MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R High-Speed Counter Module User's Manual (Application)

-RD62P2
-RD62P2E
-RD62D2

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.

[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.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- 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. Failure to do so may result in an accident due to an incorrect output or malfunction.
- 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.
- Outputs may remain on or off due to a failure of a transistor for external output. Configure an external circuit for monitoring output signals that could cause a serious accident.

[Design Precautions]

⚠CAUTION

- 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 setting values in the buffer memory are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also can 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 in Program" for "Open Method Setting" in the module parameters. If "OPEN in 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 install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm or more between them. Failure to do so may result in malfunction due to noise.

[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.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- 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 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, 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 the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[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.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- 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 cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- 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 terminal screws or 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. For the cable connected to the terminal block, loosen the terminal screw. 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 install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm or more between them. Failure to do so may result in malfunction due to noise.
- Ground the shield cable on the encoder side (relay box) with a ground resistance of 100 ohm or less. Failure to do so may cause malfunction.

[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 terminal screws, 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.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
- 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. 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 Precautions]

⚠CAUTION

- 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 undefined. The values need to be set in the buffer memory and written to the flash ROM 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.

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 MELSEC iQ-R series programmable controllers.
This manual describes the functions, parameter settings, and troubleshooting 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 products

RD62P2, RD62P2E, RD62D2

MEMO

CONTENTS

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R High-Speed Counter Module User's Manual (Application) [SH-081241ENG] (this manual)	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of the high-speed counter module	Print book e-Manual EPUB PDF
MELSEC iQ-R High-Speed Counter Module User's Manual (Startup) [SH-081239ENG]	Performance specifications, procedures before operation, wiring, and operation examples of the high-speed counter module	Print book e-Manual EPUB PDF

Point

e-Manual refers to the Mitsubishi 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.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
GX Works3	The product name of the software package for the MELSEC programmable controllers
Engineering tool	Another term for GX Works3
Global label	A label that is valid for all the program data when multiple program data are created in the project. The global label has two types: a module specific label (module label), which is generated automatically by GX Works3, and an optional label, which can be created for any specified device.
High-speed counter module	The abbreviation for the MELSEC iQ-R series high-speed counter module
Buffer memory	A memory in an intelligent module for storing data (such as setting values and monitored values) to be transferred to the CPU module
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, GX Works3 automatically generates this label, which can be used as a global label.

1 FUNCTIONS

This chapter describes the functions for the high-speed counter module and the setting methods. For details on I/O signals and buffer memory areas, refer to the following.

- ☞ Page 54 Input signals
- ☞ Page 56 Output signals
- ☞ Page 61 Details of buffer memory addresses

Point

This chapter describes the I/O numbers (X/Y), buffer memory addresses, and external I/O terminals for CH1.
To check the I/O numbers (X/Y) for CH2, refer to the following.
☞ Page 53 List of I/O signals
To check the buffer memory addresses for CH2, refer to the following.
☞ Page 59 List of buffer memory addresses

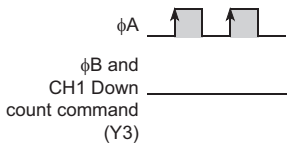
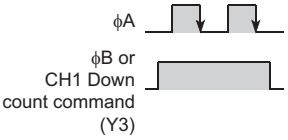
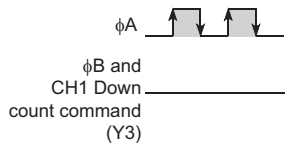
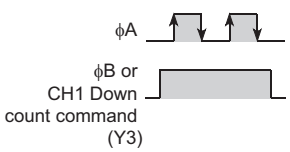
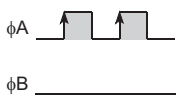
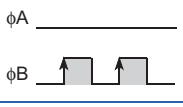
1.1 Pulse Input Modes and Counting Methods

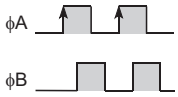
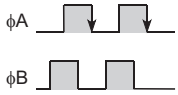
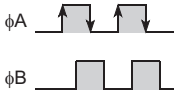
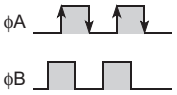
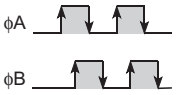
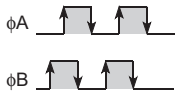
This section describes the pulse input modes and the counting methods.

Types of pulse input modes

The following six pulse input modes are prepared: 1-phase pulse input (1 multiple/2 multiples), CW/CCW pulse input, and 2-phase pulse input (1 multiple/2 multiples/4 multiples).

Pulse input modes and count timing

Pulse input mode	Count timing		
1-phase multiple of 1	For counting up		Counts on the rising edge (↑) of ϕA. ϕB and CH1 Down count command (Y3) are off.
	For counting down		Counts on the falling edge (↓) of ϕA. ϕB or CH1 Down count command (Y3) is on.
1-phase multiple of 2	For counting up		Counts on the rising edge (↑) and the falling edge (↓) of ϕA. ϕB and CH1 Down count command (Y3) are off.
	For counting down		Counts on the rising edge (↑) and the falling edge (↓) of ϕA. ϕB or CH1 Down count command (Y3) is on.
CW/CCW	For counting up		Counts on the rising edge (↑) of ϕA. ϕB is off.
	For counting down		ϕA is off. Counts on the rising edge (↑) of ϕB.

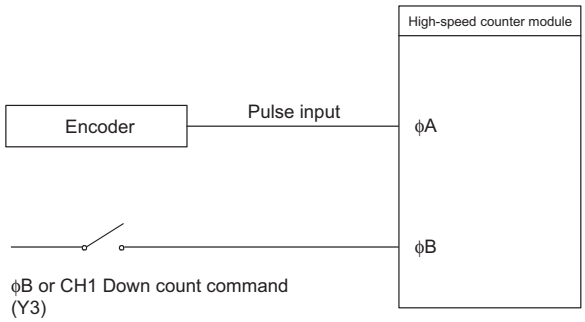
Pulse input mode	Count timing		
2-phase multiple of 1	For counting up		Counts on the rising edge (↑) of ϕA while ϕB is off.
	For counting down		Counts on the falling edge (↓) of ϕA while ϕB is off.
2-phase multiple of 2	For counting up		Counts on the rising edge (↑) of ϕA while ϕB is off. Counts on the falling edge (↓) of ϕA while ϕB is on.
	For counting down		Counts on the rising edge (↑) of ϕA while ϕB is on. Counts on the falling edge (↓) of ϕA while ϕB is off.
2-phase multiple of 4	For counting up		Counts on the rising edge (↑) of ϕA while ϕB is off. Counts on the falling edge (↓) of ϕA while ϕB is on. Counts on the rising edge (↑) of ϕB while ϕA is on. Counts on the falling edge (↓) of ϕB while ϕA is off.
	For counting down		Counts on the rising edge (↑) of ϕA while ϕB is on. Counts on the falling edge (↓) of ϕA while ϕB is off. Counts on the rising edge (↑) of ϕB while ϕA is off. Counts on the falling edge (↓) of ϕB while ϕA is on.

Point

For the 1-phase pulse input and counting up pulses, check that the B phase pulse input and CH1 Down count command (Y3) are off before performing the A phase pulse input. If at least one of the B phase pulse input and CH1 Down count command (Y3) is on, pulses are counted down in the A phase pulse input.

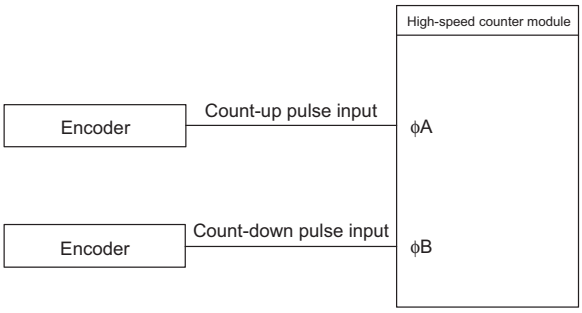
■1-phase pulse input

The count method can be selected from 1 multiple and 2 multiples. The following figure shows the relationship between the A phase pulse input and B phase pulse input or CH1 Down count command (Y3).



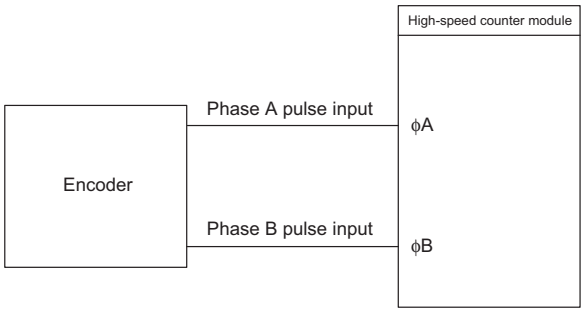
■CW/CCW pulse input

Pulses can be counted up with the A phase pulse input and counted down with the B phase pulse input. The following figure shows the relationship between the A phase pulse input and B phase pulse input.



■2-phase pulse input

The count method can be selected from 1 multiple, 2 multiples, and 4 multiples. The phase difference between the A phase pulse and B phase pulse determines whether the pulses are counted up or down. The following figure shows the relationship between the A phase pulse input and B phase pulse input.



Setting a counting method

Set a counting method in "Basic setting" For details on the setting method, refer to the following.

☞ Page 38 Basic Setting

Reading the present value

This section describes the details on the present value stored in the buffer memory and the count values selected from the counter function selection, and their reading method.

When the refresh setting is used

By configuring the refresh setting, writing and reading data can be performed without creating a communication program for the high-speed counter module. For details on the setting method, refer to the following.

☞ Page 42 Refresh Setting

When the refresh setting is not used

■Storage location of the count value

The present value is always stored in CH1 Present value (Un\G2 to Un\G3) regardless of the counter function used.
When the latch counter function, sampling counter function, or cycle pulse counter function is performed, the counter function selection count value is stored in the corresponding buffer memory addresses listed in the following table besides CH1 Present value (Un\G2 to Un\G3).

Description	Present value	Counter function selection count value				
		Latch count value	Sampling count value	Cycle pulse count previous value	Cycle pulse count current value	Cycle pulse count difference value
Buffer memory address	Un\G2 to Un\G3	Un\G12 to Un\G13	Un\G14 to Un\G15	Un\G16 to Un\G17	Un\G18 to Un\G19	Un\G24 to Un\G27

■Stored data

The present value and the counter function selection count values are stored in the buffer memory in 32-bit signed binary. However, only the cycle pulse count difference value is stored in the buffer memory in 64-bit signed binary. The values in the buffer memory are automatically updated depending on the count operation.

1.2 Selecting a Counter Type

Select a counter type in "Counter type" of "Basic setting".

Setting method

1. Set "Counter operation mode" to "Pulse count mode".
2. Set "Counter type" to "Linear counter" or "Ring counter".

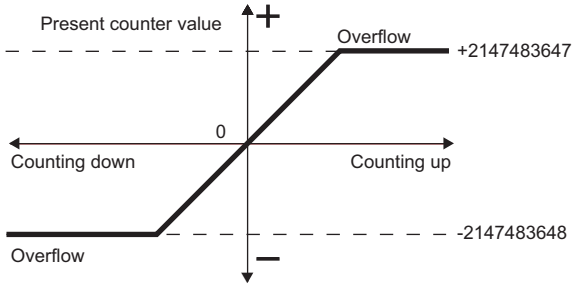
Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]

Item	Description	Reference
Linear counter	This function counts pulses between -2147483648 (lower limit value) and 2147483647 (upper limit value). If a count exceeds the range, the overflow is detected.	Page 17 Linear counter function
Ring counter	This function counts pulses repeatedly between the values stored in CH1 Ring counter lower limit value setting (Un\G20 to Un\G21) and CH1 Ring counter upper limit value setting (Un\G22 to Un\G23).	Page 18 Ring counter function

Linear counter function

Operation of the linear counter

- This function counts pulses between -2147483648 (lower limit value) and 2147483647 (upper limit value).
- The preset function and coincidence output function can be used with this function.



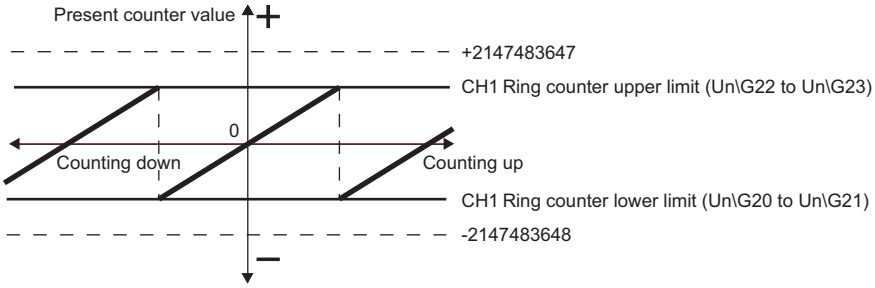
Overflow error

- When the counter type is the linear counter, an overflow error occurs if the value in CH1 Present value (Un\G2 to Un\G3) falls below -2147483648 (lower limit value) at the subtraction or exceeds 2147483647 (upper limit value) at the addition.
- If an overflow error occurs, 1 is stored in CH1 Overflow detection (Un\G8) and the counting operation stops. The present value does not change from -2147483648 or 2147483647 even if pulses are input.
- The overflow error can be cleared by performing the preset function.
- When the preset function is performed, 0 is stored in CH1 Overflow detection (Un\G8) and the counting operation restarts.

Ring counter function

Operation of the ring counter

This function repeatedly counts pulses between the values stored in CH1 Ring counter lower limit value setting (Un\G20 to Un\G21) and CH1 Ring counter upper limit value setting (Un\G22 to Un\G23). When the ring counter function is selected, an overflow error does not occur. The preset function and coincidence output function can be used with this function.



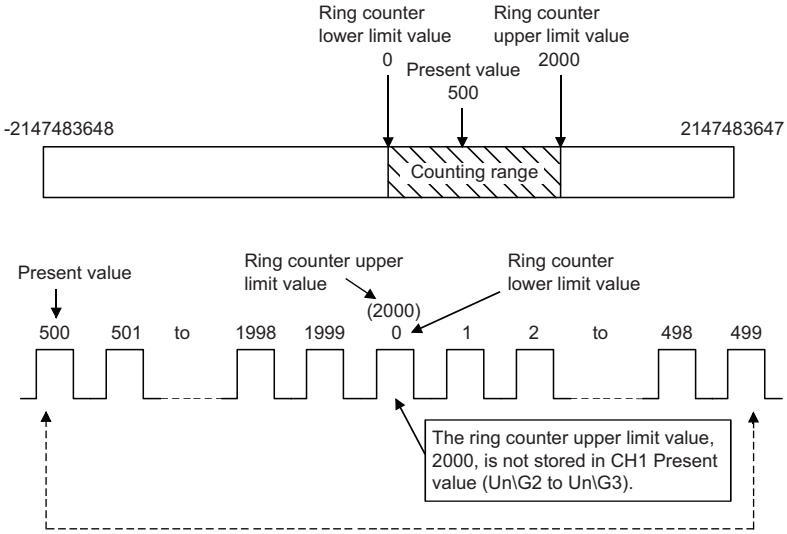
Count range of the ring counter

The count range is determined by the relationship between the ring counter lower limit value or ring counter upper limit value and the value in CH1 Present value (Un\G2 to Un\G3) when CH1 Count enable command (Y4) is turned on or when the preset function is performed. Normally, the count range is Ring counter lower limit value ≤ Present value ≤ Ring counter upper limit value.

■When the count range is Ring counter lower limit value ≤ Present value ≤ Ring counter upper limit value (normally used)

- When pulses are counted up, the ring counter lower limit value is automatically stored in CH1 Present value (Un\G2 to Un\G3) when the present value reaches the ring counter upper limit value.
- When pulses are counted down, even when the present value reaches the ring counter lower limit value, the ring counter lower limit value is held as the lower limit, and the value of Ring counter upper limit value - 1 is stored in CH1 Present value (Un\G2 to Un\G3) at the next count-down pulse input.

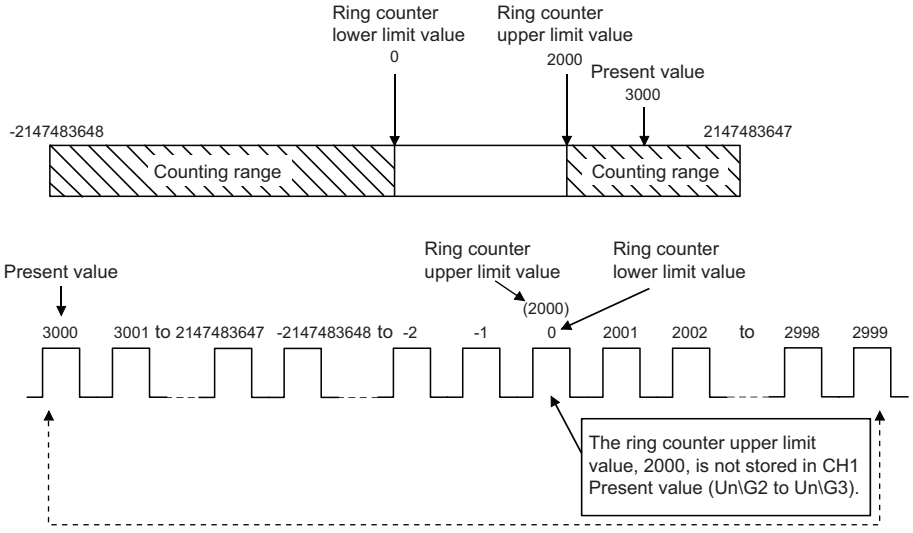
Both when pulses are counted up and when pulses are counted down, the ring counter upper limit value is not stored in CH1 Present value (Un\G2 to Un\G3). For example, when the count enable command is valid while the ring counter lower limit value is 0, the ring counter upper limit value is 2000, and the present value is 500, the count range and the present value will change as follows.



■When the count range is Present value < Ring counter lower limit value or Ring counter upper limit value < Present value

- When pulses are counted up, even when the present value reaches the ring counter lower limit value, the ring counter lower limit value is held as the lower limit, and the value of Ring counter upper limit value + 1 is stored in CH1 Present value (Un\G2 to Un\G3) at the next count-up pulse input.
- When pulses are counted down, the ring counter lower limit value is automatically stored in CH1 Present value (Un\G2 to Un\G3) when the present value reaches the ring counter upper limit value.

Both when pulses are counted up and when pulses are counted down, the ring counter upper limit value is not stored in CH1 Present value (Un\G2 to Un\G3). For example, when the count enable command is valid while the ring counter lower limit value is 0, the ring counter upper limit value is 2000, and the present value is 3000, the count range and the present value will change as follows.



■When the count range is Ring counter lower limit value = Ring counter upper limit value

When this condition is established, a value that can be expressed in 32-bit signed binary (-2147483648 to 2147483647) will be the count range, regardless or the present value.

Point

- While CH1 Count enable command (Y4) is on, even if CH1 Ring counter lower limit value setting (Un\G20 to Un\G21) and CH1 Ring counter upper limit value setting (Un\G22 to Un\G23) are changed, the high-speed counter module does not operate with the changed value. Turn off CH1 Count enable command (Y4) before changing the ring counter upper limit value or ring counter lower limit value.
- Turn off CH1 Count enable command (Y4) before changing the count range using the preset function.

1.3 Coincidence Output Function

This function compares the present count value with the preset count value, and outputs a signal when they match.

Setting method

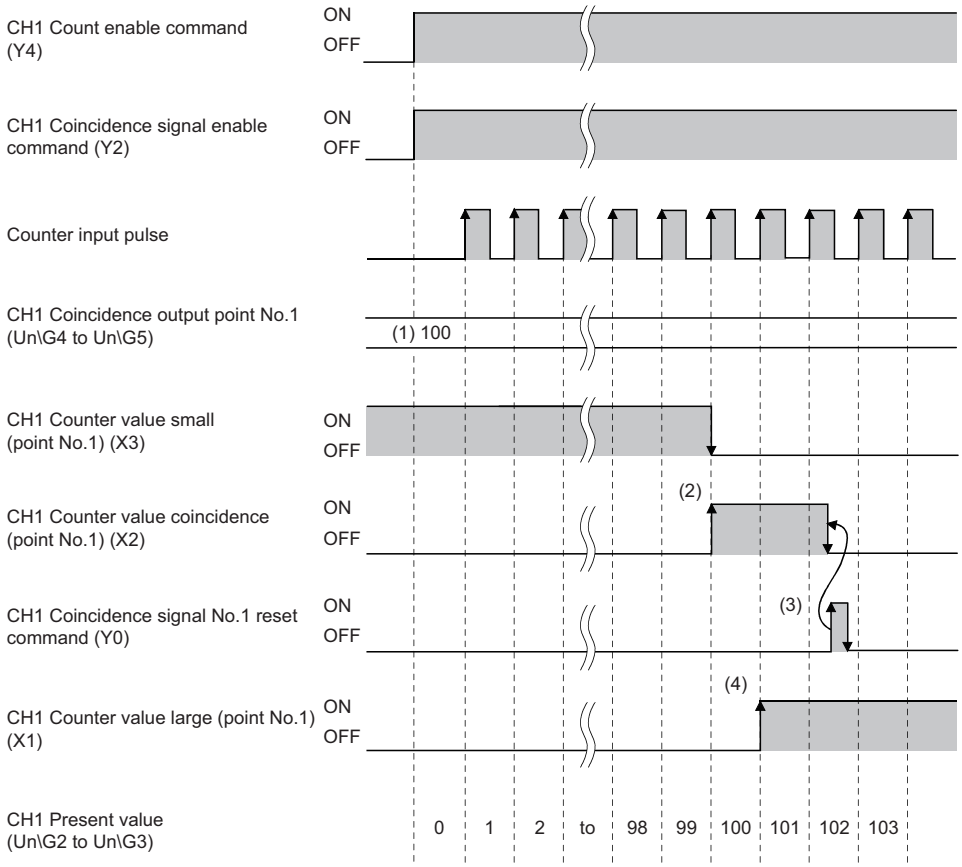
1. Set "Counter operation mode" to "Pulse count mode".
2. Set a count value for "Coincidence output point No.1 setting" or "Coincidence output point No.2 setting".

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]

Item	Setting range
Coincidence output point No.1	-2147483648 to 2147483647
Coincidence output point No.2	

Up to two coincidence outputs can be set for each channel.
When the external output of the coincidence signal is used, turn on CH1 Coincidence signal enable command (Y2) beforehand.

Operation of the coincidence output



No.	Description
(1)	Write a coincidence output point setting value into CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5) of the high-speed counter module in 32-bit signed binary.
(2)	When the count value matches with the coincidence output point setting value, CH1 Counter value smaller (point No.1) (X3) turns off and CH1 Counter value coincident (point No.1) (X2) turns on.
(3)	Turn on CH1 Coincidence signal No.1 reset command (Y0) to reset CH1 Counter value coincident (point No.1) (X2). If CH1 Counter value coincident (point No.1) (X2) remains on, the next coincidence signal cannot be output.
(4)	When the counter value exceeds the coincidence output point setting value, CH1 Counter value larger (point No.1) (X1) turns on.

Precautions for using the coincidence output function

When CH1 Coincidence signal enable command (Y2) is turned on before the count is started or while the coincidence output point setting value and the current value match, the coincidence output is performed. To avoid this status, perform one of the following operations before turning on CH1 Coincidence signal enable command (Y2).

■Setting different values to the coincidence output point setting value and the current value

Set different values to the coincidence output point setting value and the current value by one of the following methods.

- Changing the coincidence output point setting value
- Changing the current value using the preset function
- Changing the current value by inputting a pulse

■Turning off the counter value coincidence signal

Turn on and off CH1 Coincidence signal No.1 reset command (Y0).

Point

- Since CH1 Present value (Un\G2 to Un\G3) and CH1 Coincidence output point No.1 (Un\G4 to Un\G5) are 0 after the CPU module is powered on or is reset, CH1 Counter value coincident (point No.1) (X2) turns on.
- When CH1 Coincidence signal enable command (Y2) is turned on while CH1 Counter value coincident (point No.1) (X2) is on, the coincidence output is performed to outside the module. To avoid an incorrect coincidence output, turn on and off CH1 Coincidence signal No.1 reset command (Y0) before turning on CH1 Coincidence signal enable command (Y2), and turn off CH1 Counter value coincident (point No.1) (X2).

Coincidence detection interrupt function

This function outputs an interrupt request to the CPU module and starts an interrupt program when the present counter value matches with the preset coincidence output point setting value.

For details on the interrupt program, refer to the following.

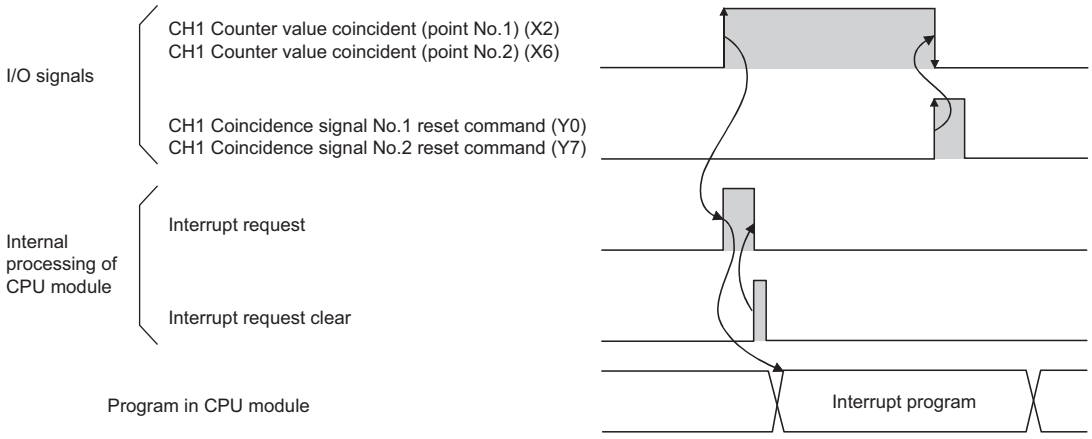
MELSEC iQ-R CPU Module User's Manual (Application)

Interrupt factor

The high-speed counter module has interrupt factors of 4 points for each coincidence output point.

Interrupt factor
Turning on CH1 Counter value coincident (point No.1) (X2)
Turning on CH1 Counter value coincident (point No.2) (X6)
Turning on CH2 Counter value coincident (point No.1) (X9)
Turning on CH2 Counter value coincident (point No.2) (XD)

Interrupt program execution timing



Setting interrupt pointers

Set interrupt pointers in the parameter settings. For details on the setting method, refer to the following.

Page 41 Interrupt Setting

Point

- A coincidence detection interrupt occurs on the rising edge of the counter value coincidence signal (When the signal is turned off and on). Therefore, the next interrupt will not be requested unless the coincidence signal is reset and the counter value coincidence signal is turned off.

1.4 Preset Function

This function overwrites the present counter value with the set numerical value. The set value is referred to as a preset value. This function can be used to start counting pulses from the preset value. The function can be performed using a program or an external control signal.

Setting method

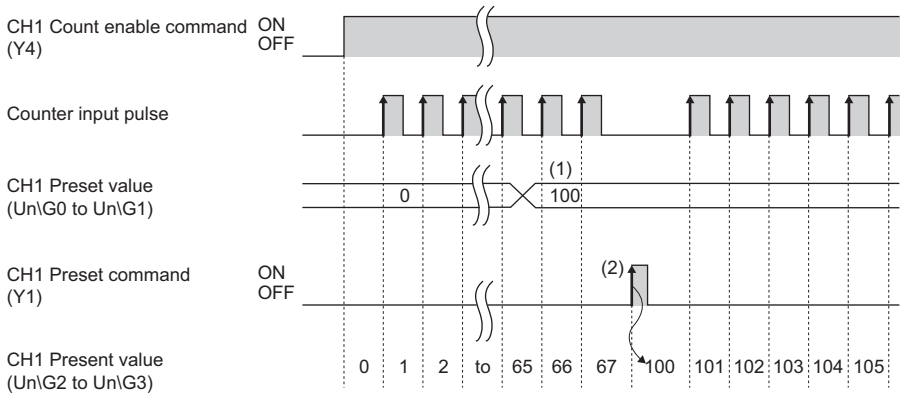
1. Set "Counter operation mode" to "Pulse count mode".
2. Set a preset value to "Preset value setting".

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]

Item	Setting range
Preset value setting	-2147483648 to 2147483647

Performing the preset function using a program

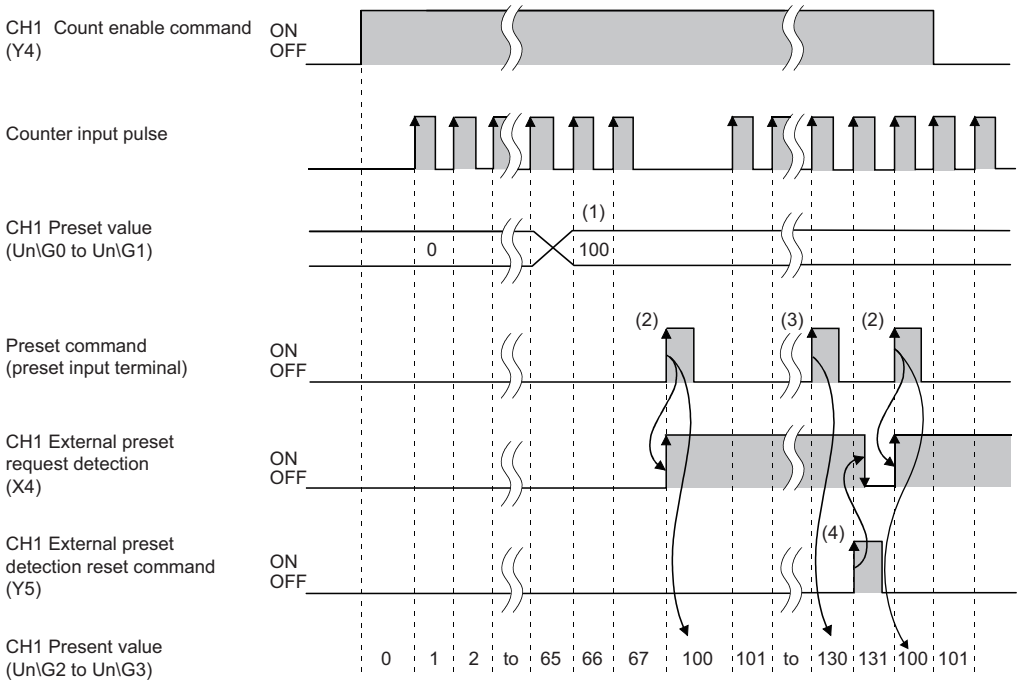
Perform the preset function by turning on CH1 Preset command (Y1) using a program.



No.	Description
(1)	Write a value into CH1 Preset value setting (Un\G0 to Un\G1) in 32-bit signed binary.
(2)	On the rising edge (off and on) of CH1 Preset command (Y1), the value in CH1 Present value (Un\G2 to Un\G3) is replaced with the value in CH1 Preset value setting (Un\G0 to Un\G1). The preset function can be performed regardless of the on/off status of CH1 Count enable command (Y4).

Performing the preset function using an external control signal

Perform the preset function by applying an ON voltage to the preset input terminal for external input.



No.	Description
(1)	Write a value into CH1 Preset value setting (Un\G0 to Un\G1) in 32-bit signed binary.
(2)	On the rising edge (off and on) of the preset command (A voltage is applied to the preset input terminal), the value in CH1 Present value (Un\G2 to Un\G3) is replaced with the value in CH1 Preset value setting (Un\G0 to Un\G1). The preset function can be performed regardless of the on/off status of CH1 Count enable command (Y4).
(3)	Even though a voltage is applied to the preset input terminal while CH1 External preset request detection (X4) is on, the value in CH1 Present value (Un\G2 to Un\G3) is not replaced with the preset value.
(4)	CH1 External preset request detection (X4) is turned off by turning on CH1 External preset detection reset command (Y5).

1.5 Counter Function Selection

The count disable function, latch counter function, sampling counter function, or cycle pulse counter function can be used by selecting each item in the counter function selection setting of the "Counter function selection setting". The selected counter function is performed by the counter function selection start command (when CH1 Counter function selection start command (Y6) is turned on using a program or a voltage is applied to the function start input terminal).
Only one of the four counter functions can be selected from the counter function selection.

Setting method

1. Set "Counter operation mode" to "Pulse count mode".
2. Set the function to be used in "Counter function selection setting".

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting]

Item	Description	Reference
Count disable function	This function stops counting pulses while CH1 Count enable command (Y4) is on.	Page 27 Count disable function
Latch counter function	This function latches the present counter value when Counter function selection start command is input.	Page 28 Latch counter function
Sampling counter function	This function counts pulses input during the specified sampling time (T) and stores the count value in the buffer memory.	Page 29 Sampling counter function
Cycle pulse counter function	This function stores the current value, previous value, and difference value of the counter in the buffer memory at every specified cycle time (T).	Page 30 Cycle pulse counter function

Point

- Change the counter function while CH1 Counter function selection start command (Y6) is off.
- The selected counter function can be performed by turning on CH1 Counter function selection start command (Y6) or applying a voltage to the function start input terminal. A signal that is input first takes priority.

Count error

A count error may occur when the selected counter function is performed using an external input (A voltage is applied to the function start input terminal) or using a program (CH1 Counter function selection start command (Y6) is turned on). The following describes how to calculate the count error.

Count error (max.) when an external input is used

Due to a delay in the input response time of the function start input terminal, the following error occurs.

$$\text{Count error (maximum)} = \frac{A}{1000}\,[s] \times B$$

A	Function input response time setting [ms] (1ms maximum)
B	Pulse input speed [pps] (= Pulse input frequency [Hz] × Multiplication [count])

Count error (max.) when a program is used

Due to a delay in the scan time of the program (Delay of turning on CH1 Counter function selection start command (Y6)), the following error occurs.

$$\text{Count error (maximum)} = \frac{A}{1000}\,[s] \times B$$

A	1 scan time [ms]
B	Pulse input speed [pps] (= Pulse input frequency [Hz] × Multiplication [count])

Count error (max.) on the sampling counter function or cycle pulse counter function

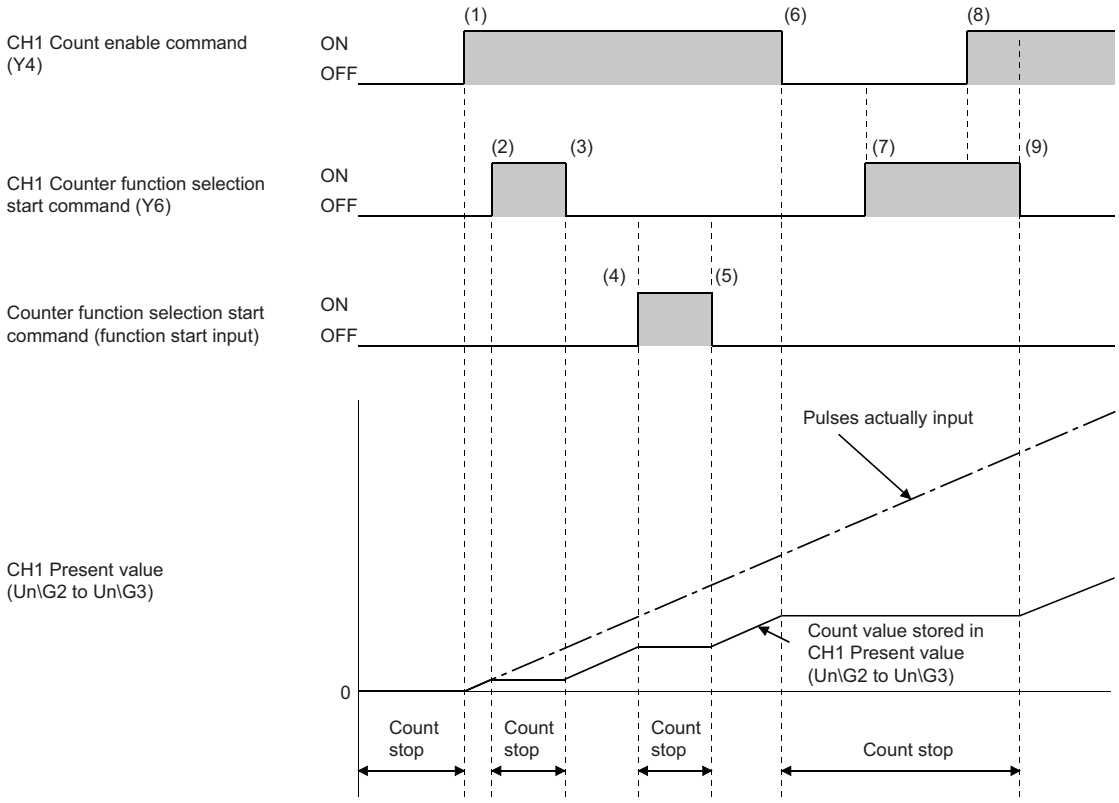
A sampling/cycle time error occurs due to an error in design (±100ppm) when the sampling counter function or cycle pulse counter function is performed. The count error is calculated as follows:

$$\text{Count error (maximum)} = \frac{A}{1000}\,[s] \times \frac{B}{1000000} \times C$$

A	Sampling/cycle time [ms]
B	100 [ppm]
C	Pulse input speed [pps] (= Pulse input frequency [Hz] × Multiplication [count])

Count disable function

This function stops counting pulses while CH1 Count enable command (Y4) is on. The following figure shows the relationship among CH1 Count enable command (Y4), Counter function selection start command, and the present counter value.

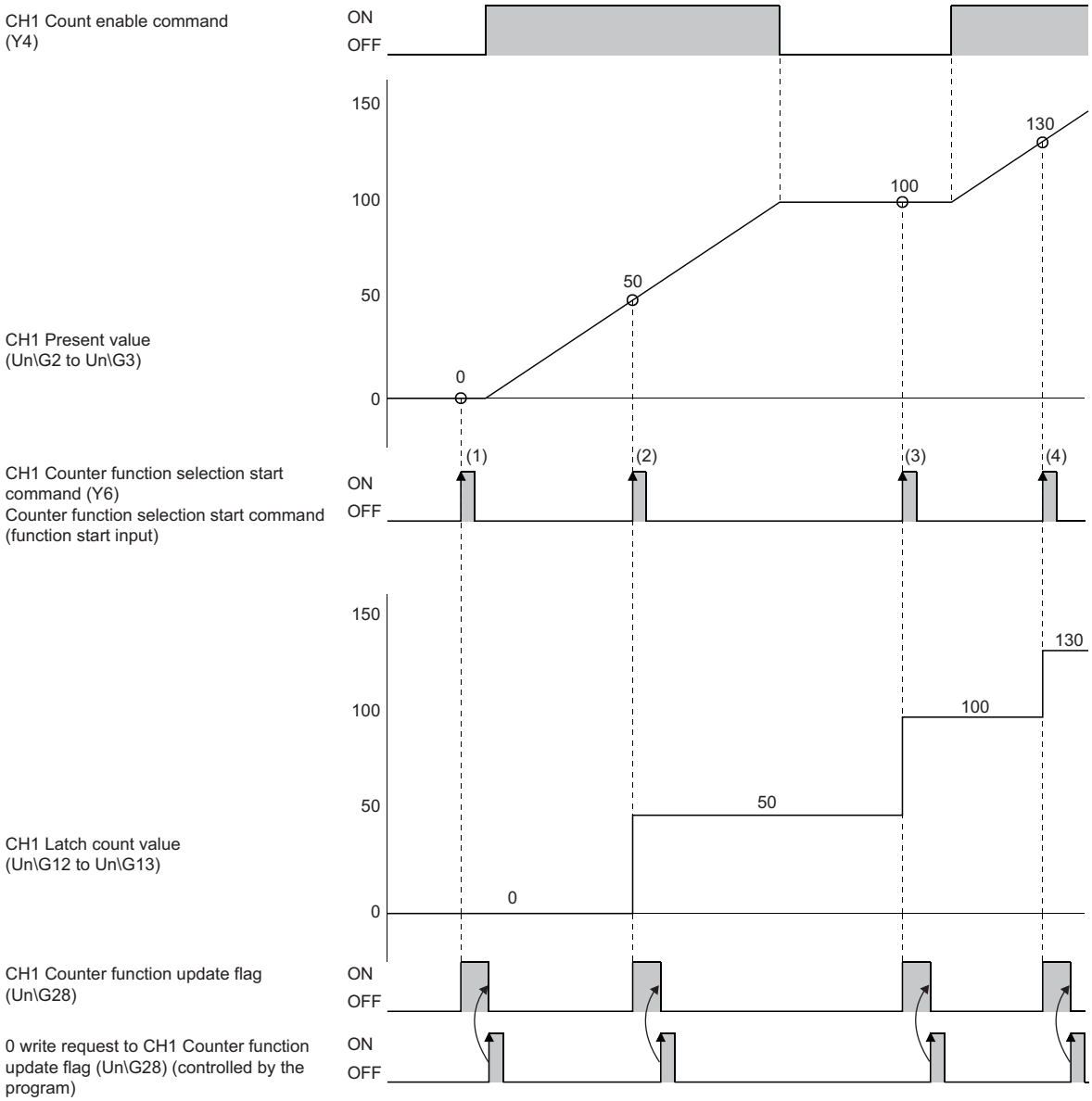


No.	Description
(1)	The count operation starts when CH1 Count enable command (Y4) is turned on.
(2)	The count operation stops when CH1 Counter function selection start command (Y6) is turned on.
(3)	The count operation restarts when CH1 Counter function selection start command (Y6) is turned off.
(4)	The count operation stops when Counter function selection start command (function start input) is turned on.
(5)	The count operation restarts when Counter function selection start command (function start input) is turned off.
(6)	The count operation stops when CH1 Count enable command (Y4) is turned off.
(7)	The count operation stops regardless of the on/off status of CH1 Counter function selection start command (Y6) because CH1 Count enable command (Y4) is off.
(8)	Even though CH1 Count enable command (Y4) is turned on, the count operation remains stopped because CH1 Counter function selection start command (Y6) is on.
(9)	The count operation restarts when CH1 Counter function selection start command (Y6) is turned off.

Latch counter function

This function latches the present counter value when Counter function selection start command is input. The following figure shows the relationship among the present counter value, Counter function selection start command, and CH1 Latch count value (Un\G12 to Un\G13).

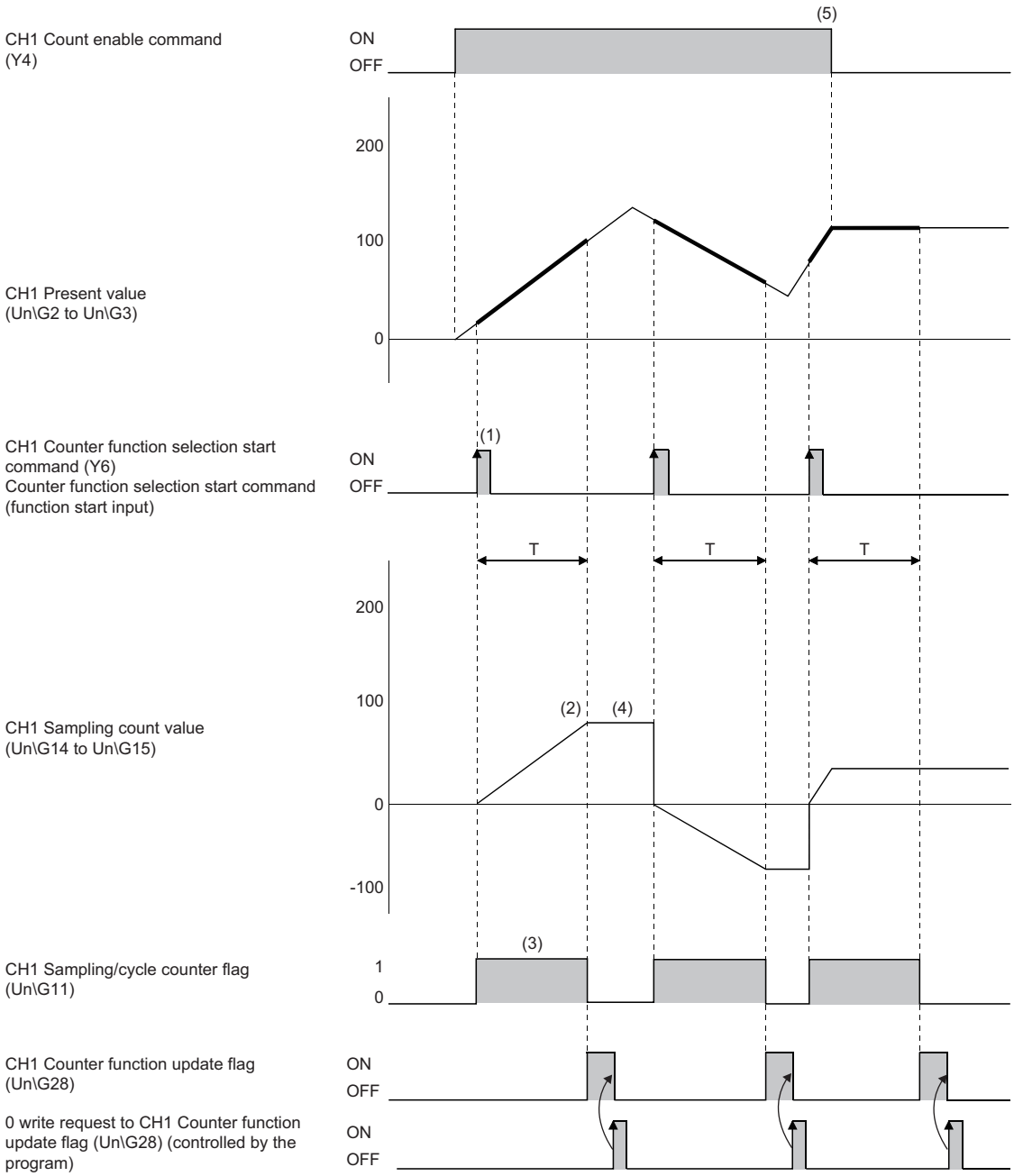
The latch counter function can be performed regardless of the on/off status of CH1 Count enable command (Y4).



No.	Description
(1)	On the rising edge of CH1 Counter function selection start command (Y6) or Counter function selection start command (function start input), the present counter value, 0 is stored in CH1 Latch count value (Un\G12 to Un\G13).
(2)	On the rising edge of CH1 Counter function selection start command (Y6) or Counter function selection start command (function start input), the present counter value, 50 is stored in CH1 Latch count value (Un\G12 to Un\G13).
(3)	On the rising edge of CH1 Counter function selection start command (Y6) or Counter function selection start command (function start input), the present counter value, 100 is stored in CH1 Latch count value (Un\G12 to Un\G13).
(4)	On the rising edge of CH1 Counter function selection start command (Y6) or Counter function selection start command (function start input), the present counter value, 130 is stored in CH1 Latch count value (Un\G12 to Un\G13).

Sampling counter function

This function counts pulses input during the specified sampling time (T) and stores the count value in the buffer memory. The following figure shows the relationship among the signals and buffer memory areas used by the sampling counter function.



No.	Description
(1)	Input pulses are counted from 0 on the rising edge of CH1 Counter function selection start command (Y6) or Counter function selection start command (function start input).
(2)	The count operation stops when the specified sampling time has elapsed.
(3)	While the sampling counter function is performed, 1 is stored in CH1 Sampling/cycle counter flag (Un\G11).
(4)	Even after the sampling counter function is performed, the value stored in CH1 Sampling count value (Un\G14 to Un\G15) is held.
(5)	The sampling counter function can be performed regardless of the on/off status of CH1 Count enable command (Y4).

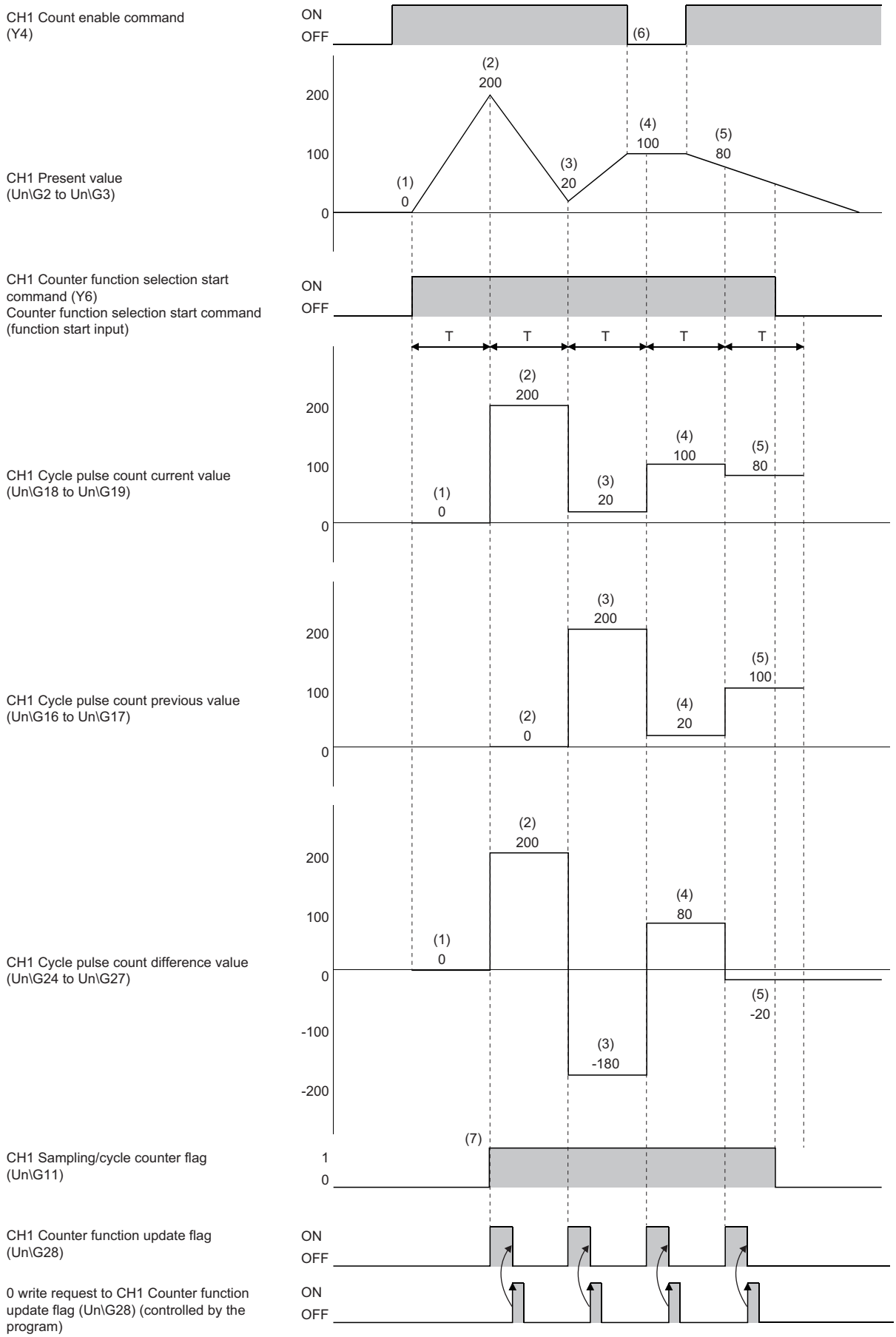
Point

Set the sampling time by writing the data within the range of 1 to 65535 to CH1 Sampling/cycle time setting (Un\G10). The unit of time differs depending on the counting speed setting in CH1 Sampling/cycle time setting (Un\G10). For details, refer to the following.

☞ Page 62 CH1 Sampling/cycle time setting

Cycle pulse counter function

This function stores the current value, previous value, and difference value of the counter in the buffer memory at every specified cycle time (T). The following figure shows the relationship among the signals and buffer memory areas used by the cycle pulse counter function.


CH1 Count enable command (Y4)
ON
OFF
(6)
CH1 Present value (Un\G2 to Un\G3)
200
100
0
(1) 0
(2) 200
(3) 20
(4) 100
(5) 80
CH1 Counter function selection start command (Y6)
Counter function selection start command (function start input)
T
CH1 Cycle pulse count current value (Un\G18 to Un\G19)
CH1 Cycle pulse count previous value (Un\G16 to Un\G17)
CH1 Cycle pulse count difference value (Un\G24 to Un\G27)
-100
-200
(7)
CH1 Sampling/cycle counter flag (Un\G11)
1
CH1 Counter function update flag (Un\G28)
0 write request to CH1 Counter function update flag (Un\G28) (controlled by the program)

No.	Description
(1)	The present counter value, 0 is stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19). The difference value with the previous value, 0 is stored in CH1 Cycle pulse count difference value (Un\G24 to Un\G27).
(2)	The present counter value, 200 is stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19). The value 0, which has been stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19), is stored in CH1 Cycle pulse count previous value (Un\G16 to Un\G17). The difference value with the previous value, 200 is stored in CH1 Cycle pulse count difference value (Un\G24 to Un\G27).
(3)	The present counter value, 20 is stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19). The value 200, which has been stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19), is stored in CH1 Cycle pulse count previous value (Un\G16 to Un\G17). The difference value with the previous value, -180 is stored in CH1 Cycle pulse count difference value (Un\G24 to Un\G27).
(4)	The present counter value, 100 is stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19). The value 20, which has been stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19), is stored in CH1 Cycle pulse count previous value (Un\G16 to Un\G17). The difference value with the previous value, 80 is stored in CH1 Cycle pulse count difference value (Un\G24 to Un\G27).
(5)	The present counter value, 80 is stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19). The value 100, which has been stored in CH1 Cycle pulse count current value (Un\G18 to Un\G19), is stored in CH1 Cycle pulse count previous value (Un\G16 to Un\G17). The difference value with the previous value, -20 is stored in CH1 Cycle pulse count difference value (Un\G24 to Un\G27).
(6)	The cycle pulse counter function is performed regardless of the on/off status of CH1 Count enable command (Y4).
(7)	While the cycle pulse counter function is performed, 1 is stored in CH1 Sampling/cycle counter flag (Un\G11).

Point

Set the cycle time by writing the data within the range of 1 to 65535 to CH1 Sampling/cycle time setting (Un\G10). The unit of time differs depending on the counting speed setting in CH1 Sampling/cycle time setting (Un\G10). For details, refer to the following.

☞ Page 62 CH1 Sampling/cycle time setting

Precautions for reading the previous value, current value, and difference value

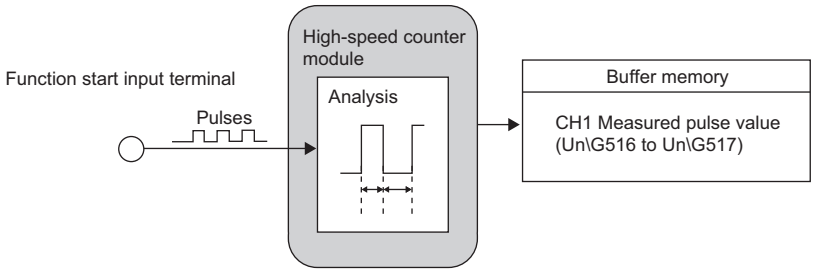
Depending on the relation between the update timing of the previous value or current value in the module and the read timing of the value using a program, the previous value and current value may match. When the previous value and current value match, read the values again.

1.6 Pulse Measurement Function

This mode measures the following times of the pulse input in the function start input terminal.

- ON width
- OFF width
- From the rising edge of the pulse to the rising edge of the next pulse
- From the falling edge of the pulse to the falling edge of the next pulse

When the next pulse is measured, the measured value is written over the previous value.



Setting method of the pulse measurement function

To use the pulse measurement function, select "Pulse measurement mode" for "Counter operation mode" in the parameter settings.

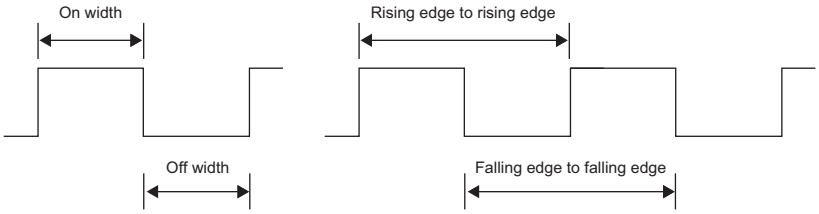
Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]

Terminals for the pulse measurement function

This function measures the pulse input in the function start input terminal.

Measurement target

Set the measurement target by storing a value in CH1 Pulse measurement section setting (Un\G512).



Measurement target	Setting value in CH1 Pulse measurement section setting (Un\G512)
ON width	0
OFF width	1
From the rising edge of the pulse to the rising edge of the next pulse	2
From the falling edge of the pulse to the falling edge of the next pulse	3

Starting and stopping methods of the pulse measurement

The start or stop of the pulse measurement is determined by CH1 Pulse measurement start command (pulse measurement) (Y6). The pulse measurement starts at the rising edge of the signal and stops at the falling edge of the signal.

Measurable range of the pulses

The measured values of the pulses are stored in CH1 Measured pulse value (Un\G516 to Un\G517). The measurable range of the pulses is between 2000 and 2147483647 (0.2ms to approx.214s).

■Overflow error

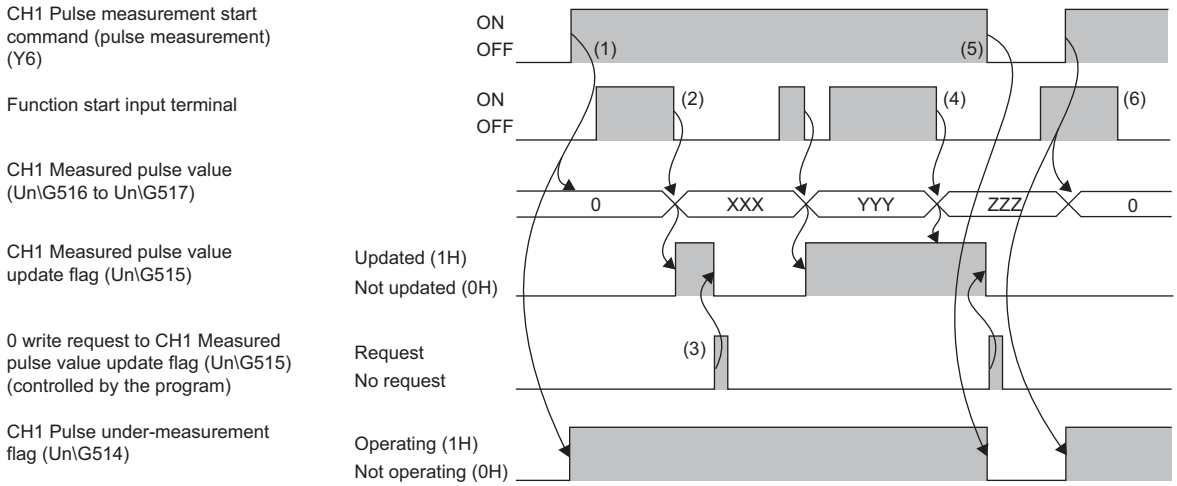
- When the input pulses are beyond the measurable range, an overflow error will be detected.
- When an overflow error occurs, 1 is stored in CH1 Overflow detection (Un\G8).
- Clear the overflow error using the following restarting method.

■Restarting method of the pulse measurement

To resume the measurement, input the pulses once again, or turn off and on CH1 Pulse measurement start command (pulse measurement) (Y6).

Operation example of the pulse measurement function

The following figure shows an operation example of the pulse measurement function. Assume that a target for pulse measurement is already set to the pulse ON width.



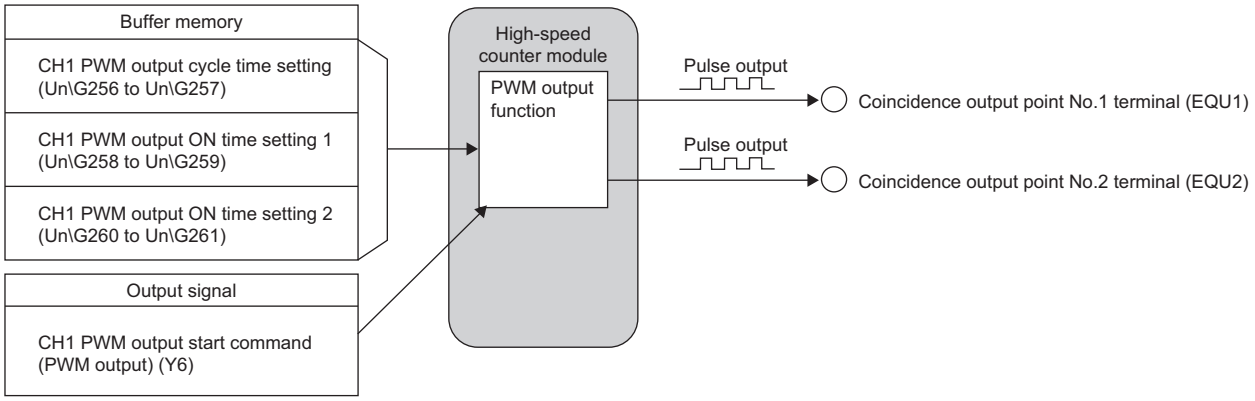
No.	Description
(1)	The following operations are performed when CH1 Pulse measurement start command (pulse measurement) (Y6) is turned off and on. Operating (1H) is stored in CH1 Pulse under-measurement flag (Un\G514). • 0 is stored in CH1 Measured pulse value (Un\G516 to Un\G517).
(2)	Updated (1H) is stored in CH1 Measured pulse value update flag (Un\G515) when a measured value is stored in CH1 Measured pulse value (Un\G516 to Un\G517).
(3)	Not updated (0H) is written in CH1 Measured pulse value update flag (Un\G515).
(4)	Even though Updated (1H) is stored in CH1 Measured pulse value update flag (Un\G515), CH1 Measured pulse value (Un\G516 to Un\G517) is updated.
(5)	When CH1 Pulse measurement start command (pulse measurement) (Y6) is turned on and off, operation stop (0H) is stored in CH1 Pulse under-measurement flag (Un\G514) and the pulse measurement stops.
(6)	If the measurement target (Pulse ON width in this example) has been input before Operating (1H) is stored in CH1 Pulse under-measurement flag (Un\G514), the values in CH1 Measured pulse value (Un\G516 to Un\G517) are not updated even though the function start input terminal is turned on and off. Note that only the pulse input after Operating (1H) is stored in CH1 Pulse under-measurement flag (Un\G514) is the measurement target.

Point

Do not use CH1 Measured pulse value update flag (Un\G515) when the values in CH1 Measured pulse value (Un\G516 to Un\G517) are retrieved via the auto refresh target device. (When Updated (1H) is stored in CH1 Measured pulse value update flag (Un\G515) after the auto refresh is done, the updated values are not reflected to the auto refresh target device and therefore, the values retrieved via the auto refresh target device are the ones before the updating.)

1.7 PWM Output Function

This function outputs the PWM waveform of up to 200kHz, 100ns as the minimum ON width (0.1μs) from the PWM output point No.1 terminal (EQU1) and PWM output point No.2 terminal (EQU2).



Setting method of the PWM output function

To use the pulse measurement function, select "PWM output mode" for "Counter operation mode" in the parameter settings.

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]

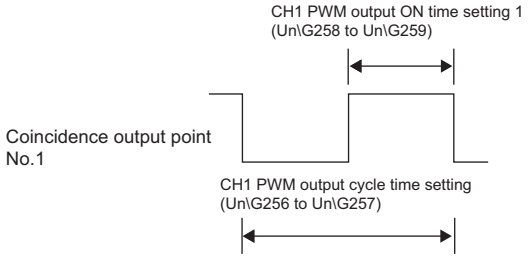
PWM output terminal

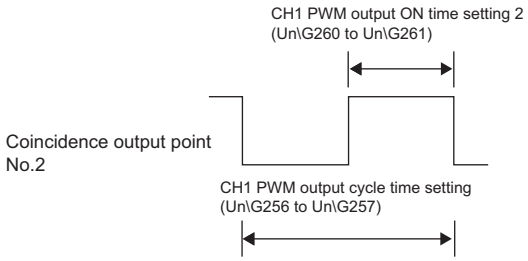
The PWM output waveform is output from the following terminals.

- PWM output point No.1 terminal (EQU1)
- PWM output point No.2 terminal (EQU2)

Setting method of the output waveform

Set the output waveform as follows. The setting values shown below can be changed during the output.





Setting item	Setting details
CH1 PWM output cycle time setting (Un\G256 to Un\G257)	Set the time of one cycle of the output pulse in the range of 0 to 2147483647. Set the value in increments of 0.1μs.
CH1 PWM output ON time setting 1 (Un\G258 to Un\G259)	• Set the ON time of the output pulse from the PWM output point No.1 terminal (EQU1) in the range of 0 to 2147483647. Set the value in increments of 0.1μs. • When no pulse is output from the PWM output point No.1 terminal (EQU1), set 0.
CH1 PWM output ON time setting 2 (Un\G260 to Un\G261)	• Set the ON time of the output pulse from the PWM output point No.2 terminal (EQU2) in the range of 0 to 2147483647. Set the value in increments of 0.1μs. • When no pulse is output from the PWM output point No.2 terminal (EQU2), set 0.

The PWM output starts in the OFF status. When PWM output cycle time - PWM output ON time passes, the PWM output is turned on. The subtraction of PWM output cycle time - PWM output ON time is performed in the high-speed counter module. When the result of the subtraction is 0, the PWM output is always on, and when the result of the subtraction is a negative value, the PWM output is always off.

Point

- When a value other than the setting range described above is set in each of CH1 PWM output cycle time setting (Un\G256 to Un\G257), CH1 PWM output ON time setting 1 (Un\G258 to Un\G259), and CH1 PWM output ON time setting 2 (Un\G260 to Un\G261), a normal pulse may not be output.
- By using the calculation formula of PWM output ON time = PWM output cycle time × Duty ratio (%) ÷ 100, the PWM output ON time can be calculated based on the duty ratio specified by users.

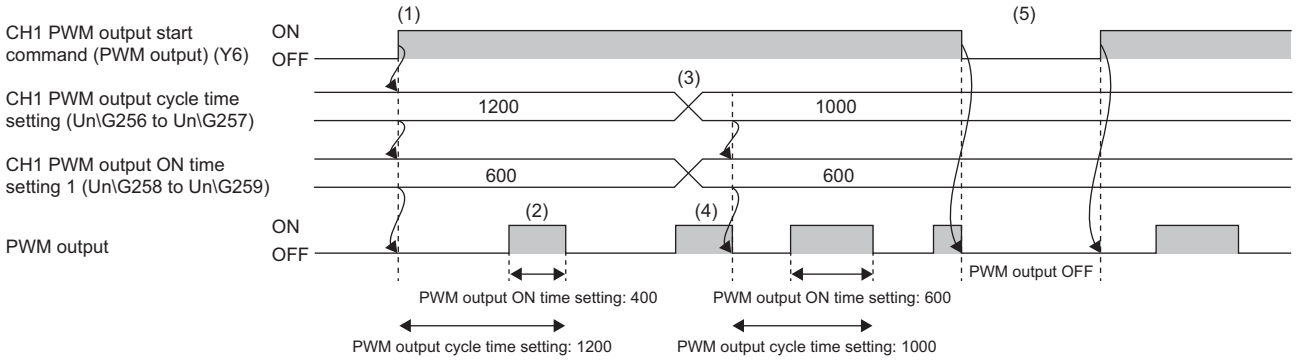
■Setting condition

Set a value that satisfies all the following conditions. Otherwise, the PWM output is always off.

- PWM output cycle time setting > 0
- PWM output ON time setting > 0
- PWM output cycle time setting ≥ PWM output ON time setting (When this relation is =, the PWM output is always on.)

Operation example of the PWM output function

The following figure shows an operation example of the PWM output function.



No.	Description
(1)	When CH1 PWM output start command (PWM output) (Y6) is turned off and on, the PWM output starts according to the following setting values. • CH1 PWM output cycle time setting (Un\G256 to Un\G257) • CH1 PWM output ON time setting 1 (Un\G258 to Un\G259) • CH1 PWM output ON time setting 2 (Un\G260 to Un\G261)
(2)	The PWM output is on while CH1 PWM output start command (PWM output) (Y6) is on.
(3)	The following setting values can be changed while the PWM output is on. • CH1 PWM output cycle time setting (Un\G256 to Un\G257) • CH1 PWM output ON time setting 1 (Un\G258 to Un\G259) • CH1 PWM output ON time setting 2 (Un\G260 to Un\G261)
(4)	When the following setting values are changed, the changes are applied from the next output. • CH1 PWM output cycle time setting (Un\G256 to Un\G257) • CH1 PWM output ON time setting 1 (Un\G258 to Un\G259) • CH1 PWM output ON time setting 2 (Un\G260 to Un\G261)
(5)	When CH1 PWM output start command (PWM output) (Y6) is turned on and off while the PWM output is on, the PWM output stops. The PWM output is off while CH1 PWM output start command (PWM output) (Y6) is off.

Point

The waveform output from the PWM output point No.1 terminal (EQU1) or PWM output point No.2 terminal (EQU2) is affected by the output circuit or connected device of the high-speed counter module. Check the waveform by using a device such as a synchroscope, and set the output waveform.

2 PARAMETER SETTINGS

This chapter describes the parameter settings of the high-speed counter module. Setting parameters here eliminates the need to program them.

2.1 Parameter Setting Procedure

1. Add the high-speed counter module to an engineering tool.

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

2. The basic setting, application setting, interrupt setting, and refresh settings are included in the parameter setting. Select one of the settings from the tree on the window shown below.

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Select the high-speed counter module ⇨ [Module Parameter]

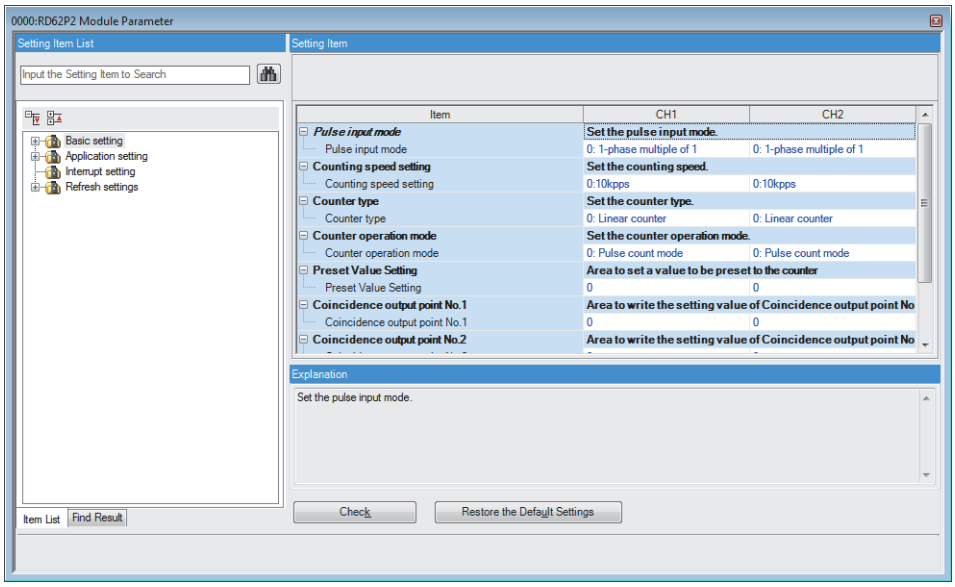
3. Write the setting to the CPU module with an engineering tool.

[Online] ⇨ [Write to PLC]

4. When the CPU module is reset or is powered off and on, the setting is reflected.

2.2 Basic Setting

Set the parameters for the basic functions of the high-speed counter module.



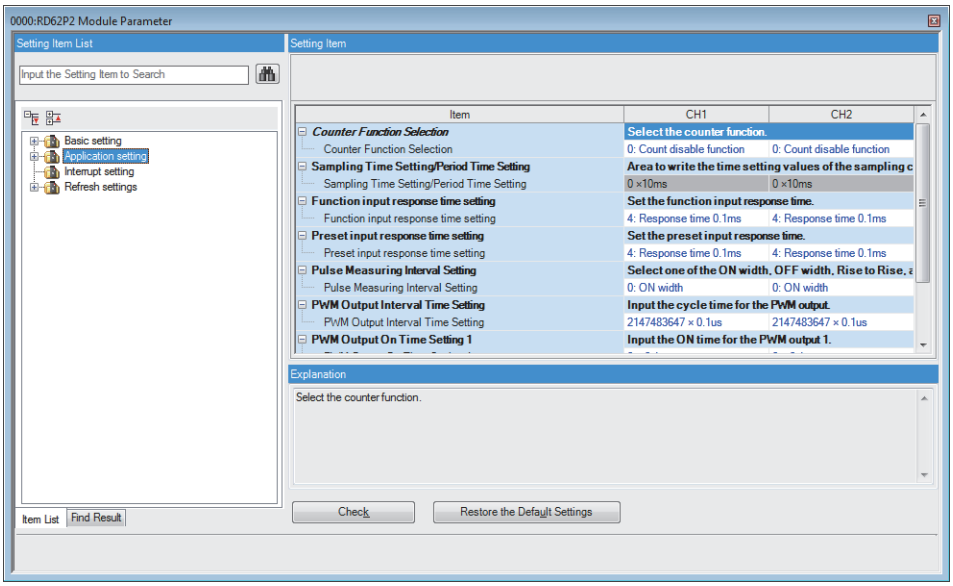
Item	Setting range	Reference
Pulse input mode[*1]	• 0: 1-phase multiple of 1 (default value) • 1: 1-phase multiple of 2 • 2: CW/CCW • 3: 2-phase multiple of 1 • 4: 2-phase multiple of 2 • 5: 2-phase multiple of 4	—
Counting speed setting[*1]	• 0: 10kpps (default value) • 1: 100kpps • 2: 200kpps • 3: 500kpps (RD62D2 only) • 4: 1Mpps (RD62D2 only) • 5: 2Mpps (RD62D2 only) • 6: 4Mpps (RD62D2 only) • 7: 8Mpps (RD62D2 only)	—
Counter type[*1]	• 0: Linear counter (default value) • 1: Ring counter	—

Item	Setting range	Reference
Counter operation mode*1	• 0: Pulse count mode (default value) • 1: Pulse measurement mode • 2: PWM output mode	—
Preset value setting	-2147483648 to 2147483647 (default value: 0)	Page 61 CH1 Preset value setting
Coincidence output point No.1	-2147483648 to 2147483647 (default value: 0)	Page 61 CH1 Coincidence output point No.1 setting
Coincidence output point No.2	-2147483648 to 2147483647 (default value: 0)	Page 61 CH1 Coincidence output point No.2 setting
Ring counter upper limit value setting	-2147483648 to 2147483647 (default value: 0)	Page 64 CH1 Ring counter upper limit value setting
Ring counter lower limit value setting	-2147483648 to 2147483647 (default value: 0)	Page 64 CH1 Ring counter lower limit value setting

*1 The item can be set only in the parameter setting. It cannot be changed from the program.

2.3 Application Setting

Set the parameters for the various functions of the high-speed counter module.



Item	Setting range	Reference
Counter function selection setting	• 0: Count disable function (default value) • 1: Latch counter function • 2: Sampling counter function • 3: Cycle pulse counter function	Page 62 CH1 Counter function selection setting
Sampling/cycle time setting	1 to 65535 (default value: 0) × 10ms*3	Page 62 CH1 Sampling/cycle time setting
Function input response time setting*1	• 0: Response time 0ms • 4: Response time 0.1ms (default value) • 8: Response time 1ms • 10: Response time 10ms	—
Preset input response time setting*1	• 0: Response time 0ms • 4: Response time 0.1ms (default value) • 8: Response time 1ms • 10: Response time 10ms	—
Pulse measurement section setting	• 0: ON width (default value) • 1: OFF width • 2: Rise—Rise • 3: Fall—Fall	Page 66 CH1 Pulse measurement section setting
PWM output cycle time setting	0 to 2147483647 (default value: 2147483647) × 0.1μs	Page 66 CH1 PWM output cycle time setting
PWM output ON time setting 1	0 to 2147483647 (default value: 0) × 0.1μs	Page 66 CH1 PWM output ON time setting 1
PWM output ON time setting 2	0 to 2147483647 (default value: 0) × 0.1μs	Page 66 CH1 PWM output ON time setting 2
Output mode upon error*1*2	• 0: Clear (default value) • 1: Hold	—

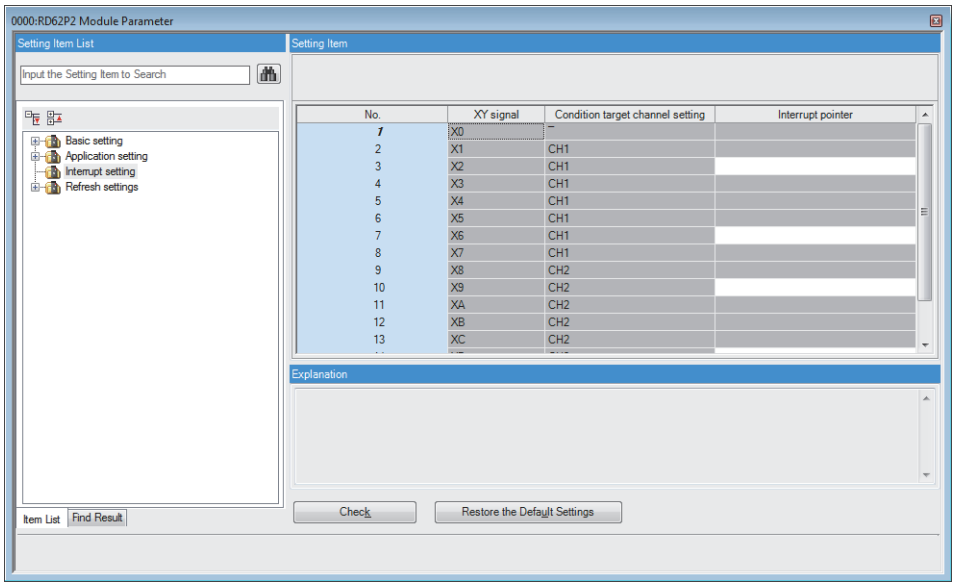
*1 The item can be set only in the parameter setting. It cannot be changed from the program.

*2 The external output status (clear/hold) of the high-speed counter module for when a CPU stop error occurs can be set.

*3 If a value larger than 1Mpps is set in "Counting speed setting" when the RD62D2 is used, the unit is changed from 10ms to 1ms.

2.4 Interrupt Setting

Set the interrupt function of the high-speed counter module.



Item	Setting range	Reference
Interrupt pointer	I0 to I15, I50 to I1023*1	Page 22 Coincidence detection interrupt function

*1 For details on the interrupt pointers that can be used, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)

2.5 Refresh Setting

Set the transfer destination of the settings in the buffer memory of the high-speed counter module such as module labels and devices of the CPU module. By configuring the refresh setting, the reading from the program is not required.
Select one of the following transfer destinations in "Target".

- Module Label (☞ Page 42 Module Label)
- Refresh Data Register (☞ Page 42 Refresh data register (RD))
- Device (☞ Page 42 Specified device)

Module Label

The settings of the buffer memory are transferred to the module label corresponding to each buffer memory area. When "Present value" of the channel transferred to the module label is set to "Enable", all the items of the set channel are set to "Enable".

Refresh data register (RD)

The settings of the buffer memory are transferred to the refresh data register (RD) of the CPU module. The transfer destinations of all items are automatically set by setting the start device to "Top Device Name".

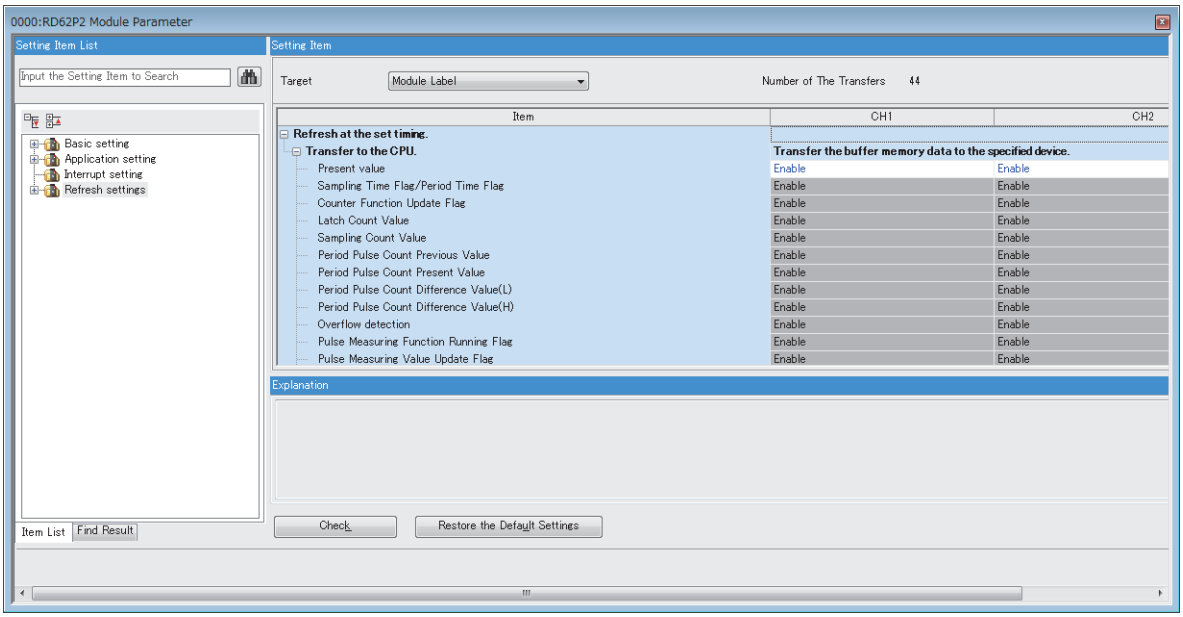
Specified device

The settings of the buffer memory are transferred to the specified device of the CPU module. The device X, Y, M, L, B, D, W, R, ZR, and RD can be specified. When the bit device X, Y, M, L, or B is used, set a number that can be divided by 16 points (example: X10, Y120, and M16). Also, the buffer memory data is stored in the devices for 16 points starting from the set device number.

Ex.
When X10 is set, the data is stored in X10 to X1F.

Setting item

The following items are provided in the refresh settings.



Item			Reference
Refresh at the set timing	Transfer to the CPU	Present value	Page 61 CH1 Present value
		Sampling/cycle counter flag	Page 63 CH1 Sampling/cycle counter flag
		Counter function update flag	Page 65 CH1 Counter function update flag
		Latch count value	Page 63 CH1 Latch count value
		Sampling count value	Page 63 CH1 Sampling count value
		Cycle pulse count previous value	Page 63 CH1 Cycle pulse count previous value
		Cycle pulse count current value	Page 64 CH1 Cycle pulse count current value
		Cycle pulse count difference value (L)	Page 64 CH1 Cycle pulse count difference value
		Cycle pulse count difference value (H)	
		Overflow detection	Page 62 CH1 Overflow detection
		Pulse under-measurement flag	Page 67 CH1 Pulse under-measurement flag
		Measured pulse value update flag	Page 67 CH1 Measured pulse value update flag
		Measured pulse value	Page 67 CH1 Measured pulse value
		Signal monitor	Page 65 CH1 Signal monitor
Refresh Group		Refresh Group	Page 43 Refresh Group
		Group [n] (n: 1-64)	
Refresh Timing (I/O)*1		Refresh Timing	—
Inter-module synchronous interrupt function	Transfer to the CPU	Synchronization latch count value	—
		Synchronization measured pulse value	—
Refresh Timing (Synchronous Interrupt)*1		Refresh Group	Page 43 Refresh Group

*1 For the high-speed counter module, the default setting cannot be changed.

■Refresh Group

Set the refresh timing of the specified refresh destination.

Setting value	Description
At the Execution Time of END Instruction	The refresh is performed when the END instruction of the CPU module is executed.
At the Execution Time of Specified Program	The refresh is performed when the program specified in "Group [n]" is executed.
At the Execution Time of Synchronous Interrupt Program between Unit	The refresh is performed when the interrupt program by the interrupt pointer is executed.

Refresh processing time

A refresh processing time [μs] is a constituent of the scan time of the CPU module. For details on the scan time, refer to the following.

📖 MELSEC iQ-R CPU Module User's Manual (Application)

The refresh processing time [μs], which is taken for refresh, is given by:

• Refresh processing time [μs] = Refresh read time (time for transferring refresh data to the CPU module)

The refresh read time varies depending on the settings of "Target".

With the inter-module synchronization function used, the refresh read time is also added to the execution time of an inter-module synchronous interrupt program.

When "Target" is a module label or a refresh data register (RD)

The following table shows the refresh read time with an R□CPU used.

Classification	When using the refresh settings			When using the inter-module synchronization function		
	Set to CH1 only	Set to CH2 only	Set to CH1 and CH2	Set to CH1 only	Set to CH2 only	Set to CH1 and CH2
Refresh read time	15.07μs	15.07μs	18.63μs	15.63μs	15.63μs	15.83μs

When "Target" is a specified device

Calculate the refresh read time according to the number of items and the number of their transfer data (word) that are set to be refreshed. For the calculation method, refer to the following.

📖 MELSEC iQ-R CPU Module User's Manual (Application)

In addition, substitute the following values in the calculation formula to calculate the refresh read time.

Item	Description
Number of refresh settings	The number of items that are set to be refreshed
Refresh time (A) of each of the first to nth set items	0.05μs per one word of each of the first to nth set items*1

*1 This value is the time with an R□CPU used.

Ex.

If all the 28 items (44 words in total) are set in the refresh read settings

$28 \times 0.98 + 0.05 \times 44 + 11.6 = 41.24$μs

The refresh read time, therefore, is 41.24μs.

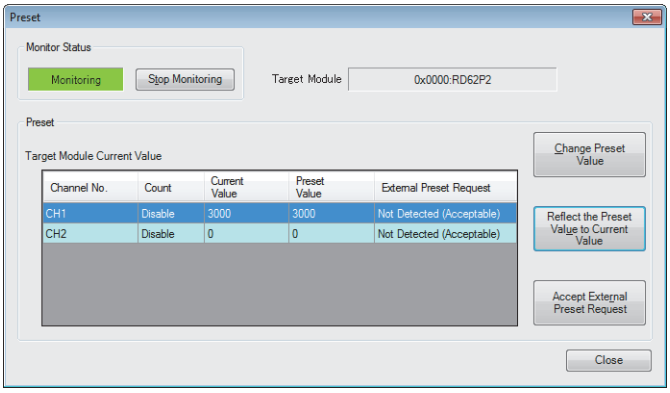
2.6 Preset Setting

Execute the preset from "Module Tool List" of the engineering tool.

Setting method

1. Select "iQ-R Series" from "Module Series Selection", and set "Preset".
2. Select the high-speed counter module to execute the preset in the "Module Selection (Preset)" window.
3. Execute the preset.

[Tool] ⇨ [Module Tool List]



Item	Description
Change Preset Value	The preset value of the selected channel is changed. The changed preset value is reflected to the "Preset Value" column.
Reflect the Preset Value to Current Value	The value of "Preset Value" is reflected to "Current Value".
Accept External Preset Request	When CH1 External preset request detection (X4) is on, the "External Preset Request" column becomes "Detected (Unacceptable)", and the preset function cannot be executed. When this button is clicked, CH1 External preset request detection (X4) turns off, and the preset function can be executed.

Point

The preset value changed with "Change Preset Value" returns to the preset value set in the parameter setting or the one set using a program when the CPU module is reset or is powered off and on. When the preset value change needs to be held, set the preset value in the parameter setting or using a program.

3 TROUBLESHOOTING

This chapter describes errors that may occur while using the high-speed counter module, and those troubleshooting.

Point

Throughout the chapter, the I/O numbers (X/Y) and buffer memory addresses are described on the basis of the case of CH1.
To check them of CH2, refer to the following:
☞ Page 53 List of I/O signals
☞ Page 59 List of buffer memory addresses

3.1 Procedure for Troubleshooting

If a trouble occurs, try the following troubleshooting steps:

1. Check whether each module is mounted and wired correctly.
(📖 MELSEC iQ-R Module Configuration Manual)
2. Check the LEDs of the power supply module and CPU module. (📖 User's Manual of each module)
3. Check the error cause and corrective action by the symptom to correct the error. (☞ Page 47 Troubleshooting by Symptom)

3.2 Checking Module Status

An overflow error can be checked in CH1 Overflow detection (Un\G8).

Error information to be detected by the high-speed counter module

Description and cause	Where to check the error information	Action
Overflow error • In linear counter, an up pulse has been counted from the present value 2147483647. • In linear counter, a down pulse has been counted from the present value -2147483648.	Overflow detection flag CH1 Overflow detection (Un\G8) stores one of the following values: • 0: No overflow • 1: Overflow occurred	Execute a preset to clear the overflow error.

3.3 Troubleshooting by Symptom

When the count operation does not start

Check item	Action
Check whether the CPU module indicates any error.	If the CPU module indicates an error, refer to the troubleshooting in the following manual. 📖 MELSEC iQ-R CPU Module User's Manual (Application)
Apply a voltage directly to the pulse input terminals of ϕA and ϕB, and check that each LED of ϕA and ϕB turns on.	If the LEDs turn on, check the external wiring and wiring on the encoder side to correct the errors. If the LEDs do not turn on, a hardware failure is a likely cause. Please consult your local Mitsubishi representative.
Check whether the external wiring of ϕA and ϕB is normal.	Check the external wiring to correct the errors.
Check whether CH1 Count enable command (Y4) is on.	Turn on CH1 Count enable command (Y4) using a program.
Check whether the pulse input method is the same as the pulse input mode of Basic setting.	Match the pulse input method to the pulse input mode of Basic setting.
Check whether the counter operation mode is set to pulse count mode.	Set the counter operation mode to pulse count mode in Basic setting.
Check whether CH1 Counter function selection start command (Y6) is on, and a voltage is applied to the function start input terminals.	If the count disable function is set by the counter function selection, turn off CH1 Counter function selection start command (Y6) and the function start input terminals.
Check whether an overflow error occurs.	Execute a preset to clear the overflow error. For details, refer to the following. ☞ Page 46 Checking Module Status

When the count operation is not normal

Check item	Action
Check whether the external wiring of ϕA and ϕB is normal.	Check the external wiring to correct the errors.
	Even in 1-phase input, connecting an ABCOM terminal to a pulse signal can result in an incorrect count. Reconnect the ABCOM terminal again to an external power supply (5V/12V/24V) or a GND terminal. (📖 MELSEC iQ-R High-Speed Counter Module User's Manual (Startup))
Check whether the maximum counting speed for input pulses falls within the range of the counting speed of Basic setting.	Correct the counting speed setting of Basic setting to accommodate the maximum counting speed for input pulses.
Check whether the waveform of pulses being inputted meets the performance specifications.	Observe and check the pulse waveform with a synchroscope. If the input pulse does not meet the performance specifications, input pulses which meet the performance specifications.
Check whether the count value data is processed as 32-bit signed binary data in the program.	Correct the program to process the count value data in 32-bit signed binary.
Check whether the shielded twisted pair cables are used for pulse input wiring.	Use the shielded twisted pair cables for pulse input wiring.
Check whether any noise comes from the grounded part of the high-speed counter module.	Separate the grounding cable of the high-speed counter module from the grounded part. If the high-speed counter module touches the grounded part, separate it.
Check whether measures against noise are taken for the adjacent devices and inside the control panel.	Take noise reduction measures such as attaching a CR surge suppressor to the magnet switch.
Check whether the distance between the high voltage device and pulse input line is kept enough.	Bundle the pulse input lines separately from other lines in piping and tubing, and keep a distance of 150mm or more between the pulse input lines and the power line even inside the control panel.
Check whether both CH1 and CH2 return the same count value after the same count is inputted.	If these count values are different each other, a hardware failure is a likely cause. Please consult your local Mitsubishi representative.
Check whether the preset value is set so that the value is out of the count range of the ring counter (ring counter function only).	Set the preset value so that the value falls within the count range of the ring counter.

When the coincidence output function does not operate normally

Check item	Action
Check whether CH1 Coincidence signal No.1 reset command (Y0) and CH1 Coincidence signal No.2 reset command (Y7) turn on.	Turn off CH1 Coincidence signal No.1 reset command (Y0) and CH1 Coincidence signal No.2 reset command (Y7).
Check whether CH1 Coincidence output point No.1 setting (Un\G4, Un\G5) and CH1 Coincidence output point No.2 setting (Un\G6, Un\G7) are set so that the values are out of the count range of the ring counter (ring counter function only).	Set CH1 Coincidence output point No.1 setting (Un\G4, Un\G5) and CH1 Coincidence output point No.2 setting (Un\G6, Un\G7) so that the values fall within the count range of the ring counter.
Check whether CH1 Coincidence signal enable command (Y2) is on.	Turn on CH1 Coincidence signal enable command (Y2).
Check whether a voltage is applied to the power supply terminal for external coincidence output.	Apply a voltage to the power supply terminal for external coincidence output.
Check whether the external wiring of the coincidence output point No.1 terminal (EQU1) and coincidence output point No.2 terminal (EQU2) is normal.	Check the external wiring to correct the errors.

When a coincidence detection interrupt does not occur

Check item	Action
Check whether the intelligent function module interrupt pointer setting of the PC parameter is incorrect.	Review and correct the intelligent function module interrupt pointer setting.
Check whether the program execution control instruction such as IMASK has been used incorrectly.	Review and correct the program.
Check whether CH1 Counter value coincident (point No.1) (X2) and CH1 Counter value coincident (point No.2) (X6) still remain on.	Reset (off) CH1 Counter value coincident (point No.1) (X2) and CH1 Counter value coincident (point No.2) (X6) by using CH1 Coincidence signal No.1 reset command (Y0) and CH1 Coincidence signal No.2 reset command (Y7) with the point number matched.

When the preset cannot be executed

Check item	Action
Check whether the CPU module indicates any error.	If the CPU module indicates an error, refer to the troubleshooting in the following manual. MELSEC iQ-R CPU Module User's Manual (Application)
Check whether CH1 External preset request detection (X4) is on.	Reset (off) CH1 External preset request detection (X4) by using CH1 External preset detection reset command (Y5).
Check whether the external wiring of the preset input terminal is normal.	Check the external wiring to correct the errors.

When the pulse measurement does not start

Check item	Action
Check whether the CPU module indicates any error.	If the CPU module indicates an error, refer to the troubleshooting in the following manual. MELSEC iQ-R CPU Module User's Manual (Application)
Check whether the counter operation mode is set to pulse measurement mode.	Set the counter operation mode to pulse measurement mode in Basic setting.
Check whether CH1 Count enable command (Y4) is on.	Turn on CH1 Count enable command (Y4) using a program.
Check whether the external wiring of the pulse measurement terminal is normal.	Check the external wiring to correct the errors.

When the pulses are not measured correctly

Check item	Action
Check whether the shielded twisted pair cables are used for pulse input wiring.	Use the shielded twisted pair cables for pulse input wiring.
Check whether any noise comes from the grounded part of the high-speed counter module.	Separate the grounding cable of the high-speed counter module from the grounded part. If the high-speed counter module touches the grounded part, separate it.
Check whether measures against noise are taken for the adjacent devices and inside the control panel.	Take noise reduction measures such as attaching a CR surge suppressor to the magnet switch.
Check whether the distance between the high voltage device and pulse input line is kept enough.	Bundle the pulse input lines separately from other lines in piping and tubing, and keep a distance of 150mm or more between the pulse input lines and the power line even inside the control panel.
Check whether the section of the pulse to be measured is corresponding to the pulse measurement section setting	Correct the pulse measurement section setting to suit the section of the pulse to be measured.
Check whether the program, if used for reading out the measured pulse value, reads out the value in unit of 2 words (32 bits).	Read out it in unit of 2 words (32 bits).
Check whether the external wiring of the pulse measurement terminal is normal.	Check the external wiring to correct the errors.

When the PWM output is not correct

Check item	Action
Check whether the CPU module indicates any error.	If the CPU module indicates an error, refer to the troubleshooting in the following manual. 📖 MELSEC iQ-R CPU Module User's Manual (Application)
Check whether the counter operation mode is set to PWM output mode.	Set the counter operation mode to PWM output mode in Basic setting.
Check whether a voltage is applied to the power supply terminal for external output.	Apply a voltage to the power supply terminal for external output.
Check whether the external wiring of the PWM output point No.1 terminal (EQU1) and PWM output point No.2 terminal (EQU2) is normal.	Check the external wiring to correct the errors.
Check whether anything other than a resistive load is connected to the PWM output point No.1 terminal (EQU1) and PWM output point No.2 terminal (EQU2).	Connect a resistive load because the output waveform is highly distorted by connecting a load other than a resistive load.
Check whether the shielded twisted pair cables are used for PWM output wiring.	Use the shielded twisted pair cables for PWM output wiring.
Check whether any noise comes from the grounded part of the high-speed counter module.	Separate the grounding cable of the high-speed counter module from the grounded part. If the high-speed counter module touches the grounded part, separate it.
Check whether measures against noise are taken for the adjacent devices and inside the control panel.	Take noise reduction measures such as attaching a CR surge suppressor to the magnet switch.
Check whether the distance between the high voltage device and PWM output line is kept enough.	Bundle the PWM output lines separately from other lines in piping and tubing, and keep a distance of 150mm or more between the PWM output lines and the power line even inside the control panel.

When the inter-module synchronization function does not operate correctly

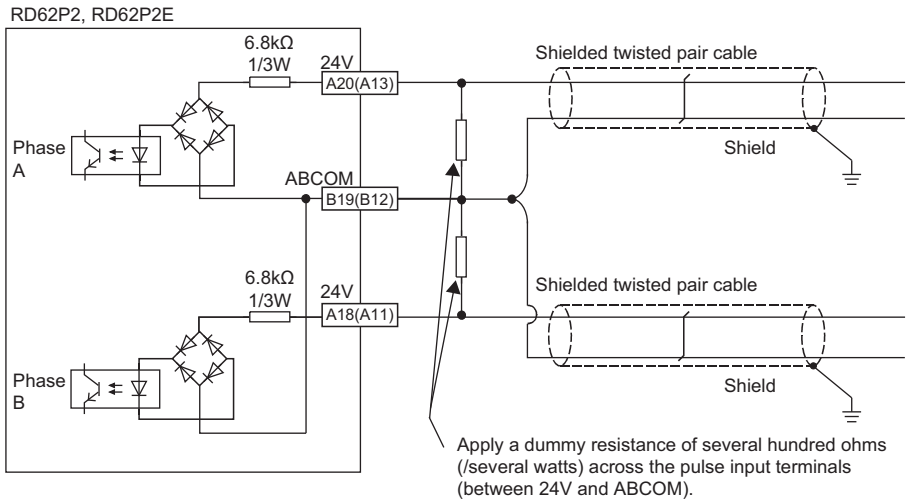
Check item	Action
Check whether the high-speed counter module is set as the synchronization target module in the system parameter setting of GX Works3.	Check "Module Synchronous Status" on the system monitor of GX Works3. When "Module Synchronous Status" is displayed as "-", the high-speed counter module is not set as the synchronization target module. Set the high-speed counter module as the synchronization target module in the system parameter setting of GX Works3.
Check that the CPU module is in the RUN status.	If the CPU module is not in the RUN status, switch the status to RUN.
Check whether the inter-module synchronous interrupt program exists.	If the inter-module synchronous interrupt program does not exist, add the program.
Check whether the EI instruction is executed.	Execute the EI instruction.

Pulse waveform shaping method

To shape pulse waveform effectively, increase the load current in cables by inserting a dummy resister of several hundreds Ω (/several W) between the pulse input terminals connected to a pulse generator. The greater the load current, the more effective this method is.

The following figure shows an example of the connection of a dummy resistor at signal level 24VDC:

• Connecting a dummy resister at 24VDC



Shaping a pulse waveform is effective as a countermeasure against the following two cases.

Distance between the pulse generator and the high-speed counter module is long.

The waveform distortion is corrected and the pulse waveform becomes stable.

Waveform is distorted under a noise environment.

The pulse waveform becomes stable by shaping the waveform, which has an effect on external noise reduction.

Point

The following example describes how to evaluate the resistance constant and rated-power of a dummy resister. For example, if a load current of approximately 30mA is set, the resistance constant of a dummy resistor is given by:

$R = V \div I = 24V \div 30mA = 800\Omega$

and the voltage applied to a dummy resistor is given by:

$P = V \times I = 24V \times 30mA = 0.72W$

Select a dummy resistor with the rated power of 2W, considering the design margin.

APPENDICES

Appendix 1 Module Label

The functions of the high-speed counter module can be set by using module labels.

Module labels of I/O signals

The module label name of an I/O signal is defined with the following structure:
"Module name"_"Module number"."I/O signal"["(Channel)"].b"Label name" or
"Module name"_"Module number"."I/O signal"["(Channel)"].b"Label name"_D

Ex.
RD62_1.stnInputSignal[0].bCoincidenceOutputPoint1CounterValueLarge_D

■Module name

The character string of a module model name is given.

■Module number

A number starting from 1 is added to identify modules that have the same module name.

■I/O signal

The character string that represents an input or output signal is given (Input signal: stnInputSignal, Output signal: stnOutputSignal). Note that RD62_(x).bReady does not include this string.

■Channel

The channel number corresponding to a module label is given. If the object belongs to CH1, 0 is given. If the object belongs to CH2, 1 is given.

■Label name

The label identifier unique to a module is given.

■_D

This string indicates that the module label is for the direct access input (DX) or direct access output (DY). A module label without the string is for the input (X) or output (Y) of the refresh processing.

Module labels of buffer memory areas

The module label name of a buffer memory area is defined with the following structure:
"Module name"_"Module number"."Data type"["(Channel)"]."Data format""Label name" or
"Module name"_"Module number"."Data type"_D["(Channel)"]."Data format""Label name"_D

Ex.
RD62_1.stnBufferBlock0_D[0].dPresetValueSetting_D

■Module name

The character string of a module model name is given.

■Module number

A number starting from 1 is added to identify modules that have the same module name.

■Data type

The data type to sort a buffer memory area is given. Each data type is as follows:

Data type	Description
stnBufferBlock0	Used for pulse count mode.
stnPulseMeasuring	Used for pulse measurement mode.
stnPWM	Used for PWM output mode.
stnSynchronousRefreshArea0	Used for the inter-module synchronization function.

■Channel

The channel number corresponding to a module label is given. If the object belongs to CH1, 0 is given. If the object belongs to CH2, 1 is given.

■Data format

The string that represents the data size of a buffer memory area is given. Each data format is as follows:

Data format	Description
u	16-bit unsigned binary value
d	32-bit signed binary value
udn	32-bit unsigned binary value

■Label name

The label identifier unique to a module is given.

■_D

This string indicates that the module label is for the direct access. A module label without the string is for the auto refresh. The following shows the differences between the auto refresh and the direct access.

Type	Description	Access timing	Example
Auto refresh	Writing to and reading from the module label is reflected in the high-speed counter module collectively at the auto refresh. The execution time of the program can be shortened. To use the auto refresh, select the module label for "Target" in "Refresh settings" of "Module Parameter".	At the auto refresh	RD62_1.stnBufferBlock0[0].dPresentValue
Direct access	Writing to and reading from the module label is reflected in the high-speed counter module instantly. Although the execution time of the program is longer than the one at the auto refresh, the responsiveness is improved.	At writing to or reading from the module label	RD62_1.stnBufferBlock0_D[0].dPresentValue_D

Appendix 2 I/O Signals

List of I/O signals

The following table lists the I/O signals of the high-speed counter module.
For details on the I/O signals, refer to the following.
☞ Page 54 Input signals
☞ Page 56 Output signals

Point

- The I/O numbers (X/Y) in this section apply when the start I/O number of the high-speed counter module is set to 0.
- The use prohibited signals are used by the system and is not available for users. If any of those signals is used (turned off and on) by users, the performance of the high-speed counter module is not guaranteed.

Input signal

Device No.	Signal name
X0	Module ready
X1	CH1 Counter value larger (point No.1)
X2	CH1 Counter value coincident (point No.1)
X3	CH1 Counter value smaller (point No.1)
X4	CH1 External preset request detection
X5	CH1 Counter value larger (point No.2)
X6	CH1 Counter value coincident (point No.2)
X7	CH1 Counter value smaller (point No.2)
X8	CH2 Counter value larger (point No.1)
X9	CH2 Counter value coincident (point No.1)
XA	CH2 Counter value smaller (point No.1)
XB	CH2 External preset request detection
XC	CH2 Counter value larger (point No.2)
XD	CH2 Counter value coincident (point No.2)
XE	CH2 Counter value smaller (point No.2)
XF	Use prohibited

Output signal

Device No.	Signal name
Y0	CH1 Coincidence signal No.1 reset command
Y1	CH1 Preset command
Y2	CH1 Coincidence signal enable command
Y3	CH1 Down count command
Y4	CH1 Count enable command
Y5	CH1 External preset detection reset command
Y6	CH1 Counter function selection start command/PWM output start command/Pulse measurement start command
Y7	CH1 Coincidence signal No.2 reset command
Y8	CH2 Coincidence signal No.1 reset command
Y9	CH2 Preset command
YA	CH2 Coincidence signal enable command
YB	CH2 Down count command
YC	CH2 Count enable command
YD	CH2 External preset detection reset command
YE	CH2 Counter function selection start command/PWM output start command/Pulse measurement start command
YF	CH2 Coincidence signal No.2 reset command

Input signals

This section describes the details on the input signals from the high-speed counter module to the CPU module.
The I/O numbers (X/Y) in this section apply when the start I/O number of the high-speed counter module is set to 0.

Point

This section describes the I/O numbers (X/Y), buffer memory addresses, and external I/O terminals for CH1.
To check the I/O numbers (X/Y) for CH2, refer to the following.
☞ Page 53 List of I/O signals
To check the buffer memory addresses for CH2, refer to the following.
☞ Page 59 List of buffer memory addresses

Module ready

- This signal turns on when the high-speed counter module is ready for counting operations after the CPU module is powered on or is reset.
- Pulses are not counted while this signal is off.

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
Module ready	X0	

CH1 Counter value larger (point No.1)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is larger than the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5).
- This signal turns off when the value in CH1 Present value (Un\G2 to Un\G3) is equal to or smaller than the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5).

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value larger (point No.1)	X1	X8

CH1 Counter value coincident (point No.1)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is equal to the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5) and the on state will be latched.
- This signal turns off when CH1 Coincidence signal No.1 reset command (Y0) is turned on. Even if the value in CH1 Present value (Un\G2 to Un\G3) is kept to be equal to the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5), this signal does not turn on. After once the value in CH1 Present value (Un\G2 to Un\G3) becomes not equal to the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5), this signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) becomes equal to the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5) again.

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value coincident (point No.1)	X2	X9

CH1 Counter value smaller (point No.1)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is smaller than the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5).
- This signal turns off when the value in CH1 Present value (Un\G2 to Un\G3) is equal to or larger than the one in CH1 Coincidence output point No.1 setting (Un\G4 to Un\G5).

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value smaller (point No.1)	X3	XA

CH1 External preset request detection

- This signal turns on by a preset command from an external input terminal and the on state will be latched.
- This signal turns off by CH1 External preset detection reset command (Y5).

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ External preset request detection	X4	XB

CH1 Counter value larger (point No.2)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is larger than the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7).
- This signal turns off when the value in CH1 Present value (Un\G2 to Un\G3) is equal to or smaller than the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7).

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value larger (point No.2)	X5	XC

CH1 Counter value coincident (point No.2)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is equal to the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7) and the on state will be latched.
- This signal turns off when CH1 Coincidence signal No.2 reset command (Y7) is turned on. Even if the value in CH1 Present value (Un\G2 to Un\G3) is kept to be equal to the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7), this signal does not turn on. After once the value in CH1 Present value (Un\G2 to Un\G3) becomes not equal to the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7), this signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) becomes equal to the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7) again.

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value coincident (point No.2)	X6	XD

CH1 Counter value smaller (point No.2)

- This signal turns on when the value in CH1 Present value (Un\G2 to Un\G3) is smaller than the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7).
- This signal turns off when the value in CH1 Present value (Un\G2 to Un\G3) is equal to or larger than the one in CH1 Coincidence output point No.2 setting (Un\G6 to Un\G7).

■Device number

The following table shows the device number of this input signal.

Signal name	CH1	CH2
CH☐ Counter value smaller (point No.2)	X7	XE

Output signals

This section describes the details on the output signals from the high-speed counter module to the CPU module.
The I/O numbers (X/Y) in this section apply when the start I/O number of the high-speed counter module is set to 0.

Point

This section describes the I/O numbers (X/Y), buffer memory addresses, and external input terminals for CH1.
To check the I/O numbers (X/Y) for CH2, refer to the following.
☞ Page 53 List of I/O signals
To check the buffer memory addresses for CH2, refer to the following.
☞ Page 59 List of buffer memory addresses

CH1 Coincidence signal No.1 reset command

This signal is turned on to reset CH1 Counter value coincident (point No.1) (X2).

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Coincidence signal No.1 reset command	Y0	Y8

■Operation timing

The command is valid as long as this signal is on.

CH1 Preset command

This signal is turned on to execute the preset function.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Preset command	Y1	Y9

■Operation timing

The command is valid at the rising edge of this signal (turned off and on).

CH1 Coincidence signal enable command

This signal is turned on to output the statuses of CH1 Counter value coincident (point No.1) (X2) and CH1 Counter value coincident (point No.2) (X6) to the external terminal.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Coincidence signal enable command	Y2	YA

■Operation timing

The command is valid as long as this signal is on.

CH1 Down count command

- This signal is turned on to count down pulses in the 1-phase pulse input mode. (The command is invalid in the 2-phase pulse input mode.)
- The module counts down pulses when the B phase pulse input or this signal is turned on.
- For counting up pulses, check that the B phase pulse input and this signal are off.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Down count command	Y3	YB

■Operation timing

The command is valid as long as this signal is on.

CH1 Count enable command

- The status of Y4 in the pulse count mode is shown.
- This signal is turned on to count pulses.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Count enable command	Y4	YC

■Operation timing

The command is valid as long as this signal is on.

CH1 External preset detection reset command

This signal is turned on to reset CH1 External preset request detection (X4).

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ External preset detection reset command	Y5	YD

■Operation timing

The command is valid as long as this signal is on.

CH1 Counter function selection start command

- The status of Y6 in the pulse count mode is shown.
- This signal is turned on to execute the counter function selection.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Counter function selection start command	Y6	YE

■Operation timing

The operation timing differs depending on the function used.

Function	Timing to become valid
Latch counter function	At the rising edge of the signal (turned off and on)
Sampling counter function	
Count disable function	While the signal is on
Cycle pulse counter function	

CH1 PWM output start command (PWM output)

- The status of Y6 in the PWM output mode is shown.
- This signal is turned on to execute the PWM output.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ PWM output start command (PWM output)	Y6	YE

■Operation timing

The command is valid as long as this signal is on.

CH1 Pulse measurement start command (pulse measurement)

- The status of Y6 in pulse measurement mode is shown.
- This signal is turned on to execute the pulse measurement.

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Pulse measurement start command (pulse measurement)	Y6	YE

■Operation timing

The command is valid as long as this signal is on.

CH1 Coincidence signal No.2 reset command

This signal is turned on to reset CH1 Counter value coincident (point No.2) (X6).

■Device number

The following table shows the device number of this output signal.

Signal name	CH1	CH2
CH☐ Coincidence signal No.2 reset command	Y7	YF

■Operation timing

The command is valid as long as this signal is on.

Appendix 3 Buffer Memory Areas

List of buffer memory addresses

The following table lists the buffer memory addresses of the high-speed counter module. For details on the buffer memory addresses, refer to the following.

☞ Page 61 Details of buffer memory addresses

Point

Do not write any data to the system area or the area whose data type is monitor in the buffer memory. Writing any data in those areas may cause a malfunction.

Address Decimal (hexadecimal)		Name	Default value	Data type	Auto refresh
CH1	CH2				
0 (0H)	32 (20H)	CH□ Preset value setting (L)	0	Setting	×
1 (1H)	33 (21H)	CH□ Preset value setting (H)	0	Setting	×
2 (2H)	34 (22H)	CH□ Present value (L)	0	Monitor	○
3 (3H)	35 (23H)	CH□ Present value (H)	0	Monitor	○
4 (4H)	36 (24H)	CH□ Coincidence output point No.1 setting (L)	0	Setting	×
5 (5H)	37 (25H)	CH□ Coincidence output point No.1 setting (H)	0	Setting	×
6 (6H)	38 (26H)	CH□ Coincidence output point No.2 setting (L)	0	Setting	×
7 (7H)	39 (27H)	CH□ Coincidence output point No.2 setting (H)	0	Setting	×
8 (8H)	40 (28H)	CH□ Overflow detection	0	Monitor	○
9 (9H)	41 (29H)	CH□ Counter function selection setting	0	Setting	×
10 (0AH)	42 (2AH)	CH□ Sampling/cycle time setting	0	Setting	×
11 (0BH)	43 (2BH)	CH□ Sampling/cycle counter flag	0	Monitor	○
12 (0CH)	44 (2CH)	CH□ Latch count value (L)	0	Monitor	○
13 (0DH)	45 (2DH)	CH□ Latch count value (H)	0	Monitor	○
14 (0EH)	46 (2EH)	CH□ Sampling count value (L)	0	Monitor	○
15 (0FH)	47 (2FH)	CH□ Sampling count value (H)	0	Monitor	○
16 (10H)	48 (30H)	CH□ Cycle pulse count previous value (L)	0	Monitor	○
17 (11H)	49 (31H)	CH□ Cycle pulse count previous value (H)	0	Monitor	○
18 (12H)	50 (32H)	CH□ Cycle pulse count current value (L)	0	Monitor	○
19 (13H)	51 (33H)	CH□ Cycle pulse count current value (H)	0	Monitor	○
20 (14H)	52 (34H)	CH□ Ring counter lower limit value setting (L)	0	Setting	×
21 (15H)	53 (35H)	CH□ Ring counter lower limit value setting (H)	0	Setting	×
22 (16H)	54 (36H)	CH□ Ring counter upper limit value setting (L)	0	Setting	×
23 (17H)	55 (37H)	CH□ Ring counter upper limit value setting (H)	0	Setting	×
24 (18H)	56 (38H)	CH□ Cycle pulse count difference value (LL)	0	Monitor	○
25 (19H)	57 (39H)	CH□ Cycle pulse count difference value (LH)	0	Monitor	○
26 (1AH)	58 (3AH)	CH□ Cycle pulse count difference value (HL)	0	Monitor	○
27 (1BH)	59 (3BH)	CH□ Cycle pulse count difference value (HH)	0	Monitor	○
28 (1CH)	60 (3CH)	CH□ Counter function update flag	0	Monitor	○
29 (1DH)	61 (3DH)	CH□ Signal monitor	Depends on external signal status	Monitor	○
30 (1EH)	62 (3EH)	CH□ Synchronization latch count value (L)	0	Monitor	○
31 (1FH)	63 (3FH)	CH□ Synchronization latch count value (H)	0	Monitor	○
64 to 255 (40H to FFH)		System area	—	—	—
256 (100H)	272 (110H)	CH□ PWM output cycle time setting (L)	FFFFH	Control	×
257 (101H)	273 (111H)	CH□ PWM output cycle time setting (H)	7FFFH	Control	×
258 (102H)	274 (112H)	CH□ PWM output ON time setting 1 (L)	0	Control	×
259 (103H)	275 (113H)	CH□ PWM output ON time setting 1 (H)	0	Control	×
260 (104H)	276 (114H)	CH□ PWM output ON time setting 2 (L)	0	Control	×

Address Decimal (hexadecimal)		Name	Default value	Data type	Auto refresh
CH1	CH2				
261 (105H)	277 (115H)	CH☐ PWM output ON time setting 2 (H)	0	Control	×
262 to 271 (106H to 10FH)	278 to 287 (116H to 11FH)	System area	—	—	—
288 to 511 (120H to 1FFH)		System area	—	—	—
512 (200H)	528 (210H)	CH☐ Pulse measurement section setting	0	Setting	×
513 (201H)	529 (211H)	System area	—	—	—
514 (202H)	530 (212H)	CH☐ Pulse under-measurement flag	0	Monitor	○
515 (203H)	531 (213H)	CH☐ Measured pulse value update flag	0	Monitor	○
516 (204H)	532 (214H)	CH☐ Measured pulse value (L)	0	Monitor	○
517 (205H)	533 (215H)	CH☐ Measured pulse value (H)	0	Monitor	○
518 (206H)	534 (216H)	CH☐ Synchronization measured pulse value (L)	0	Monitor	○
519 (207H)	535 (217H)	CH☐ Synchronization measured pulse value (H)	0	Monitor	○
520 to 527 (208H to 20FH)	536 to 544 (218H to 21FH)	System area	—	—	—

Details of buffer memory addresses

Point

This section describes the I/O numbers (X/Y), buffer memory addresses, and external I/O terminals for CH1.
To check the I/O numbers (X/Y) for CH2, refer to the following.
☞ Page 53 List of I/O signals
To check the buffer memory addresses for CH2, refer to the following.
☞ Page 59 List of buffer memory addresses

CH1 Preset value setting

- A preset value is stored in this area.
- The setting range is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Preset value setting	0 to 1	32 to 33

CH1 Present value

- The present counter value is stored in this area.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Present value	2 to 3	34 to 35

CH1 Coincidence output point No.1 setting

- The setting value of the coincidence output point No.1 for comparison with the present counter value is stored in this area.
- The setting range is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Coincidence output point No.1 setting	4 to 5	36 to 37

CH1 Coincidence output point No.2 setting

- The setting value of the coincidence output point No.2 for comparison with the present counter value is stored in this area.
- The setting range is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Coincidence output point No.2 setting	6 to 7	38 to 39

CH1 Overflow detection

- When the counter type is set to linear counter in the pulse count mode, or when the pulse measurement mode is set, the overflow status of the counter is stored in this area.
- Either of the following values is stored based on the overflow status.

Status	Stored value
No overflow detected	0
Overflow detected	1

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Overflow detection	8	40

CH1 Counter function selection setting

- A value to select the counter function is stored in this area.
- The following table shows the setting value for each function.

Counter function selection	Setting value
Count disable function	0
Latch counter function	1
Sampling counter function	2
Cycle pulse counter function	3

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Counter function selection setting	9	41

CH1 Sampling/cycle time setting

A time value for the sampling counter function or cycle pulse counter function is stored in this area.

■Setting range

- The setting range is between 1 and 65535 (16-bit unsigned binary value).
- The unit of time differs depending on the counting speed setting.

Counting speed setting	Time unit
500kpps or less	×10 ms
1Mpps or more	×1 ms

Ex.

When 500kpps is set in the counting speed setting and 420 is set in CH1 Sampling/cycle time setting (Un\G10), the function operates at 4200ms (420 × 10ms).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Sampling/cycle time setting	10	42

CH1 Sampling/cycle counter flag

- When the sampling counter function or cycle pulse counter function is selected, the operating status of the selected function is stored in this area.
- Either of the following values is stored based on the operating status of the function.

Operating status	Stored value
Function stopped	0
Function being executed	1

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Sampling/cycle counter flag	11	43

CH1 Latch count value

- The latch count value is stored in this area during the execution of the latch counter function.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Latch count value	12 to 13	44 to 45

Point

Although the storage addresses differ between the latch count value and cycle pulse count current value, the stored values are always the same (updated simultaneously). Therefore, when the latch counter function or cycle pulse counter function is executed, the latch count value and cycle pulse count current value do not hold their previous values.

CH1 Sampling count value

- The sampling count value is stored in this area during the execution of the sampling counter function.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Sampling count value	14 to 15	46 to 47

CH1 Cycle pulse count previous value

- The cycle pulse count previous value is stored in this area during the execution of the cycle pulse counter function.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Cycle pulse count previous value	16 to 17	48 to 49

CH1 Cycle pulse count current value

- The cycle pulse count current value is stored in this area during the execution of the cycle pulse counter function.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Cycle pulse count current value	18 to 19	50 to 51

Point

Although the storage addresses differ between the latch count value and cycle pulse count current value, the stored values are always the same (updated simultaneously). Therefore, when the latch counter function or cycle pulse counter function is executed, the latch count value and cycle pulse count current value do not hold their previous values.

CH1 Ring counter lower limit value setting

- When the counter type is set to ring counter, the lower limit value of the count range is stored in this area.
- The setting range is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Ring counter lower limit value setting	20 to 21	52 to 53

CH1 Ring counter upper limit value setting

- When the counter type is set to ring counter, the upper limit value of the count range is stored in this area.
- The setting range is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Ring counter upper limit value setting	22 to 23	54 to 55

CH1 Cycle pulse count difference value

- The difference value between the cycle pulse count previous value and cycle pulse count current value is stored in this area during the execution of the cycle pulse counter function.
- The range of the stored value is between -8589934592 and 8589934591 (64-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Cycle pulse count difference value	24 to 27	56 to 59

CH1 Counter function update flag

The value indicating whether the buffer memory areas for the selected counter function are updated or not is stored in this area. When the buffer memory areas are updated, 1H is stored. When the buffer memory areas are not updated, 0H is stored.

Counter function selection	Buffer memory area
Latch counter function	CH1 Latch count value (Un\G12 to Un\G13)
Sampling counter function	CH1 Sampling count value (Un\G14 to Un\G15)
Cycle pulse counter function	CH1 Cycle pulse count previous value (Un\G16 to Un\G17)
	CH1 Cycle pulse count current value (Un\G18 to Un\G19)
	CH1 Cycle pulse count difference value (Un\G24 to Un\G27)

The buffer memory areas shown above are updated without resetting this area. To check the update status once again, reset this area by the following resetting method.

■Resetting method

Write 0H in this area using a program and reset this area.

Point

When this area is used as an interlock, consider the scan time. Depending on the program used, immediately after 0H is written by a program, either of the buffer memory areas shown above may be updated, and 1H may be stored in this area.

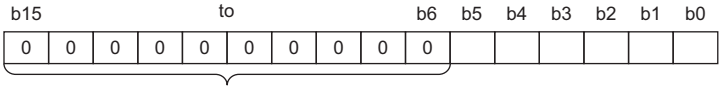
■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Counter function update flag	28	60

CH1 Signal monitor

The input statuses of the preset input terminal for the external input, function start input terminal, A phase input terminal, and B phase input terminal, as well as the output statuses of the coincidence output point No.1 terminal and coincidence output point No.2 terminal for the external output are stored.



Bit	Stored status	Stored value
b5	The output status of the coincidence output point No.1 terminal is stored.	• ON (1) • OFF (0)
b4	The output status of the coincidence output point No.2 terminal is stored.	
b3	The pulse input status to the phase A pulse input terminal is stored.	
b2	The pulse input status to the phase B pulse input terminal is stored.	
b1	The input status to the preset input terminal is stored.	
b0	The input status to the function start input terminal is stored.	

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Signal monitor	29	61

CH1 Synchronization latch count value

- The present counter value is latched by synchronizing with the fall of the synchronization signal during the execution of the synchronization control function (during the inter-module synchronization control).
- In this area, the present counter value is latched only in the pulse count mode.
- The range of the stored value is between -2147483648 and 2147483647 (32-bit signed binary value).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ Synchronization latch count value	30 to 31	62 to 63

CH1 PWM output cycle time setting

- Set the time of one cycle for the PWM output.
- The setting range is between 0 and 2147483647 (in increments of 0.1μs).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ PWM output cycle time setting	256 to 257	272 to 273

CH1 PWM output ON time setting 1

- Set the ON time of the PWM output of the PWM output point No.1 terminal (EQU1).
- The setting range is between 0 and 2147483647 (in increments of 0.1μs). In addition, set a value that is equal to or smaller than the setting value in CH☐ PWM output cycle time setting (Un\G256 to Un\G257, Un\G272 to Un\G273) in this area.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ PWM output cycle time setting	258 to 259	274 to 275

CH1 PWM output ON time setting 2

- Set the ON time of the PWM output of the PWM output point No.2 terminal (EQU2).
- The setting range is between 0 and 2147483647 (in increments of 0.1μs). In addition, set a value that is equal to or smaller than the setting value in CH☐ PWM output cycle time setting (Un\G256 to Un\G257, Un\G272 to Un\G273) in this area.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH☐ PWM output cycle time setting	260 to 261	276 to 277

CH1 Pulse measurement section setting

Set the pulse measurement section of the pulse measurement function.

Pulse measurement section setting	Setting value
ON width	0
OFF width	1
From the rising edge of the pulse to the rising edge of the next pulse	2
From the falling edge of the pulse to the falling edge of the next pulse	3

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH□ Pulse measurement section setting	512	528

CH1 Pulse under-measurement flag

- The value indicating whether the pulse is being measured in the pulse measurement function is stored in this area.
- When the pulse is being measured, 1H is stored. When the pulse is not being measured, 0H is stored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH□ Pulse under-measurement flag	514	530

CH1 Measured pulse value update flag

- The update status of CH1 Measured pulse value (Un\G516 to Un\G517) is stored. When the buffer memory areas are updated, 1H is stored. When the buffer memory areas are not updated, 0H is stored.
- The buffer memory areas shown above are updated without resetting this area. To check the update status once again, reset this area by the following resetting method.

■Resetting method

Write 0H in this area using a program and reset this area.

Point

When this area is used as an interlock, consider the scan time. Depending on the program used, immediately after 0H is written by a program, either of the buffer memory areas shown above may be updated, and 1H may be stored in this area.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH□ Measured pulse value update flag	515	531

CH1 Measured pulse value

- The measured value of the ON width or OFF width of the pulse input to the function start input terminal is stored.
- The measurement range is between 2000 and 2147483647 (in increments of 0.1μs).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH□ Measured pulse value	516 to 517	532 to 533

CH1 Synchronization measured pulse value

- The measured pulse value is latched by synchronizing with the rise of the synchronization signal during the execution of the synchronization control function (during the inter-module synchronization control).
- In this area, the measured pulse value is latched only in the pulse measurement mode.
- The range of the stored value is between 2000 and 2147483647 (in increments of 0.1μs).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory address name	CH1	CH2
CH□ Synchronization measured pulse value	518 to 519	534 to 535

Appendix 4 Added or Changed Functions

This section describes the functions added to or changed for the high-speed counter module.

Added or changed contents	Reference
Online module change	MELSEC iQ-R Online Module Change Manual

MEMO

INDEX

MEMO

REVISIONS

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

Revision date	*Manual number	Description
June 2014	SH(NA)-081241ENG-A	First edition
January 2015	SH(NA)-081241ENG-B	■Added function Online module change ■Added or modified parts RELEVANT MANUALS, Appendix 4

Japanese manual number: SH-081240-B

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.

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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

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5. Changes in product specifications

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

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SH(NA)-081241ENG-B(1501)MEE
MODEL: RD62-U-OU-E
MODEL CODE: 13JX14

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN