

Programmable Controller

MELSEC iQ-R series **MELSENSOR**

MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Startup)

-R60MH112NA



SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the MELSEC iQ-R Module Configuration Manual.

In this manual, the safety precautions are classified into two levels: "⚠️ WARNING" and "⚠️ CAUTION".

 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠️ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Precautions for Using Laser Products]

WARNING

- The laser products use semiconductor laser light sources. When handling laser products, observe the following because human access to laser radiation may result in injury.
 - (1) Do not disassemble the laser products. Doing so may result in exposure to laser radiation.
 - (2) Shut off the external power supply (all phases) to stop laser emission before replacing a failed laser product or changing the layout.
 - Observe the following handling precautions for the laser products in each class.
 - (1) Class 3R laser products
 - Do not aim the laser beam at people.
 - Do not directly look at or come in contact with the laser beam and its reflection from a specular surface (such as a mirror). In addition, never look at the beam and its reflection through optical instruments (such as a microscope and a telescope).
 - Shorten the beam paths as much as possible to prevent diffusion of laser beams. Terminate the laser beams at the end of their paths by diffusely reflecting materials of appropriate reflectivity and thermal properties or by absorbers.
 - Locate the beam path above or below the eye level. Wearing protective eyewear is recommended when handling the laser products.
 - Install the laser products carefully so that the laser beam is not unintentionally reflected from specular surfaces.
 - (2) Class 2 laser products
 - Do not aim the laser beam at people.
 - Do not stare into the laser beam and its reflection from specular surfaces.
 - To prevent exposure to laser radiation (specularly or diffusely reflected laser beams), install a protective enclosure with an appropriate reflectance.
 - Locate the beam path above or below the eye level.
 - (3) Class 1 laser products
 - Do not stare into the laser beam and its reflection from specular surfaces.
-

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
 - In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
 - For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.
 - When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
-

[Design Precautions]

WARNING

- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
 - Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
 - If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Incorrect output or malfunction due to a communication failure may result in an accident.
 - To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
 - Provide safety measures such as a dual safety mechanism when the module is used for applications that have the possibility of causing physical injury or serious damage.
-

[Design Precautions]

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
 - During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
 - After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
 - Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may cause malfunction or failure of the module.
 - When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not Open by Program" for "Opening Method" of "Module Parameter". If "Open by Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.
 - Do not use the laser displacement sensor outside of its specifications (such as ratings or environments). Doing so may result in overheating or smoke.
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[Design Precautions]

CAUTION

- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
 - Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
-

[Installation Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.
-

[Installation Precautions]

CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
 - To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
 - To mount a module with no module fixing hook, place the concave part(s) located at the bottom onto the guide(s) of the base unit, push in the module, and fix it with screw(s). Incorrect interconnection may cause malfunction, failure, or drop of the module.
 - When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
 - When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
 - Securely insert an extended SRAM cassette or a battery-less option cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
 - Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, battery-less option cassette, or connector. Doing so can cause malfunction or failure of the module.
-

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
 - After installation and wiring, attach a blank cover module (RG60) to each empty slot and an included extension connector protective cover to the unused extension cable connector before powering on the system for operation. Failure to do so may result in electric shock.
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[Wiring Precautions]

CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
 - Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
 - Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
 - Securely connect the connector to the module. Poor contact may cause malfunction.
 - Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
 - Place the cables in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in malfunction or damage to modules or cables.
In addition, the weight of the cables may put stress on modules in an environment of strong vibrations and shocks.
Do not clamp the extension cables with the jacket stripped. Doing so may change the characteristics of the cables, resulting in malfunction.
 - Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
 - Tighten the connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
 - When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
 - Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
 - A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
 - Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
 - For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.
 - Do not apply the 24VDC power before connecting a sensor head. If the power is applied before wiring, normal data transmission is not guaranteed.
-

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
 - Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
 - Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the connector screws or module fixing screws. Failure to do so may result in electric shock.
-

[Startup and Maintenance Precautions]

CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
 - Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
 - Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
 - Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
 - Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
 - After the first use of the product, do not perform each of the following operations more than 50 times (IEC 61131-2/JIS B 3502 compliant).
Exceeding the limit may cause malfunction.
 - Mounting/removing the module to/from the base unit
 - Inserting/removing the extended SRAM cassette or battery-less option cassette to/from the CPU module
 - Mounting/removing the terminal block to/from the module
 - After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
 - Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
 - Do not touch the integrated circuits on the circuit board of an extended SRAM cassette or a battery-less option cassette. Doing so may cause malfunction or failure of the module.
 - Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
 - Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
 - Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
-

[Operating Precautions]

CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
 - Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so can cause malfunction or failure of the module.
-

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.
 - When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.
-

[Transportation Precautions]

CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
 - The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.
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CONDITIONS OF USE FOR THE PRODUCT

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;

- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
- ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above restrictions, Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi Electric MELSEC iQ-R series programmable controllers.

This manual describes the procedures, system configuration, and wiring of the relevant products listed below.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.

When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.

Please make sure that the end users read this manual.

Relevant product

R60MH112NA

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- MELSEC iQ-R Module Configuration Manual
- Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the following manuals.

- MELSEC iQ-R Module Configuration Manual
- Safety Guidelines (This manual is included with the base unit.)

MEMO

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RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Startup) [SH-082017ENG] (this manual)	Specifications, procedures before operation, system configuration, wiring, and communication examples of the control module	Print book e-Manual PDF
MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application) [SH-082019ENG]	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of the control module	Print book e-Manual PDF
MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Sensor Head) [SH-082023ENG]	Precautions for using the sensor head, installation methods, specifications, and maintenance and inspection	Print book e-Manual PDF
Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual [SH-082021ENG]	Operation methods, functions, and error messages of the setting tool It also describes the use of the buffering function and the received light intensity waveform display function, which are useful for an evaluation analysis of the laser displacement sensor MH11 or optimum settings.	e-Manual PDF

This manual does not include detailed information on the following:

- General specifications
- Installation
- Applicable combinations of CPU modules and the other modules, and the number of mountable modules

For details, refer to the following.

 MELSEC iQ-R Module Configuration Manual

Point

e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.
- Sample programs can be copied to an engineering tool.

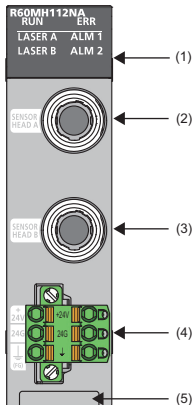
TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Control module	An abbreviation for the MELSEC iQ-R laser displacement sensor control module
CPU module	A generic term for the MELSEC iQ-R series CPU modules
Device	A device (X, Y, M, D, or others) in a CPU module
Engineering tool	Another name for the software package for the MELSEC programmable controllers
Label	A label that represents a device in a given character string
Module label	A label that represents one of memory areas (I/O signals and buffer memory areas) specific to each module in a given character string. For the module used, the engineering tool automatically generates this label, which can be used as a global label.
Sensor head	An abbreviation for the laser displacement sensor MH11 sensor head
Setting tool	An abbreviation for the laser displacement sensor MH11 SettingTool Version 2

1 PART NAMES

This chapter describes the part names of the control module.



No.	Name	Description
(1)	RUN LED	Indicates the operating status of the module. <ul style="list-style-type: none"> On: Normal operation Off: Module power supply interrupted
	ERR LED	Indicates the error status of the module. <ul style="list-style-type: none"> On: Minor error (📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)) Flashing: Moderate error (📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)) Off: Normal operation
	LASER A LED	<ul style="list-style-type: none"> On: Sensor head A laser emission Off: Sensor head A laser stop
	LASER B LED	<ul style="list-style-type: none"> On: Sensor head B laser emission Off: Sensor head B laser stop
	ALM1 LED	<ul style="list-style-type: none"> On: Alarm in OUT1 (📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)) Flashing: Replacing sensor head (📄 Page 25 Procedure for sensor head replacement) Off: Normal operation
	ALM2 LED	<ul style="list-style-type: none"> On: Alarm in OUT2 (📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)) Flashing: Replacing sensor head (📄 Page 25 Procedure for sensor head replacement) Off: Normal operation
(2)	Sensor head A connector	The sensor head connected to this connector is recognized as sensor head A, to activate the control module.
(3)	Sensor head B connector	The sensor head connected to this connector is recognized as sensor head B, to activate the control module.
(4)	External power supply terminal block	A terminal block for connecting an external power supply cable to the control module
(5)	Production information marking	Shows the production information (16 digits) of the module.

Point 🔍

The production information and firmware version can be checked by using the setting tool or engineering tool. To check the firmware version by using the setting tool, check "Controller Ver" on the setting tool window. For details, refer to the following.

- 📖 Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual
- 📖 MELSEC iQ-R Module Configuration Manual

MEMO

2 SPECIFICATIONS

2.1 Performance Specifications

This chapter describes the performance specifications of the control module.

Item	Description	
Sampling cycle	10 μ s, 20 μ s, 40 μ s, 100 μ s, 200 μ s, 400 μ s, 1ms, 2ms	
Number of occupied I/O points	32 points	
Buffer memory capacity	64k words	
Number of connected sensor heads	2 maximum	
Internal current consumption (5VDC)	0.14A maximum	
External power supply	24VDC -15% to +20%, including ripple of 0.5V (p-p)	
	Maximum inrush current: 18A, 250 μ s or less	
	Maximum current consumption: 0.5A	
External dimensions	Height	106mm (Base unit mounting side: 98mm)
	Width	27.8mm
	Depth	125mm
Weight	0.24kg	

3 FUNCTION LIST

This chapter describes the functions of the control module. For details on the functions, refer to the following.

📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

Sensing function

Function	Description
Measurement function	Measures an object.
Judgment output	Judges the measurement value when the upper/lower limit values are set.
Head/laser control	Switches the state of laser between emission and stop.
Zero set	Sets the measurement value obtained when the zero set is turned on to the reference value of measurement (zero). The setting of the reference value of measurement is disabled when the zero set is turned off.
Timing	Holds the measurement value and the judgment output at a desired timing.
Reset	Resets the measurement value.
Emitted light intensity search	Searches the received light intensity of all measurement surfaces and sets the appropriate emitted light intensity automatically.

Memory operation function

Function	Description
Output setting copy	Copies the OUT setting between memory areas.
Memory change	Changes the destination memory for saving the settings.
Memory copy	Copies the settings saved in a memory area to another memory area.
Initialization	Initializes the settings in the memory area.
Save	Saves the settings in all the memory areas.

Buffering function

Function	Description
Self-stop	Stops buffering operation automatically.
Buffering mode	Sets the buffering mode.
Buffering type	Selects the output data to be accumulated.
Buffering rate	Loads data to be accumulated for a long time by being longer of the accumulation time interval.
Accumulation amount	Sets the accumulation amount of data.
Trigger condition	Sets the conditions of trigger generation.
Trigger delay	Delays the timing of data accumulation after trigger generation.
Trigger point	The data accumulation before trigger generation is displayed.
Sample trigger accumulation amount	Sets the accumulation amount of data for each trigger generation.
Status readout	Checks the status of accumulation operation.
Accumulation amount readout	Reads the accumulation amount of data.
Trigger counter readout	Reads out the number of generated triggers.

Intelligent function

Function	Description
External power supply interruption detection function	Detects an interruption of the external power supply.
Received light intensity waveform acquisition function	Loads the received light intensity waveform to the buffer memory of the control module.

Recipe selecting function

Function	Description
Default recipe	Sets the parameters of the laser displacement sensor just by selecting the recipe (setting value of each function) corresponding to the measurement object.

MEMO

4 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation.

1. Mounting a module

Mount the control module in any desired configuration.

☞ Page 27 Configuration of Laser Displacement Sensor

2. Wiring

Perform wiring of external devices to the control module.

☞ Page 32 Wiring Method

3. Adding a module

Add the control module to a module configuration by using the engineering tool.

☞ Page 37 Communication Example Between Control Module and Sensor Head

4. Configuring parameter settings

Configure the parameter settings of the control module by using the engineering tool.

📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

5. Measuring an object

Configure the settings for connecting of sensor heads and proper measurement of objects by using the setting tool, and measure the objects.

☞ Page 22 Measuring an Object

6. Programming

Create a program.

☞ Page 37 Communication Example Between Control Module and Sensor Head


4.1 Measuring an Object

Procedures when measuring an object

This section describes the operating procedures when measuring an object using by the control module.

1. Turning on the external power supply

Turn on the external power supply.

 Page 32 Connection method of external power supply

2. Power-on the programmable controller.

Power on the programmable controller and start up the control module.

If the external power supply is not supplied more than five seconds after the programmable controller is powered on, the external power supply interruption error (error code: 3010H) occurs.

3. Check that the laser displacement sensor is start-up.

Check that the sensor head emits a laser beam and the laser radiation indicator is on.

Be careful of the following when checking the laser displacement sensor is start-up.

- When the sensor head is start-up (the laser radiation indicator (LASER ON) is on), laser emission starts regardless of whether the state of CPU module is RUN or STOP.
- Be careful that not to point the laser beam to people's eyes when the sensor head is start-up.
- Allow at least 40 to 50 seconds after power-on to use a laser beam.
- Allow at least 30 minutes of warming up after emitted laser beam from a sensor head to ensure the performance of the sensor head.
- If the RUN LED of the control module is not turn on, check that the programmable controller is turned on and the external power supply is connected to the control module.

4. Starting up the setting tool.


Start the setting tool.

5. Set the default recipe.

Set the basic settings depending on a measurement object in the default recipe.

To select the measurement object in the default recipe can be set the following settings.

- Head setting
- OUT setting
- Common setting

 Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual

6. Position adjustment of sensor head

Checking the connecting direction of a sensor head. Select the optimum direction according to the shape or moving direction of the measurement object.

- Checking the installation

The installation for the specular reflection measurement is different from that for the diffuse reflection measurement.

- Checking the measurement center

The measurement range indicator (RANGE) turns on in yellow around the measurement center.

- Checking the measurement range

Move a measurement object to check the displacement of the object is within the measurement range.

The measurement range indicator (RANGE) blinks in yellow when the object is within the measurement range.

Check that the received light intensity waveform of the sensor head A and B on the received light intensity waveform window of the setting tool.

 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Sensor Head)

 Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual

7. Measurement

When the measurement completes normally, the measurement value is displayed on the measurement value display window of the setting tool.

If the measurement value is not displayed, refer to the troubleshooting by symptom.

( MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application))

Check the peak waveform of the received light intensity and the peak received light intensity on the received light intensity window.

If an alarm occurs within the measurement range, the received light intensity status can be checked by checking the peak received light intensity.

Procedures for initialization when the setting is failed

When the setting is failed, initialize the setting details.

For details, refer to the following.

 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

Procedure for sensor head replacement

This section describes the operating procedures for replacing the sensor head without the power-off of the programmable controller.

When using a sensor head replacement request

By using 'Sensor head replace request' (Y1), the sensor head can be replaced without causing a module error.

The following describes the procedure for replacing the sensor head when using 'Sensor head replace request' (Y1).

1. Saving the parameters

Save the parameters by using the setting tool or a buffer memory command.

Otherwise, the parameters will be lost during operation.

After replacement, the module operates with the parameter saved last.

2. Issuing a sensor head replacement request

Turn on 'Sensor head replace request' (Y1) and check that 'Sensor head replace request receiving status' (X1) is turned on.

3. Turning off the external power supply

Turn off the external power supply.

4. Replacing the sensor head

Replace the sensor head.

5. Turning on the external power supply

Turn on the external power supply.

6. Checking that the sensor head is recognized

After 'Sensor head configuration complete' (X4) turns on, check 'Sensor head A READY' (X2) or 'Sensor head B READY' (X3).

If 'Sensor head A READY' (X2) or 'Sensor head B READY' (X3) does not turn on despite the sensor head being connected, try again from step 3.

For details on a sensor head recognition error, refer to the following.


 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

7. Clearing a sensor head replacement request

Turn off 'Sensor head replace request' (Y1) and check that 'Sensor head replace request receiving status' (X1) is turned off.

8. Position adjustment of sensor head

Check the connecting direction and measurement distance of sensor head.

 Page 22 Procedures when measuring an object

9. Measurement

Check that the system operates normally.

If an error occurs, refer to the troubleshooting in the following manual.

 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

When not using a sensor head replacement request

Even if an error occurs temporarily after the sensor head is replaced, if there is no problem, the replacement procedure can be made simple.

The following describes the procedure for replacing the sensor head when 'Sensor head replace request' (Y1) is not used.

1. Saving the parameters

Save the parameters by using the setting tool or a buffer memory command.

Otherwise, the parameters will be lost during operation.

After replacement, the module operates with the parameter saved last.

2. Turning off the external power supply

Turn off the external power supply.

Then, any of the errors shown below is cleared and an external power supply interruption error (error code: 3010H) occurs.

- Sensor head unconnected
- Connection head mismatch
- Automatic head adjustment error
- Circuit operation failure
- Head system error
- Head connection check error

3. Replacing the sensor head

Replace the sensor head.

4. Turning on the external power supply

Turn on the external power supply.

5. Checking that an external power supply interruption error is cleared

Check that the external power supply interruption error is cleared.

However, if the error causes are not eliminated in step 2, these errors occur again.

When these errors occur, perform the replacement procedure from step 2 again.

6. Position adjustment of sensor head

Check the connecting direction and measurement distance of sensor head.

 Page 22 Procedures when measuring an object

7. Measurement

Check that the system operates normally.

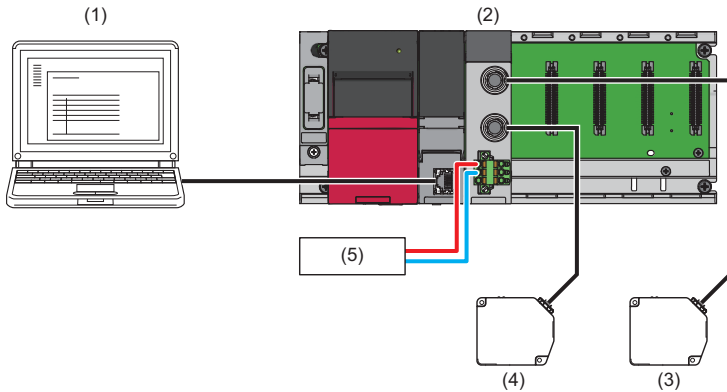
If an error occurs, refer to the troubleshooting in the following manual.

 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

5 SYSTEM CONFIGURATION

5.1 Configuration of Laser Displacement Sensor


The following figure shows the system configuration of the control module.



- (1) Engineering tool, setting tool
- (2) Control module
- (3) Sensor head A
- (4) Sensor head B
- (5) External power supply


Point

For applicable combinations of CPU modules and the other modules and for the number of mountable modules, refer to the following.

 MELSEC iQ-R Module Configuration Manual

Precautions

- When connecting one sensor head to the control module, connect the sensor head to the SENSOR HEAD A connector. When one sensor head is used and it is connected to the SENSOR HEAD B connector, measurement cannot be performed.
- Be careful of the incorrect wiring when connecting each device. For the wiring, refer to the following.

 Page 32 Wiring Method

5.2 Supported Software Package

The following table shows the software packages supported by the control module.

Software	Version
GX Works3 (Engineering tool)	Version 1.055H or later
Setting tool	Version 2.001B or later

About setting tool

For details on the setting tool, please consult your local Mitsubishi representative.


■Operating environment and installation/uninstallation

For details on the operating environment and installation/uninstallation of the setting tool, refer to the following.

 Laser Displacement Sensor MH11 SettingTool Version 2 Installation Instructions


■Software license agreement

For details on the software license agreement to use the setting tool, refer to the following.

 Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual

■Operation method and function

For details on the operation method and function of the setting tool, refer to the following.

 Laser Displacement Sensor MH11 SettingTool Version 2 Operating Manual


6 INSTALLATION AND WIRING

6.1 Correct Usage

Regarding execution and use, be aware of the following.


Installation environment

Do not install the product in the following conditions.


- Where the ambient temperature, ambient humidity, or ambient illuminance of light receiving surface is beyond the range of specifications ( Page 29 Usage environment)
- Where dew condensation occurs due to rapid temperature change
- In an atmosphere of corrosive gas or flammable gas
- Where the product is exposed to dust, iron powder, and salt
- In an atmosphere where the product is likely to be exposed to organic solvent such as benzene, thinner, or alcohol, or to strong alkaline materials such as ammonia or sodium hydroxide
- Where heavy vibration or impact is applied
- Where direct sunlight is received
- Where water, oil or chemicals splashes
- Where load is applied to the product

Usage environment

For the usage environment, refer to the general specifications of the following.

 MELSEC iQ-R Module Configuration Manual

For details on the sensor head, refer to the general specifications of the following.

 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Sensor Head)

Protective structure


Although the sensor head is waterproof, the control module and connectors are not structurally dustproof, waterproof, or corrosion-resistant. Therefore, measurement underwater or in the rain is not allowed. Be aware of the usage environment.

Warming up time

Allow at least 30 minutes of warming up after emitted laser beam from a sensor head to ensure the performance of the sensor head.

Measures to reduce noise

- Install the product as far away as possible from noise source such as high-voltage lines, high-voltage device, power lines, power device, machines which generate a large starting and stopping surge, welding machines, and inverter motor.
- Install the product as far away as possible from a wireless device that has a transmitter, such as an amateur radio device.
- Do not run the sensor head cable along (bundled in parallel) with other wirings. Keep it at least 100mm away from other wires. Run the cable so that it is separate from high voltage and power circuit lines. If it is necessary to run the cable in parallel with them, shield the cable by running it through a grounded electrical conduit.
- Ground FG with a ground resistance of 100 ohms or less and avoid sharing the ground with other devices. This may produce an opposite effect.
- Connect a noise filter to the external power supply. Use a noise filter with the damping characteristic, RSEN-2006 (manufactured by TDK-Lambda Corporation) or equivalent. For details on a noise filter, refer to the following.


 MELSEC iQ-R Module Configuration Manual

Insulation resistance and withstand voltage

Do not perform insulation resistance and withstand voltage tests between an exposed metal part of the sensor head connector and the entire sensor head. Doing so may cause failure.

Power supply

■ External power supply of the control module

- For the external power supply voltage, use the system within the rated voltage range of 20.4 to 28.8VDC.
- For the external power supply, use the control module with the satisfied performance specifications. ( Page 17 Performance Specifications)
- When using a commercial switching regulator for the external power supply, be sure to ground the FG terminal to avoid the influence of high frequency noise. Do not cascade the FG terminal between control modules.
- When using a transformer in the external power supply, be sure to use an insulated transformer. The product or the external power supply may be damaged if an auto transformer is used.
- Use an insulated external power supply incorporating a protective circuit to protect it against abnormal voltages from the power line.
- When using a power supply not incorporating a protective circuit, be sure to power on through a protective element such as a fuse.

■ Power supply sequence for the control module and the programmable controller

- Turn on the external power supply, and then turn on the programmable controller.
- If the external power supply is not supplied more than five seconds after the programmable controller is powered on, the external power supply interruption error (error code: 3010H) occurs.
- Turn off the programmable controller first, then, turn off the external power supply. If the external power supply turns off prior to the programmable controller, the control module may malfunction.
- Leave an interval for at least 10 seconds between turning off the programmable controller and turning on the power again. Failure to do so may corrupt saved data.
- It takes about 40 to 50 seconds from power-on to operating state (startup completed), depending on the settings saved. Because outputs are not determined during startup, do not use them. Doing so may cause malfunction of devices due to an incorrect output.
- Do not turn off the power while saving the settings. In the worst case, the system of the control module is destroyed and fail to restart.
- When a sensor head is start-up (the laser radiation indicator (LASER ON) is on), laser emission starts regardless of whether the state of CPU module is RUN or STOP.
- Be careful that not to point the laser beam to people's eyes when the sensor head is start-up.

Instantaneous power failure

If an instantaneous power failure occurs, the system operates continuously, or goes to stop operation or restart the system, depending on the duration of power failure. Do not use the system in the environment where an instantaneous power failure occurs.

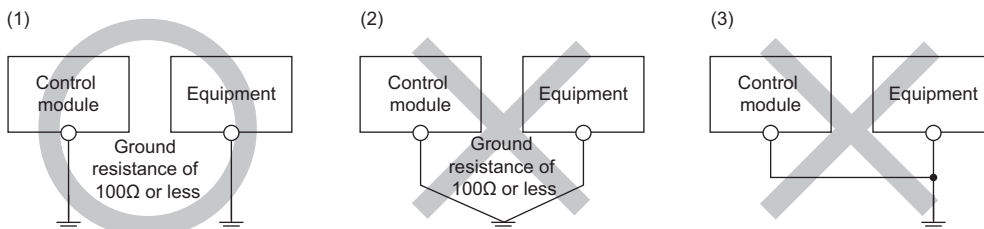
Grounding

Ground the FG terminals when substantial noise effects are present.

While there is adequate noise resistance in a normal environment, use the grounding process for environments with particularly loud noise.

■ Grounding process


- Use a power cable of 1.5mm² or more, with a ground resistance of 100Ω or less.
- Keep the grounding point as close to the control module as possible, to shorten the ground wire distance.
- Provide independent grounding in any cases. Sharing the grounding with other devices may produce an opposite effect.
- The sensor head case and sensor head cable connector housing are electrically connected via the sensor head cable to the FG terminal of the control module.



- (1) Independent grounding
(2) Shared grounding
(3) Common grounding

Connecting

■ Wire connections and connectors

- Turn off the power of the programmable controller and external power supply before connecting or disconnecting the connectors and any other connections.
- When connecting or disconnecting the sensor head, be sure to hold the connector body of the sensor head cable and not to apply extra force to the cable.
- Be careful not to touch the terminals of disconnected connectors or to let foreign objects get in disconnected connectors.
- Be careful not to apply force to around the connectors of sensor head cable and extension cable for sensor head. Do not bend the cables near connectors of sensor head cable and extension cable for sensor head. Doing so causes disconnection of the cables.
- Fit the connector of the sensor head cable to the plug-in side of the connector. ( Page 35 Connecting sensor head to control module)

6.2 Wiring Method

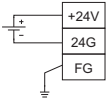
Connection method of external power supply

The external power supply is used for operating a sensor head.

Wiring

- For connecting the external power supply of the control module, use the +24V terminal and the 24G terminal of the external power supply terminal block, and supply 24VDC.
- To reduce the effects of noise, perform twist processing (stranded wire processing) for the power cable.

For the wiring of the external power supply, refer to the following connection diagram.



Terminal block

The terminal block can be removed from the control module. Use the terminal block and the tightening tool that satisfy the following conditions:

- Terminal block

The terminal block socket is manufactured by Mitsubishi Electric. For details on the terminal block socket, please consult your local representative.

- Tightening tool

Flathead screwdriver	Tightening torque range
Blade width: 0.6mm × 3.5mm	0.2 to 0.3N·m

Removal and installation of terminal block

■Removal

To remove a terminal block, loosen terminal block mounting screws using a flathead screwdriver, and pull out the terminal block.

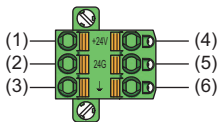
■Installation

To install the terminal block, insert a terminal block to a connector, and secure the terminal block by attaching a terminal block mounting screws using a flathead screwdriver.

Insufficient fixing may cause drop, short-circuit, or malfunction of the module.

Signal name of terminal block

The following shows the signal names of the terminal block.

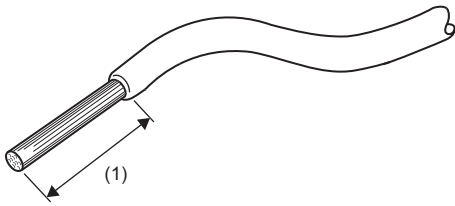


No.	Signal name	Function
(1)	+24V	24VDC (input) for power supply
(2)	24G	Ground for power supply
(3)	↓ (FG)	Functional ground
(4)	+24V	24VDC (output) for power supply
(5)	24G	Ground for power supply
(6)	↓ (FG)	Functional ground (use prohibited)

Processing method of the cable terminal

Strip the cable sheath from the tip for the strip length.

Attach the bar solderless terminal to the stripped area.



(1) Strip length

A recommended strip length is 13mm.

Wiring to terminal block

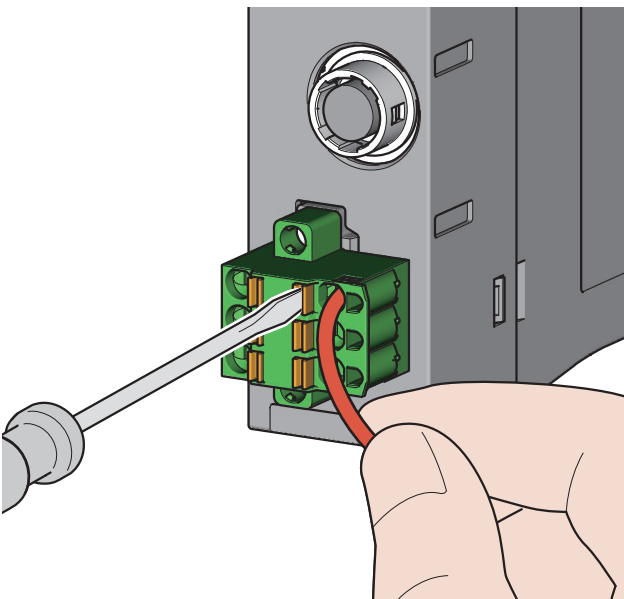
■Connecting a cable

Fully insert a wire having a bar solderless terminal into a wire insertion opening, and push the wire in. After inserting the wire, pull it lightly to check that it is securely clamped.

Incomplete connections may cause short circuit, fire, or malfunction.

■Disconnecting a cable

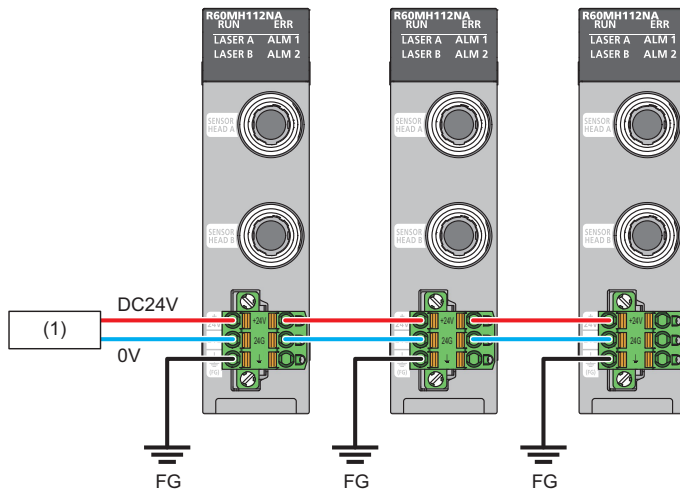
Push in the open/close button of the wire to be disconnected using a flathead screwdriver. Pull out the wire with the open/close button pushed in.



Transition wiring of external power supply

When multiple control modules are installed, power can be supplied through the transition wiring.

To perform the transition wiring of the external power supply, connect the +24V terminal and 24G terminal of the power supply source control module to the +24V terminal and 24G terminal of the power supply destination control module.



(1) External power supply

Point

- Ground the FG terminals.
- Do not cascade the FG terminal between control modules.
- Ground the FG terminal for each control module.
- Leave the FG terminal on the right side open all the time.

The number of cascade-connectable control modules (n) depends on the external power supply capacity.

Cascade the number of control modules that satisfies the following conditions.

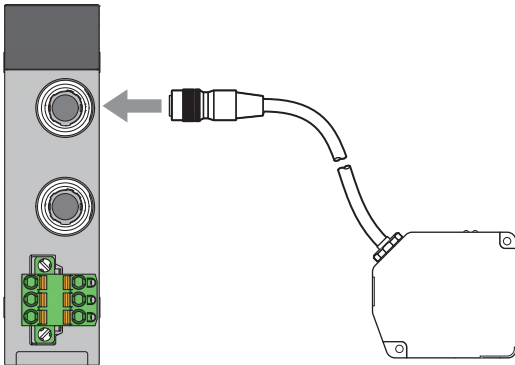
- The voltage at the external power supply terminal of the cascaded terminal module is 20.4VDC or higher.
- Output current of the external power supply \geq current consumption of the module (0.5A) \times n modules

Connecting sensor head to control module

The following describes the procedure to connect a sensor head to the control module.

Pay attention to the direction of a sensor head cable connector and insert the cable to the control module until it clicks.

Pull the cable lightly and check that it has been connected securely.



Precautions

- When connecting one sensor head to the control module, connect the sensor head to the SENSOR HEAD A connector. The measurement cannot be performed when the controller is connected to the SENSOR HEAD B connector.
- Do not mount the sensor head to the control module while the external power supply is turned on. Doing so may cause sensor head failure.
- For details on connecting cables with sensor head fixed, refer to the following.

📖 MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Sensor Head)

6.3 Wiring Product

This section describes the wiring products used for the control module.

Applicable wire

For the wire to be connected to the terminal block, use the following.

Size	Conductor cross-section area	Material	Temperature rating
24 to 14 AWG (stranded wire)	0.25 to 2.0mm ²	Copper	75°C or greater

Bar solderless terminal

Use bar solderless terminals that satisfy the following conditions:

Type	Model name	Applicable wire size	Contact
Bar solderless terminal	AI 0.25-10YE	0.25mm ²	PHOENIX CONTACT GmbH & Co. KG
	AI 0.34-10TQ	0.34mm ²	
	AI 0.5-10WH	0.5mm ²	
	AI 0.75-10GY	0.75mm ²	
	AI 1-10RD	1.0mm ²	
	AI 1.5-10BK	1.5mm ²	
	AI 2.5-10BU	2.5mm ²	
Bar solderless terminal tool	CRIMPFOX6	—	
Bar solderless terminal	TE 0.5-10	0.5mm ²	NICHIFU Co.,Ltd.
	TE 0.75-10	0.75mm ²	
	TE 1.0-10	1.0mm ²	
	TE 1.5-10	1.5mm ²	
	TE 2.5-10	2.5mm ²	
Bar solderless terminal tool	NH 79A	—	

Precautions

- Always turn off the power before proceeding with attachment or removal of wiring and the terminal block.
- Do not use wires with a soldered end. Poor contact or insertion/extraction failure to the spring clamp terminal block may occur depending on the finished quality of the soldering.
- Do not use bar solderless terminals without insulation sleeve.

7 COMMUNICATION EXAMPLE

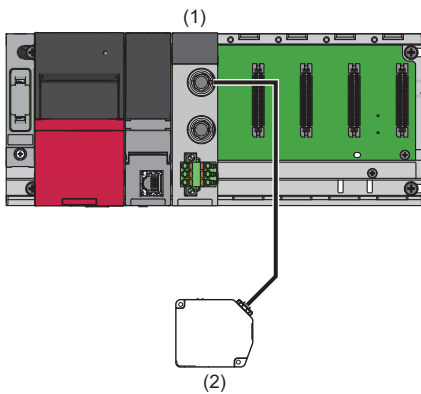
7.1 Communication Example Between Control Module and Sensor Head

This section describes the communication example between the control module and the sensor head.

System configuration example

The communication example uses the following system configuration.

System configuration



- (1) Programmable controller system
- Power supply module: R61P
 - CPU module: R04CPU
 - Control module: R60MH112NA
- (2) Sensor head: MH11H05B0SNA

Parameter setting

Set the parameters using the engineering tool and the setting tool.

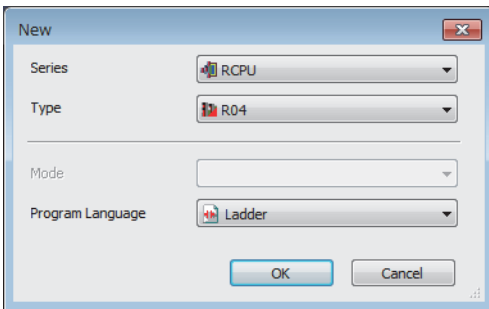
Setting of engineering tool

■Setting of control module

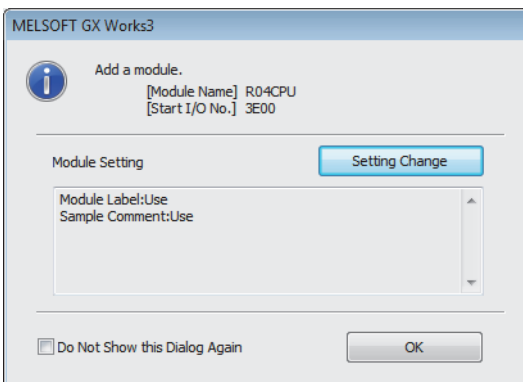
Connect the engineering tool to the CPU module, and set the parameters.

1. Set the CPU module.


 [Project] ⇒ [New]

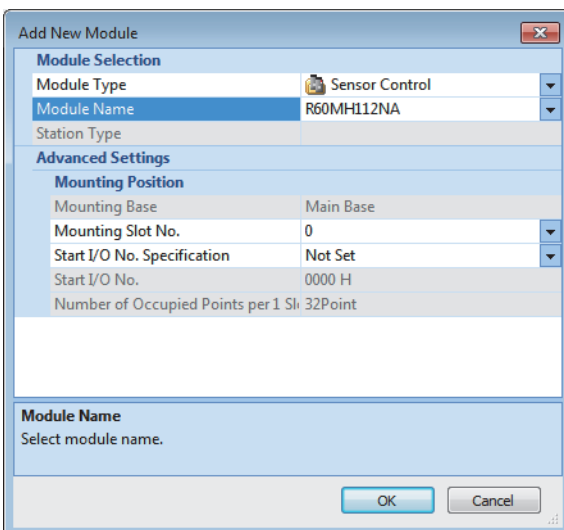


2. Click the [Setting Change] button and set "Use Module Label" to "Yes".
3. Click the [OK] button, then, the module label of the CPU module is added.

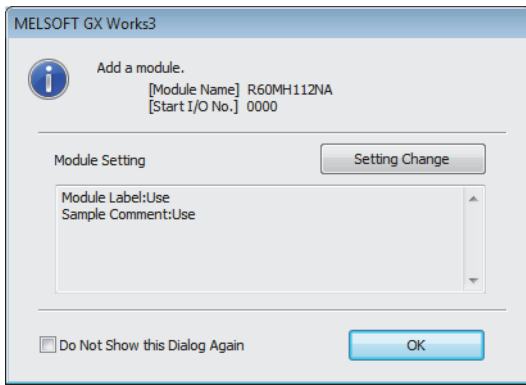


4. Set the control module.

 [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ Right-click ⇒ [Add New Module]

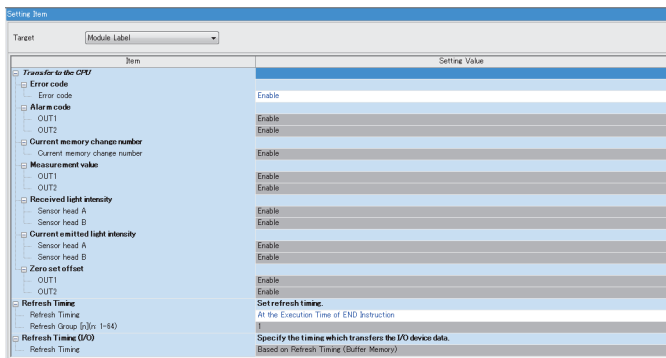


5. Click the [OK] button and add the module label of the control module.



6. Set the parameters.

[Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60MH112NA]



7. Write the parameters to the CPU module, and reset or power off and on the CPU module.

[Online] ⇒ [Write to PLC]

Point

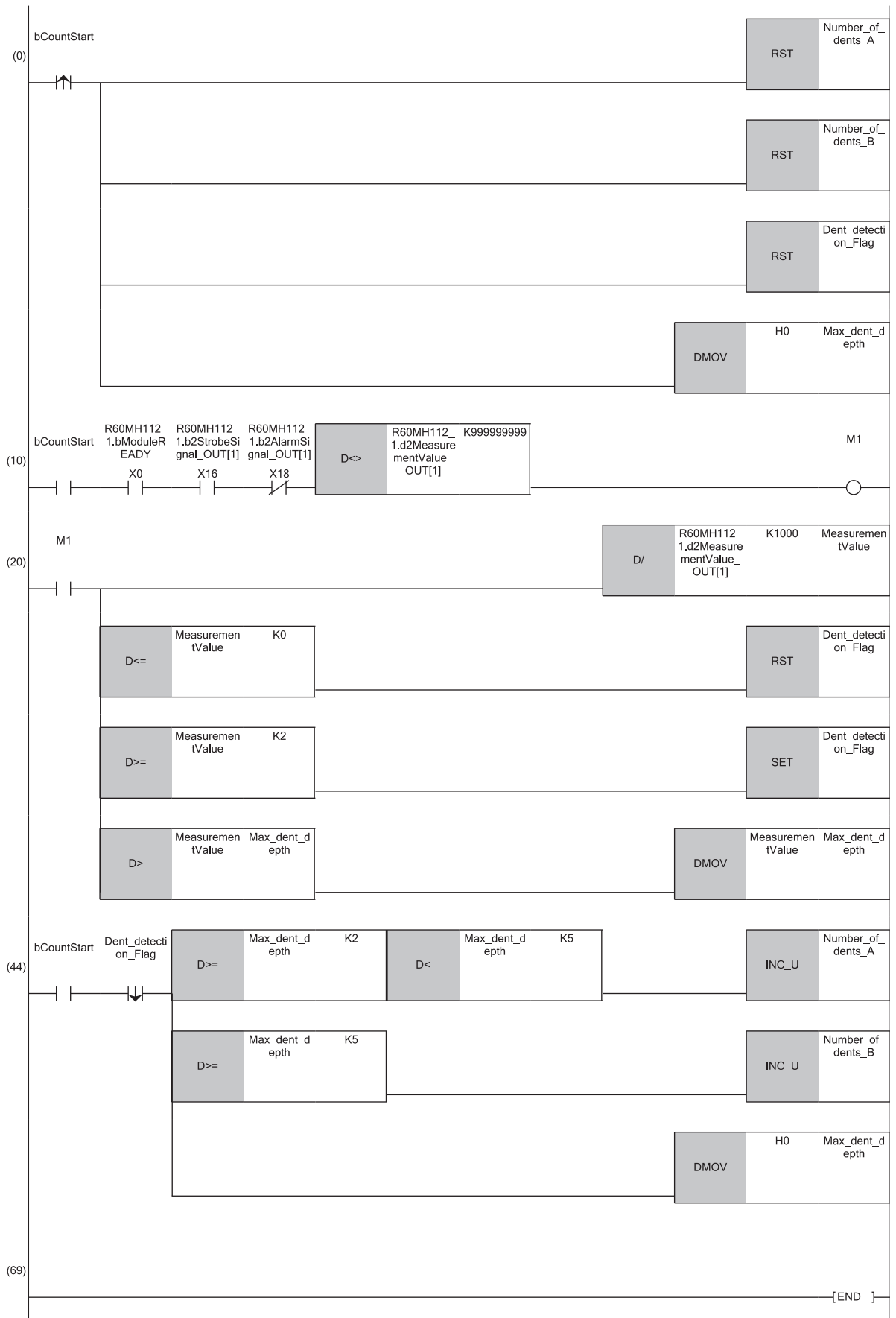
In this example, default values are used for parameters that are not shown above. For the parameters, refer to the following.

MELSEC iQ-R Laser Displacement Sensor Control Module User's Manual (Application)

Program example

The following shows the program example of the measurement value acquisition processing.

Classification	Label name	Description	Device																					
Module label	R60MH112_1.bModuleREADY	Module READY	X0																					
	R60MH112_1.b2StrobeSignal_OUT[1]	Strobe signal OUT1	X16																					
	R60MH112_1.b2AlarmSignal_OUT[1]	Alarm signal OUT1	X18																					
	R60MH112_1.d2MeasurementValue_OUT[1]	Measurement value OUT1	U0/G16																					
Label to be defined	Define the local labels as follows.																							
	<table border="1"> <thead> <tr> <th>Label Name</th> <th>Data Type</th> <th>Class</th> </tr> </thead> <tbody> <tr> <td>bCountStart</td> <td>Bit</td> <td>VAR</td> </tr> <tr> <td>MeasurementValue</td> <td>Double Word [Signed](0..1)</td> <td>VAR</td> </tr> <tr> <td>Dent_detection_Flag</td> <td>Bit</td> <td>VAR</td> </tr> <tr> <td>Max_dent_depth</td> <td>Double Word [Signed]</td> <td>VAR</td> </tr> <tr> <td>Number_of_dents_A</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>VAR</td> </tr> <tr> <td>Number_of_dents_B</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>VAR</td> </tr> </tbody> </table>	Label Name	Data Type	Class	bCountStart	Bit	VAR	MeasurementValue	Double Word [Signed](0..1)	VAR	Dent_detection_Flag	Bit	VAR	Max_dent_depth	Double Word [Signed]	VAR	Number_of_dents_A	Word [Unsigned]/Bit String [16-bit]	VAR	Number_of_dents_B	Word [Unsigned]/Bit String [16-bit]	VAR		
Label Name	Data Type	Class																						
bCountStart	Bit	VAR																						
MeasurementValue	Double Word [Signed](0..1)	VAR																						
Dent_detection_Flag	Bit	VAR																						
Max_dent_depth	Double Word [Signed]	VAR																						
Number_of_dents_A	Word [Unsigned]/Bit String [16-bit]	VAR																						
Number_of_dents_B	Word [Unsigned]/Bit String [16-bit]	VAR																						

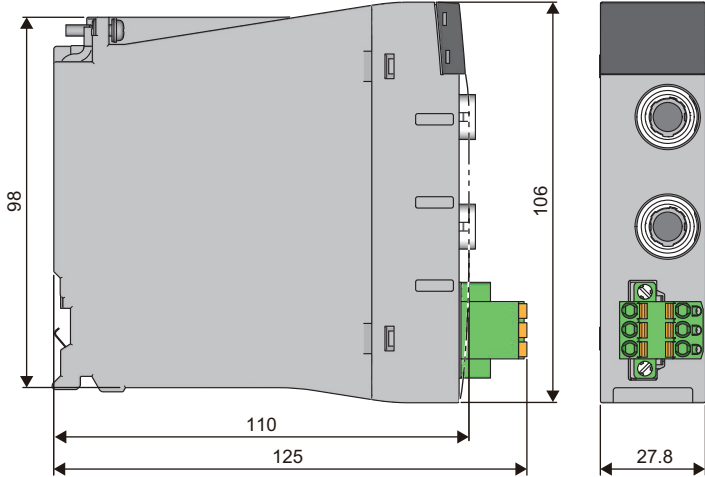


(0) The value of the depth of a dent is measured when the count start (bCountStart) is turned off and on, then, its value is stored in data (Max_dent_depth).
 (44) The number of the dents are counted and classified according to its values. (Number_of_dents_A: Dent (between 2µm and 5µm), Number_of_dents_B: Dent (5µm or more))

APPENDICES

Appendix 1 External Dimensions

This section describes the external dimensions of the control module.



(Unit: mm)

A

Appendix 2 Export Regulations by Japanese Government

The products have specifications not subject to export regulations by the Foreign Exchange and Foreign Trade Law.

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
June 2019	SH(NA)-082017ENG-A	First edition

Japanese manual number: SH-082016-A

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WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
 1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
 2. Failure caused by unapproved modifications, etc., to the product by the user.
 3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
 4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
 5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
 6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
 7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

TRADEMARKS

The company names, system names and product names mentioned in this manual are either registered trademarks or trademarks of their respective companies.

In some cases, trademark symbols such as [™] or [®] are not specified in this manual.

SH(NA)-082017ENG-A(1906)MEE

MODEL: R60MH112-U-IN-E

MODEL CODE: 13JX91

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Specifications subject to change without notice.