for Japan).

5.2 How to use the inspection service

This section explains the procedure for using the inspection service.

5.2.1 How to use the inspection service in Japan

The procedure for using the inspection service in Japan is as follows.

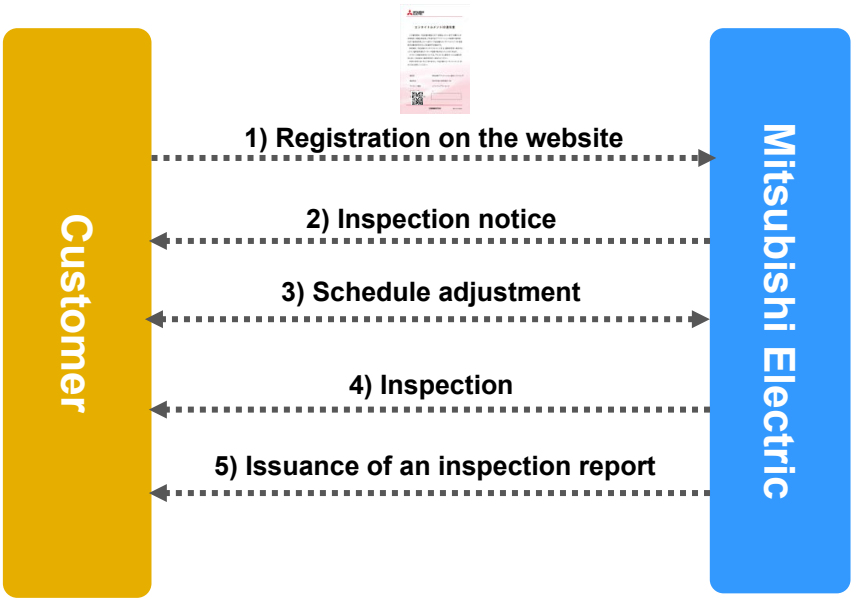


Fig. 5-1 Procedure for using service in Japan

Table 5-2 How to use the inspection service in Japan

No.	Item	Description
1	Registration on the website	Use the ID (iQ Care MELFA Support ID) registered by the customer for a user registration on the website. · How to check the ID: Refer to "8.1 Viewing iQ Care MELFA Support information". · URL: <https://www.mitsubishielectric.co.jp/fa/ssl/wap/robotusers/entryList.do>
2	Inspection notice	A service company will notify the customer of an inspection.
3	Schedule adjustment	Arrange an appointment of an inspection with the service company.
4	Inspection	The service engineers will visit the customer to perform inspection.
5	Issuance of an inspection report	The service company will issue an inspection report.

5.2.2 How to use the inspection service in a country other than Japan

The usage method differs depending on the region.
Refer to the documents provided by sales companies in the region and information on the website.

5.3 Checking the inspection service information

You can check the contract status of the inspection service and the remaining number of inspections by referring to the parameters. Parameters related to this function are shown below.

Table 5-3 Parameters related to iQ Care MELFA Support inspection services

Parameter	Parameter name	Number of elements	Description		Remarks
Registered robot controller serial number	MSRCSER	String 1	Indicates the robot controller serial number registered as the target of the current service.		
Registered robot arm serial number	MSRBSER	String 1	Indicates the robot arm serial number registered as the target of the current service.		
Service status ID	MSMDL	String 1	Indicates the service status ID (model) of iQ Care MELFA Support currently in use.		
iQ Care MELFA Support ID	MSID	String 1	Indicates the iQ Care MELFA Support ID currently in use.		
Last service status ID	MSMDLP	String 1	Indicates the service status ID previously used when a takeover occurred.		
Last iQ Care MELFA Support ID	MSIDP	String 1	Indicates the iQ Care MELFA Support ID previously used when a takeover occurred.		
Support area	MSAREA	String 1	Indicates the supported region (two-letter country code) of iQ Care MELFA Support being used.		
iQ Care MELFA Support status	MSSTS	Integer 1	Enabled 2, 3, 4, 5, 7, 8	Indicates the function enabled status of iQ Care MELFA Support.	
			Disabled 1, 6, 9, 10		
Controller reset process	MECHRST	String 1	Resets the information saved in the robot controller to the default settings.		Do not use the process under any circumstances unless otherwise specified specifically. (Refer to 8.5.)
iQ Care MELFA Support controller reset process	MSRST	String 1	Resets the relevant data of iQ Care MELFA Support stored in the robot controller to the default settings.		Do not use the process under any circumstances unless otherwise specified specifically. (Refer to 8.5.)
Valid number of simple inspections	MSNOIS	Integer 1	Indicates the number of possible simple inspections currently registered for the service.		
Valid number of precise inspections	MSNOIP	Integer 1	Indicates the number of possible precise inspections currently registered for the service.		
Latest inspection date	MSINSD	String 1	Indicates the date of the previous inspection.		yyyy/MM/dd notation
Latest inspection result	MSINSR	String 1	OK	Indicates the result of the previous inspection. "-" is displayed when the warranty period expires.	
			NG		
			-		

5.4 Precautions

This section describes precautions to be observed when using the inspection service.

(1) For information on how to sign up for additional warranty after inspection, refer to "4. Warranty extension service" in this manual.
If an inspection is performed after the warranty period and the inspection results are acceptable, the customer can sign up for additional warranty. The sign up grace period is 60 days after inspection.

(2) If the inspection results are not acceptable in the inspection service, the applicable parts need to be repaired.
The service engineers will visit the customer site again. After all the applicable parts have been repaired, the customer can sign up for additional warranty. The sign up grace period is 60 days after repair.

6 Monitoring service

This chapter describes the conditions and items to be checked when using the monitoring service.

6.1 Service overview

The monitoring service is a service that enables users to collect and refer to data related to maintenance and operation. For example, users can acquire the operating information of the target robot and back up their settings. If you sign up with the warranty extension service or inspection service once, the service can be used permanently with the exception of some functions.
In addition to storing data regularly on the iQ Care MELFA Support SD card, users can also refer to the acquired data and use the stored data using RT ToolBox3.

Table 6-1 List of monitoring service supported functions

Function	Information
Recovery function (Refer to Section 6.2.)	Robot recovery data is automatically backed up to the SD card. The data is used to restore the status of the specified date.
Condition management function (Refer to Section 6.3.)	Robot operating information and maintenance related data is compiled into files. These files are stored regularly on the SD card. The saved data can be viewed graphically using RT ToolBox3.
Predictive maintenance function (Refer to Section 6.4.)	The preventive and predictive maintenance functions that can be used with the MELFA Smart Plus card A/B type can be used. In addition, data related to the predictive and preventive maintenance function is stored in a file on the SD card.
Oscillograph function (Refer to Section 6.5.)	Time series data of devices that can be referenced by the real time monitor function of RT ToolBox3, such as motor current values and load ratios of individual axes, are compiled into files and stored periodically on the SD card. The saved data can be viewed in RT ToolBox3.
Drive recorder function (Refer to Section 6.6.)	If a specified error occurs in the robot being used, the error will trigger the function to store logs of servo data for several seconds before and after the error occurrence. The saved data can be viewed in RT ToolBox3.

6.2 Recovery function

6.2.1 Overview of the function

The recovery function automatically backs up various setting data and robot programs for the robot using iQ Care MELFA Support to use the data for restore. The robot controller status can be restored to the specified date when a robot failure is repaired or when the robot malfunctions due to incorrect settings.
By selecting from the calendar display on RT ToolBox3, you can restore the data to the state of the specified date.
The data saving interval can be set by the user.
In this chapter, the data saved by the recovery function is referred to as automatic backup data.

6.2.2 How to set the backup interval

With the recovery function, the robot data is automatically backed up periodically at intervals set by parameters, and the backup data is stored in the SD card. Robot parameters related to automatic backup are as follows. To change the saving interval or saving time of automatic backup data, change the setting of the corresponding parameter using the teaching pendant or RT ToolBox3.

Table 6-2 Parameters related to the recovery function

Parameter	Parameter name	Number of elements	Description	Default setting value
Saving interval of automatic backup data [day]	MSABIVL	Integer 1	Sets the interval (in days) for backing up data. Setting range 1 to 3660 (enabled), -1 (disabled)	1
Saving time of automatic backup data	MSABT	Integer 3	Set the time to back up the data. * Data saving may not start at the specified time depending on how the robot is moving at the specified saving time. Element 1: Hour Setting range 0 to 23 Element 2: Minute Setting range 0 to 59 Element 3: Second Setting range 0 to 59	14, 0, 0
Last saving time of automatic backup data	MSABTP	String 1	Displays the last saving time of backup data. (Read only)	-
Next saving time of automatic backup data	MSABTN	String 1	Displays the next saving time of backup data. (Read only)	-
Automatic backup data program saving	BKPRG	Integer 1	Sets whether to include programs in the automatic backup data. 0: Program information not included 1: Program information included	1

6.2.3 How to recover data (restoring data using automatic backup data)

The recovery function allows you to restore the robot controller to the state when the automatic backup data is saved using the dedicated screen of RT ToolBox3. The recovery procedure is as follows.

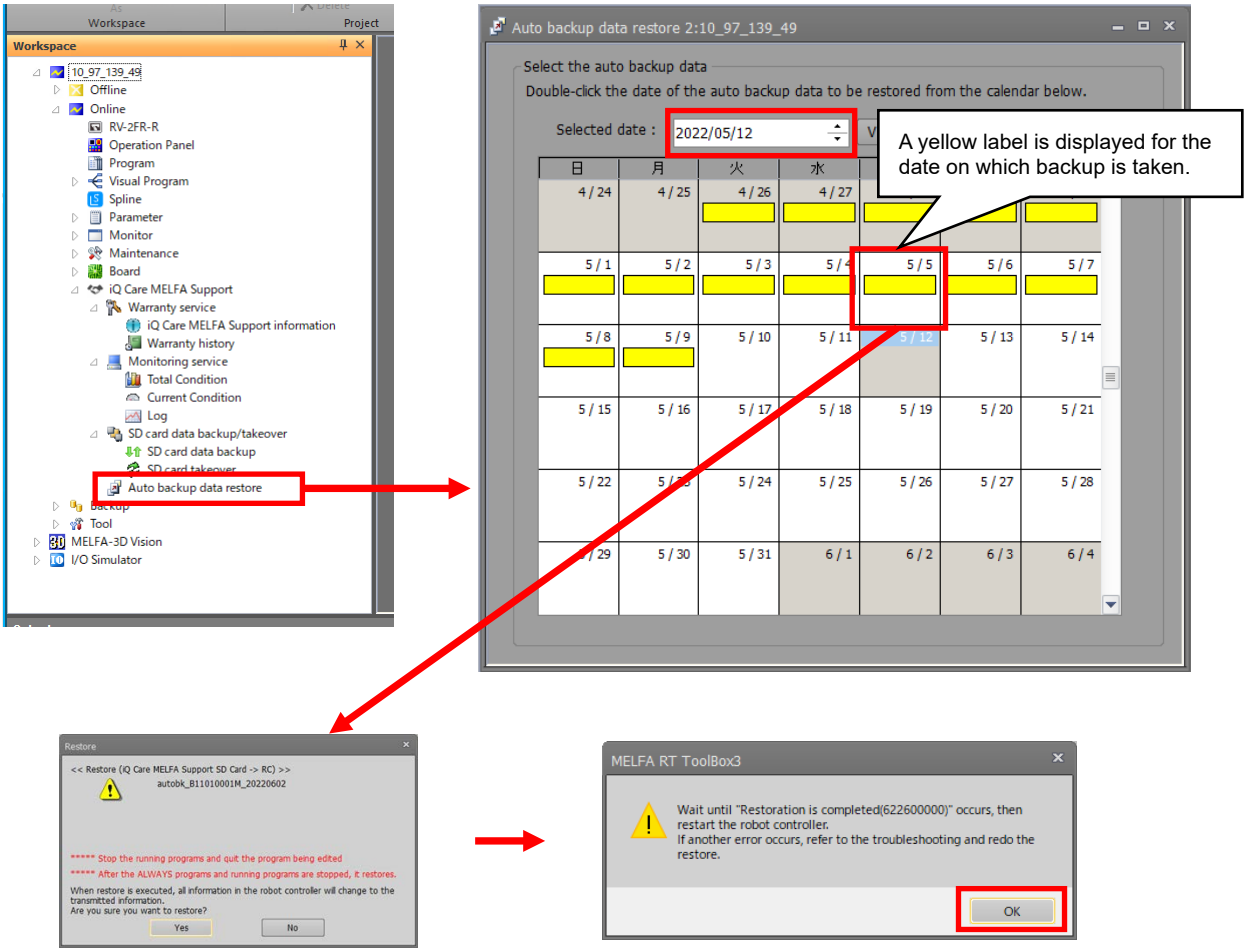


Fig. 6-1 Example of recovery operation using automatic backup data

(1) If a robot program is being executed, stop the operation.
(2) When online, double-click "Auto backup data restore" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace.
(3) The calendar is displayed. In the Selected date field, select the year, month, day around the date you want for restore.
(4) If a yellow label appears on the date you want for restore, you can select the backup data on that date. Double-click the date field.
(5) The message for confirmation of restore using automatic backup data will appear. If you want to perform a restore, select OK.
(6) A message will appear upon start of the restore. After error H6226 (Restoration is completed) occurs, turn off and on the power.
* If an error other than H6226 has occurred, refer to the error list, follow the solution to the error, then try again.

6.2.4 Precautions

This section describes precautions to be observed when using the recovery function.

(1) When the data capacity on the SD card is insufficient, automatic backup data will not be saved. Use the data backup function of RT ToolBox3 regularly to reserve the data capacity of the SD card. For details on how to back up data on the SD card, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".
(2) The backup data stored on the SD card can be moved to a computer with RT ToolBox3 installed and used for restore. However, a warning message may appear due to the difference in the file configuration. This does not affect the restore operation.
(3) If a password is registered in "File" by the security function of the robot controller, backup and restore cannot be performed. Delete the password of the security function before use. For details on the security function and how to delete the password, refer to "RT ToolBox3/RT ToolBox3 mini User's Manual.
(4) If you perform a restore operation under certain conditions, an error will occur and you will not be able to perform the restore operation. Perform the operation with no errors. For the error occurrence conditions, refer to "7 Error list".
(5) For details on operations and precautions related to backup and restore, refer to "RT ToolBox3/RT ToolBox3 mini User's Manual".
(6) The saving time of backup data saved by the recovery function may be delayed depending on how the robot is moving in the process of data saving.
(7) The saving process time of backup data saved by the recovery function may take long depending on how the robot is moving in the process of data saving.
(8) If the time setting of the robot controller is changed, the saving process time of data saved by the recovery function may take long temporarily.
(9) If the process of backup data saving is performed while a program including commands that change backup data (such as PrmWrite) is running, error C6232 (Failed to write file) may occur.

6.3 Condition management function

6.3.1 Overview of the function

The condition management function automatically saves the operation information and maintenance information of the robot using iQ Care MELFA Support to the memory area of the SD card, and continuously checks the status of the robot. This function allows users to check the state of the robot every day without any troublesome data sorting, and helps them to collect operation data by month, year, and so on.
In addition to being able to refer to the general information of the target robot and the present operation status from the dedicated screens on RT ToolBox3, the stored log information is visualized by charting, which is effective for analyzing the operation status. Since the acquired data is saved in csv file format, it can also be used for your own data aggregation.

6.3.2 How to set the data saving time

The condition management function regularly acquires robot data at one-day intervals and stores it in the SD card. Robot parameters related to the condition management function are as follows. To change the data saving time, change the settings of corresponding parameters using the teaching pendant or RT ToolBox3.

Table 6-3 Parameters related to the condition management function

Parameter	Parameter name	Number of elements	Description	Default setting value
Maintenance data/predictive maintenance data saving interval [day]	MSMAIVL	Integer 1	Sets whether to save data related to the condition management. Setting range 1 (once every day), -1 (disabled)	1
Last saving time of maintenance data/predictive maintenance data	MSMATP	String 1	Displays the last saving time of maintenance data and predictive maintenance data. (Read only)	-
Next saving time of maintenance data/predictive maintenance data	MSMATN	String 1	Displays the next saving time of maintenance data and predictive maintenance data. (Read only)	-
Saving time of maintenance data/predictive maintenance data	MSMAT	Integer 3	Sets the time to back up data related to condition management. * Data saving may not start at the specified time depending on how the robot is moving at the specified saving time. Element 1: Hour Setting range 0 to 23 Element 2: Minute Setting range 0 to 59 Element 3: Second Setting range 0 to 59	14, 0, 0

6.3.3 Stored data format

The data related to the condition management function is saved in the iQ Care MELFA Support SD card in the following file formats. These files are periodically overwritten with data according to the set data acquisition interval. Do not edit or delete the target file. Doing so disables checking of the accumulated data.
The condition management function uses a mntdat file that stores maintenance-related data and a ppmdat file that stores data related to the predictive maintenance function. For details on the ppmdat file, refer to "6.4.5 Stored data format".

Table 6-4 Condition management function: Saved file information

Folder/file name		Description	Backup recommended	Remarks
mntdat	mntdat_[RCSERIAL].csv	Files saved by the condition management function.	✔	
ppmdat	ppmdat_[RCSERIAL].csv	Files saved by the predictive maintenance function.	✔	For details, refer to "6.4 Predictive maintenance function".

* [RCSERIAL]: Controller serial number of the robot to be serviced

Table 6-5 List of data acquired by the condition management function

No.	Label name	Unit	Description
1	Power on time(total)	[hour]	Displays the cumulative power on time of the robot controller.
2	Power on time(a day)	[hour]	Displays the power on time of the robot controller for the target day.
3	Servo on time(total)	[hour]	Displays the cumulative servo on time.
4	Servo on time(a day)	[hour]	Displays the servo on time for the target day.
5	Operation time(total)	[hour]	Displays the cumulative operation time (robot program running time).
6	Operation time(a day)	[hour]	Displays the operation time (robot program running time) for the target day.
7	Run time(total)	[hour]	Displays the cumulative time of actual operation (motor running time).
8	Run time(a day)	[hour]	Displays the actual operation time (motor running time) for the target day.
9	Servo on(total)	[times]	Displays the cumulative number of servo on times.
10	Servo on(a day)	[times]	Displays the number of servo on times for the target day.
11	Servo revolutions(total)	[1000 rev.]	Displays the cumulative number of servo revolutions for each axis.
12	Servo revolutions(a day)	[1000 rev.]	Displays the number of servo revolutions for each axis for the target day.
13	Brake release(total)	[times]	Displays the cumulative number of brake release times for each axis.
14	Brake release(a day)	[times]	Displays the number of brake release times for each axis for the target day.
15	Max. axis load level	[%]	Displays the maximum load ratio for each axis for the target day.
16	Max. current(FB)	[Arms]	Displays the maximum current value for each axis for the target day.
17	Max. speed(FB)	[rpm]	Displays the maximum speed for each axis for the target day.
18	Max. encoder temperature	[deg C]	Displays the maximum encoder temperature for each axis for the target day.
19	Max. error of presumed torque	[%]	Displays the maximum estimated torque error for each axis for the target day. (from J1 to J6)
20	Min. power voltage	[V]	Displays the minimum motor power voltage for the target day.
21	Max. power voltage	[V]	Displays the maximum motor power voltage for the target day.
22	Max. regeneration level	[%]	Displays the maximum regenerative level of the target day.
23	Max. controller temperature	[deg C]	Displays the maximum temperature in the robot controller panel for the target day.

No.	Label name	Unit	Description
24	Min. voltage(24V)	[V]	Displays the minimum control voltage (24V system) for the target day. (Cannot be output for the R-type/Q-type.)
25	Max. voltage(24V)	[V]	Displays the maximum control voltage (24V system) for the target day. (Cannot be output for the R-type/Q-type.)
26	Min. voltage(5V)	[V]	Displays the minimum control voltage (5V system) for the target day.
27	Max. voltage(5V)	[V]	Displays the maximum control voltage (5V system) for the target day.
28	Min. voltage(3.3V)	[V]	Displays the minimum control voltage (3.3V system) for the target day.
29	Max. voltage(3.3V)	[V]	Displays the maximum control voltage (3.3V system) for the target day.
30	Min. voltage(2.5V)	[V]	Displays the minimum control voltage (2.5V system) for the target day. (Cannot be output for the R-type.)
31	Max. voltage(2.5V)	[V]	Displays the maximum control voltage (2.5V system) for the target day. (Cannot be output for the R-type.)
32	Min. voltage(1.3V)	[V]	Displays the minimum control voltage (1.3V system) for the target day. (Cannot be output for the R-type.)
33	Max. voltage(1.3V)	[V]	Displays the maximum control voltage (1.3V system) for the target day. (Cannot be output for the R-type.)
34	RIO connection error CH1(a day)	[times]	Displays the number of RIO (CH1) connection errors for the target day.
35	RIO CRC error CH1(a day)	[times]	Displays the number of RIO (CH1) communication errors for the target day.
36	RIO connection error CH2(a day)	[times]	Displays the number of RIO (CH2) connection errors for the target day.
37	RIO CRC error CH2(a day)	[times]	Displays the number of RIO (CH2) communication errors for the target day.
38	RIO connection error CH3(a day)	[times]	Displays the number of RIO (CH3) connection errors for the target day.
39	RIO CRC error CH3(a day)	[times]	Displays the number of RIO (CH3) communication errors for the target day.
40	RIO connection error CH4(a day)	[times]	Displays the number of RIO (CH4) connection errors for the target day.
41	RIO CRC error CH4(a day)	[times]	Displays the number of RIO (CH4) communication errors for the target day.
42	RIO connection error CH5(a day)	[times]	Displays the number of RIO (CH5) connection errors for the target day.
43	RIO CRC error CH5(a day)	[times]	Displays the number of RIO (CH5) communication errors for the target day.
44	RIO connection error of hand (a day)	[times]	Displays the number of RIO (electric hand) connection errors for the target day.
45	RIO CRC error of hand(a day)	[times]	Displays the number of RIO (electric hand) communication errors for the target day.
46	Max. override	[%]	Displays the maximum override setting (operation panel setting value) for the target day.
47	Instantaneous override	[%]	Displays the override setting value at the time of data acquisition.

* The cumulative data of day is reset when the acquisition of the relevant data is started.
* The data for one day may not be the data for 24 hours due to the reasons such as power-off of the robot controller.

6.3.4 How to refer to stored data

Using the condition management function, the cumulative data and the present status of the target robot can be checked by using the dedicated screen of RT ToolBox3.

6.3.4.1 Total Condition screen

When online, click "Total Condition" in "Monitoring service" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace to display the Total Condition screen, which allows you to check the overall robot information calculated from the data stored by various functions of iQ Care MELFA Support.

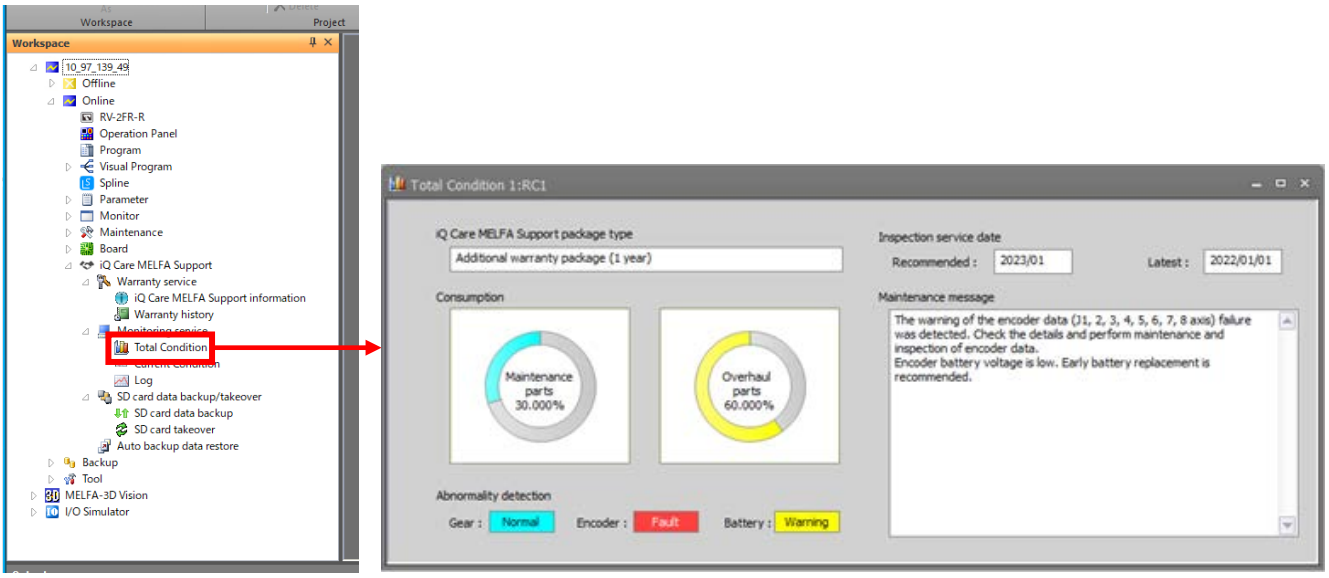


Fig. 6-2 Example of display of the Total Condition screen

Table 6-6 Display items of the Total Condition screen

Display item		Display example	Description	Remarks
iQ Care MELFA Support package type		Additional warranty package (1 year)	Displays the name of the service package currently in use.	
		Additional warranty package (2 years)		
		Inspection service package (Simple Inspection)		
		Inspection service package (Precise Inspection)		
		Additional warranty & Inspection service package (Simple Inspection)		
		Additional warranty & Inspection service package (Precise Inspection)		
Inspection service date	Recommended	yyyy/MM	When using the inspection service, the previous inspection date and the next recommended date are displayed.	
	Latest	yyyy/MM/dd		

Display item		Display example	Description	Remarks
Consumption	Maintenance parts	Pie chart + Ratio [%] display	Displays the degree of wear for parts. The ratio is calculated by the predictive maintenance function. Blue for good, yellow for warning, and red for error conditions.	When the predictive maintenance function is disabled, display without cumulative data is shown.
	Overhaul parts			
Abnormality detection	Gear	Normal/warning/fault	Displays the status of parts calculated by the predictive maintenance function. Blue for normal, yellow for warning, and red for abnormal conditions.	
	Encoder			
	Battery			
Maintenance message		-	A detailed message is displayed for abnormality detection or wear ratio calculation by the predictive maintenance function.	

6.3.4.2 Current Condition screen

When online, click "Current Condition" in "Monitoring service" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace to display the Current Condition screen to show the present robot operation status or other data acquired through communication with the target robot. By means of oscillograph data communication, it is possible to check the operation status by graphical display, etc.

* When using the CR800-D controller, the robot controller needs to be connected to RT ToolBox3 with an Ethernet cable. When using the CR800-R/CR800-Q controller, the robot CPU module needs to be connected to RT ToolBox3 with an Ethernet cable. When using the CR800-R/CR800-Q controller, use a hub for the cable connection.

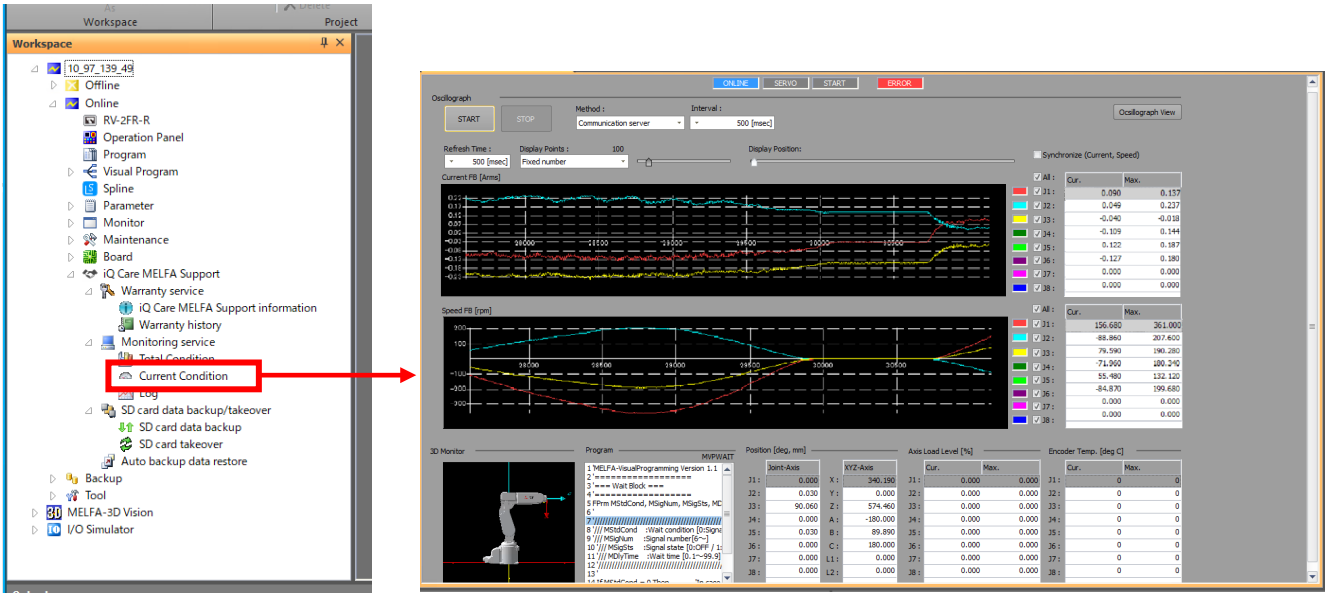


Fig. 6-3 Example of display of the Current Condition screen

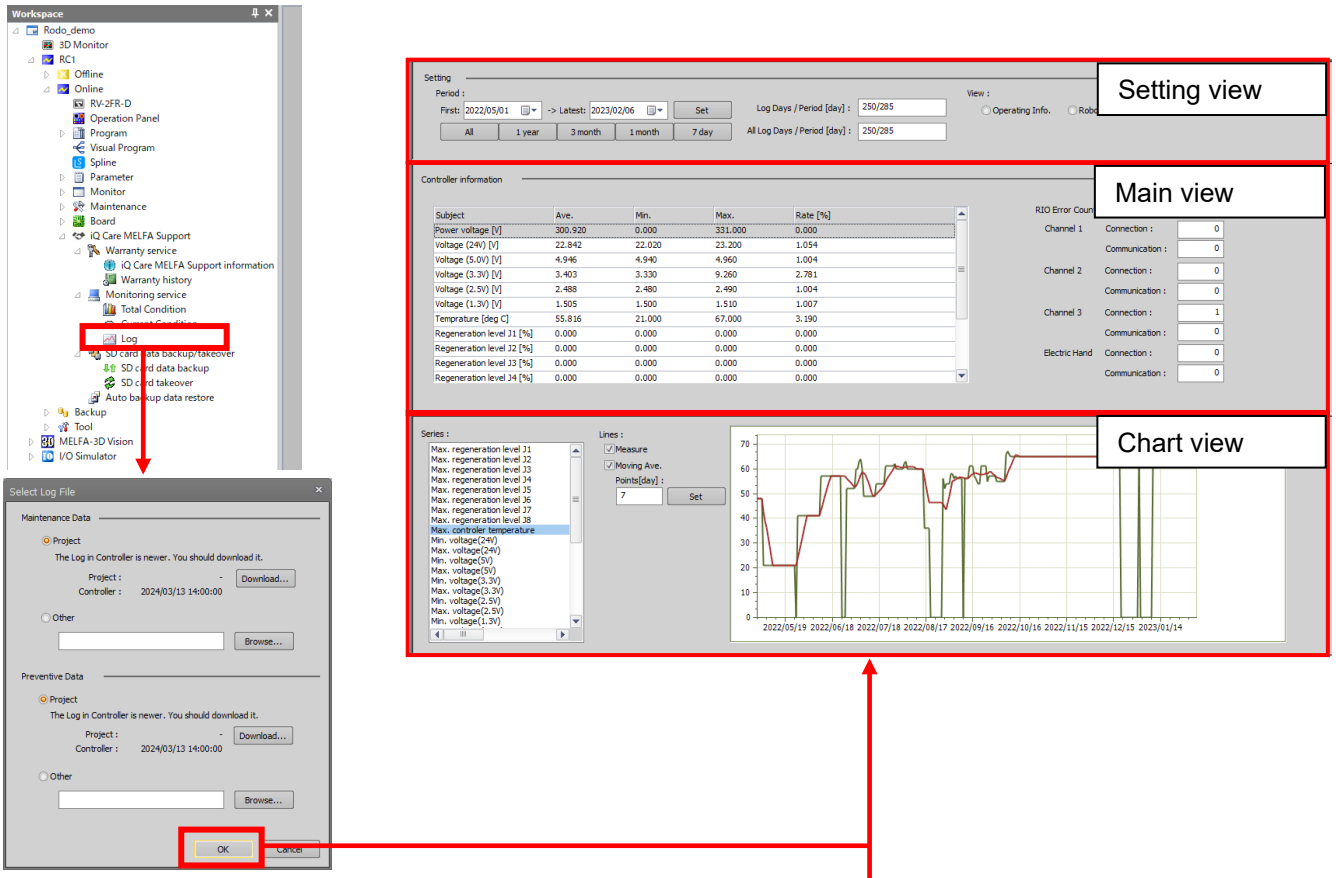
Table 6-7 Display items of the Current Condition screen

Display item		Display example	Description	Remarks
Basic state	Connection	ONLINE (blue)/OFFLINE (red)	Displays the status of the connected robot in characters and colors.	
	Servo	SVO ON (blue)/SVO OFF (gray)		
	Start	START (blue)/STANDBY or STOPPING (gray)		
	Error	ERROR (red)/NO ERROR (Gray)		
Oscillograph	START/STOP	-	Switches used to start or stop monitoring by the oscillograph function.	
	Method	Communication server/Real time monitor	Selects the communication method used for monitoring by the oscillograph function.	
	Interval	*** [msec]	Set the communication interval for communication with the communication server.	Displayed only when the communication server is selected.
	Refresh Time	*** [msec]	Set the time to refresh the graph display.	
	Display Points	Number or time specified (** minutes)	Set the number of points or display time for the graph display.	
	Display Position	-	The display range of the graph can be changed by slider operation.	
Current FB [Arms]	Graph	Line graph	Displays the current feedback status of each axis in a line graph. The horizontal axis can be set by the number of display points. The vertical axis is automatically adjusted. The list shows the current value obtained and the maximum value in the graph.	
	Line color	-		
	Display check	Checkbox checking		
	Current/Max	*** [Arms]		
Speed FB [rpm]	Graph	Line graph	Displays the current feedback status of each axis in a line graph. The horizontal axis can be set by the number of display points. The vertical axis is automatically adjusted. The list shows the current value obtained and the maximum value in the graph.	
	Line color	-		
	Display check	Checkbox checking		
	Current/Max	*** [rpm]		
Check synchronization		Checkbox checking	Switch used to synchronize the check status of current feedback and speed feedback.	
Oscillograph View		-	Switch used to activate the oscillograph screen.	
3D Monitor		Robot appearance	Field for monitoring used to display the robot operation in a simple way.	
Program		(program details)	Displays the name and details of the program currently in operation (up to 17 lines). The current run line is displayed in blue.	
Position [deg, mm]	Joint-Axis	(axis coordinates of J1 to J8)	Displays the axis coordinates of each axis of the current robot by means of numerical values.	
	XYZ-Axis	(axis coordinates of XYZABC)		
Axis Load Level [%]	Cur./Max.	*** [%]	The current value of the load level for each axis of the robot and the maximum value in the graph are displayed by numbers.	
Encoder Temp. [deg C]	Cur./Max.	*** [deg C]	The current value of the encoder temperature for each axis of the robot and the maximum value in the graph are displayed by numbers.	

6.3.4.3 Log screen

When online, click "Log"*1 in "Monitoring service" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace to display the log screen that allows you to view the robot status using tables and charts based on the data stored by the condition management function. In addition to viewing the most recent log data stored on the iQ Care MELFA Support SD card, you can also view data in the same format that has been backed up on a computer or other device.
The log screen consists of three views: the setting view, the main view, and the chart view. You can display the time series information of the data stored in the log data at once.
*1 When offline, click "Log" in "Monitoring service" under "Online"-"iQ Care MELFA Support". Then, press the Browse button on the Select Log File screen and select a log file on the computer. The log file should be downloaded from the project when online and saved to the computer in advance.

・Display when online



・Display when offline (RT ToolBox3 version 2.10L or later)

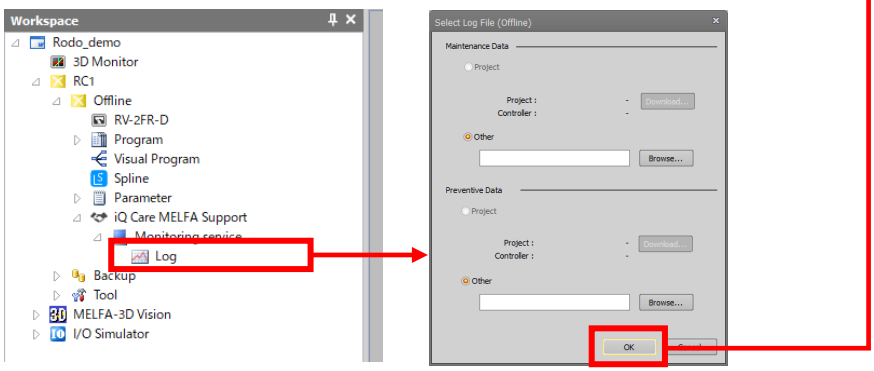


Fig. 6-4 Example of display of the log screen

(1) Selecting a log file

When online, click "Log" in "Monitoring service" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace to display the screen to select a log file displayed on the log screen.
On the Select Log File screen, you can select whether to download and use the most recent log file in the iQ Care MELFA Support SD card installed in the robot controller, or to use an existing log file stored in another location.
The log screen requires two types: maintenance data and predictive maintenance data.
Select the file to be referenced and press OK to display the log screen.

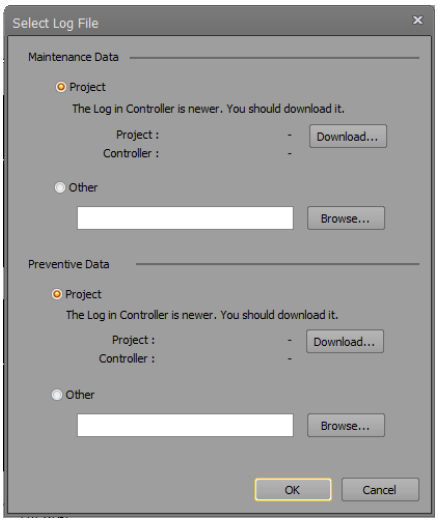


Table 6-8 Display items of the Select Log File screen

Setting		Description of settings	Remarks
Maintenance data	Project	Select the maintenance log data (mntdat_[RCSERIAL].csv) of the robot controller used in the target project for reference. If the date of the data stored on RT ToolBox3 is older than the date of the data stored on the iQ Care MELFA Support SD card, you can download the stored data on the SD card by pressing the Download button.	Select either of the options.
	Other	Select data that exists in the specified file path for reference. The file path selection browser is available by pressing the Browse button.	
Predictive maintenance data	Project	Select the predictive maintenance log data (ppmdat_[RCSERIAL].csv) for the robot controller used in the target project for reference. If the date of the data stored on RT ToolBox3 is older than the date of the data stored on the iQ Care MELFA Support SD card, you can download the stored data on the SD card by pressing the Download button.	Select either of the options.
	Other	Select data that exists in the specified file path for reference. The file path selection dialog is available by pressing the Browse button.	

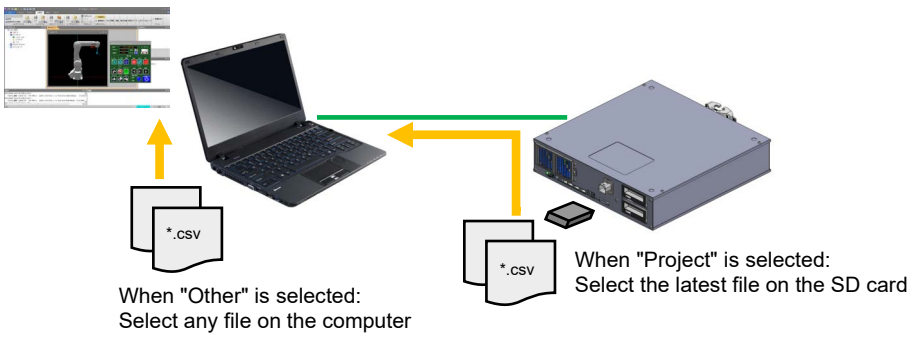


Fig. 6-6 Image of log file selection

(2) Log screen

Setting view

In the setting view, you can change the display period and display items of the main view and chart view.

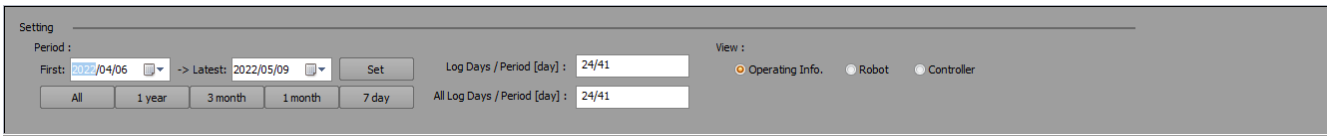


Fig. 6-7 Log screen: Setting view display example

Table 6-9 Log screen: Display items of the setting view

Display item		Display example	Description	Remarks
Period	First	yyyy/MM/dd	Set the start and end dates for the data display period. You can change the display period of the main view and chart view by pressing the Set button.	
	Latest	yyyy/MM/dd		
	Set	-		
	All	-	By pressing the button, you can specify the period of time to display in the main view and chart view. The end date is the last date in the acquired data.	
	1 year			
	3 month			
	1 month			
	7 day			
	Log Days / Period [day]	**/**	Displays the number of days for which the log was acquired during the specified period.	
	All Log Days / Period [day]	**/**	Displays the number of days the log was acquired for the cumulative number of days since the log acquisition start date.	
View	Operating Info.	-	Toggles the display of the main view and chart view. Select one of the items to display.	
	Robot			
	Controller			

Main view

In the main view, the display items change according to the settings in the setting view. The display items are switched according to any setting of operation information, robot information, or controller information, and the log information of the robot acquired by the condition management function is displayed.

1) Operation information display

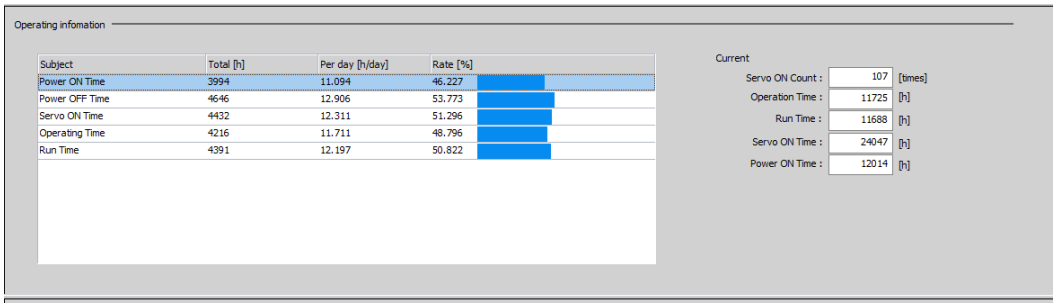


Fig. 6-8 Log screen: Operating information display example in the main view

Table 6-10 Log screen: Display items of operating information in the main view

Display item		Display example	Description	Remarks
Operating information	Power ON Time	Total ** [h] ** per day [h/day] Rate ** [%]	Displays the time and composition ratio of each item per display period.	Displayed when "Operating Info." is selected in the setting view.
	Power OFF Time			
	Servo ON Time			
	Operating Time			
	Run Time			
	Servo ON Count	** [times]	Displays the current cumulative number of servo on times.	
	Operation Time	** [h]	Displays the current cumulative operating time (robot program running time).	
	Run Time	** [h]	Displays the current cumulative actual operating time (the time the motor was running).	
	Servo ON Time	** [h]	Displays the current cumulative servo on time.	
	Power ON Time	** [h]	Displays the current cumulative power on time.	

2) Robot information display

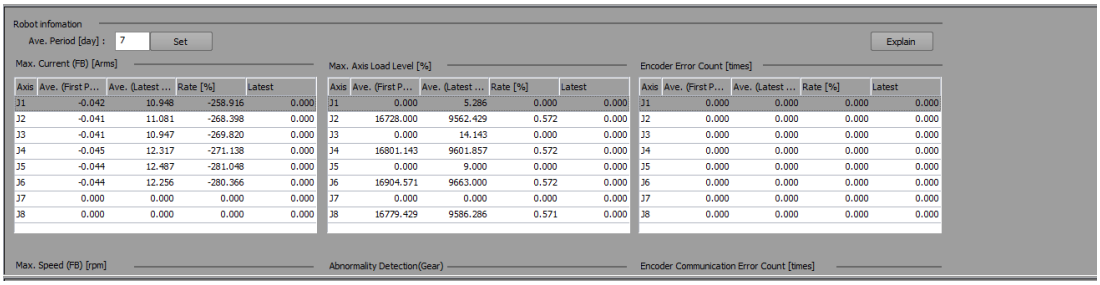


Fig. 6-9 Log screen: Robot information display example in the main view

Table 6-11 Log screen: Display items of robot information in the main view

Display item		Display example	Description	Remarks
Robot information	Ave. Period [day]	** [day]	Specifies the length of the start section average and end section average of the display. Pressing the Set button will reflect the display.	Displayed when "Robot" is selected in the setting view.
	Set	-		
	Max. Current [Arms]	** [Arms]	Displays the average value, rate of change, and the latest value of each axis item per display period. For the meaning of the displayed data, refer to "6.3.3 Stored data format".	
	Max. Axis Load Level [%]	** [%]		
	Max. Speed [rpm]	** [rpm]		
	Brakes Release Count [times]	** [times]		
	Abnormality Detection(Gear)	** [no unit]	Displays the average value, rate of change, and the latest value of each axis item per display period. For the meaning of the displayed data, refer to "6.4.5 Stored data format".	
	Encoder Error Count [times]	** [times]		
	Encoder communication error count [times]:	** [times]		
	Motor Cumulative Rotation Count [rev.]	** [rev.]		
	Motor Average Rotation Count [rev.]	** [rev.]		
	Explain	-	Pressing the button displays an explanatory image for the values in the table.	

3) Controller information display

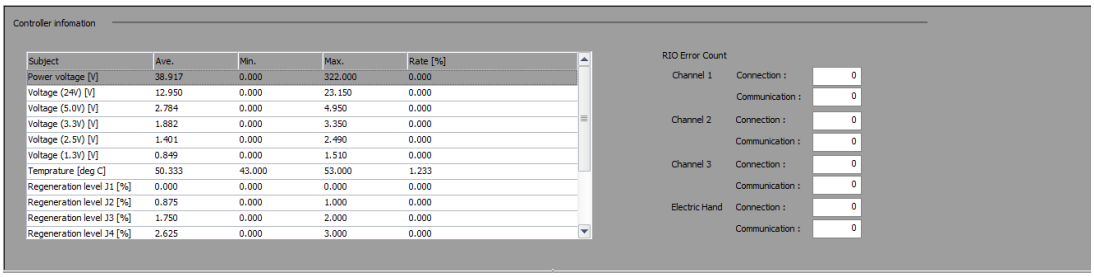


Fig. 6-10 Log screen: Controller information display example in the main view

Table 6-12 Log screen: Display items of controller information in the main view

Display item		Display example	Description	Remarks
Controller information	Power voltage [V]	** [V]	Displays the average value, rate of change, and the latest value of each axis item per display period. For the meaning of the displayed data, refer to "6.3.3 Stored data format".	Displayed when "Controller" is selected in the setting view.
	Voltage (24V) [V]			
	Voltage (5.0V) [V]			
	Voltage (3.3V) [V]			
	Voltage (2.5V) [V]			
	Voltage (1.3V) [V]			
	Temperature [deg C]	** [deg C]		
	Regeneration level [%]	** [%]		
	RIO Channel 1 Connection Error Count	** [times]	Displays the cumulative number of communication errors that occurred in the target item.	
	RIO Channel 1 Communication Error Count			
	RIO Channel 2 Connection Error Count			
	RIO Channel 2 Communication Error Count			
	RIO Channel 3 Connection Error Count			
	RIO Channel 3 Communication Error Count			
	RIO Electric Hand Connection Error Count			
	RIO Electric Hand Communication Error Count			

Chart view

In the chart view, the items that can be displayed and selected for the chart are changed according to the settings in the setting view. By selecting an item that can be displayed and selected and selecting items to be displayed in the chart, the time series data of the target items is displayed in the chart.

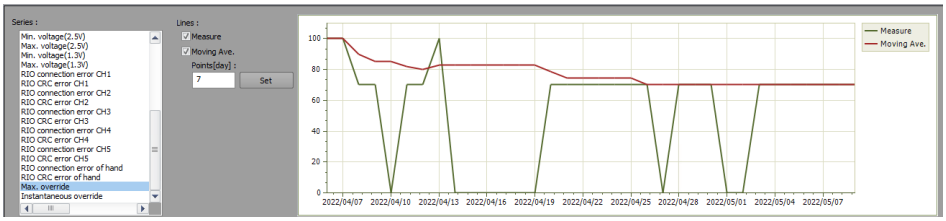


Fig. 6-11 Log screen: Chart view display example

Table 6-13 Log screen: Display items of the chart view

Setting view selection	Item that can be displayed and selected	Description	Remarks
Operation information	Controller power on time	Displays the robot controller power on time.	
	Servo on time	Displays the robot servo on time.	
	Operation time	Displays the robot program operation time.	
	Run time	Displays the time the motor was running.	
	Servo on count	Displays the number of times the servo has been turned on.	
Robot information	Servo speed	Displays the servo speed of the selected axis.	
	Brake release count	Displays the brake release count for the selected axis.	
	Maximum load factor	Displays the maximum load factor of the selected axis.	
	Maximum current value	Displays the maximum current value of the selected axis.	
	Maximum speed	Displays the maximum speed of the selected axis.	
	Maximum encoder temperature	Displays the maximum encoder temperature for the selected axis.	
	Maximum estimated torque error	Displays the maximum estimated torque error for the selected axis.	
	Wear rate (<parts>)	Displays the wear rate of the target part of the selected axis. The chart is displayed only when the predictive maintenance function is enabled.	Target parts: General mechanical parts (maintenance parts), general mechanical parts (overhaul parts), grease, timing belt, reduction gear, bearing, ball screw/spline
	Remaining time (<parts>)	Displays the remaining time of the target part of the selected axis. The chart is displayed only when the predictive maintenance function is enabled.	Target parts: General mechanical parts (maintenance parts) and servo on time (when to perform overhaul)
	Wear status (<parts>)	Displays the wear status of the target parts of the selected axis. The chart is displayed only when the predictive maintenance function is enabled.	Target parts: General mechanical parts (maintenance parts), general mechanical parts (overhaul parts), grease, timing belt, reduction gear, bearing, ball screw/spline, servo on time (when to perform overhaul)

Setting view selection	Item that can be displayed and selected	Description	Remarks
Robot information	Abnormality detection score on the previous day (<parts>)	Displays the abnormality detection score up to the previous day for the target part of the selected axis. The chart is displayed only when the predictive maintenance function is enabled.	Target parts: reduction gear, encoder data, encoder communication
Controller information	Maximum regenerative level	Displays the maximum regenerative level of the robot controller.	
	Maximum controller internal temperature	Displays the maximum temperature in the robot controller panel.	
	Maximum control voltage (*V)	Displays the maximum control voltage for the selected voltage system.	
	Minimum control voltage (*V)	Displays the minimum control voltage for the selected voltage system.	
	Number of RIO (channel) connection errors	Displays the number of connection errors for the selected channel.	
	Number of RIO (channel) CRC errors	Displays the number of communication errors for the selected channel.	
	Maximum override	Displays the maximum override setting value of the day of data acquisition.	
	Instantaneous override value	Displays the override setting value at the time of data acquisition.	

Table 6-14 Log screen: Setting items of the chart display

Setting	Description	Display method
Measure	Charts the values recorded in the log file.	Solid line
Moving Ave.	Displays the moving average value in a chart. The number of moving average points can be changed by entering numerical values and pressing the Set button.	Solid line
Total	The cumulative value from the start point is displayed in a chart.	Solid line
Estimation	Displays the prediction line for the cumulative value.	Dashed line

6.3.4.4 Other reference methods

The data files shown in "6.3.3 Stored data format" can also be referenced on the computer by using the communication middleware "MelfaRXM.ocx" included in the DVD-ROM of RT ToolBox3. For the reference methods, refer to "8.6 How to manipulate data on the iQ Care MELFA Support SD card".

6.3.5 Precautions

This section describes precautions to be observed when using the condition management function.

(1) If there is insufficient space on the SD card, condition management data will not be saved. Use the data backup function of RT ToolBox3 regularly to reserve the data capacity of the SD card. For details on how to back up data on the SD card, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".
(2) If the log data "mntdat_[RCSERIAL].csv" and "ppmdat_[RCSERIAL].csv" referenced by the condition management function are deleted from the iQ Care MELFA Support SD card, the saved data history cannot be referenced. Be careful not to accidentally edit or delete files.
(3) If the robot controller has been turned off during the condition management data saving time, the data will not be saved. The data of the date and time when the data was not saved is recorded in the log file as blank.
(4) Predictive maintenance data is recorded only when the predictive maintenance function is enabled. When the predictive maintenance function is disabled, "-1" is recorded in the file as invalid indication.
(5) For details on the usage period and the stored contents of the predictive maintenance data, refer to "6.4 Predictive maintenance function".
(6) The saving time of data saved by the condition management function may be delayed depending on how the robot is moving in the process of data saving.
(7) The saving process time of data saved by the condition management function may take long depending on how the robot is moving in the process of data saving.
(8) Data saving and data reference using RT ToolBox3 may take long depending on how the robot is moving.
(9) If the time setting of the robot controller is changed, the saving process time of data saved by the condition management function may take long temporarily.

6.4 Predictive maintenance function

6.4.1 Outline of functions

The predictive maintenance function in iQ Care MELFA Support can use all the preventive maintenance functions and predictive maintenance functions that can be used in MELFA Smart Plus (optional). In addition, information related to the predictive maintenance of robots using iQ Care MELFA Support can be automatically saved to the memory area of the SD card and checked together with the data saved by the condition management function.
In addition to viewing the collected data from a dedicated screen on RT ToolBox3, the data is saved in the csv file format, so you can use it for your own data aggregation.

This function can only be used during period of warranty by the warranty extension service or for one year after the iQ Care MELFA Support SD card is inserted. For continued use, you must subscribe to one of iQ Care MELFA Support services or purchase a MELFA Smart Plus card.

The content of the preventive maintenance function and predictive maintenance function that can be used with MELFA Smart Plus (optional) is the same as the predictive maintenance function in iQ Care MELFA Support. Please prepare the "BFP-A3663 Predictive Maintenance Function User's Manual" beforehand, and refer to it for details of the functions and how to use them.

Table 6-15 Function overview of the predictive maintenance function

	Function	Summary	MELFA Smart Plus	Reference manual
1	Maintenance simulation	This function estimates the timing of part replacement and maintenance recommendations when a specified operation pattern is repeated during simulations on an actual machine or RT ToolBox3. It can also be used for preliminary examination of maintenance cycles and for verification of the operation of parts-friendly robots.	A type B type card pack (common)	BFP-A3663 Predictive Maintenance Function User's Manual
2	Wear calculation function	This function calculates the wear ratio [%] of robot components from the actual operating status of the robot (motor speed, load status, etc.), and displays and notifies the period until maintenance inspection and overhaul. It supports efficient maintenance, such as notification of maintenance timing and maintenance prioritization.	A type B type card pack (common)	BFP-A3663 Predictive Maintenance Function User's Manual
3	Fault detection function	This function detects abnormality and deterioration of robot components as soon as possible. Even if there is no additional sensor or computer for analysis, the robot controller alone detects an error in the reduction gear or encoder. Abnormalities can be detected earlier and downtime can be reduced.	B type card pack (common)	BFP-A3663 Predictive Maintenance Function User's Manual
4	Predictive maintenance data Log output (calculation of wear ratio)	Data related to predictive maintenance and preventive maintenance calculated by the wear calculation function and fault detection function is compiled into a file and output as log data. With the condition management function (refer to 6.3 Condition management function), the output data can be checked by showing it in a chart that includes a specified item and time series data over a specified period of time. Maintenance and abnormality detection can be carried out more efficiently to further reduce downtime.	None	This document
5	Predictive maintenance data Log output (abnormality detection)		None	

6.4.2 Usage conditions of the predictive maintenance function

Unlike other monitoring-service functions, predictive maintenance functions in iQ Care MELFA Support are limited in usable time. Please note that the usable time varies depending on the service package of iQ Care MELFA Support you purchased.
When using MELFA Smart Plus (optional) together with the predictive maintenance function or the preventive maintenance function, the product can be used without limitation. However, some functions (abnormality detection) will expire when using MELFA Smart Plus A type.

Table 6-16 Conditions to use the predictive maintenance function

	Function	Warranty extension service			Inspection service		
		iQ Care MELFA Support only	Combined use of MELFA Smart Plus A type	Combined use of MELFA Smart Plus Card pack or B type	iQ Care MELFA Support only	Combined use of MELFA Smart Plus A type	Combined use of MELFA Smart Plus Card pack or B type
1	Maintenance simulation	No limit	No limit	No limit	No limit	No limit	No limit
2	Wear calculation function	Available only within warranty period	No limit	No limit	Available only for one year after inserting the SD card	No limit	No limit
3	Fault detection function	Available only within warranty period	Available only within warranty period	No limit	Available only for one year after inserting the SD card	Available only for one year after inserting the SD card	No limit
4	Preventive maintenance data Log output (calculation of wear ratio)	Available only within warranty period	No limit	No limit	Available only for one year after inserting the SD card	No limit	No limit
5	Predictive maintenance data Log output (abnormality detection)	Available only within warranty period	Available only within warranty period	No limit	Available only for one year after inserting the SD card	Available only for one year after inserting the SD card	No limit

6.4.3 How to use the predictive maintenance function

6.4.3.1 Enabling the predictive maintenance function

To enable the predictive maintenance function, the function enable parameter must be set while the iQ Care MELFA Support SD card is inserted in the robot controller. Use the teaching pendant or RT ToolBox3 to set the corresponding parameters.

Table 6-17 Predictive maintenance function enabling parameter

Parameter	Parameter name	Number of elements	Description	Default setting value
Enable predictive maintenance function	PMENA	Integer 1	Enables the predictive maintenance function. Setting range 1 (enabled), 0 (disabled)	0

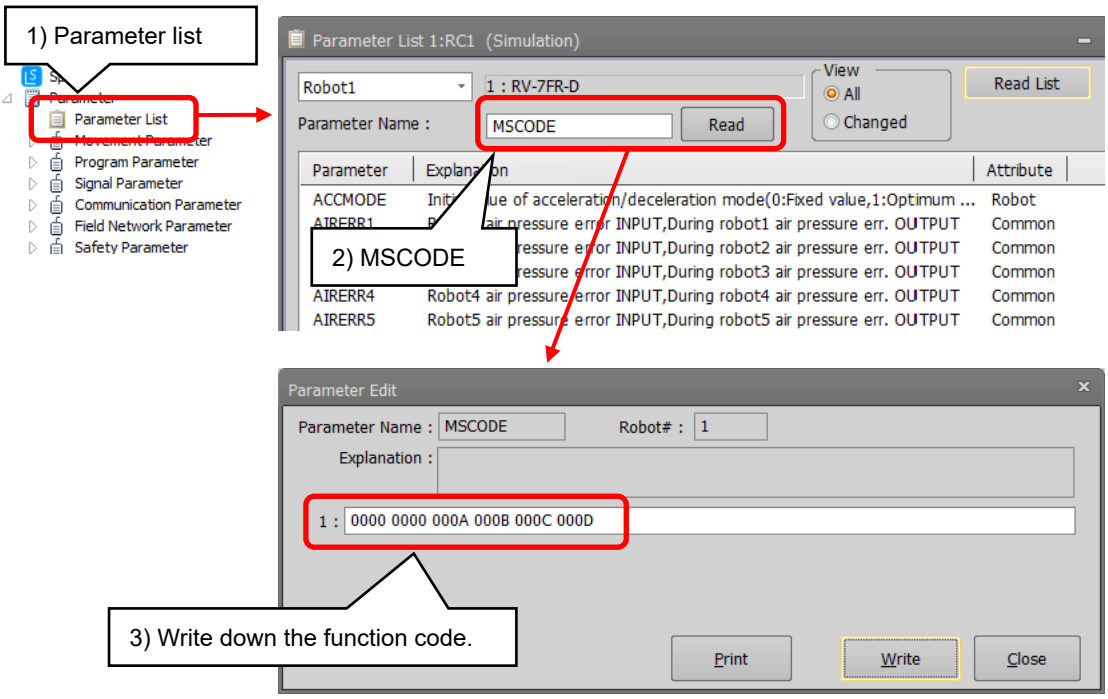
6.4.3.2 Initial setting of the predictive maintenance function

You can set how to notify you when parts are exhausted, specify how to notify you when a warning occurs, and so on.
For the setting procedure, refer to "Initial setting of the predictive maintenance function" in the "BFP-A3663 Predictive Maintenance Function User's Manual".

6.4.3.3 Setting maintenance simulation

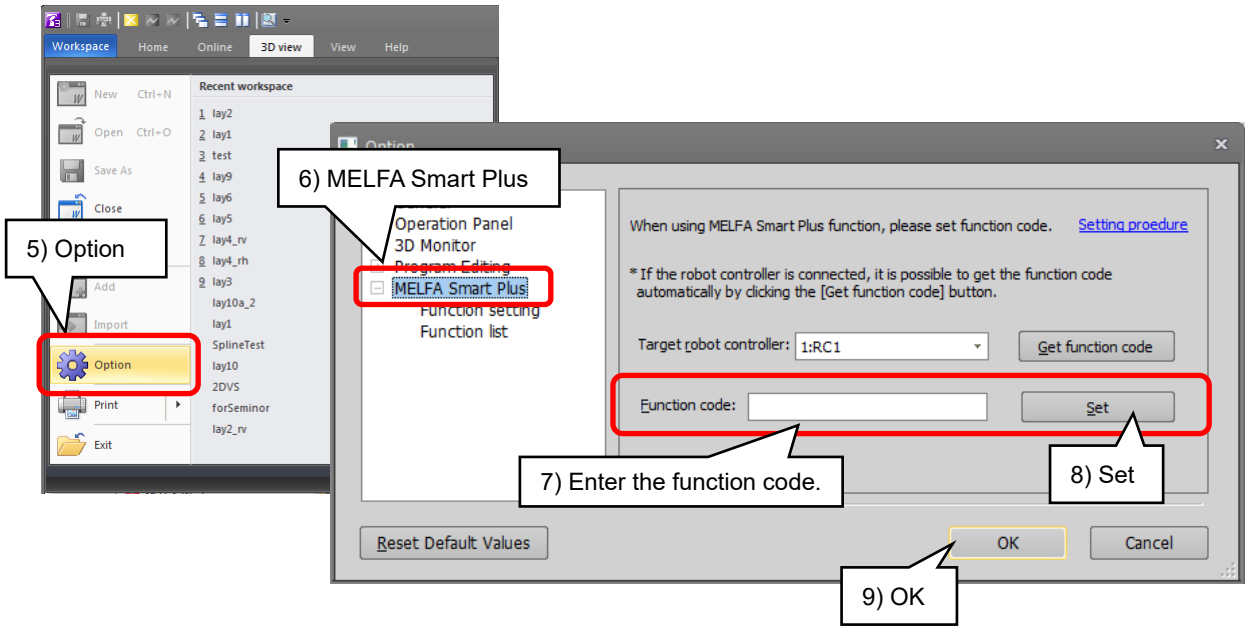
To enable the maintenance simulation function using the iQ Care MELFA Support SD card, you need to set the function code of iQ Care MELFA Support. Perform the setting according to the following procedure from the robot controller in which "6.4.3.1 Enabling the predictive maintenance function" is completed.

1) Connect RT ToolBox3 to the robot controller. Select [Parameter List] from the project tree.
2) Enter "MSCODE" in the Parameter Name field in the Parameter List window, and press the Read button.
3) Write down the function code (24 alphanumeric characters) displayed in the "Parameter Edit" window.



* The parameter "MSCODE" can also be read by the teaching pendant.

4) Exit RT ToolBox3 once. Right-click on the RT ToolBox3 desktop icon and select Run as administrator.
5) Select [Option] from the Workspace tab.
6) Select [MELFA Smart Plus] from the tree structure on the left of the Option window.
7) Enter the function code described in step 3) in the "Function code" field.
8) Press the Set button.
9) Press OK to restart RT ToolBox3.



6.4.3.4 Log output setting of predictive maintenance data

iQ Care MELFA Support's predictive maintenance function logs wear and abnormality detection data in addition to MELFA Smart Plus's preventive maintenance and predictive maintenance functions, and stores them in the SD card at one-day intervals. This setting is a common parameter to the condition management function. For details of the condition management function, refer to "6.3 Condition management function".

Table 6-18 Parameters related to the predictive maintenance data log

Parameter	Parameter name	Number of elements	Description	Default setting value
Maintenance data/predictive maintenance data saving interval [day]	MSMAIVL	Integer 1	Sets whether to save data related to the condition management. Setting range 1 (once every day), -1 (disabled)	1
Last saving time of maintenance data/predictive maintenance data	MSMATP	String 1	Displays the last saving time of maintenance data and predictive maintenance data. (Read only)	-
Next saving time of maintenance data/predictive maintenance data	MSMATN	String 1	Displays the next saving time of maintenance data and predictive maintenance data. (Read only)	-
Saving time of maintenance data/predictive maintenance data	MSMAT	Integer 3	Sets the time to back up data related to condition management. * Data saving may not start at the specified time depending on how the robot is moving at the specified saving time. Element 1: Hour Setting range 0 to 23 Element 2: Minute Setting range 0 to 59 Element 3: Second Setting range 0 to 59	14, 0, 0

6.4.4 Predictive maintenance function

6.4.4.1 Functions common with the preventive/predictive maintenance of MELFA Smart Plus

Refer to the corresponding chapters in the "BFP-A3663 Predictive Maintenance Function User's Manual" for how to refer to the basic screens for predictive/preventive maintenance using RT ToolBox3, as well as how to use the wear calculation function, fault detection function, and maintenance simulation.

6.4.4.2 Predictive maintenance function supported in iQ Care MELFA Support

The iQ Care MELFA Support monitoring service enables output of various types of maintenance data such as the wear ratio of robot components calculated by MELFA Smart Plus's predictive/preventive maintenance function and the component error/deterioration detection as daily log data. The output data are stored on the iQ Care MELFA Support SD card periodically. The stored data can be referenced on the log screen of the condition management function. Since the data is saved in csv file format, it can also be used for your own data aggregation.

6.4.5 Stored data format

The data related to the predictive maintenance function is saved in the iQ Care MELFA Support SD card in the following file format. This file is periodically overwritten according to the set data acquisition interval. Do not delete the target file. Doing so disables checking of the accumulated data.

Table 6-19 Predictive maintenance function: Saved file information

Folder/file name		Description	Backup recommended	Remarks
ppmdat	ppmdat_[RCSERIAL].csv	Files saved by the predictive maintenance function.	✔	

* [RCSERIAL]: Robot controller serial number of the robot to be serviced

Table 6-20 List of data acquired by the predictive maintenance function

No.	Label name		Unit	Description	Remarks
1	Power on time from the previous overhaul		[hour]	Displays the cumulative power on time from the previous overhaul.	
2	Servo on time from the previous overhaul		[hour]	Displays the cumulative servo on time from the previous overhaul.	
3	Operation time from the previous overhaul		[hour]	Displays the cumulative operation time (robot program running time) from the previous overhaul.	
4	Actual operation time from the previous overhaul		[hour]	Displays the cumulative time of actual operating (motor running time) from the previous overhaul.	
5	Servo on count from the previous overhaul		[times]	Displays the cumulative number of servo on times from the previous overhaul.	
6	Motor rotation count from the previous overhaul		[rev.]	Displays the number of motor revolutions for each axis from the previous overhaul.	
7	Consumption degree	Mechanism total (maintenance parts)	[%]	Displays the wear ratio of general mechanical parts (maintenance parts (grease and timing belts)).	
8		Mechanism total (overhaul parts)	[%]	Displays the wear ratio of general mechanical parts (overhaul parts (reduction gears, bearings, ball screws, and ball splines)).	
9		Grease	[%]	Displays the wear ratio of grease for each axis.	
10		Timing belt	[%]	Displays the wear ratio of the timing belt for each axis.	
11		Reduction gear	[%]	Displays the wear ratio of the reduction gear for each axis.	
12		Bearing	[%]	Displays the wear ratio of the bearing for each axis.	
13		Ball screw / ball spline	[%]	Displays the wear ratio of the ball screw/ball spline for each axis.	
14	Remaining time	Mechanism total (maintenance parts)	[hour]	Displays the remaining time of general mechanical parts (maintenance parts (grease and timing belts)).	
15		Servo on time(at overhaul implementation)	[hour]	Displays the remaining time until the specified overhaul time for the cumulative servo on time.	
16	Consumption status	Mechanism total (maintenance parts)	-	Displays the wear status of general mechanical parts (maintenance parts (grease and timing belts)). 0: good, 1: warning, 2: error	
17		Mechanism total (overhaul parts)	-	Displays the wear status of general mechanical parts (overhaul parts (reduction gears, bearings, ball screws, and ball splines)). 0: good, 1: warning, 2: error	

No.	Label name		Unit	Description	Remarks
18	Consumption status	Servo on time(at overhaul implementation)	-	Displays the arrival status of until the specified overhaul time for the cumulative servo on time. 0: good, 1: warning, 2: error	
19		Grease	-	Displays the wear status of grease for each axis. 0: good, 1: warning, 2: error	
20		Timing belt	-	Displays the wear status of the timing belt for each axis. 0: good, 1: warning, 2: error	
21		Reduction gear	-	Displays the wear status of the reduction gear for each axis. 0: good, 1: warning, 2: error	
22		Bearing	-	Displays the wear status of the bearing for each axis. 0: good, 1: warning, 2: error	
23		Ball screw / ball spline	-	Displays the wear status of the ball screw/ball spline for each axis. 0: good, 1: warning, 2: error	
24	Abnormality score of the previous day (reduction gear)		-	Displays the abnormality detection score of the reduction gear for each axis up to the previous day.	Only when fault detection function is enabled.
25	Date of the previous day (reduction gear)		[yyMMdd]	Displays the abnormality detection score display date for the reduction gear.	
26	Encoder data abnormality score of the previous day		-	Displays the abnormality detection score of encoder data for each axis up to the previous day.	
27	Date of the previous day (encoder data)		[yyMMdd]	Displays the abnormality detection score display date for the encoder data.	
28	Encoder communication abnormality score of the previous day		-	Displays the abnormality detection score of encoder communication for each axis up to the previous day.	
29	Date of the previous day (encoder communication)		[yyMMdd]	Displays the abnormality detection score display date for encoder communication.	
30	Abnormality detection status (reduction gear)		-	Displays the abnormality detection status of the reduction gear for each axis.	
31	Abnormality detection status (encoder data abnormality)		-	Displays the abnormality detection status of encoder data for each axis.	
32	Abnormality detection status (encoder communication abnormality)		-	Displays the abnormality detection status of encoder communication for each axis.	
33	Abnormality detection status (battery voltage status)		-	Displays the battery voltage abnormality detection status.	

* For details on acquired data, refer to the "BFP-A3663 Predictive Maintenance Function User's Manual".

6.4.6 How to refer to stored data

6.4.6.1 Functions common with the preventive/predictive maintenance of MELFA Smart Plus

Refer to the corresponding chapters in the "BFP-A3663 Predictive Maintenance Function User's Manual" for how to refer to the basic screens for predictive/preventive maintenance using RT ToolBox3, as well as how to use the wear calculation function, fault detection function, and maintenance simulation.

6.4.6.2 Predictive maintenance function supported in iQ Care MELFA Support

The data regularly stored on the iQ Care MELFA Support SD card in the monitoring service of iQ Care MELFA Support can be viewed from the log screen of the condition management function. For information on the log screen of the condition management function, refer to "6.3.4.3 Log screen".

When iQ Care MELFA Support is enabled, the parameters related to the predictive maintenance function can be checked. Parameters related to this function are shown below.

Table 6-21 Parameters related to the iQ Care MELFA Support predictive maintenance function

Parameter	Parameter name	Number of elements	Description		Remarks
Predictive maintenance function status	MSPMSTS	Integer 1	Enabled 2, 3, 4	Indicates whether the predictive maintenance function of iQ Care MELFA Support is enabled.	
			Disable 0, 1, 5, 6		
Start time of predictive maintenance function usage	MSPMTST	String 1	Indicates the start time of the usable period of the predictive maintenance function for the service currently in use.		yyyy/MM/dd HH:mm:ss notation

6.4.6.3 Other reference methods

The data files shown in "6.4.5 Stored data format" can also be referenced on the computer by using the communication middleware "MelfaRXM.ocx" included in the DVD-ROM of RT ToolBox3. For the reference methods, refer to "8.6 How to manipulate data on the iQ Care MELFA Support SD card".

6.4.7 Precautions

This section describes precautions to be observed when using the predictive maintenance function.

(1) If there is insufficient space on the SD card, condition management data will not be saved. Use the data backup function of RT ToolBox3 regularly to reserve the data capacity of the SD card. For details on how to back up data on the SD card, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".
(2) If the log data "ppmdat_[RCSERIAL].csv" referenced by the condition management function is deleted from the iQ Care MELFA Support SD card, the saved data history cannot be referenced. Be careful not to accidentally delete the file.
(3) If the robot controller has been turned off during the condition management data saving time, the data will not be saved. The data of the date and time when the data was not saved is recorded in the log file as blank.
(4) Predictive maintenance data is recorded only when the predictive maintenance function is enabled. When the predictive maintenance function is disabled, "-1" is recorded in the file as invalid indication.
(5) The saving time of data saved by the predictive maintenance function may be delayed depending on how the robot is moving in the process of data saving.
(6) The saving process time of data saved by the predictive maintenance function may take long depending on how the robot is moving in the process of data saving.
(7) If the time setting of the robot controller is changed, the saving process time of data saved by the predictive maintenance function may take long temporarily.

6.5 Oscillograph function

6.5.1 Overview of the function

The oscillograph function is used to compile time series data of devices that can be referenced by the real time monitor function of RT ToolBox3, such as motor current values and load ratios of individual axes, into files, which are stored periodically on the SD card. The saved data can be viewed in RT ToolBox3 using the real time monitor function. Collecting high-speed processing data, which is difficult to collect under normal usage conditions, helps users to utilize data in a wide range of applications, including checking the condition of aging due to continued use of robots and checking detailed data to identify malfunctioning parts.
The collected data can be viewed in the real time monitor screen on RT ToolBox3, and the data saving interval can be set by the user.

6.5.2 How to set the data saving interval

The oscillograph function periodically acquires data at intervals set by parameters and saves the data in the SD card. Robot parameters related to the oscillograph function are as follows. To change the data saving interval/saving time or stored data content, change the settings of corresponding parameters using the teaching pendant or RT ToolBox3.

Table 6-22 Parameters related to the oscillograph function

Parameter	Parameter name	Number of elements	Description	Default setting value
Saving interval of oscillograph data [day]	MSOSIVL	Integer 1	Sets the interval (unit: day) at which oscillograph data is to be acquired. Setting range 1 to 3660 (enabled), -1 (disabled)	1
Saving time of oscillograph data	MSOST	Integer 3	Sets the time at which the oscillograph data is to be acquired. * Data saving may not start at the specified time depending on how the robot is moving at the specified saving time. Element 1: Hour Setting range 0 to 23 Element 2: Minute Setting range 0 to 59 Element 3: Second Setting range 0 to 59	14, 0, 0
Last saving time of oscillograph data	MSOSTP	String 1	Displays the last saving time of oscillograph data. (Read only)	-
Next saving time of oscillograph data	MSOSTN	String 1	Displays the next saving time of oscillograph data. (Read only)	-
Selection of oscillograph data	MSOSD	Integer 4	Selects the type of data to be acquired by the oscillograph function. For information on the types of data, refer to "6.5.3 Stored data format". Element 1: Data 1 Element 2: Data 2 Element 3: Data 3 Element 4: Data 4	1 (motor current value), 6 (joint position feedback), 9 (motor rotation speed), 29 (robot information)
Oscillograph data time	MSOSL	Integer 1	Sets the time (data acquisition length in seconds) for which oscillograph data is to be acquired. Setting range: 1 to 30	30

6.5.3 Stored data format

The data related to the oscillograph function is saved in the iQ Care MELFA Support SD card in the following file format. Up to four types of data can be acquired per file. For each type of data, data is saved in the csv file. The value is acquired in 3.5ms cycle (CR800-D/CR800-R) or 7.1ms cycle (CR800-Q).

Table 6-23 Oscillograph function: Saved file information

Folder/file name		Description	Backup recommended	Remarks
oscdat	[RCSERIAL]_yyyyMMdd-HHmmss.csv	Files saved by the oscillograph function.	✔	

* [RCSERIAL]: Robot controller serial number of the robot to be serviced
* yyyyMMdd-HHmmss : Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minute (2 digits), second (2 digits)

Table 6-24 List of data displayed in the graph of the oscillograph function

MSOSD setting	Notation on graph	Unit	Description
0	-	-	No data acquisition
1	Current feedback	[Arms]	Motor current value of each axis
2	Axis load level	[%]	Motor load ratio of each axis displayed as an alarm level
3	Position feedback	[Pulse]	Motor rotation position of each axis displayed as encoder pulse value
4	Joint position(CMD)	[mm deg]	Current position of each joint
5	XYZ position(CMD)	[mm deg]	Current position of XYZ coordinate
6	Joint position (FB)	[deg]	Feedback position of each joint
7	XYZ position (FB)	[mm deg]	Feedback position of XYZ coordinate
8	Position droop	[Pulse]	Deviation amount of the motor rotation position with respect to the position command of each axis
9	Speed (FB)	[rpm]	Current motor rotation speed of each axis
10	Voltage	[V]	Power supply voltage value
11	RMS current	[Arms]	Effective motor current (RMS) of each axis
12	Regeneration level	[%]	Regenerative current value of each axis displayed as an alarm level
13	Encoder temperature	[deg C]	Encoder temperature of each axis
14	Current command	[Arms]	Current command to the motor of each axis
15	Tolerable command +	[Arms]	+ side of the current command set for the motor of each axis
16	Tolerable command -	[Arms]	- side of the current command set for the motor of each axis
17	Force sensor	[N Nm]	Input value from the force sensor
18	Force sensor(+resultants)	[N Nm]	Input value (resultant force and resultant moment) from the force sensor
19	Force pos CMD(XYZ)	[mm rad]	Move command calculated by force sense control
20	COL threshold +	[0.1%] Ratio to the rated current	Upper detection threshold (+ side) of the collision detection function
21	COL threshold -	[0.1%] Ratio to the rated current	Upper detection threshold (- side) of the collision detection function
22	COL presumed torque	[0.1%] Ratio to the rated current	Estimated torque of the collision detection function
23	COL torque	[0.1%] Ratio to the rated current	Actual torque of the collision detection function
24	Ref. value of COL level	[%]	Displays the difference between the estimated torque and the actual torque for collision detection level (ColLvl command, parameter COLLVL, COLLVLJG setting). The value is displayed while the collision detection is enabled and the servo is on.
25	Error of presumed torque	[% rating]	Displays the absolute value of difference between the estimated torque of each axis and the actual torque. The value is displayed only when torque width monitoring is enabled for the safety option.

MSOSD setting	Notation on graph		Unit	Description
26	Ex-T coordinates speed		[mm/s]	Ex-T coordinate transit speed during Ex-T control/Ex-T spline interpolation
27	Ex-T coordinates position		[mm deg]	Ex-T coordinate transit speed during Ex-T control/Ex-T spline interpolation
28	Spline path point of adjusted speed		-	Path point number on which speed adjustment occurred during spline interpolation/Ex-T spline interpolation
29	Robot information	Tool point speed(FB)	[mm/s]	Speed (feedback value) of the tool center point
		Remaining distance(FB)	[mm]	Remaining distance (feedback value) to the target position for interpolation in progress
		Tool point speed(CMD)	[mm/s]	Speed (command value) of the tool center point
		Remaining distance(CMD)	[mm]	Remaining distance (command value) to the target position for interpolation in progress
		Gap of CMD and FB	[mm]	Difference between the commanded position and the feedback position
		Transport factor(CMD)	[%]	Arrival rate (command value) to the target position during operation
		Acceleration state(CMD)	-	Acceleration status during operation (command value) [0 = stop, 1 = acceleration, 2 = constant speed, 3 = deceleration] is displayed.
		Controller temperature	[deg C]	Temperature inside the robot controller panel
30	Safety input		-	Signal status that is turned on when either safety input signal A or safety input signal B is off
31	Safety input signal A		-	Input signal status (128 to 135)
32	Safety input signal B		-	Input signal status (160 to 167)
33	SCNI Signal		-	Input signal status (1264 to 1271)
	INPUT		-	Input signal status of 32 consecutive points
	OUTPUT		-	Output signal status of 32 consecutive points
34	Predictive maintenance score (speed reducer abnormality)		-	Current abnormality detection score of the reduction gear (harmonic drive)
35	Predictive maintenance score (encoder data error)		-	Current abnormality detection score of encoder data
36	Predictive maintenance score (encoder communication error)		-	Current abnormality detection score of encoder communication

6.5.4 How to refer to stored data

The saved oscillograph data can be viewed in RT ToolBox3 using the real time monitor function. Remove the iQ Care MELFA Support SD card from the robot controller, transfer the relevant data to a computer with RT ToolBox3 installed, and refer to the data.
For details on how to use the real time monitor function, refer to "Realtime monitor" in the "RT ToolBox3/RT ToolBox3 mini User's Manual".
The data files shown in "6.5.3 Stored data format" can also be referenced on the computer by using the communication middleware "MelfaRXM.ocx" included in the DVD-ROM of RT ToolBox3. For the reference methods, refer to "8.6 How to manipulate data on the iQ Care MELFA Support SD card".

6.5.5 Precautions

This section describes precautions to be observed when using the oscillograph function.

(1) If there is insufficient space on the SD card, condition management data will not be saved. Use the data backup function of RT ToolBox3 regularly to reserve the data capacity of the SD card. For details on how to back up data on the SD card, refer to "8.3 Backing up data on the iQ Care MELFA Support SD card".
(2) The saving time of data saved by the oscillograph function may be delayed depending on how the robot is moving in the process of data saving.
(3) The saving process time of data saved by the oscillograph function may take long depending on how the robot is moving in the process of data saving.
(4) If the time setting of the robot controller is changed, the saving process time of data saved by the oscillograph function may take long temporarily.

6.6 Drive recorder function

6.6.1 Outline of functions

If a specified error occurs in the robot that uses iQ Care MELFA Support, the error will trigger the drive recorder function to store logs of servo data for several seconds before and after the error occurrence. The saved log data can be viewed in RT ToolBox3 using the real time monitor function. Once an error occurs, data will be generated. Data before and after the problem can be referenced using the drive recorder function. The data is useful for applications such as investigating into the cause of the problem. Data only for the specific time interval can be acquired, minimizing storage space.

6.6.2 How to use the drive recorder function

The drive recorder function can be used without performing special operation for function activation. A log file containing various types of data for four seconds (three seconds before and one second after the error occurrence) is saved automatically as a log file. For information on the settings of the error, refer to "6.6.3 How to set the drive recorder function".
Data is saved automatically, and the number of saved files is 10 max. If the number of saved files exceeds 10, the oldest file will be deleted.
Acquired log files are saved as files related to full backup data. They are saved in the backup data generated by the full backup function of RT ToolBox3.
For information on how to generate backup data in RT ToolBox3, refer to "Backup(Robot -> PC)" in the "RT ToolBox3 / RT ToolBox3 mini User's Manual".

6.6.3 How to set the drive recorder function

The errors that will trigger acquisition of data using the drive recorder function have been set before shipment. To change such errors, change the relevant parameter settings.

Table 6-25 List of parameters related to the drive recorder function

Parameter	Parameter name	Number of elements	Description	Default setting value
Specifying a trigger error number	SDLTRGE	Integer 16	Specify trigger error numbers (8 types max.). To change the settings, power off and on the robot controller after the parameter has been changed. Element 1: Trigger error No. #1 Setting range 0 (not specified), 1 to 9999 Element 2: Error No. #1 type specification* Setting range 0 (common error), 1 (axis error) Element 3: Trigger error No. #2 Setting range 0 (not specified), 1 to 9999 Element 4: Error No. #2 type specification* Setting range 0 (common error), 1 (axis error) ... Element 15: Trigger error No. #8 Setting range 0 (not specified), 1 to 9999 Element 16: Error No. #8 type specification* Setting range 0 (common error), 1 (axis error) * If the error number set to the trigger error number does not exist, no operation will be performed. * If an axis error is specified, the first digit of the trigger error number will be recognized as 0 for error check.	910 (overspeed), 1, 930 (motor overcurrent), 1, 960 (excessive margin 1), 1, 1010 (collision detection), 1, 920 (servo amplifier power module overcurrent), 1, 940 (power supply main circuit error), 0, 1680 (servo ON timeout), 0, 0, 0

6.6.4 Data that can be checked by the drive recorder function

The drive recorder function saves the following data as a log according to the trigger setting error. The saved data can be checked by using the oscillograph function of RT ToolBox3. For information on how to refer to saved data, refer to "6.6.5 How to refer to saved files".

Table 6-26 List of data that can be referenced using the drive recorder function

Label name	Item	Description	Remarks
Servo Command#1	Servo command #1	The information related to the servo command of the robot is output in the bit format. The following data is applicable. Bit0: Ready ON Bit1: Servo ON Bit2, Bit3: Not used normally. Bit4: Not used normally. Bit5: Not used normally. Bit7: Alarm reset Bit8, Bit9: Not used normally.	
Servo Command#2	Servo command #2	Not used normally.	
Servo Status#1	Servo status #1	The information related to the servo status of the robot is output in the bit format. The following data is applicable. Bit0: Ready ON Bit1: Servo ON Bit2, Bit3: Not used normally. Bit4: Not used normally. Bit5: Not used normally. Bit7: Alarm reset Bit8, Bit9: Not used normally. BitC: Not used normally. BitD: Not used normally. BitE: Not used normally. BitF: Warning occurring	
Servo Status#2	Servo status #2	Not used normally.	
Command Pulse	Position command	Indicates information on position commands of each axis.	
Feedback Pulse	Position feedback	Indicates information on position feedback of each axis.	
Velocity Feedback	Speed feedback	Indicates information on speed feedback of each axis.	
Torque Feedback	Torque feedback	Indicates information on torque feedback of each axis.	
Velocity Command	-	Not used normally.	
Current Command (q-axis)	-	Not used normally.	
Voltage	Bus voltage	Indicates information on the motor voltage.	
Position Droop	-	Not used normally.	

6.6.5 How to refer to saved files

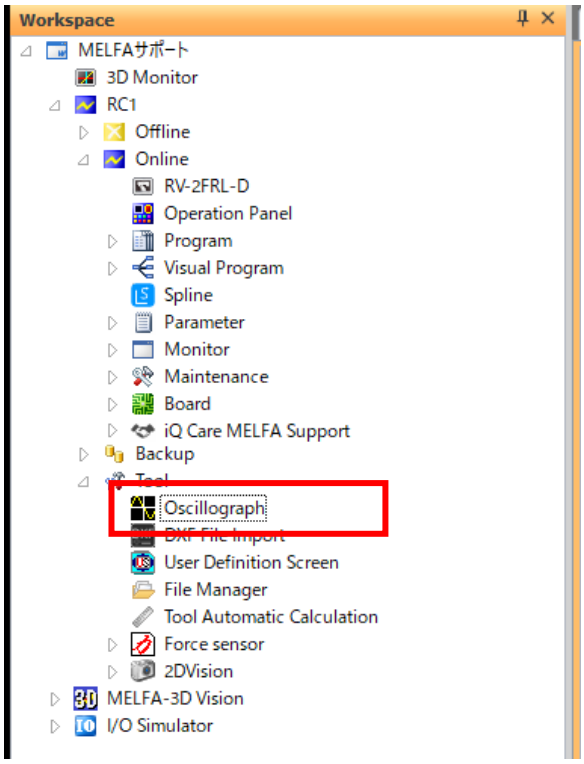
Log files are saved in the backup data, and the file name is "SDLog#*.sdl (* represents any number from 1 to 10)". Data can be referenced using the following steps. For details on how to use the oscillograph function, refer to "Oscillograph" in the "RT ToolBox3 / RT ToolBox3 mini User's Manual".

<How to acquire log files>

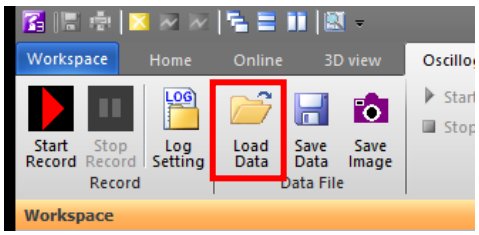
[Performing a full backup in RT ToolBox3]
1) Create full backup data of the target robot controller by referring to "Backup(Robot -> PC)" in the "RT ToolBox3 / RT ToolBox3 mini User's Manual".
2) SDLog#*.sdl is saved in the NG folder located in the created backup data folder.

<How to refer to log files>
To refer to log files in RT ToolBox3, the iQ Care MELFA Support function needs to be enabled (the iQ Care MELFA Support SD card needs to be inserted into the robot controller connected in online mode).

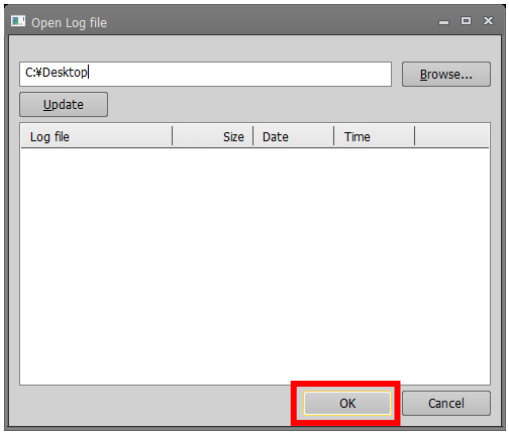
1) Select "Oscillograph" (accessed from "Online"-"Tool" in the tree structure on the RT ToolBox3 workspace in online mode).



2) After "Oscillograph" has started, select "Load Data" on the tool bar.



3) The "Open Log file" dialog will appear. Select a file (file extension: sdl) you want to check, then press OK.



6.6.6 Precautions

This section describes precautions to be observed when using the drive recorder function.

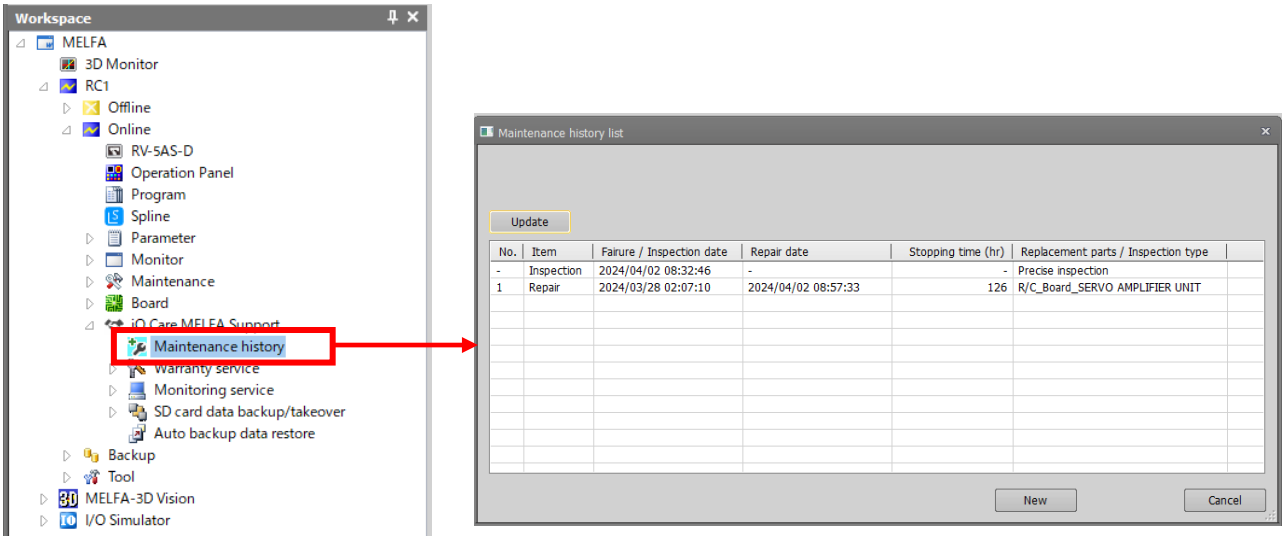
(1) Log data is automatically acquired according to the occurrence of specified errors. The oldest data is overwritten when the number of data increases. To prevent overwriting data, perform a full backup within a short period of time after an error occurs.
(2) To refer to log files in RT ToolBox3, the iQ Care MELFA Support function needs to be enabled (the iQ Care MELFA Support SD card needs to be inserted into the robot controller connected in online mode). If work, such as data saving, is performed while the iQ Care MELFA Support SD card is removed, data cannot be referenced.

6.7 Maintenance history function

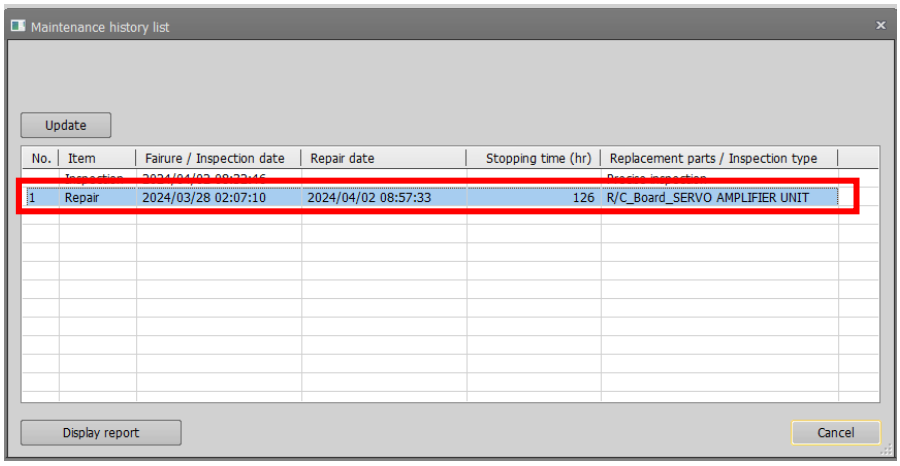
The maintenance history function is used to check the repair and inspection history. Service engineers can save the repair and inspection information to an SD card after the service. The information can be saved as a report and checked by the customer. Up to 50 maintenance histories can be viewed.

6.7.1 How to check the maintenance history

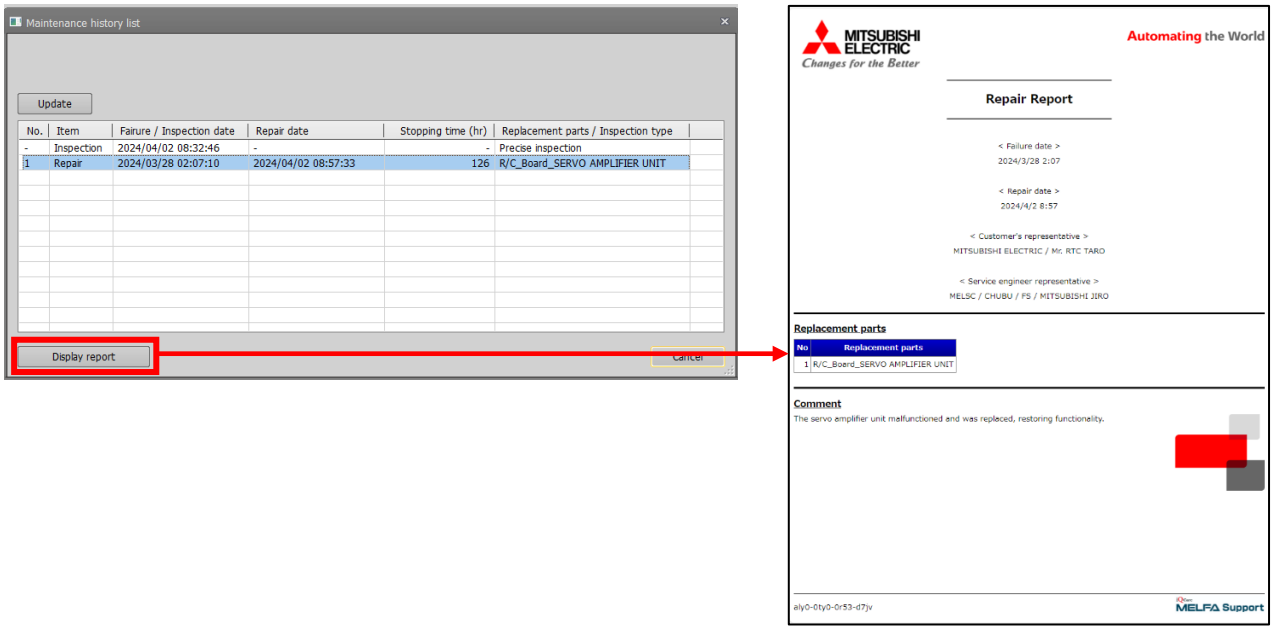
1) In RT ToolBox3 in the online state, select "Maintenance history" under "Online"-"iQ Care MELFA Support" in the tree structure on the workspace. The Maintenance history list screen will appear.



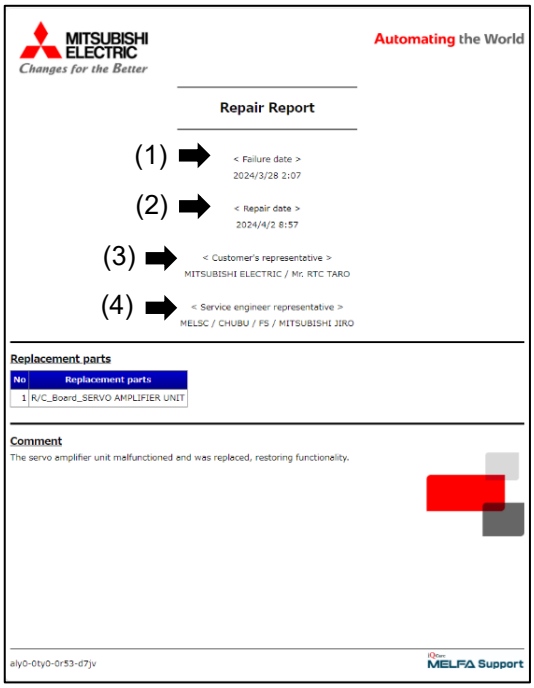
2) Select the history to be checked on the Maintenance history list screen. The Display report button will appear.



3) Press the Display report button. The report is displayed and the repair (or inspection) results can be checked.



■ Repair



■ Inspection service

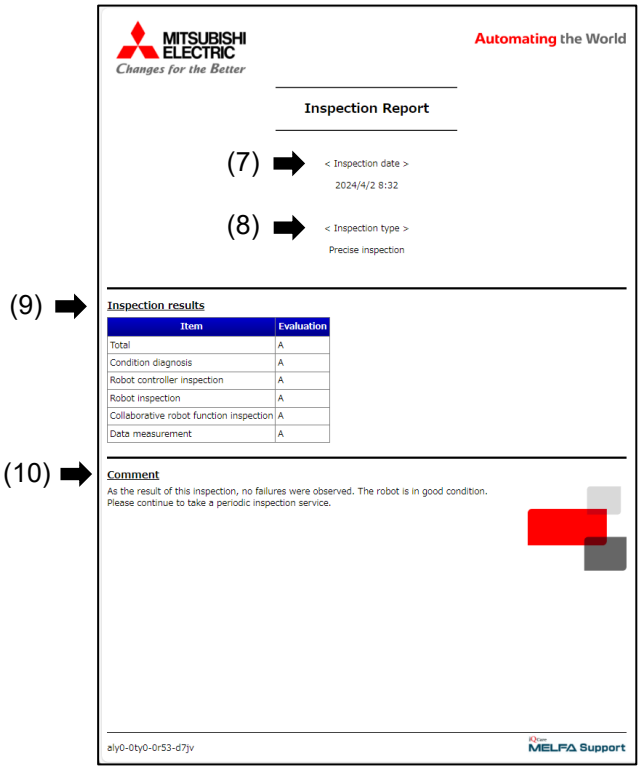


Fig. 6-12 Examples of displayed reports

Table 6-27 List of contents in the displayed reports

No.	Items	Contents	Display
(1)	Repair	Failure date	yyyy/MM/dd HH:mm
(2)		Repair date	yyyy/MM/dd HH:mm
(3)		Customer's representative	Company name
			Department name
			My name
(4)		Service engineer representative	Company name
			Location
			Affiliation
			My name
(5)		Replacement parts	Part name
(6)		Comment	Symptom (Cause, Action taken, Result etc.)
(7)	Inspection	Inspection date	yyyy/MM/dd HH:mm
(8)		Inspection type	Precise inspection or Light inspection
(9)		Inspection results	Judgment for each item
(10)		Comment	Evaluation based on inspection results (Robot condition, Repair recommendations etc.)

7 Error list

This chapter describes causes and solutions for iQ Care MELFA Support related errors.

The meaning of the error Nos. are show below.

□OOOO*

- ・An error marked with a * reset by turning the power OFF and ON. Take the measures given.
- ・The error type is indicated with a 4-digit number.
- ・Three types of error classes are indicated.
  - H: High level error.....The servo turns OFF.
  - L: Low level error.....The operation will stop.
  - C: Warning.....The operation will continue.

Table 7-1 Errors related to iQ Care MELFA Support

Error number	Causes and solutions	
C6201	Error message	MELFA Support is enabled
	Cause	MELFA Support function is enabled.
	Solution	Perform error reset before use.
C6202	Error message	Takeover is completed
	Cause	MELFA Support takeover is completed.
	Solution	Perform error reset before use.
L6203	Error message	Used SD card is invalid
	Cause	Used SD card is invalid.
	Solution	Use a new iQ Care MELFA Support SD card.
L6204	Error message	MELFA Support takeover is failed
	Cause	MELFA Support takeover is failed (ID is unmatched).
	Solution	Start with the correct combination of the robot, robot controller, and iQ Care MELFA Support SD card registered for the iQ Care MELFA Support service.
L6205	Error message	Failed to activate MELFA Support
	Cause	MELFA Support activation is failed (ID is unmatched).
	Solution	Start with the correct combination of the robot, robot controller, and iQ Care MELFA Support SD card registered for the iQ Care MELFA Support service.
H6206 *	Error message	Takeover file is abnormal
	Cause	Takeover file is saved in SD card abnormally.
	Solution	Remove the file for takeover (HISTORY.ser) in the iQ Care MELFA Support SD card. Then, perform the takeover operation again.
H6207 *	Error message	Identification is failed
	Cause	MELFA Support identification is failed.
	Solution	Contact the manufacturer.
L6208	Error message	Incompatible service package
	Cause	Warranty expansion service package is disabled to sign up.
	Solution	Receive inspection service beforehand. If the inspection results are acceptable, you can sign up for additional warranty.
L6209	Error message	Time configuration is abnormal
	Cause	Time configuration is abnormal.
	Solution	Set the correct time. If the error occurs even though the time is correct, the time setting of the controller may be incorrect. Refer to "8.7 Solutions if error L6209 occurs ".

Error number	Causes and solutions	
L6210	Error message	Warranty period will be expired
	Cause	Warranty period will be expired soon.
	Solution	To continue the warranty extension, take over to the additional warranty package.
C6211	Error message	Warranty period was expired
	Cause	Warranty period was expired.
	Solution	Have an inspection service when you sign up with the warranty extension service again.
C6212	Error message	Warranty expansion expired soon
	Cause	Warranty expansion service will be expired soon.
	Solution	When you extend the warranty, take over the service to the additional warranty package.
C6213	Error message	Predictive maintenance expired
	Cause	Predictive maintenance function was expired.
	Solution	When using the predictive maintenance function continuously, select a package to take over the service.
C6214	Error message	Please enable predictive maintenance function (PMENA)
	Cause	Predictive maintenance function is disabled.
	Solution	Enable the iQ Care MELFA Support predictive maintenance function. (Refer to "6.4.3.1 Enabling the predictive maintenance function".)
C6216	Error message	MELFA Support is deactivated (MELFA Support SD card not found)
	Cause	MELFA Support SD card communication error.
	Solution	Check that the iQ Care MELFA Support SD card is connected and restart the robot controller.
C6219	Error message	Cannot execute during RUN
	Cause	Cannot execute during operation
	Solution	Stop the operation, then try again.
C6220	Error message	Another data is being processed
	Cause	It is invalid for another data processing.
	Solution	The operation can be performed after other data processing is complete.
C6221	Error message	SD card was not found
	Cause	SD card was not found.
	Solution	Check the SD card connection.
C6222	Error message	Insufficient SD card memory
	Cause	SD card memory is insufficient.
	Solution	Back up the data on the SD card and delete the data, or use a new SD card.
C6225	Error message	Restoration error
	Cause	Unable to restore the backup data
	Solution	Use the backup data of the robot controller of the same model and the robot arm of the same model.
H6226 *	Error message	Restoration is completed
	Cause	Restoration is completed.
	Solution	Restart the robot controller.
C6227	Error message	Backup data is abnormal
	Cause	Backup data is abnormal. Backup may have failed in the middle of operation.
	Solution	Check that the backup data has been successfully acquired.
C6228	Error message	Maximum number of files exceeded
	Cause	The maximum number of files was saved already in the SD card.
	Solution	Back up the data on the iQ Care MELFA Support SD card and delete the data, or use a new SD card.
C6229	Error message	MELFA Support is deactivated (ID is unmatched)
	Cause	MELFA Support is deactivated (ID is unmatched).
	Solution	Start with the correct combination of the robot, robot controller, and iQ Care MELFA Support SD card registered for the iQ Care MELFA Support service.

Error number	Causes and solutions	
C6230	Error message	No MELFA Support SD card
	Cause	MELFA Support SD card is not inserted.
	Solution	Insert a valid iQ Care MELFA Support SD card.
C6231	Error message	Failed to open file
	Cause	Failed to open file because target file not found.
	Solution	Check that the SD card is installed properly, and restart the robot controller. If it recurs, contact the manufacturer.
C6232	Error message	Failed to write file
	Cause	Failed to write file
	Solution	Check that the media is installed properly, and restart the robot controller. Data of the file to be written to the media may be changed at the time of file writing. If a program including commands, such as PrmWrite, is running, reset the saving time so that the timing of file writing is set in the period during which the program is not running.
C6236	Error message	RAM is insufficient
	Cause	RAM is insufficient
	Solution	The robot controller RAM disk storage space was insufficient when saving the automatic backup data using the recovery function. Reduce the program size to reduce the capacity of the backup data, or change the setting of BKPRG so that program saving is not performed. Alternatively, restart the robot controller to delete temporary data inside the robot controller.
C6238	Error message	Maximum data size is exceeded
	Cause	Maximum data size of oscillograph data is exceeded.
	Solution	Check the parameter (MSOSL) for setting the time for the oscillograph data.
C6239	Error message	Maximum data size is exceeded
	Cause	Maximum data size of predictive maintenance data is exceeded.
	Solution	After backing up the predictive maintenance data, delete the file of iQ Care MELFA Support or reduce the number of saved data in the target file. When deleting the file, also delete the backup data (ppmdat_backup.ser) in the system folder.
C6240	Error message	Maximum data size is exceeded
	Cause	Maximum data size of maintenance data is exceeded.
	Solution	After backing up the maintenance data, delete the file in the iQ Care MELFA Support SD card or reduce the number of saved data in the target file. When deleting the file, also delete the backup data (mntdat_backup.ser) in the system folder.
C6241	Error message	Maximum data size is exceeded
	Cause	Maximum data size of inspection data is exceeded.
	Solution	The size of the inspection data file to be saved exceeds the upper limit of the storage memory. Reduce the data size of the inspection data.
C6242	Error message	Maximum data size is exceeded
	Cause	Maximum data size of history data is exceeded
	Solution	The size of the history data file to be saved exceeds the upper limit of the storage memory. Reduce the data size of the history data.
H6243 *	Error message	MELFA Support is reset
	Cause	MELFA Support information of controller is reset.
	Solution	Remove the iQ Care MELFA Support SD card and restart the robot controller. When replacing the robot arm or the robot controller, refer to "8.5 Changing the combination of the robot arm and the robot controller".
C6244	Error message	MELFA Support is deactivated
	Cause	MELFA Support is deactivated due to dead battery.
	Solution	Replace the battery of the robot arm.

Error number	Causes and solutions	
C6245	Error message	Failed to open history file
	Cause	Failed to open history file.
	Solution	If the history file does not exist, the iQ Care MELFA Support history information cannot be displayed. When the history file "HISTORY.ser" exists on the iQ Care MELFA Support SD card, delete the file. * Since the contents of the history file will be lost, it is recommended to back up the file.
C6246	Error message	Receive timeout
	Cause	PC is not responding.
	Solution	Check the cable connection to the computer and the communication status.
C6247	Error message	File for takeover is abnormal
	Cause	File for takeover is abnormal.
	Solution	Contact the manufacturer.
C6248	Error message	Creating the file name list
	Cause	Cannot be executed because the file name list is being created
	Solution	The file name list is updated immediately after startup of the controller. Wait for a while, then try again.
C7880	Error message	Ethernet communication error
	Cause	Ethernet cable is disconnected.
	Solution	Check the Ethernet connection between the robot CPU and the robot controller. If the Ethernet cable is connected and disconnected many times, wait for a while, then check the connection again. If the error frequently occurs in environments susceptible to noise, take preventive measures such as installing a ferrite core to the Ethernet cable.
C7881	Error message	Ethernet communication error
	Cause	CPU unit - controller Ethernet communication is invalid.
	Solution	Check the setting of the parameter [RCDUETH].
C7882	Error message	IP address is abnormal
	Cause	NETIP and RCDUIP are duplicated or are not in same subnet.
	Solution	Check the setting of the parameter [NETIP] or [RCDUIP].

8 Appendix

8.1 Viewing iQ Care MELFA Support information

In RT ToolBox3 (optional), you can view the contract status of iQ Care MELFA Support.
When online, you can read information registered for iQ Care MELFA Support by clicking "iQ Care MELFA Support information" under "Warranty service" (accessed from "Online"-"iQ Care MELFA Support" in the tree structure on the workspace).

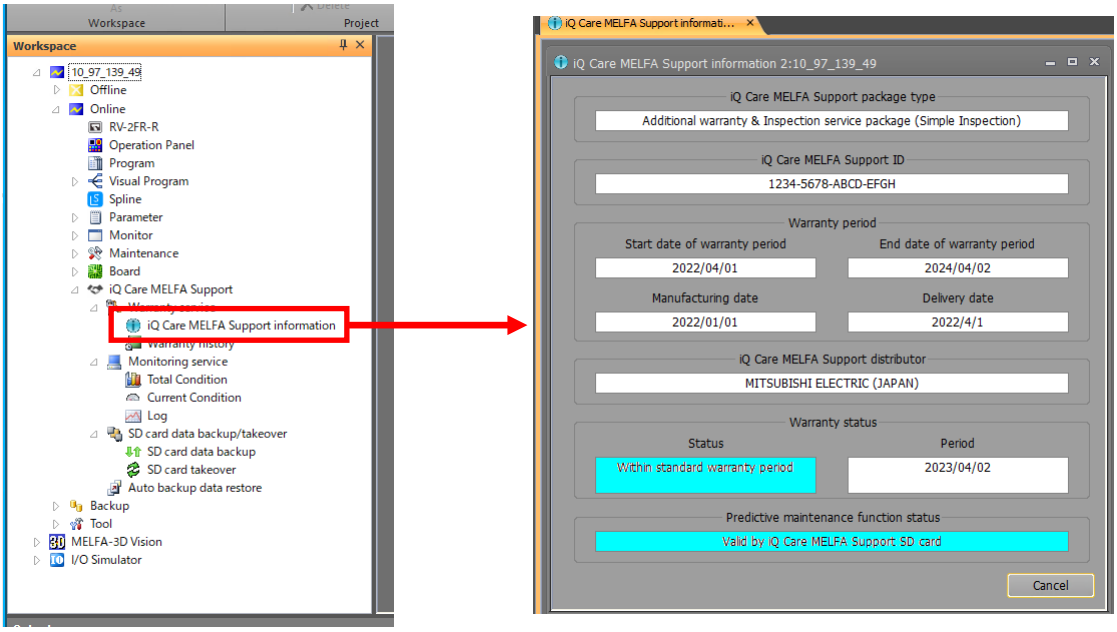


Fig. 8-1 iQ Care MELFA Support contract status indication in RT ToolBox3

Table 8-1 Display items of the iQ Care MELFA Support contract status

Display item		Display example	Description	Remarks
iQ Care MELFA Support package type		Additional warranty package (1 year)	Displays the name of the service package currently in use.	
		Additional warranty package (2 years)		
		Inspection service package (Simple Inspection)		
		Inspection service package (Precise Inspection)		
		Additional warranty & Inspection service package (Simple Inspection)		
		Additional warranty & Inspection service package (Precise Inspection)		
iQ Care MELFA Support ID		****-****-****-****	Displays the license ID granted for each SD card purchased.	
Warranty period	Start date of warranty period/First power on date	yyyy/MM/dd	Displays the start date of the standard warranty period for the target robot.	If the delivery date is displayed in yellow, the first power on date is displayed.
	End date of warranty period/Estimated end date of warranty period	yyyy/MM/dd	Displays the end date of additional warranty period.	When the delivery date is displayed in yellow, the estimated end date of warranty period is displayed.
	Manufacturing date	yyyy/MM/dd	Displays the manufacturing date of the robot controller.	
	Delivery date*	yyyy/MM/dd	Displays the delivery date of the robot controller to be serviced.	The background color is yellow when the period of warranty is not determined.

Display item		Display example	Description	Remarks
iQ Care MELFA Support distributor		MITSUBISHI ELECTRIC (JAPAN)	Displays the distributor of the iQ Care MELFA Support SD card.	
Warranty status	Status	Within standard warranty period	Displays the current status of the warranty extension service.	
		Within additional warranty period		
		Within takeover grace period		
		Out of warranty period		Indicates the period out of the period of warranty.
		Out of warranty period		
		Sign up grace period for warranty will be expired soon		
		Invalid (Takeoverd)		
		Invalid		
	Period	yyyy/MM/dd	Displays the end date of warranty period during the period of warranty.	
Predictive maintenance function status		Valid by iQ Care MELFA Support SD card	Displays the usage status of the predictive maintenance function.	For details, refer to "6.4 Predictive maintenance function".

* When the difference between the manufacturing date of the robot controller and the first power on date is large, the background color becomes yellow showing that the delivery date is unclear.
There is no functional difference even if the background color is yellow.

Alternatively, when the iQ Care MELFA Support SD card data "MELFA_SUPPORT.ser" is displayed in text format, the following data is shown. The contract status can be checked from the content.

Table 8-2 Display items of the iQ Care MELFA Support contract status

Display item	Tag	Description	Remarks
iQ Care MELFA Support package	SERVICE_ID	Model that corresponds to the service package currently in use	
iQ Care MELFA Support ID	SUPPORT_ID	License ID granted for each SD card purchased	
Previously used iQ Care MELFA Support package	PRE_SERVICE_ID	Model corresponding to the previous service package	
Previously used iQ Care MELFA Support ID	PRE_SUPPORT_ID	License ID granted for the previous SD card	
Date of manufacture	MANUFACTUREING_TIME	Manufacturing date of the robot controller	
Date of delivery	WARRANTY_START_TIME	Delivery date of the robot controller	
Robot arm serial number	RBSERIAL	Serial number of the robot arm	
Robot controller serial number	RCSERIAL	Serial number of the robot controller	

8.2 Removing the iQ Care MELFA Support SD card

The iQ Care MELFA Support function is enabled only when the iQ Care MELFA Support SD card is installed in the target robot controller. When the iQ Care MELFA Support SD card is removed, it can be enabled again by powering off the robot controller once, installing the SD card, and turning on the power.
Note that period of warranty, validity period, and other time-of-use calculations will include the time during which the iQ Care MELFA Support SD card is removed.

8.3 Backing up data on the iQ Care MELFA Support SD card

If the iQ Care MELFA Support SD card is physically damaged, the data stored on the SD card cannot be restored. Back up the data stored on the SD card regularly to an external computer or other device to protect the data. Data related to various iQ Care MELFA Support functions can be backed up to RT ToolBox3 project folders using the dedicated screen of RT ToolBox3. The backup procedure is as follows.

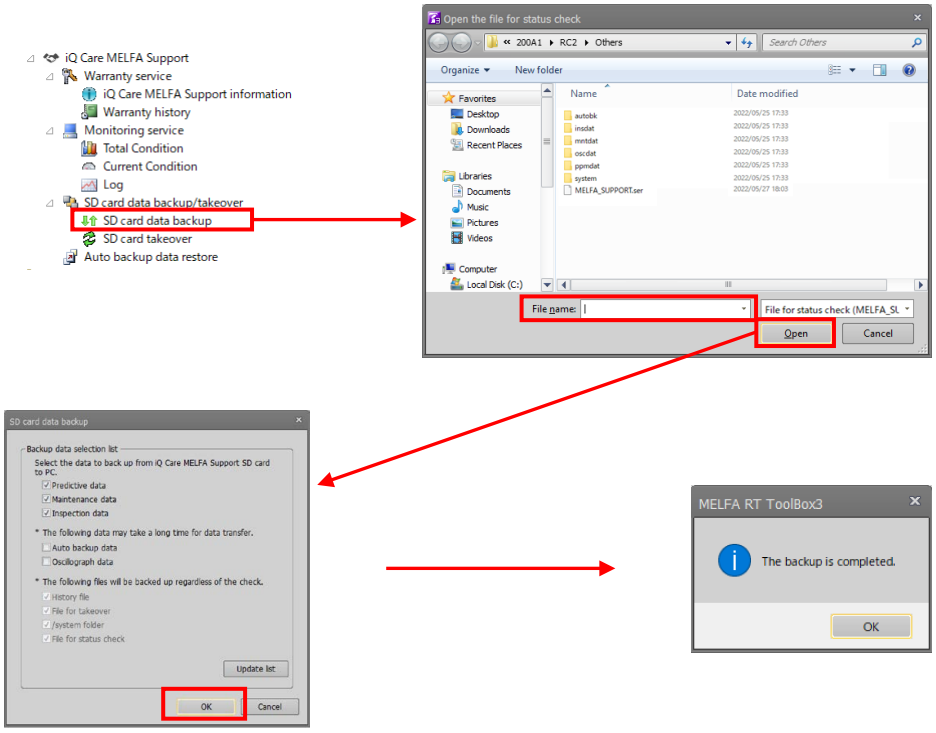


Fig. 8-2 Example of iQ Care MELFA Support SD card backup operation in RT ToolBox3

Start

1. Removing/installing the iQ Care MELFA Support SD card (preparation)

Turn off the power of the robot controller and remove the original iQ Care MELFA Support SD card from the SD card slot.
Attach the removed iQ Care MELFA Support SD card to the SD card drive of the computer with RT ToolBox3.

2. Selecting the iQ Care MELFA Support SD card

From the tree on the RT ToolBox3 workspace, select "SD card data backup" under "iQ Care MELFA Support" - "SD card data backup/takeover".
When the dialog box for selecting the status check target file is displayed, select "MELFA_SUPPRT.ser" in the SD card to be backed up and press Open.

3. Selecting data to be backed up

When the SD card data backup screen is displayed, select the check boxes of the items to be backed up.
After selecting items, press OK to back up the data.

End

The backup data is saved in the RT ToolBox3 project.

- Save destination: Workspace name¥project name¥MELFASupport¥SDBackup
- Folder name:
  sdbackup_[RCSERIAL]_yyyyMMdd-HHmmss

Backup date and time (year, month, date, hour, minute, and second)

Serial number of the robot controller

⚠CAUTION The time required to complete the backup depends on the data capacity in the SD card and the performance of the computer being used. In addition, if automatic backup data and the oscillograph data are selected for backup, the time until completion may be longer.

⚠CAUTION Because the backup operation is performed by removing the SD card from the robot controller, the robot can be operated normally during the backup operation. Note that the iQ Care MELFA Support function will be disabled for robot operation while the SD card is being removed.

8.4 Solutions to take when the robot controller time setting is changed

If the robot controller's time setting has been changed for reasons such as exhausting the robot's battery or changing the settings of the robot CPU of CR800-R/CR800-Q controller, abnormal values may be shown as the period of warranty depending on the time after the change.
If the time setting has been changed, take the following actions according to the status.

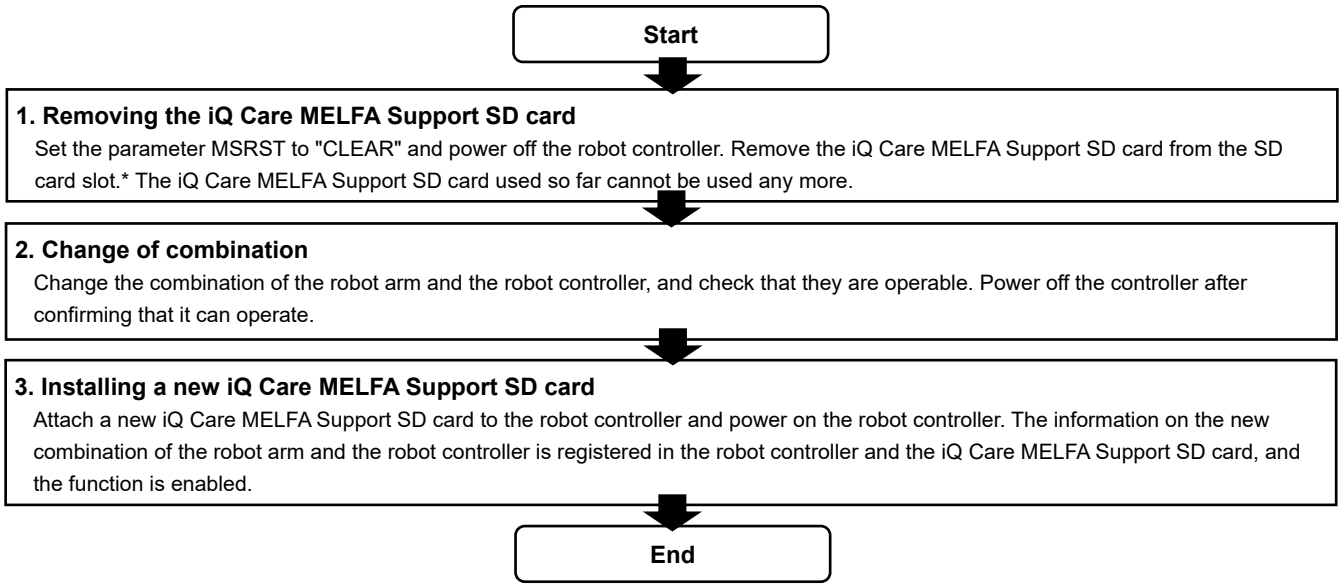
Table 8-3 Solutions to take when the robot controller time setting is changed

Controller type	Cause	Date and time settings	Event	Solution
CR800-D	The robot battery has been removed for more than a certain period.	The clock is behind.	iQ Care MELFA Support function has been temporarily disabled.	Remove the iQ Care MELFA Support SD card, set the clock, and turn on the power supply. Turn off the power again, install the SD card, and turn on the power.
		The clock is ahead.	The remaining period of warranty extension service has been consumed.	The consumed period of warranty cannot be recovered. Contact the manufacturer.
	The clock setting was changed while the power was on.	The clock was set backward (within 24 hours).	The time setting has been changed.	The controller can be used as it is.
		The clock was set backward (24 hours or more).	The time setting has been changed and the saved data has been renamed.	It can be used as it is, but the accumulated data will be replaced with a new file. If the clock setting is not the intended one, set the clock time back and organize the data on the SD card.
		The clock was set backward (earlier than the robot controller manufacturing time).	The iQ Care MELFA Support function has been disabled.	Remove the iQ Care MELFA Support SD card, set the clock, and turn on the power supply.
		The clock was set forward.	The time setting has been changed.	The controller can be used as it is.
CR800-R CR800-Q	The robot CPU module was started and the time was changed while the power of the robot controller was off.	The clock is behind.	iQ Care MELFA Support function has been temporarily disabled.	Remove the iQ Care MELFA Support SD card, set the clock, and turn on the power supply. Turn off the power again, install the SD card, and turn on the power.
		The clock is ahead.	The remaining period of warranty extension service has been consumed.	The consumed period of warranty cannot be recovered. Contact the manufacturer.
	The clock setting was changed while the robot controller and the robot CPU module were on.	The clock was set backward (within 24 hours).	The time setting has been changed.	The controller can be used as it is.
		The clock was set backward (24 hours or more).	The time setting has been changed and the saved data has been renamed.	It can be used as it is, but the accumulated data will be replaced with a new file. If the clock setting is not the intended one, set the clock time back and organize the data on the SD card.
		The clock was set backward (earlier than the robot controller manufacturing time).	The iQ Care MELFA Support function has been disabled.	Remove the iQ Care MELFA Support SD card, set the clock, and turn on the power supply.
		The clock was set forward.	The time setting has been changed.	The controller can be used as it is.

⚠CAUTION For the CR800-R/CR800-Q controllers, the correct time setting is not applied if the parameter "TIMESYNC" is set to 0 (Time synchronization between the robot CPU and robot controller is disabled). When using the CR800-R/CR800-Q controllers, set the parameter "TIMESYNC" to 1 (Time synchronization between the robot CPU and robot controller is enabled).

8.5 Changing the combination of the robot arm and the robot controller

iQ Care MELFA Support operates only in the combination of the robot arm and the robot controller for which the function was first enabled. When changing the combination of the robot arm and the robot controller, you must prepare a new, unused iQ Care MELFA Support SD card, and delete the registration information on the robot controller.
Note that once the registration information is deleted, it cannot be restored to the previous registration status. Also note that the iQ Care MELFA Support SD card used prior to the combination change cannot be used any more.



8.6 How to manipulate data on the iQ Care MELFA Support SD card

The data saved on the iQ Care MELFA Support SD card can be referenced by removing the SD card from the robot controller, installing it in the computer, etc., and copying the file. In addition, the data can be referenced without removing the SD card if the communication middleware "MelfaRXM.ocx" included in the DVD-ROM of RT ToolBox3 is used. (MelfaRXM.ocx is not included in RT ToolBox3 mini.)
For information on MelfaRXM.ocx, refer to "About the "MelfaRXM.ocx" communications middleware" and "MelfaRXM.ocx Communications Middleware Setup" in the "RT ToolBox3 / RT ToolBox3 mini User's Manual.
This section describes request transmission commands to operate files supporting the iQ Care MELFA Support function.

8.6.1 Request ID specifications

The request IDs to be specified in request transmission related to iQ Care MELFA Support are as follows.

Table 8-4 List of IDs to operate files for the external storage device

ID value	Function name
369	Reading the list of files from the external storage device
370	Reading files from the external storage device
371	Writing files to the external storage device
372	Reading files from the external storage device (file output)

[Reading the list of files from the external storage device]

Item	Description
Summary	Reads the list of files (folder) stored in the external storage device of the robot controller.
Request ID	369
Argument when requested	Data type
Data received	Number of files <LF> File name 1 <LF> Number of bytes used for file 1 <LF> File 1 date <LF> File 1 time <LF> ... File name N <LF> Number of bytes used for file N <LF> File N date <LF> File N time
Remarks	(1) Data type 0: Backup folder 1: Oscillograph 2: Inspection data
Argument example	2
Example of data received	2<LF> Test1.TXT<LF> 36<LF> 02/06/24<LF>14:49:54<LF> TEST2.TXT<LF> 8323<LF> 02/06/24<LF>14:12:54

[Reading files from the external storage device]

Item	Description
Summary	Reads the contents of files stored in the external storage device of the robot controller.
Request ID	370
Argument when requested	File name <LF> Data type
Data received	File name <LF> Number of data characters used in the file <LF> File contents
Remarks	(1) Data type 0: - (reading regular files when specified) 1: Oscillograph 2: Inspection data 3: Maintenance data 4: Predictive maintenance 5: Data in the root directory (2) A file extension is required. Not case-sensitive. (3) Binary files cannot be read. Only text data can be used.
Argument example	Test.txt 2
Example of data received	Test.txt<LF> 36<LF> --Test Data-- This is data for test.

[Writing files to the external storage device]

Item	Description
Summary	Writes specified files to the external storage device of the robot controller.
Request ID	371
Argument when requested	File name <LF> Data type <LF> Number of data characters used in the file <LF> File contents
Data received	-
Remarks	(1) Data type 0: - (reading regular files when specified) 1: Oscillograph 2: Inspection data 3: Maintenance data 4: Predictive maintenance (2) A file extension is required. Not case-sensitive. (3) Binary files cannot be written. Only text data can be used.
Argument example	Test.txt<LF> 2<LF> 36<LF> --Test Data-- This is data for test.

[Reading files from the external storage device (file output)]

Item	Description
Summary	Reads files from the external storage device of the robot controller and outputs them.
Request ID	372
Argument when requested	Number of read files <LF> Data type <LF> Read source file name 1 <LF> Read destination file path 1 <LF> Read source file name 2 <LF> Read destination file path 2 <LF> ... Read source file name N <LF> Read destination file path N
Data received	-
Remarks	(1) Data type 0: - (reading regular files when specified) 1: Oscillograph 2: Inspection data 3: Maintenance data 4: Predictive maintenance 5: Data in the root directory (2) A file extension is required. (3) Binary files cannot be read. Only text data can be used.
Argument example	2<LF> 3<LF> 1.prg<LF>c:¥1.prg<LF> common.prm<LF>c:¥Temp¥common.prm

⚠CAUTION If a file operation is requested for the external storage device while the robot controller accesses the iQ Care MELFA Support SD card (file saving/file calling), error C6220 "It is invalid for another data processing" will occur. If an error occurs, wait until the robot controller processing ends, then perform a request again.

8.7 Solutions if error L6209 occurs

If error L6209 (robot time setting error) occurs at the start of iQ Care MELFA Support, the error can be resolved with the timestamp adjustment function of RT ToolBox3.

* The timestamp adjustment function is available for RT ToolBox3/RT ToolBox3 mini/RT ToolBox3 Pro version 2.30G or later.

⚠CAUTION Use the timestamp adjustment function only if error L6209 occurs at the start of iQ Care MELFA Support. Otherwise, the warranty period may be shortened.
Error L6209 may also occur when the robot controller is replaced. To find solutions, refer to "8.5 Changing the combination of the robot arm and the robot controller ".

⚠CAUTION If the iQ Care MELFA Support SD card is inserted in the robot controller, remove it before starting the timestamp adjustment function. The timestamp adjustment function cannot be used if the SD card is inserted.

8.7.1 Starting the timestamp adjustment function

Establish online connection between RT ToolBox3 and the robot, then double-click [Time stamp adjustment] under [Online] - [Maintenance] of the intended project. The Time stamp adjustment screen will appear.

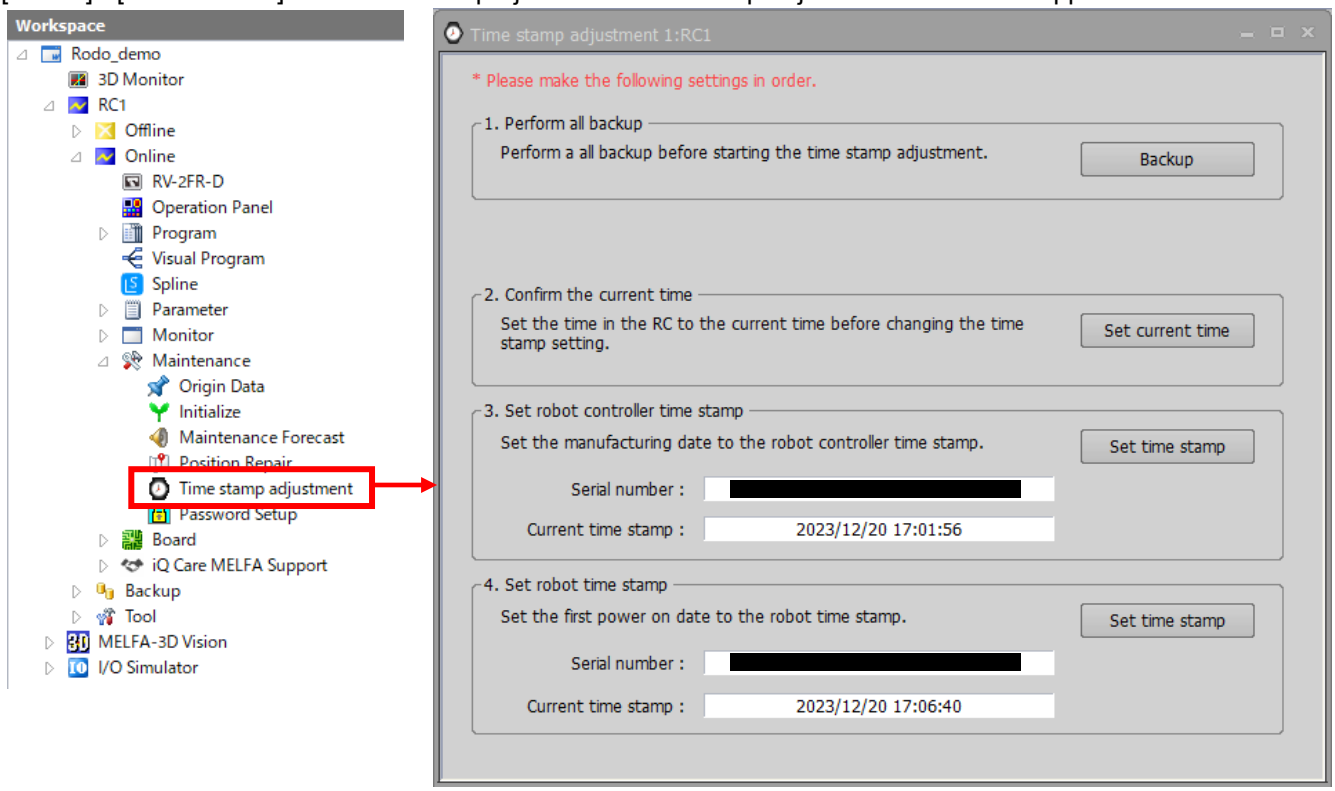


Fig. 8-3 Starting the timestamp adjustment function

8.7.2 Steps to operate the timestamp adjustment function

Perform the numbered operations shown on the Time stamp adjustment screen in order.

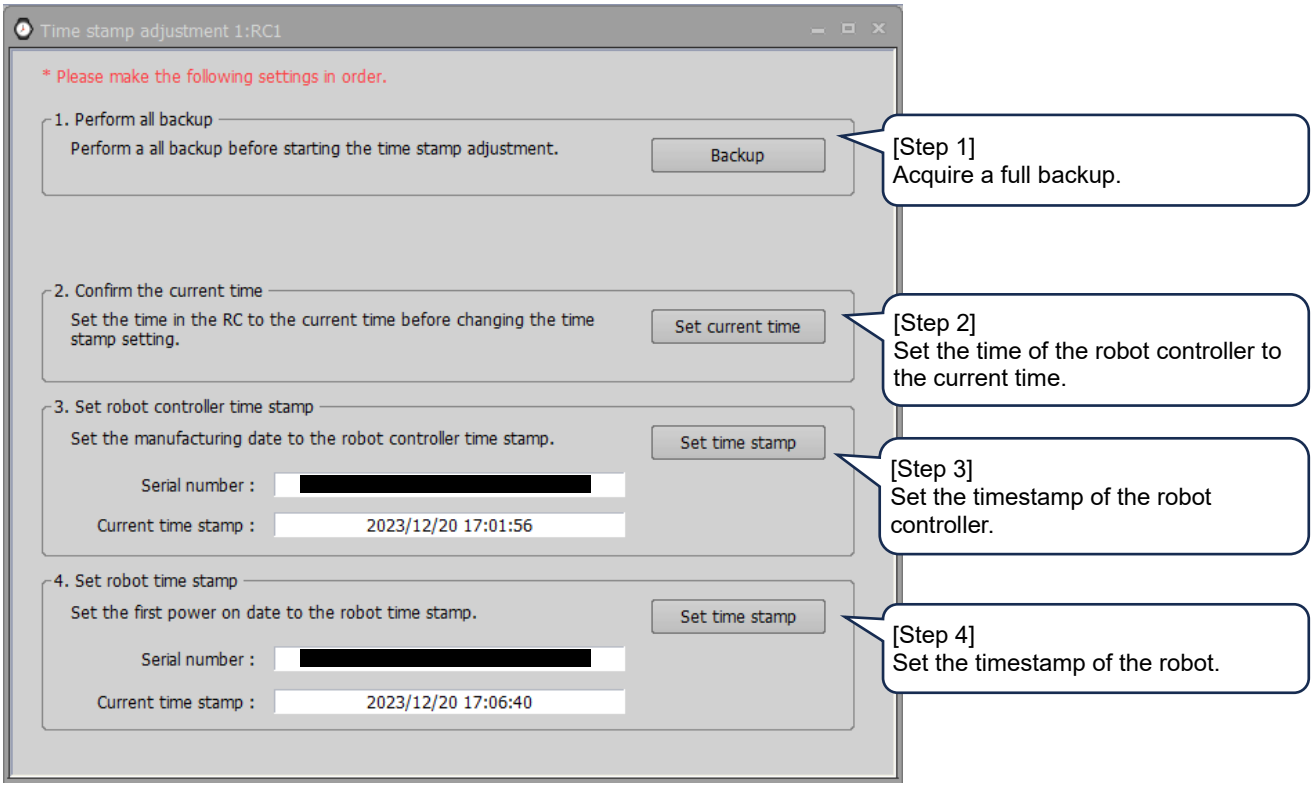
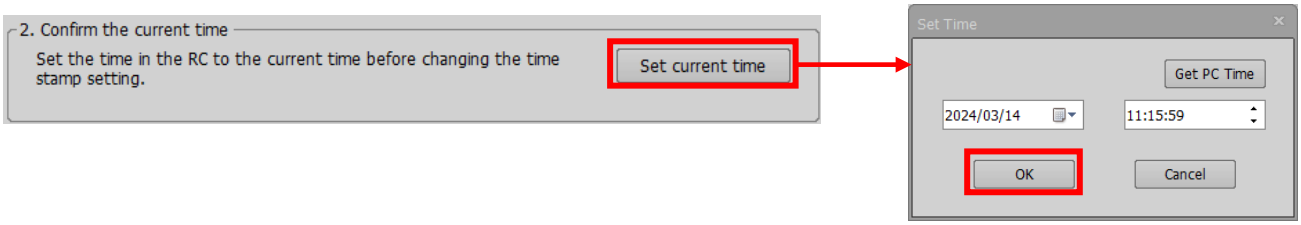


Fig. 8-4 Steps to operate the timestamp adjustment function

[Step 1]
Perform a full backup of data before work.
Press the backup button and follow the instructions on the displayed screen to perform a full backup.

[Step 2]
If the date and time of the robot controller differs from the current date and time, set the current date and time.
* The date and time of the robot controller can be checked on the initialization screen. Double-click [Initialize] under [Online] - [Maintenance] to display the initialization screen.

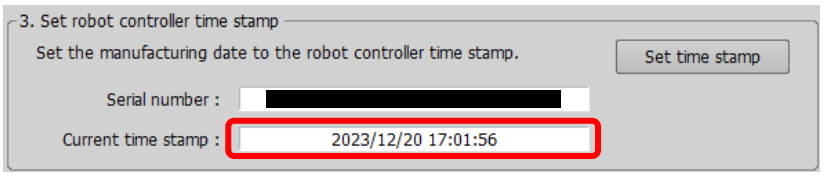
Perform the following steps:
1) Press the Set current time button. The Set Time screen will appear.
2) Set the date and time on the Set Time screen and press the OK button to complete the time setting.
(The date and time of the computer can be imported by pressing the Get PC Time button on the Set Time screen.)



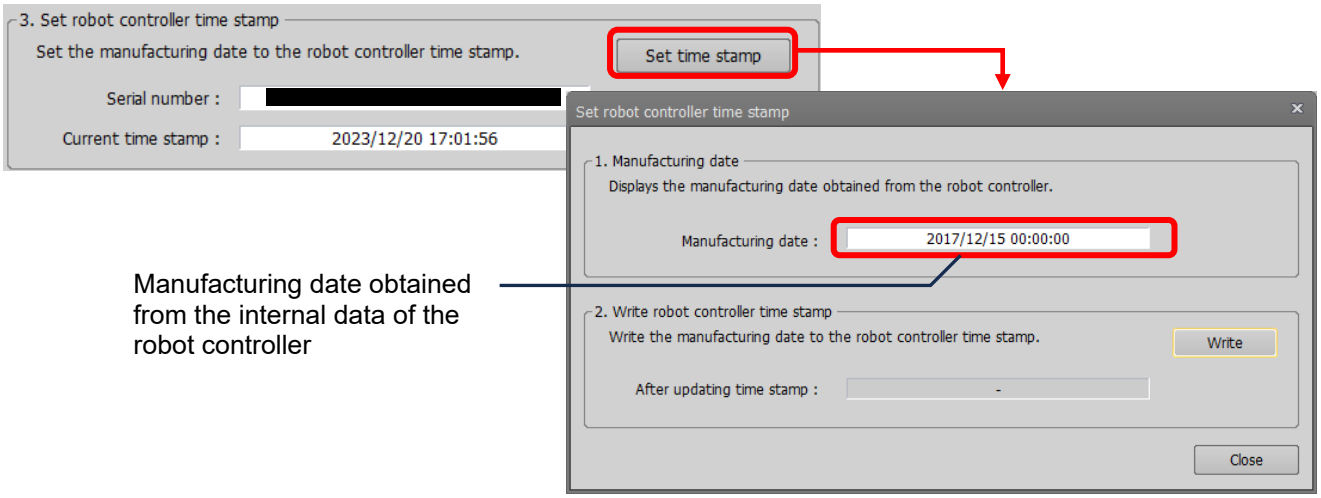
[Step 3]
If the manufacturing date data of the controller (timestamp of the controller) differs from the actual manufacturing date, correct the timestamp of the controller.

Perform the following steps:

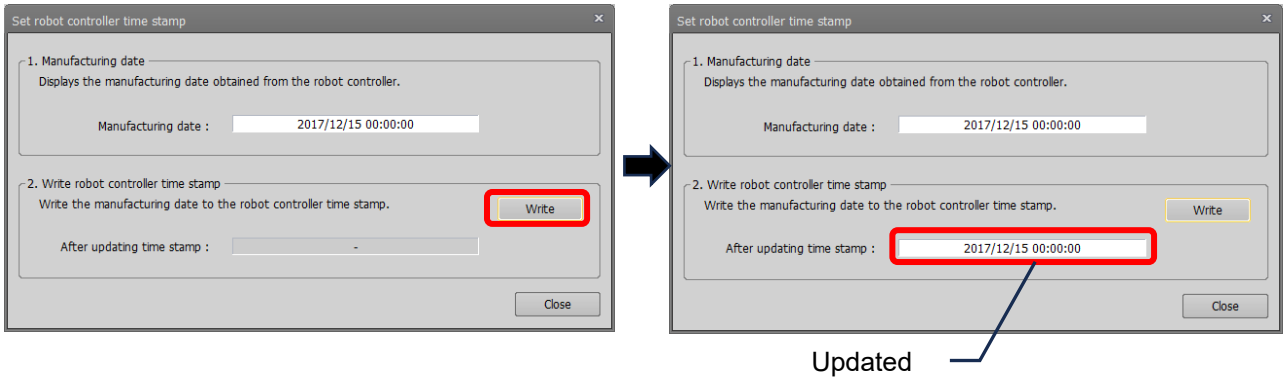
1) Check the manufacturing date of the controller (current timestamp).



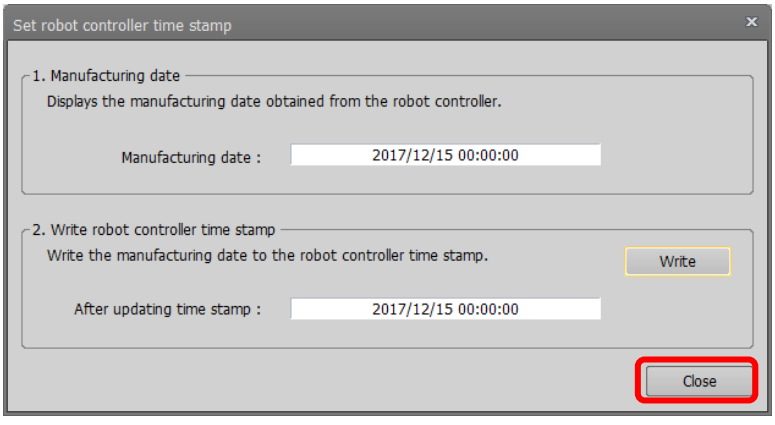
2) Press the Set time stamp button. The Set robot controller time stamp screen will appear.
The displayed manufacturing date is obtained from the internal data of the robot controller. (* The date and time is set to a fixed value of 00:00:00 on the 15th.)



3) Press the Write button. The timestamp of the controller will be updated.



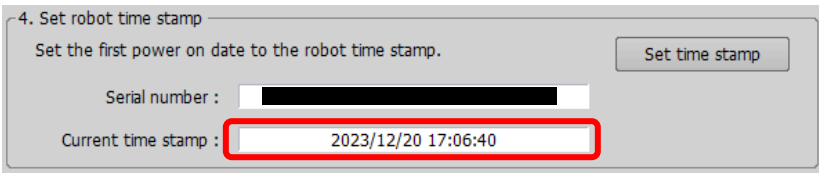
4) Press the Close button to complete the settings.



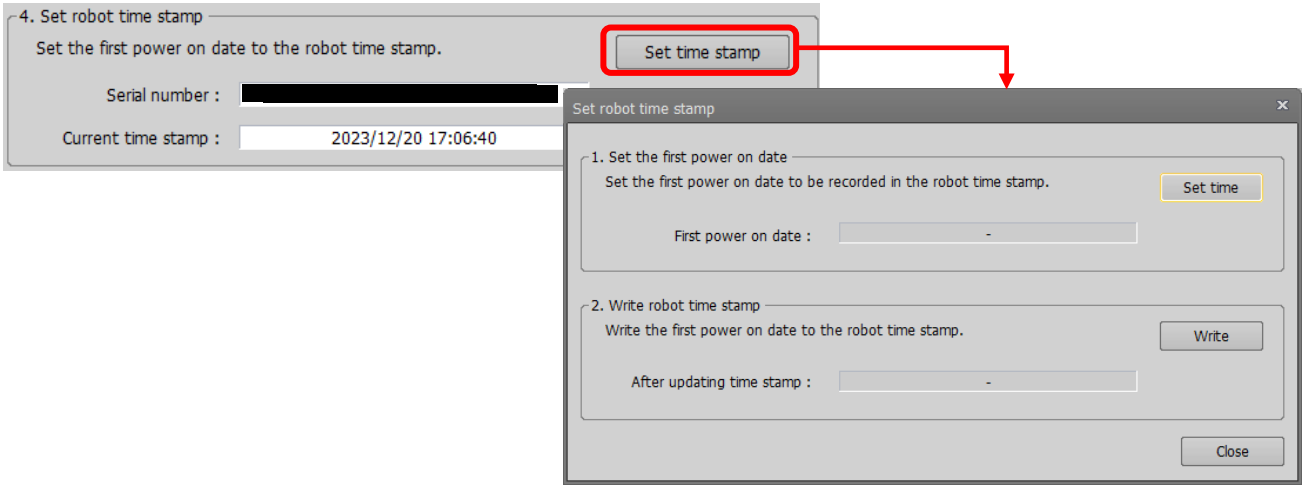
[Step 4]
If the first power-on date data (timestamp of the robot) differs from the actual power-on date, correct the first power-on date data.

Perform the following steps:

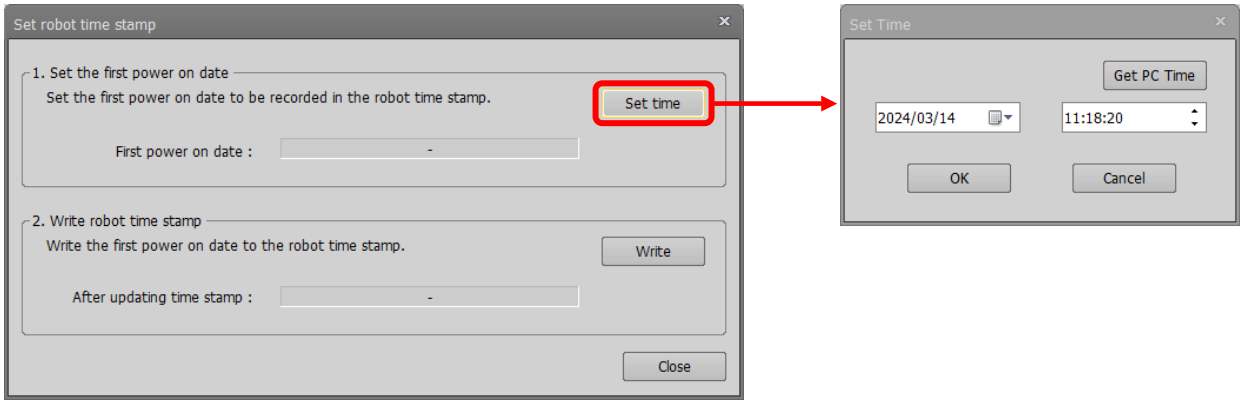
1) Check the first power-on date (current timestamp).



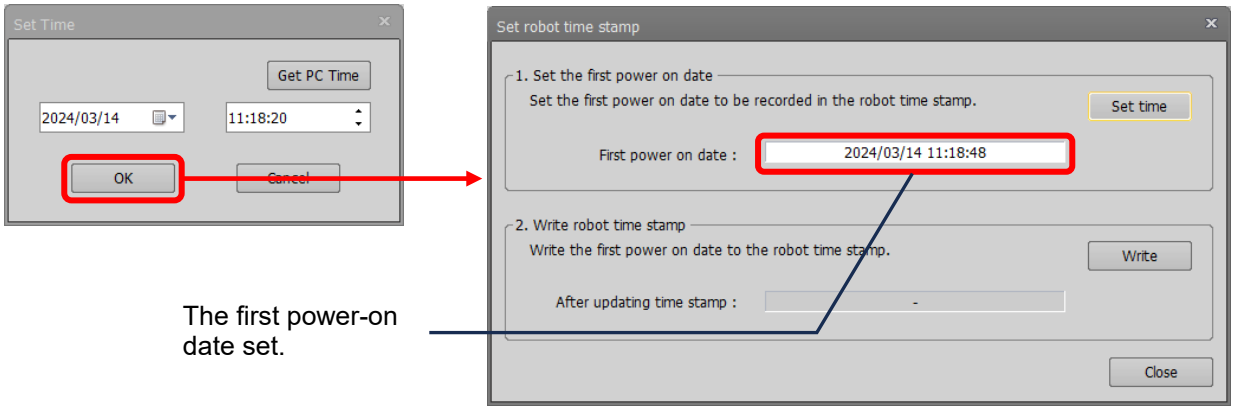
2) Press the Set time stamp button. The Set time stamp screen of the robot will appear.



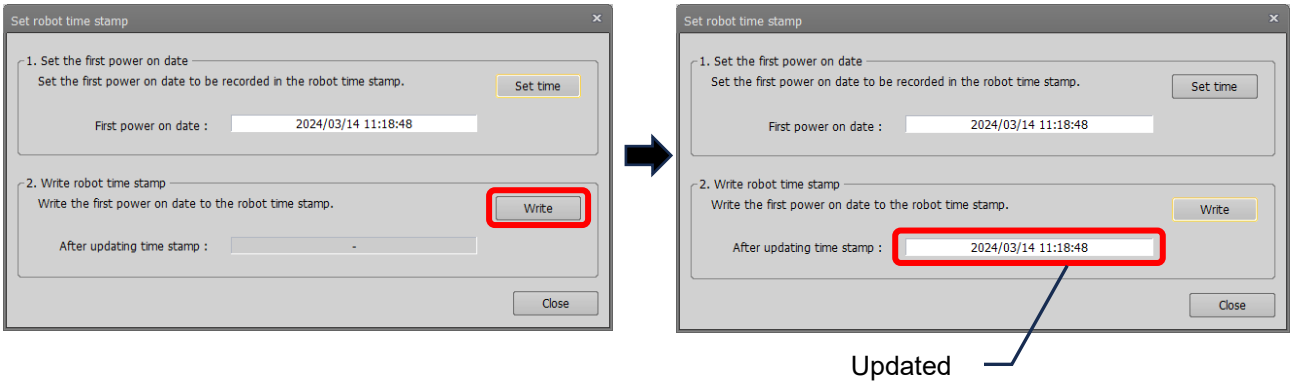
3) Press the Set time stamp button. The Set Time screen will appear.



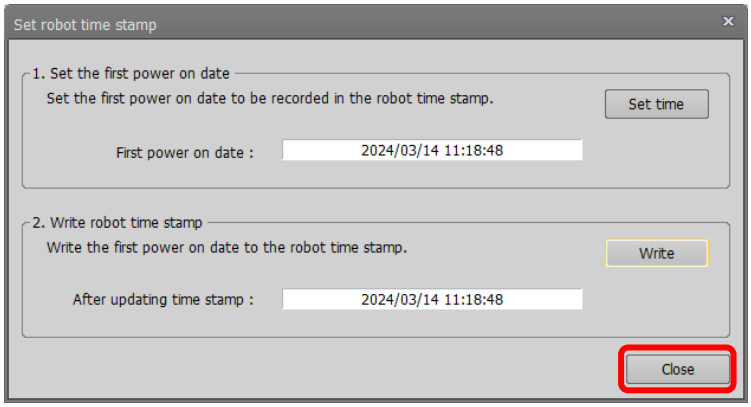
4) Set the date and time on the Set Time screen and press the OK button. The time setting is completed, and the first power-on date is set.
(The date and time of the computer can be imported by pressing the Get PC Time button on the Set Time screen.)



5) Press the Write button. The timestamp of the robot will be updated.



6) Press the Close button to complete the settings.



⚠CAUTION Set the first power-on date (timestamp of the robot) to a date later than the manufacturing date of the controller (timestamp of the controller).

9 Descriptions based on "Marking for the restriction of the use of hazardous substances in electrical and electronic product"

按照中华人民共和国公布的“电器电子产品有害物质限制使用标识”要求，对使用的标识记载如下
The following are descriptions based on "Marking for the restriction of the use of hazardous substances in electrical and electronic product" in the People's Republic of China.

规制含有物質（选项配件类）
本产品含有的 6 种有害物质的名称，含有量以及含有零件如以下一览表显示。

(1) iQ Care MELFA Support 安全 SD 存储卡
(1-1) 电器电子产品有害物质限制使用标识

(1-2) 型号的一览

型号					
RA-1W00MJP	RA-2W00MJP	RA-0W11MJP	RA-0W21MJP	RA-1W11MJP	RA-1W21MJP

(1-3) 本产品含有的 6 种有害物质的名称
本产品含有的 6 种有害物质的名称，含有量以及含有零件如以下一览表显示。

部件名称	6 种有害物质的名称					
	铅（Pb）	汞（Hg）	镉（Cd）	六价铬（Cr(VI)）	多溴联苯（PBB）	多溴二苯醚（PBDE）
SD 存储卡	○	○	○	○	○	○

本表格依据 SJ/T11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

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May. 2024 Specifications are subject to change without notice.