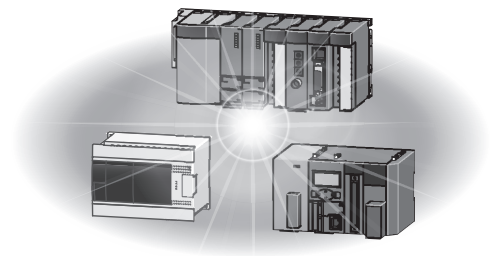# MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC Q series   MELSEC L series

MELSEC-Q/L Serial Communication Module User's Manual (Application)

-QJ71C24N
-QJ71C24N-R2
-QJ71C24N-R4
-QJ71C24
-QJ71C24-R2
-LJ71C24
-LJ71C24-R2

●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 user's manual for the CPU module used.

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.

When using the MELSEC-Q series serial communication module

[Design Precautions]

<table>
<tr><td colspan="1">⚠️ WARNING</td></tr>
<tr><td>

● For the operation status of each station at communication error in each station, refer to the respective manual for each station.
Incorrect output or malfunction due to a communication failure may result in an accident.

● When using the notification function, the pager receiver may not be contacted due to the frequency transmission status from the system setup environment and error on the receiver side.
To ensure the safety of the programmable controller system, install a call circuit with a lamp display or buzzer sound.

● When connecting a peripheral with the CPU module or connecting an external device, such as a personal computer, with an 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 or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. 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" of the buffer memory in the intelligent function module. Also, do not use any "use prohibited" signals as an output signal from the programmable controller CPU to the intelligent function module.
Doing so may cause malfunction of the programmable controller system.

</td></tr>
</table>

[Design Precautions]

⚠ CAUTION
● Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise. ● When using the module while values, such as buffer memory set values, are registered in the Flash ROM, do not turn off the power supply for the module loading station nor reset the programmable controller CPU. If the power supply for the module loading station is turned off or the programmable controller CPU is reset while any values are registered, the data contents in the Flash ROM become inconsistent and as a result the values must be set again in the buffer memory, etc. and reregistered to the Flash ROM. Also, this may cause failure and malfunction of the module.

[Installation Precautions]

⚠ CAUTION
● Use the programmable controller in an environment that meets the general specifications in the user's manual for the CPU module used. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product. ● To mount the module, while pressing the module mounting lever located in the lower part of the module, fully insert the module fixing projection(s) into the hole(s) in the base unit and press the module until it 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. ● Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may result in damage to the product. ● Do not directly touch any conductive parts and electronic components of the module. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠ **CAUTION**
● When turning on the power and operating the module after installation and wiring are completed, always attach the terminal cover that comes with the product. There is a risk of electric shock if the terminal cover is not attached. ● Perform correct pressure-displacement, crimp-contact or soldering for external wire connections using the tools specified by the manufactures. Incomplete connections may cause short circuit, fire, or malfunction. ● Securely connect the connector to the module. ● 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. ● 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 within the specified torque range. Undertightening the terminal screws can cause short circuit or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, 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 by hand and pull it out. For the cable connected to the terminal block, loosen the terminal block screws. Failure to do so may result in malfunction and 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.

[Startup and Maintenance Precautions]

⚠CAUTION

● Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
● Shut off the external power supply (all phases) used in the system before mounting or removing a module.
  Failure to do so may cause the module to fail 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 more than 50 times (IEC 61131-2 compliant) respectively.
  Exceeding the limit may cause malfunction.
● Do not touch any terminal while power is on.
  Doing so may cause malfunction.
● Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws or module fixing screws.
  Failure to do so may cause the module to fail or malfunction.
  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.
● 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.
  Failure to perform correct operations to change data, program, or the status may result in system malfunction, machine damage, or an accident.

[Disposal Precautions]

⚠CAUTION

● When disposing of this product, treat it as industrial waste.

When using the MELSEC-L series serial communication module

[Design Precautions]

⚠ WARNING
● For the operation status of each station at communication error in each station, refer to the respective manual for each station. Incorrect output or malfunction due to a communication failure may result in an accident. ● When connecting a peripheral with the CPU module or connecting an external device, such as a personal computer, with an 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 or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. 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" of the buffer memory in the intelligent function module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to the intelligent function module. Doing so may cause malfunction of the programmable controller system.

[Design Precautions]

⚠ CAUTION
● Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.

[Installation Precautions]

⚠ WARNING
● Shut off the external power supply (all phases) used in the system before mounting or removing a 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 MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection).   Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.   ● To interconnect modules, engage the respective connectors and securely lock the module joint levers.   Incorrect interconnection may cause malfunction, failure, or drop of the module.   ● Do not directly touch any conductive parts and electronic components of the module.   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 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

- Use applicable solderless terminals and tighten them within the specified torque range.
  If any spade solderless terminal is used, it may be disconnected when a terminal block screw comes loose, resulting in 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.
- 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.
- 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 block screws within the specified torque range.
  Undertightening can cause 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.
  Failure to do so may result in malfunction and 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.

[Startup and Maintenance Precautions]

⚠ WARNING
● Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
● Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal block screws. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

⚠ CAUTION
● Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
● Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may cause the module to fail or malfunction.
● Tighten the terminal block 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 (module, display unit, and terminal block), the number of connections/disconnections is limited to 50 times (in accordance with IEC 61131-2). Exceeding the limit may cause malfunction.
● 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 data change, program modification, and status control may cause malfunction of the system, mechanical damage, or accidents.
● While set values in the buffer memory are being registered to the flash ROM in the module, do not turn off the power to the module and do not reset the CPU module. Doing so will affect the flash ROM data, and setting to the buffer memory and registration to the flash ROM need to be performed again. Also, this may cause failure and malfunction of the module.

[Disposal Precautions]

⚠ CAUTION
● When disposing of this product, treat it as industrial waste.

●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-Q or -L series programmable controllers.
This manual explains the functions and programming required to use the serial communication module.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC-Q or -L series programmable controller to handle the product correctly.
When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

Please make sure that the end users read this manual.

Point

● To use LJ71C24 and LJ71C24-R2 serial communication modules
When reading the manual, substitute the contents in the table with the following descriptions in the explanations.

Description in manual	After substitution
Q series C24	L series C24
QCPU	LCPU
QCPU station	LCPU station
Q/QnACPU	Q/L/QnACPU

The specifications of MELSEC-L series and MELSEC-Q series are partially different.
Before using the equipment, please refer to the following to gain familiarity with the different in specifications.

Remark ●

● The program examples shown in this manual are the examples in which the serial communication module is assigned to the I/O No. X/Y00 to X/Y1F unless otherwise specified. For the assignment of I/O No., refer to the user's manual (function explanation, program fundamentals) for the CPU module used.

● This manual explains operations by using GX Configurator-SC.

● ●

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.
- • QCPU User's Manual (Hardware Design, Maintenance and Inspection)
- • Safety Guidelines

(This manual is included with the CPU module or base unit.)

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

(2) Additional measures

No additional measures are necessary for compliance of this product with the EMC and Low Voltage Directives.

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RELEVANT MANUALS

The specifications and usage of special functions can be checked in this manual.

In addition, use the following manuals according to their intended use.

Manual name	Manual number (Model code)
Q Corresponding Serial Communication Module User's Manual (Basic) Overview of the module, applicable system configuration, specifications, procedures prior to operations, basic methods for communicating with the external device, maintenance and inspection, and troubleshooting of the Q series serial communication module. (Sold separately)	SH-080006 (13JL86)
MELSEC-L Serial Communication Module User's Manual (Basic) Overview of the module, applicable system configuration, specifications, procedures prior to operations, basic methods for communicating with the external device, maintenance and inspection, and troubleshooting of the MELSEC-L serial communication module. (Sold separately)	SH-080894ENG (13JZ40)
MELSEC Communication Protocol Reference Manual Information on how the external device reads data from and writes data to the programmable controller CPU through communication using the MC protocol by utilizing the serial communication module or Ethernet interface module. (Sold separately)	SH-080008 (13JF89)
GX Configurator-SC Version 2 Operating Manual (Protocol FB support function) Features and usage of the protocol FB support function that supports creation of the data communication program of the serial communication module and how to set parameters. (Sold separately)	SH-080393E (13JU46)
GX Configurator-SC Version 2 Operating Manual (Pre-defined protocol support function) The pre-defined protocol support function and usage of the serial communication module, and the protocol setting method. (Sold separately)	SH-080850ENG (13JU66)

MANUAL'S USE AND STRUCTURE

(1) How to use this manual

This manual describes the use of special functions for the Q series C24 (QJ71C24N, QJ71C24N-R2, QJ71C24N-R4, QJ71C24, QJ71C24-R2), with each chapter covering a specific function.

Please read this manual and use the contents below as a reference.

(a) To read an overview of special functions

An overview of the major special functions is described in Chapter 1.

(b) To use the function that monitors errors in the programmable controller CPU

- Chapter 2 describes the programmable controller CPU monitoring function, which monitors the programmable controller CPU status and devices and automatically sends status information to the other communicating device upon occurrence of an error.
- For how to register/cancel the programmable controller CPU monitoring from the external device using the MC protocol, refer to the MELSEC Communication Protocol Reference Manual.

(c) To use the data communication function for the exchange of data with an external device at a remote location

Chapter 3 describes the specifications, procedures and other items regarding communication using the modem function in order to exchange of data with an external device at a remote location.

(d) To use the function for reading received data from the external device using an interrupt program in order to reduce the scan time

Chapter 4 describes the programming for execution of a receiving program only when data from the external device is received.

(e) To use the function for monitoring the data communication time with the external device

Chapter 6 describes the function that monitors the data communication time with the external device, along with the reception-interval time and the response-reception time for transmission.

(f) To use the transmission control function to control data transmission/reception with the external device

Chapter 7 describes the DTR/DSR control and the DC code function to control the data communication with the external device.

(g) To use the function for simplifying the data communication program with the registration data when preregistering the fixed-format section of the communication message

Chapters 9 to 11 describe the data transmission/reception function with user frames in which the fixed-format section of the communication message has been preregistered.

(h) To use the function that performs the data communication in ASCII code with the external device

Chapter 13 describes the handling of binary code on the programmable controller CPU and ASCII-BIN conversion function for communicating ASCII code data for an external device.

(i) To use dedicated instructions

Chapter 17 describes the dedicated instructions that are used to execute the functions explained in this manual.

(2) Structure of this manual

This manual describes how to perform the initial settings to execute special functions by using GX Developer and the utility package for the Q series C24 (GX Configurator-SC).

For details on the usage of GX Developer and GX Configurator-SC, refer to the Q Corresponding Serial Communication Module User's Manual (Basic).

GENERIC TERMS AND ABBREVIATIONS

In this manual, the following generic terms and abbreviations are used to explain the serial communication module and data communication devices, unless otherwise specified. Specific names or model names are provided when it is necessary to explicitly identify the model being discussed.

(1) Generic terms and abbreviations for modules

Term	Description	
Q series C24 (C24)	Generic term for QJ71C24N, QJ71C24N-R2, QJ71C24N-R4, QJ71C24 and QJ71C24-R2 serial communication modules. (Indicated as "C24" in diagrams)	
L series C24	Generic term for LJ71C24 and LJ71C24-R2	
QC24	Generic term for AJ71QC24, AJ71QC24-R2, AJ71QC24-R4, A1SJ71QC24, and A1SJ71QC24-R2	
QC24N	Generic term for AJ71QC24N, AJ71QC24N-R2, AJ71QC24N-R4, A1SJ71QC24N1, A1SJ71QC24N1-R2, A1SJ71QC24N, and A1SJ71QC24N-R2	
QC24(N)	Generic term for QC24 and QC24N	
Serial communication module	Generic term for the modules below.	
	Q series	QJ71C24N, QJ71C24N-R2, QJ71C24N-R4, QJ71C24, QJ71C24-R2
	L series	LJ71C24, LJ71C24-R2
	QnA series	AJ71QC24, AJ71QC24-R2, AJ71QC24-R4, A1SJ71QC24, A1SJ71QC24-R2, AJ71QC24N, AJ71QC24N-R2, AJ71QC24N-R4, A1SJ71QC24N1, A1SJ71QC24N1-R2, A1SJ71QC24N, A1SJ71QC24N-R2
UC24 A series computer link module	Generic term for AJ71UC24, A1SJ71UC24-R2, A1SJ71UC24-R4, A1SJ71UC24-PRF, A1SJ71C24-R2, A1SJ71C24-R4, A1SJ71C24-PRF, A2CCPUC24, and A2CCPUC24-PRF	
QCPU	Generic term for Q00JCPU, Q00UJCPU, Q00CPU, Q00UCPU, Q01CPU, Q01UCPU, Q02CPU, Q02HCPU, Q02PHCPU, Q02UCPU, Q03UDCPU, Q03UDECPU, Q03UDVCPU, Q04UDHCPU, Q04UDEHCPU, Q04UDVCPU, Q06HCPU, Q06PHCPU, Q06UDHCPU, Q06UDEHCPU, Q06UDVCPU, Q10UDHCPU, Q10UDEHCPU, Q12HCPU, Q12PHCPU, Q12PRHCPU, Q13UDHCPU, Q13UDEHCPU, Q13UDVCPU, Q20UDHCPU, Q20UDEHCPU, Q25HCPU, Q25PHCPU, Q25PRHCPU, Q26UDHCPU, Q26UDEHCPU, Q26UDVCPU, Q50UDEHCPU, and Q100UDEHCPU	
LCPU	Generic term for L02CPU, L02CPU-P, L26CPU-BT, and L26CPU-PBT	
QnACPU	Generic term for Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU, and Q4ARCPU	
Q/QnACPU	Generic term for QCPU and QnACPU	
Ethernet module Q series E71 (E71)	Generic term for QJ71E71-100, QJ71E71-B5 and QJ71E71-B2 Ethernet interface modules (Indicated as "E71" in diagrams)	

(2) Abbreviations for dedicated instructions

Term	Description
BIDIN	Abbreviation for G.BIDIN or GP.BIDIN.
BIDOUT	Abbreviation for G.BIDOUT or GP.BIDOUT.
BUFRCVS	Abbreviation for Z.BUFRCVS.
CPRTCL	Abbreviation for G.CPRTCL or GP.CPRTCL.
CSET	Abbreviation for ZP.CSET.
GETE	Abbreviation for G.GETE or GP.GETE.
INPUT	Abbreviation for G.INPUT.
ONDEMAND	Abbreviation for G.ONDEMAND or GP.ONDEMAND.
OUTPUT	Abbreviation for G.OUTPUT or GP.OUTPUT.
PRR	Abbreviation for G.PRR or GP.PRR.
PUTE	Abbreviation for G.PUTE or GP.PUTE.
SPBUSY	Abbreviation for G.SPBUSY or GP.SPBUSY.
UINI	Abbreviation for ZP.UINI.

(3) Generic terms and abbreviations for the manuals

Term	Description
User's Manual (Basic)	Q Corresponding Serial Communication Module User's Manual (Basic) MELSEC-L Serial Communication Module User's Manual (Basic)
Operating Manual (Protocol FB support function)	GX Configurator-SC Version 2 Operating Manual (Protocol FB support function)
Operating Manual (Pre-defined protocol support function)	GX Configurator-SC Version 2 Operating Manual (Pre-defined protocol support function)

(4) Others

Term	Description
Data communication function	Generic term for MC protocol, pre-defined protocol, nonprocedural protocol, bidirectional protocol
QCPU station	Generic term for the programmable controller installed QCPU
LCPU station	Generic term for the programmable controller installed LCPU

TERMS

The following table lists the definitions and descriptions of terminology used in this manual.

Term	Description
A compatible 1C frame (Formats 1 to 4)	One of the message formats for the serial communication modules, which is used to perform ASCII data communication by MC protocol. This is the same message format as the one used when communicating using the protocol for the A series computer link modules. Device memory read/write operations for the QCPU are allowed within the device range of the AnACPU.
Bidirectional protocol	A communication procedure for the serial communication modules, with which any data communication is available between the programmable controller CPU and the other device.
Buffer memory	Memory of the intelligent function modules/special function modules, which is used for storing data sent to or received from the programmable controller CPU (setting values, monitor values, etc.)
Device	A memory of the programmable controller CPU used for storing data
GX Configurator-SC	Setting and monitoring tool for the serial communication module (MELSOFT product)
GX Developer	A programming tool for designing, debugging and maintenance (MELSOFT product)
Independent operation	Operation of each of the two interfaces on the serial communication module when data communication is performed with other devices using the specified protocols respectively.
Intelligent function module	MELSEC-Q/L series modules with functions other than I/O functions such as A/D and D/A conversion module
Linked operation	Operation of each of the two interfaces on the serial communication module that are connected to external devices and linked one another in order to communicate data to/from the external devices. The two interfaces communicate data using the identical data-communication function (MC protocol (identical format) or non procedure protocol) and the identical transmission specifications. (Linked operation using the pre-defined protocol or the bidirectional protocol is not allowed.)
MELSEC communication protocol (MC protocol)	A communication procedure for the Q series C24 or the Ethernet interface modules, and a communication method for accessing a programmable controller CPU from an external device. (This is called the MC protocol in this manual.) There are two communication types; one uses ASCII code data and the other uses binary code data.
Message send function (Printer function)	This function registers character data (messages) to be sent to external devices (mainly printers) to the serial communication module as a user frame in advance, and sends the registered data for multiple user frames using the non procedure protocol.
Multidrop connection	A name of the connection when multiple external devices or other C24s are connected on a 1:n or m:n basis using the serial communication module's RS-422/485 interface.
MX Component	Active X® control library for serial communication (MELSOFT product)
Non procedure protocol	A communication procedure and one of the data communication functions for communicating any data between the programmable controller CPU and the other device.
Packet	Data string used for communication using pre-defined protocol with external devices
Pre-defined protocol	One of the data communication functions available for the QJ71C24N(-R2/R4) and LJ71C24(-R2). In data communication between the QJ71C24N(-R2/R4) or LJ71C24(-R2) and an external device, data can be sent or received by using a protocol for the external device. This must be set in GX Configurator-SC (Pre-defined protocol support function).
Pre-defined protocol support function	This function can be used in GX Configurator-SC (Pre-defined protocol support function). The functional overview of the pre-defined protocol support function is indicated below. • Protocol setting according to the opposite device • The writing and reading of protocol setting data to QJ71C24N(-R2/R4) and LJ71C24(-R2) flash ROM • Debugging support function
QnA compatible 2C frame (Formats 1 to 4)	One of the message formats for the serial communication modules, which is used to perform ASCII data communication by MC protocol. This is the same message format as the communication frame using the protocol for the QnA series serial communication modules. • QnA compatible 2C frame (Formats 1 to 4): QnA simplified frame (Formats 1 to 4)
QnA compatible 3C frame (Formats 1 to 4) QnA compatible 4C frame (Formats 1 to 4)	One of the message formats for the serial communication modules, which is used to perform ASCII data communication by MC protocol. This is the same message format as the communication frame using the protocol for the QnA series serial communication modules. • QnA compatible 3C frame (Formats 1 to 4): QnA frame (Formats 1 to 4) • QnA compatible 4C frame (Formats 1 to 4): QnA extension frame (Formats 1 to 4)

Term	Description
QnA compatible 4C frame (Format 5)	One of the message formats for the serial communication modules, which is used to perform ASCII data communication by MC protocol. This is the same message format as the communication frame using the protocol for the QnA series serial communication modules. • QnA compatible 4C frame (Format 5): QnA extension frame (Format 5)
Special function module	MELSEC-QnA/A series modules with functions other than I/O functions such as A/D and D/A conversion module
User frame	Data name when the fixed format portion of messages to be sent or received between a serial communication module and an external device is registered in the module and used for sending and receiving data. (The contents of a user frame data should conform to the specifications of the external device.) The data array of the head and tail sections of a message (transmission control code, serial communication module station No., sum check, fixed data, etc.) to be sent and received is registered in the serial communication module before use. User frame is used in MC protocol on-demand functions and data communication functions which use the non procedure protocol.

CHAPTER 1 OVERVIEW

1.1 Overview

This manual explains special functions of the MELSEC-Q/L series C24.

When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

This chapter provides an overview of these special functions.

The primary special functions of the Q series C24 and a functional overview are indicated below.

(1) Monitoring the programmable controller CPU (☞ Page 34, CHAPTER 2)

(a) The local station programmable controller CPU can be monitored at time intervals set by the user without a sequence program.

- The following information can be registered as items to be monitored. (Monitoring a device for the local station programmable controller CPU)
  - A numeric value stored in a word device
  - The ON/OFF status of a bit device (Monitoring the status of the local station programmable controller CPU)
  - Monitoring the status of the local station programmable controller CPU
- For the results of the programmable controller CPU monitoring, the following monitored information can be transmitted/notified.
  - Transmission of information on the device to be monitored and status of the programmable controller CPU (Monitoring information obtained through combined use of the modem function can also be transmitted.)
  - Notification of notification messages (character string data) registered for connecting the modem function when using with the modem function together
- The user can select one of the following as transmission timing for the programmable controller CPU monitoring results to the external device.
  - Transmission/notification each time the programmable controller CPU is monitored. (Constant cycle transmission)
  - Transmission/notification when the information read from the programmable controller CPU agrees with conditions set by the user. (Condition agreement transmission)

(b) The programmable controller CPU monitoring function can be used in communication using MC protocol or non procedure protocol.

(c) Using the programmable controller CPU monitoring function makes it possible to do the following:
- Sends device data without using a sequence program
- Simplifies the device monitor procedure
- Sends the programmable controller CPU error information
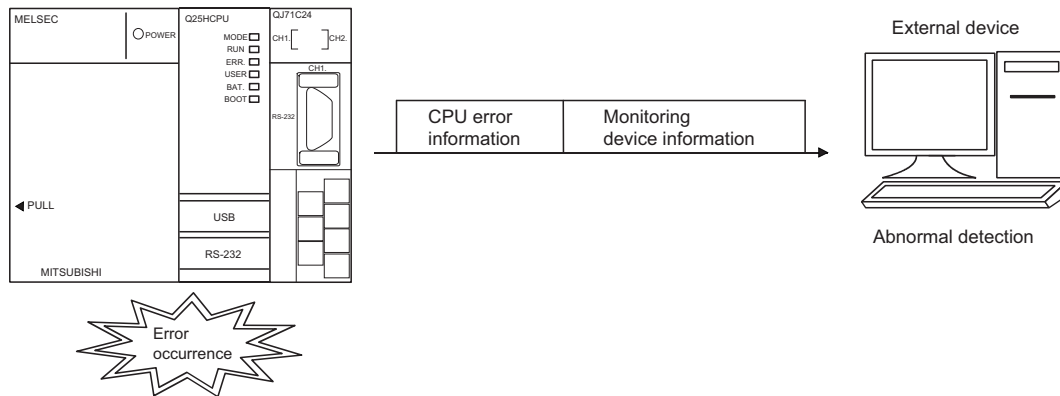
(2) Communicating with the external device at a remote location via a modem (Page 69, CHAPTER 3)

(a) Connecting a modem or TA (terminal adapter) to the RS-232 interface facilitates communication via a public line/private line/digital line (ISDN), such as data communication with a device at a remote location (listed below) and calling a pager device.
- Data communication using the MC protocol
- Data sending and receiving using the non procedure protocol
- Data communication using the bidirectional protocol
- Programmable controller access using the GX Developer

(b) Initialization of a modem or TA, line connection (dialing), and line disconnection are performed by the programmable controller CPU.

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(c) When a remote password is set in the QCPU with the GX Developer, the following access from the external device to QCPU using the Q series C24 modem function can be performed by executing the unlock processing to the remote password. [*1]

- Data communication using the MC protocol
- Accessing the programmable controller using the GX Developer

[*1] The remote password function is a QCPU function designed to prevent improper access to the QCPU by users. The QCPU remote password function can be used by setting a remote password in the QCPU with GX Developer.
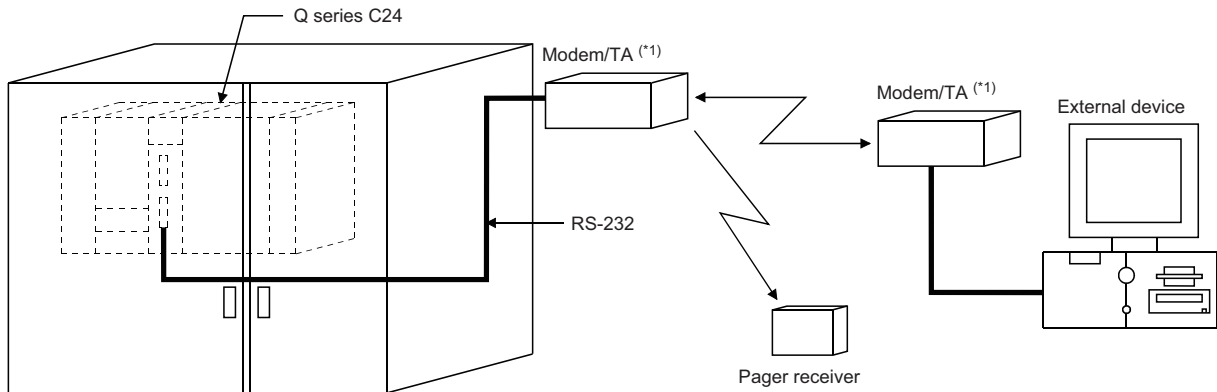
*1 TA is an abbreviation for Terminal Adapter.

(3) Receiving data with an interrupt program (☞ Page 184, CHAPTER 4)

(a) In data communication between the Q series C24 and the external device, an interrupt program can be used to receive data for the following data communication functions.

- Data reception during communication using the non procedure protocol
- Data reception during communication using the bidirectional protocol

(b) Receiving data using an interrupt program expedites data reception by the programmable controller CPU.
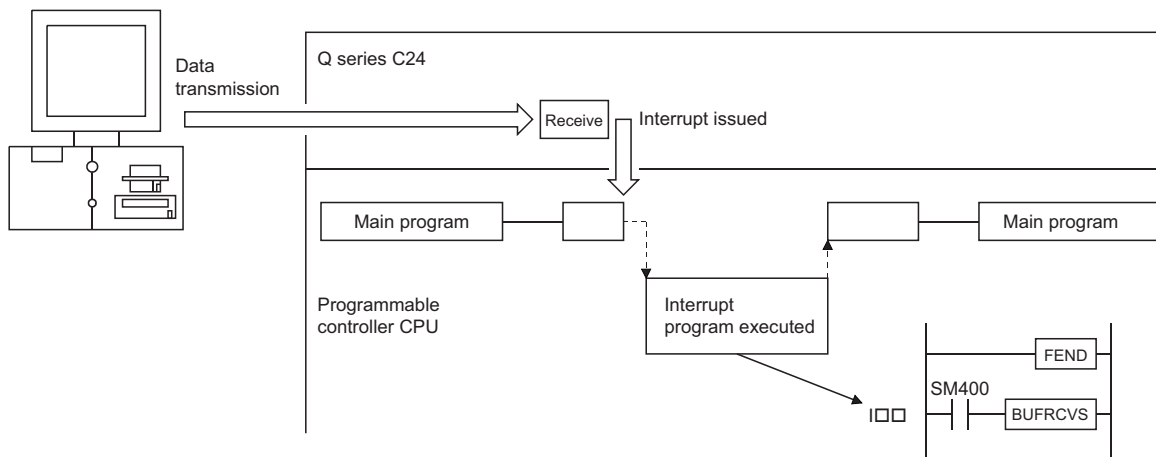
(4) Controlling data communication in accordance with the external device (☞ Page 203, CHAPTER 7)

(a) The Q series C24 controls data communication with the external device by turning ON/OFF the DTR/DSR signal and sending/receiving the DC code.

(b) DTR/DSR signal control

Using the ER (DTR) and DR (DSR) signals, the external device is notified of whether or not data communication can be performed.

(c) DC code control

By sending/receiving the DC1 and DC3 code data, the external device is notified of whether or not data can be received. By enclosing the user data with the DC2 and DC4 code data, the external device is notified of the valid transmission data range.
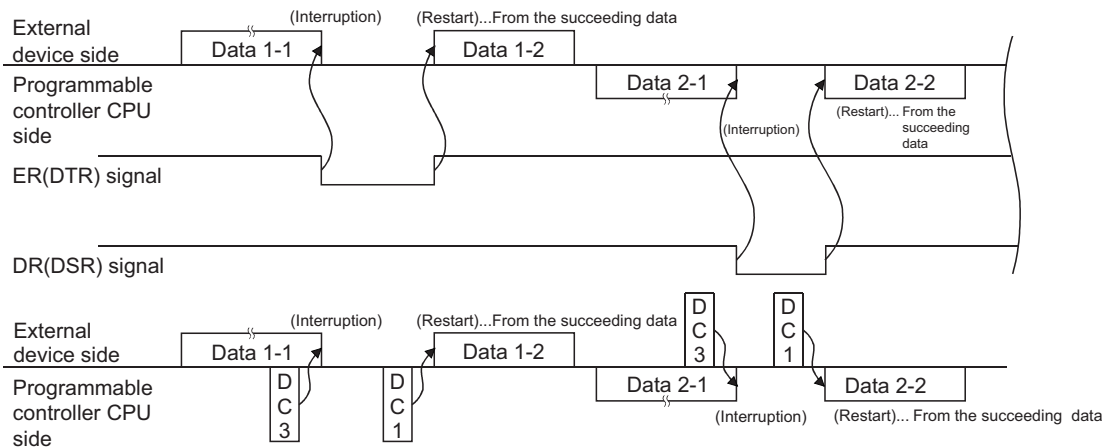
(5) Converting binary code data to ASCII code data to communicate with the external device specification (☞ Page 319, CHAPTER 13)

(a) Binary code data that is processed by the programmable controller CPU can be converted to ASCII code data for communication.

(b) ASCII-BIN conversion is performed by the Q series C24 according to user settings.

1
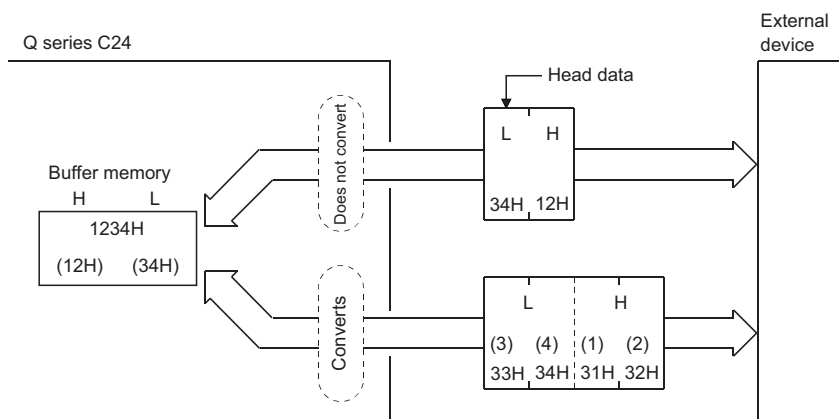
(6) Sending/receiving data in a message format tailored to the external device
(☞ Page 220, CHAPTER 9 to Page 252, CHAPTER 11)

(a) By preregistering the data arrangement (user frames) of the messages to be sent
and received by the external device, to the Q series C24, the following data
communications can be performed using registered frames.

- MC protocol: Data transmission from the programmable controller CPU to the external device using the on-demand function
- Non procedure protocol: Data communication between the programmable controller CPU and the external device

(b) For example, multiple first frames and last frames (called user frames) with the
definition shown in the diagram below can be preregistered in the Q series C24.
When sending data to the external device, the data that is arranged as shown in the
diagram below can be sent by designating the preregistered user frame numbers
and arbitrary data. When receiving data from the external device, by setting the
preregistered user frame numbers for reception at the startup of the Q series C24,
the arbitrary data section can be read to the programmable controller CPU when the
message with the registered content is received.

| ENQ | Password | Destination station number | Self-station number | Arbitrary data | CR | LF |

First frame — Last frame
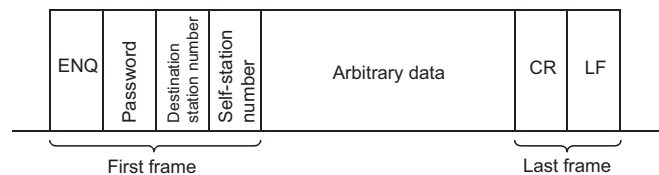
- Before sending data, the Q series C24 adds the first frame and last frame to arbitrary data. When data is received, the arbitrary data section is stored in the buffer memory as receive data.

(c) User frames and various setting values for data communication with the external
device can be preregistered to the Q series C24 flash ROM.

1.1 Overview

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The following table lists which special functions are available for the main data communication functions of the Q series C24.

Special functions		Main data communication functions				Reference section
		MC protocol	Nonprocedural protocol	Bidirectional protocol	Pre-defined protocol	
Monitoring of the programmable controller CPU using the programmable controller CPU monitoring function		○	○	×	×	Page 34, CHAPTER 2
Data communication to a remote location using the modem function		○	○	○	×	Page 69, CHAPTER 3
Reading received data using an interrupt program		×	○	○	×	Page 184, CHAPTER 4
Changing the unit of the data length for communication data		○	○	○	×	Page 192, CHAPTER 5
Changing the monitoring time for data communication		○	○	○	×	Page 194, CHAPTER 6
Transmission control for data communication • DC code control (Including Xon/Xoff control) • DTR/DSR (ER/DR) control		○	○	○	○	Page 203, CHAPTER 7
Data communication using half-duplex communication		○	○	○	○	Page 212, CHAPTER 8
Data communication using user frames	Registration	○	○	×	×	Page 220, CHAPTER 9
	Transmission, reception	○	—	×	×	Page 243, CHAPTER 10
		—	○	×	×	Page 252, CHAPTER 11
Data communication using the transparent code		×	○	○	×	Page 296, CHAPTER 12
Communication using ASCII code data by ASCII-BIN conversion		×	○	○	×	Page 319, CHAPTER 13
Data communication with multiple external devices using a multi-drop connection (m:n connection)		○	×	×	×	Page 334, CHAPTER 14
Changing the interface mode after starting data communication (Changes to communication protocol and transmission specifications)		○	○	○	○	Page 345, CHAPTER 15

○: Available, ×: Not available

1.2 Functions Added/Changed for the QJ71C24N (-R2/R4) and QJ71C24 (-R2)

For the function versions, serial numbers, and software versions of the QJ71C24N(-R2/R4) or QJ71C24(-R2) with the added or changed functions, refer to the following.

📖 Q Corresponding Serial Communication Module User's Manual (Basic)

CHAPTER 2 USING THE PROGRAMMABLE CONTROLLER CPU MONITORING FUNCTION

This chapter explains the programmable controller CPU monitoring function with which the Q series C24 monitors the programmable controller CPU based on the monitoring information reregistered by the user.

2.1 Overview

The following explains an overview of the programmable controller CPU monitoring function:

(1) Transmission without using a sequence program

(a) The programmable controller CPU monitoring function enables the Q series C24 to monitor the local station's programmable controller CPU at time intervals set by the user by reregistering data to be used for the programmable controller CPU monitoring function. Data transmission and notification to the external device is possible by communication using the MC or non procedure protocol without using a sequence program.

(b) The following monitoring information selected by the user can be sent or notified to the external device as the programmable controller CPU monitoring results.

Item	Monitoring result		Without the modem function	Combined use of the modem function (modem communication)
Data transmission	Local station programmable controller CPU device (information on the device to be monitored)	Numeric value stored in a word device	○	○
		ON/OFF status for a bit device		
	Status of modules of the local station programmable controller CPU			
Notification	Notification message registered in data for connection (character string data)		×	○

(c) Two separate timings--constant cycle transmission and condition agreement transmission--are used to transmit and notify the programmable controller CPU monitoring results to the external device.

- In the constant cycle transmission, transmission and notification are performed each time the programmable controller CPU is monitored.
- In the condition agreement transmission, transmission and notification are performed when the information read from the programmable controller CPU satisfies the user-defined conditions and an error is detected in the programmable controller CPU.

(2) Simplifying the device monitoring procedure

When device monitoring is performed by communication using the MC protocol, the external device must repeatedly perform monitor request transmission and monitor data reception processing after it executes monitor registration.

By designating the constant cycle transmission for the programmable controller CPU monitoring function, the device data can be monitored without performing the monitor request reception processing.

(3) Notification of an error in the programmable controller CPU

In the condition agreement transmission and notification, error information can be sent to the external device without a sequence program whenever a programmable controller CPU error occurs.
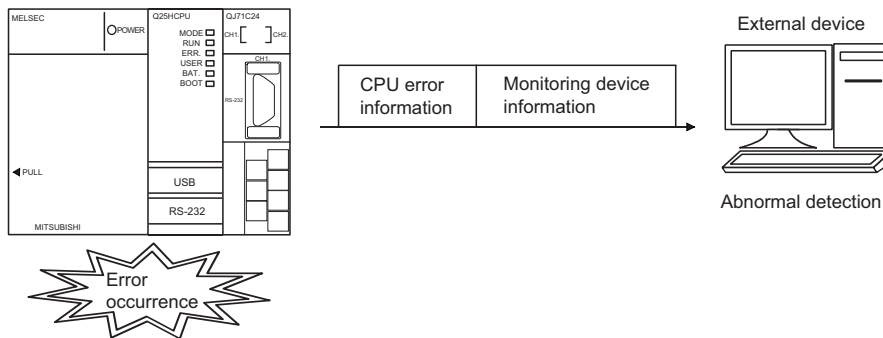
2.2 About the Programmable Controller CPU Monitoring Function

This section explains the programmable controller CPU monitoring function.

2.2.1 Data registration for using the programmable controller CPU monitoring function

The following explains the data registration by the user to use the programmable controller CPU monitoring function.

(1) Programmable controller CPU monitor registration for the Q series C24 that is required to use the programmable controller CPU monitoring function is described in the following sections.

    (a) Registration using the Q series C24 dedicated utility package (GX Configurator-SC)

    (b) Registration using the programmable controller CPU monitoring registration command (0630) for communication with the MC protocol (📖 MELSEC Communication Protocol Reference Manual)

    (c) Registration using the programmable controller CPU "CSET" instruction (☞ Page 369, CHAPTER 17)

(2) When this function is used with the modem function and data is transmitted or a notification message is notified as a programmable controller CPU monitoring result, register the connection data for the modem function on the "PLC CPU monitoring system setting" screen of GX Configurator-SC.

(3) By registering the data for using the above programmable controller CPU monitoring function, the Q series C24 begins monitoring the programmable controller CPU.

2.2.2 Programmable controller CPU monitoring information

This section explains the monitoring target information used to execute the programmable controller CPU monitoring function.

(1) The following information can be registered as the target of the programmable controller CPU monitoring function.

(a) Device monitoring for the local station's programmable controller CPU
- Monitoring of the numeric values stored in the word device
- Monitoring of the bit device ON/OFF status

(b) Monitoring of the local station's programmable controller CPU status

(2) In monitoring word and bit devices, a maximum total device point value of 960 (equivalent to a maximum of 15360 bits for only bit devices), or a total of 10 blocks when any continuous device range comprises one block, can be registered. Since monitoring of the local station's programmable controller CPU status will also be registered as a one-block portion, up to 11 blocks can be registered.

$11 \geq$ (Number of word device blocks registered + number of bit device blocks registered) + CPU status monitoring (1 block)

960 points $\geq$ (Total number of all word device block points (1 point = 1 word) + total number of all bit device block points(1 point = 16 bits))

(3) With device monitoring of the blocks for which the word and bit devices are registered, the head device of each block becomes the monitoring target.

Ex. For a block in which 10 points of word devices from D100 to D109 are registered
Monitoring target: Numeric value stored in D100
Data transmitted: Numeric values stored in D100 to D109

Ex. For a block in which two points of bit devices from M100 to M131 are registered
Monitoring target: ON/OFF status of M100
Data transmitted: ON/OFF status of M100 to M131

(4) The word and bit devices that can be designated as the monitoring targets and the device codes that are used to register the monitoring devices are listed in the table below. Register the devices using the device ranges existing in the programmable controller CPU.

Classification	Device		Device type		Device code		Device range (Default)
			Bit	Word	ASCII	Binary	
Internal system	Special relay		○		SM	91H	0 to 2047
	Special register			○	SD	A9H	
Internal user	Input		○		X*	9CH	0 to 1FFFH
	Output		○		Y*	9DH	
	Internal relay		○		M*	90H	0 to 8191
	Latch relay		○		L*	92H	
	Annunciator		○		F*	93H	0 to 2047
	Edge relay		○		V*	94H	
	Link relay		○		B*	A0H	0 to 1FFFH
	Data register			○	D*	A8H	0 to 12287
	Link register			○	W*	B4H	0 to 1FFFH
	Timer	Contact	○		TS	C1H	0 to 2047
		Coil	○		TC	C0H	
		Current value		○	TN	C2H	
	Retentive timer	Contact	○		SS	C7H	
		Coil	○		SC	C6H	
		Current value		○	SN	C8H	
	Counter	Contact	○		CS	C4H	0 to 1023
		Coil	○		CC	C3H	
		Current value		○	CN	C5H	
	Link special relay		○		SB	A1H	0 to 7FFH
	Link special register			○	SW	B5H	
	Step relay		○		S*	98H	0 to 8191
	Direct input		○		DX	A2H	0 to 1FFFH
	Direct output		○		DY	A3H	
	Index register			○	Z*	CCH	0 to 15
Register	File register			○	R*	AFH	0 to 32767
				○	ZR	B0H	0 to FE7FFH

Point

● Designating a non-existent device code will result in an error.

● When the device range in the parameter setting has been changed, the new device range can be set as the programmable controller CPU's monitoring target.

2.2.3   Timing for programmable controller CPU monitoring

The following explains the timing for programmable controller CPU monitoring when the programmable controller CPU monitoring function is executed.

(1) Programmable controller CPU monitoring using the Q series C24 is performed continuously at cycle time intervals registered by the user.

(2) Values from 1 to 65535 (unit: 100ms/s/min) can be registered as the cycle time. Use the following expressions as a reference when registering the cycle time.

(a) When sending device data or the programmable controller CPU status

Cycle time designation > K + sequence scan time + processing time + data transmission time

(b) When notifying through combined use of the modem function[1]

(when notifying)

Cycle time designation > K + sequence scan time + processing time

+ data transmission time + data transmission delay time of the modem

+ modem connection and disconnection time

(when sending data)

Cycle time designation > K + sequence scan time + processing time

+ data transmission time + data transmission delay time of the modem

+ modem connection and disconnection time + circuit disconnection wait time

[1]   When modem initialization has not been performed, the modem initialization time will be added. (We recommend that the modem initialization be performed in advance.)

The items that appear in the above expressions are explained below:

- K: 60ms constant (internal processing time of the Q series C24)
- Processing time: Processing time for the "Multiple block batch read word unit command 0406"

For 1 point: 11.3ms

For 480 points: 23.4ms

For 960 points: 36.2ms

- Data transmission time = 1 / transmission rate $\times$ bit count for one byte portion during transmission $\times$ byte count for transmission data
- Bit count for one byte portion during transmission = 1 + data bit count + parity bit + stop bit count

(parity bit = 1, no parity bit = 0)

- Data transmission delay time by the modem: Depends on the modem specifications, line specifications and line status.
- Modem connection and disconnection time: Depends on the modem specifications, line specifications and line status.
- Modem initialization time: Depends on the modem specifications.

(3) To monitor the programmable controller CPU, the Q series C24 reads monitoring information (device information, programmable controller CPU status information) from the programmable controller CPU at time intervals set by the user.

Point

● Since the Q series C24 reads the monitoring information (device data, programmable controller CPU status) at the time of the next programmable controller CPU END process after the cycle time elapses, make the cycle time as long as possible.

● The following should be considered if the cycle time is short.
  • The scan time of the programmable controller CPU is longer and the number of scan cycles has increased.
  • The increase in the processing time of the Q Series C24 programmable controller CPU monitoring function has increased causing an increase in the processing time of other data communication functions.
  • The load on the external device has increased.

2.2.4 Timings of transmission and notification of monitoring results to the external device

The following explains the timings for the transmission and notification of the programmable controller CPU monitoring results.

There are two transmission methods for transmitting and notifying the monitoring results of the local station programmable controller CPU to the external device. These include constant cycle transmission and condition agreement transmission. One of these methods must be selected by the user during programmable controller CPU monitoring registration.

(1) Constant cycle transmission

The monitoring results are transmitted and notified each time monitoring information is read from the programmable controller CPU.
(Timing to transmit data)
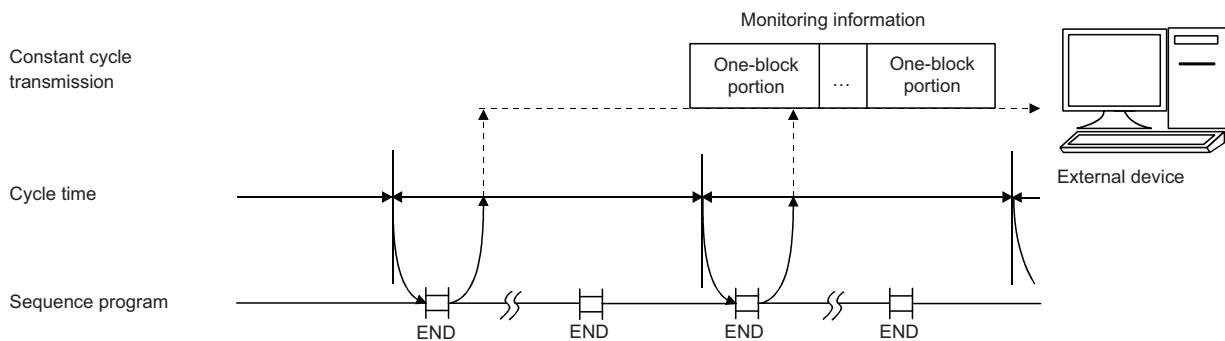
(2) Condition agreement transmission

(a) For device monitoring, the monitoring conditions registered by the user (conditions for sending monitoring results), the monitoring condition values and the monitoring information read from the programmable controller CPU are compared. The monitoring results are sent or notified when there is a block where the monitoring conditions match.

For programmable controller CPU status monitoring, the monitoring results are sent or notified only once when an error is detected for the first time from the status information read from the programmable controller CPU.
(This corresponds to the edge triggered transmission noted below.)

(b) Two transmission methods of the monitoring results are available for the condition agreement transmission for device monitoring. These include edge triggered transmission and level triggered transmission.

• Edge triggered transmission

The monitoring conditions registered by the user (conditions for sending monitoring results), the monitoring condition values and the monitoring information read from the programmable controller CPU are compared. The monitoring results are sent or notified only once when an agreement of the monitoring conditions is detected for the first time.

After that, when the monitoring information read from the programmable controller CPU does not match the monitoring conditions and then it matches the monitoring conditions once again, the monitoring results are sent or notified.

• Level triggered transmission

The monitoring conditions registered by the user (conditions for sending monitoring results), the monitoring condition values and the monitoring information read from the programmable controller CPU are compared. While the monitoring conditions agree, the monitoring results are sent or notified at each cycle time.

(Timing to transmit data)
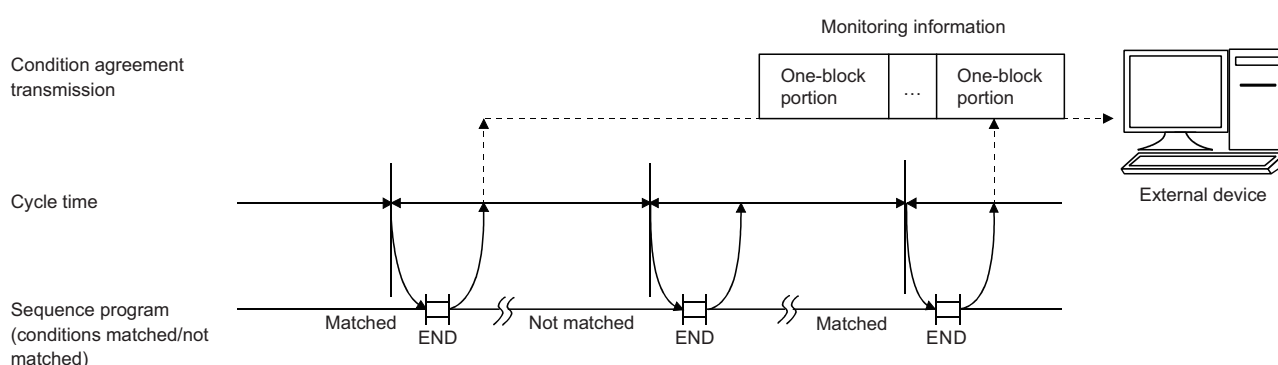
(c) In the condition agreement transmission for device monitoring, the head device for each block is the monitoring target for condition monitoring of each block device.

For the condition agreement transmission, the monitoring conditions that can be designated for the device to be registered by the user and the registration values when designating the monitoring condition are listed in the table below.

Register the monitoring conditions for the head device of each block using the following table.

Monitoring condition (item to be judged)		Registration value		Valid designated device	
		For edge triggered transmissions	For level triggered transmissions	Bit	Word
Device value or status = device monitoring condition value or status		0001H	0101H	○	○
Device value or status ≠ device monitoring condition value or status		0002H	0102H		
Unsigned	Monitoring device ≤ monitoring condition value	0003H	0103H	×	○
	Monitoring device < monitoring condition value	0004H	0104H		
	Monitoring device ≥ monitoring condition value	0005H	0105H		
	Monitoring device > monitoring condition value	0006H	0106H		
Signed	Monitoring device ≤ monitoring condition value	0007H	0107H		
	Monitoring device < monitoring condition value	0008H	0108H		
	Monitoring device ≥ monitoring condition value	0009H	0109H		
	Monitoring device > monitoring condition value	000AH	010AH		

(d) In device monitoring, register the monitoring condition value or status when the Q series C24 judges that the numeric value/status of the monitoring device for condition agreement transmission (head device of each block) agrees with the condition using the registration values listed below.

Type of monitoring device	Monitoring condition value or status	Registration value
Bit device	OFF	0000H
	ON	0001H
Word device	Numerical value	0000H to FFFFH

Ex. When M0 = ON is the condition agreement

Monitoring condition registration value: 0001H

Registration value for the monitoring condition value or status: 0001H

Ex. When D0 > 100 (signed) is the condition agreement

Monitoring condition registration value: 000AH

Registration value for the monitoring condition value or status: 100(64H)

Remark •

In status monitoring for the programmable controller CPU, the monitoring conditions and condition values for condition agreement transmission are not registered.

Instead, it is registered as whether or not programmable controller CPU status monitoring will be performed.

Monitoring results in condition agreement transmission are sent or notified only once when an error is detected by the status information read from the programmable controller CPU for the first time.

• •

2

2.2 About the Programmable Controller CPU Monitoring Function

2.2.5 Transmission methods of monitoring results and transmission data to the external device

The following explain the method of transmitting the programmable controller CPU monitoring results and data to the external device.

(1) Data transmission to the external device while performing communication using the MC protocol

(a) The same format as for the messages sent with the on-demand function is used to transmit data, except that the on-demand data section is replaced with the device information and programmable controller CPU status information. The data is sent as explained in Page 44, Section 2.2.5 (1) (c) and Page 45, Section 2.2.5 (1) (d). (📖 MELSEC Communication Protocol Reference Manual)

When the interface that is to use the modem function is set in the MC protocol, connection processing and disconnection processing to the modem are performed when the programmable controller CPU monitoring results are transmitted.

Ex. Data transmission by MC protocol with modem function (condition agreement transmission)
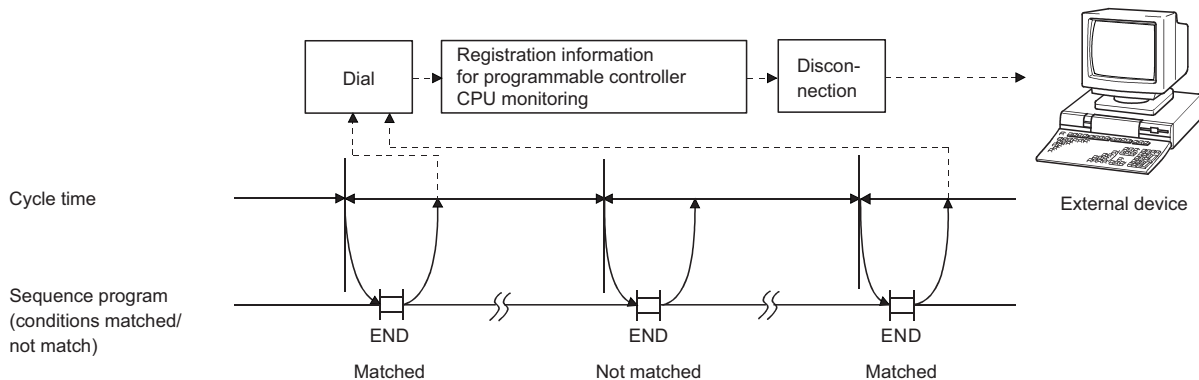
(b) When the transmission of on-demand data using user frames is designated, the same format as for sending on-demand data using user frames is used to transmit data, except that the on-demand data section is replaced with the device information and programmable controller CPU status information. The data is sent as explained in Page 44, Section 2.2.5 (1) (c) and Page 45, Section 2.2.5 (1) (d) below.

See the following explanatory items for data reception by the external device side.
- Device information, programmable controller CPU status information arrangement: 📖 MELSEC Communication Protocol Reference Manual
- Arrangement of data in the user frame section to be sent: ☞ Page 243, CHAPTER 10

(c) When sending the monitoring results as data during constant cycle transmission, the entire block portion of the monitoring target device information and programmable controller CPU status information is transmitted in batch mode.

(d) When sending the monitoring results as data during condition agreement transmission, head data (header) and end data (footer) for the on-demand function are added to the device information for a block with matched monitoring conditions and the programmable controller CPU status information upon the occurrence of an error. The header and footer are added to each clock, and then the monitoring result data is transmitted.

Results are sent in the following order: The programmable controller CPU status information, the device information registered in the word block and then the device information registered in the bit block.

Point

When there is communication using the MC protocol form 1) to 4), all of the device monitoring head device number will be converted to hexadecimal ASCII data and sent. (The same conversion is performed during either constant cycle transmission or condition agreement transmission.)

(2) Data transmission to the external device while performing communication using the non procedure protocol

(a) The device information and CPU information are sent by the word/byte unit designations.

When the communication data ASCII-BIN conversion is designated, it is converted to ASCII code data and sent. (Examples are shown in Page 48, Section 2.2.5 (2) (f)).

• When the word/byte unit designation is word

The device information and CPU information are each sent in one-word segments in a (H) (L) sequence.

• When the word/byte unit designation is byte

The device information and CPU information are each sent in one-word segments in a (L) (H) sequence.

When the interface that is to use the modem function is set in the non procedure protocol, connection processing and disconnection processing to the modem are performed when the programmable controller CPU monitoring results are transmitted.

Ex Data transmission by non procedure protocol with modem function (condition agreement transmission)
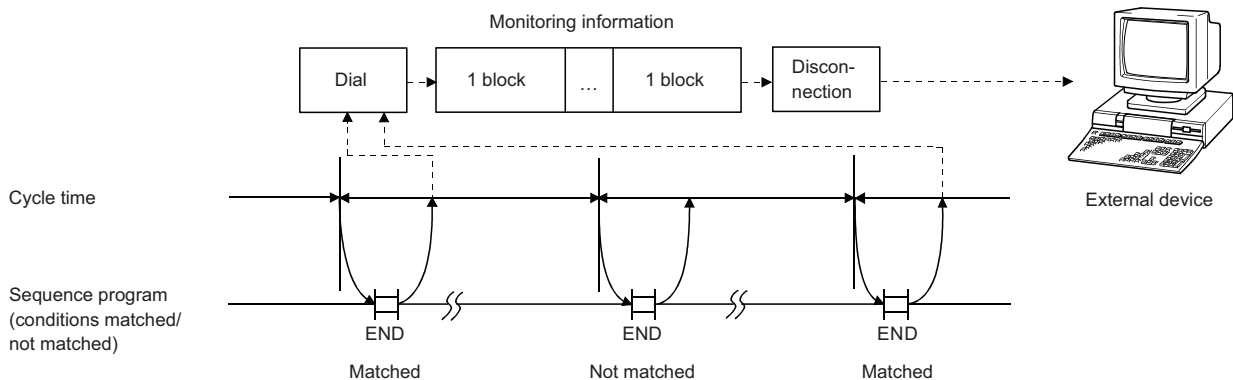
(b) When sending monitoring results as data during constant cycle transmission, the device information of two or more user frame No. and programmable controller CPU status information that have been currently designated for the constant cycle transmission by the Q series C24.

(c) When sending the monitoring results as data during condition agreement transmission, the device information of two or more user frame No. and programmable controller CPU status information that have been currently designated by the Q series C24 for the condition agreement transmission of the block where the monitoring conditions match are transmitted in batch mode.

When the monitoring conditions of two or more block match, the device information and programmable controller CPU status information are transmitted for each block.

Point

When there is an ASCII-BIN conversion of communication data using non procedure protocol, all of the device monitoring head device number will be converted to hexadecimal ASCII data and sent. (The same conversion is performed during either constant cycle transmission or condition agreement transmission.)

(d) The user frame numbers that can be designated for data transmission of programmable controller CPU monitoring results are listed below.

- 1H to 3E7H (Default registration frame numbers)
- 3E8H to 4AFH (Frame numbers registered by the user in the flash ROM)
- 8001H to 801FH (Frame numbers registered by the user in the buffer memory)
- B001H to B01FH (Dedicated frame numbers for this function listed in Page 47, Section 2.2.5 (2) (e) below)

For details on how to designate user frame numbers, see Transmission using user frames in Page 252, CHAPTER 11.

(e) For instructing to transmit the device information and programmable controller CPU status information when sending monitoring results as data, use the following dedicated user frame numbers.

Frame number	Information to be transmitted		Valid function	
			Constant cycle transmission	Condition agreement transmission
B001H	Device information for the block registered in number n	Number 1	○	○
B002H		Number 2		
B003H		Number 3		
B004H		Number 4		
B005H		Number 5		
B006H		Number 6		
B007H		Number 7		
B008H		Number 8		
B009H		Number 9		
B00AH		Number 10		
B061H	Programmable controller CPU status information (CPU abnormal monitoring data)		○	○
B080H	Number of blocks sent		○	○
B081H	Monitoring result information for all blocks			
B082H	Monitoring result information for blocks satisfying the conditions		×	○

(f) Device information and programmable controller CPU status information are sent using the data arrangement shown below.

The ASCII-BIN conversion designation is designated in buffer memory address 121H/1C1H.

Note that when the user frame has been designated by setting to on the value for bit 14, which indicates the user frame No., there will be ASCII-BIN conversion of corresponding send data. It will be sent as binary data.

(⮕ Page 321, Section 13.3)

• When user frame numbers B001H to B00AH are designated (example of a one-block portion)

  • When word device data (W100 to W103, (4 points)) is sent

When the word/byte unit designation is word unit, the device data will be sent in a (H) → (L) sequence.

The number of registered points is the number of points in word units.

(When ASCII-BIN conversion is not performed)

The total number of bytes for the device data section is the number of device points × 2.

(When ASCII-BIN conversion is performed)

The total number of bytes for the device data section is the number of device points × 4.

When the word/byte unit designation is word

Device code	Monitoring head device	Number of registered points	Device data
H L	H — — — — L	H — — — L	H — — L ┆ H — — L ┆ H — — L ┆ H — — L
W *	0 0 0 1 0 0	0 0 0 4	0 0 0 0 ┆ 0 0 0 1 ┆ 0 0 0 2 ┆ 0 0 0 3
57H 2AH	30H 30H 30H 31H 30H 30H	30H 30H 30H 34H	30H 30H 30H 30H ┆ 30H 30H 30H 31H ┆ 30H 30H 30H 32H ┆ 30H 30H 30H 33H
			W100 ┆ W101 ┆ W102 ┆ W103
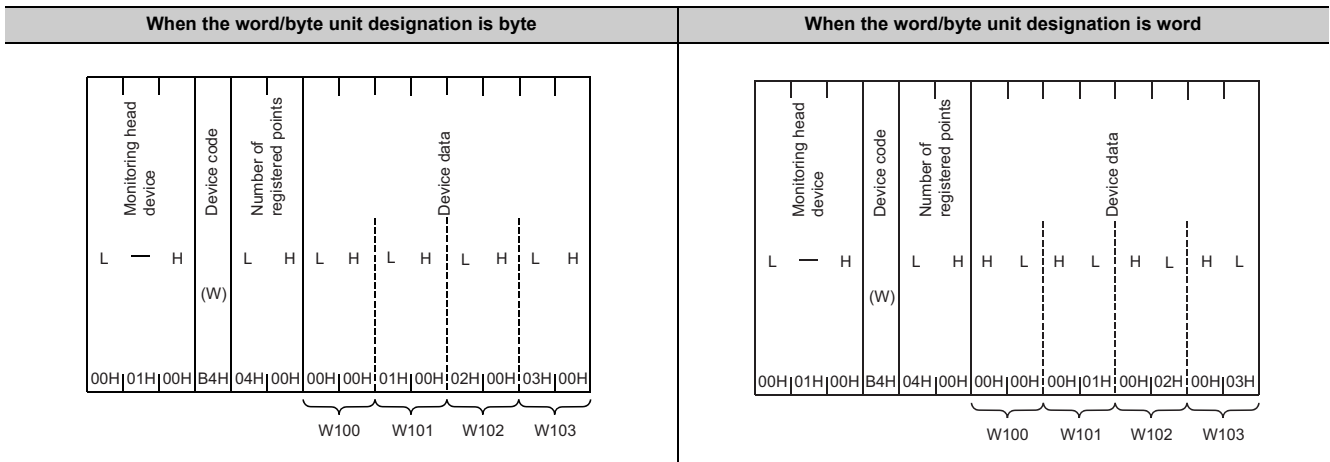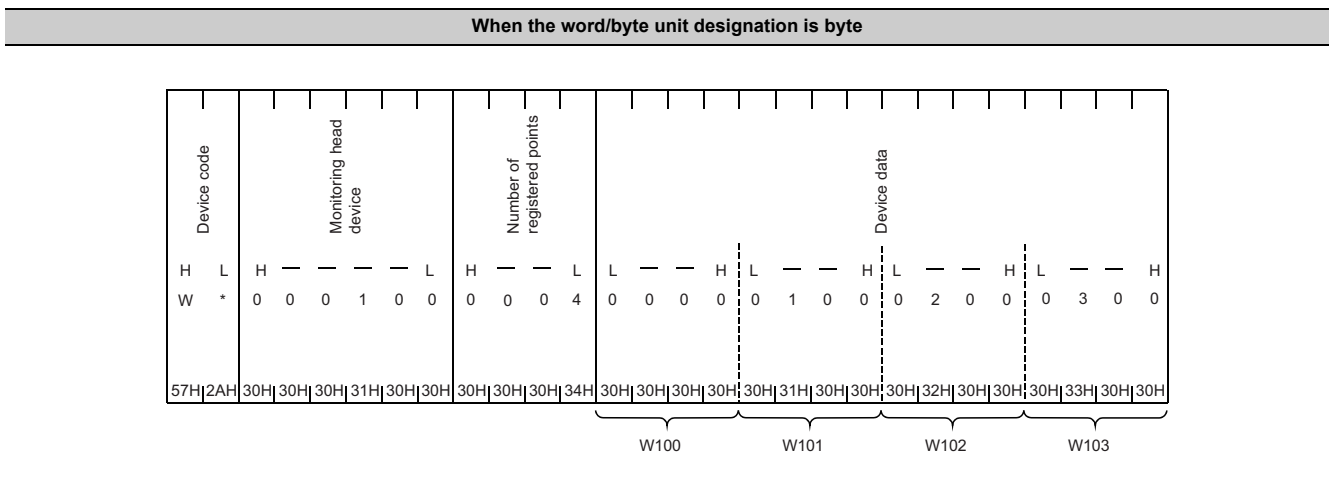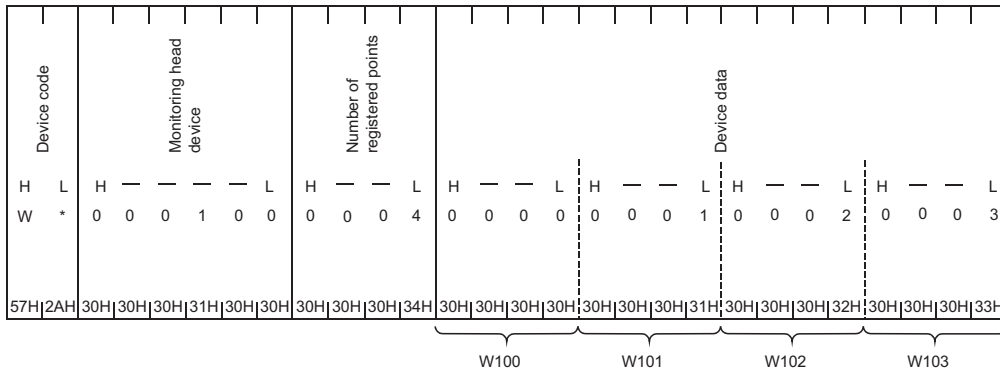
- When data for bit device (M16 to M175, (10 point)) is sent

When the word/byte unit designation is word unit, the device data will be sent in a (H) → (L) sequence.

The number of registered points is the number of points in word units.

(When ASCII-BIN conversion is not performed)

The total number of bytes for the device data section is the number of device points × 2.

When the word/byte unit designation is byte	When the word/byte unit designation is word

(When ASCII-BIN conversion is performed)

The total number of bytes for the device data section is the number of device points × 4.

When the word/byte unit designation is byte

When the word/byte unit designation is word
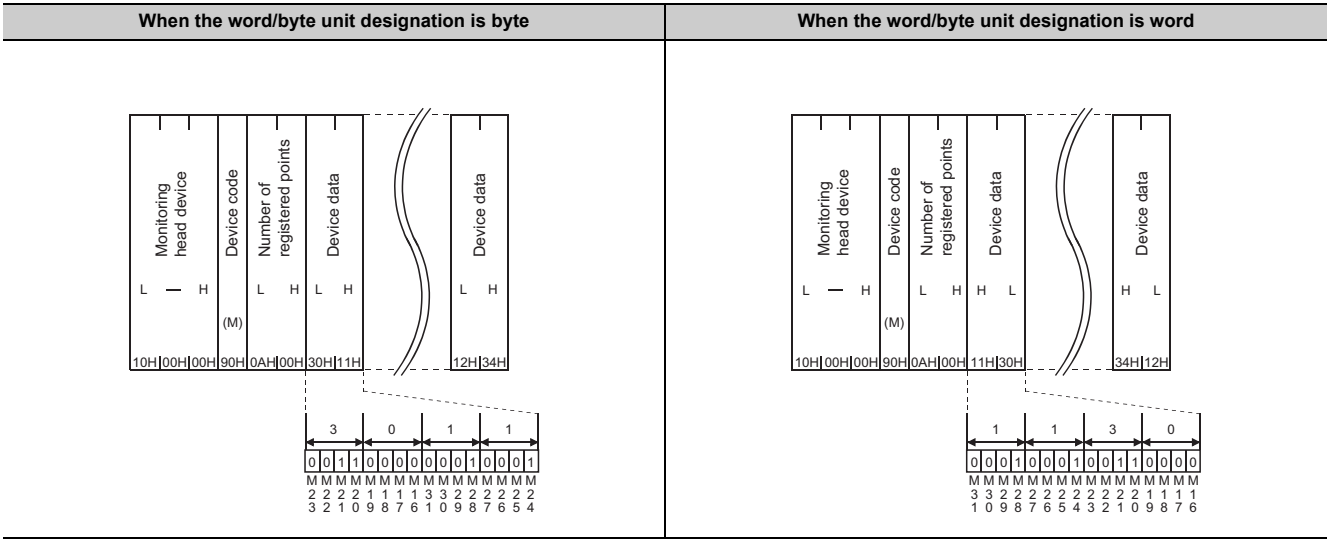
- When user frame No. B061H is designated

Programmable controller CPU status information (for one block) is sent as the following data:

Item		when communicating with ASCII code	when communicating with binary code	Remarks
Device code		"01"	01H	All fixed value
Number of registered points		"0001"	0001H	
Monitoring head device		"000000"	000000H	
Device data	During normal operation	"0000"	0000H	
	Module warning occurring	"0001"	0001H	
	Module error/module system error occurring	"0002"	0002H	

(When ASCII-BIN conversion is not performed)

The total number of bytes for the device data section is the number of device points × 2.

When the word/byte unit designation is byte	When the word/byte unit designation is word

(When ASCII-BIN conversion is performed)

The total number of bytes for the device data section is the number of device points × 4.

When the word/byte unit designation is byte	When the word/byte unit designation is word

- When user frame No. B080H is designated

The transmission block count will be sent as follows:

Ex. Number of registered word blocks: 2 (D0 to D3 (4 points), W100 to W107 (8 points))
Number of registered bit blocks: 1 (M0 to M31 (2 points))

When ASCII-BIN conversion is not performed	When ASCII-BIN conversion is performed

• When user frame No. B081H is designated

Information on monitoring results for all blocks are sent as follows:

Results are sent in the following order: the device information registered in the word block, the device information registered in the bit block and then programmable controller CPU status information.

Ex. Number of registered word blocks: 1 (W100 to W103 (4 points))
Number of registered bit blocks: 1 (M0 to M15 (1 point))
Perform CPU status monitoring: 1 (1 point)

(When ASCII-BIN conversion is not performed)

The total number of bytes for the device data section is the number of device points × 2.

When the word/byte unit designation is byte
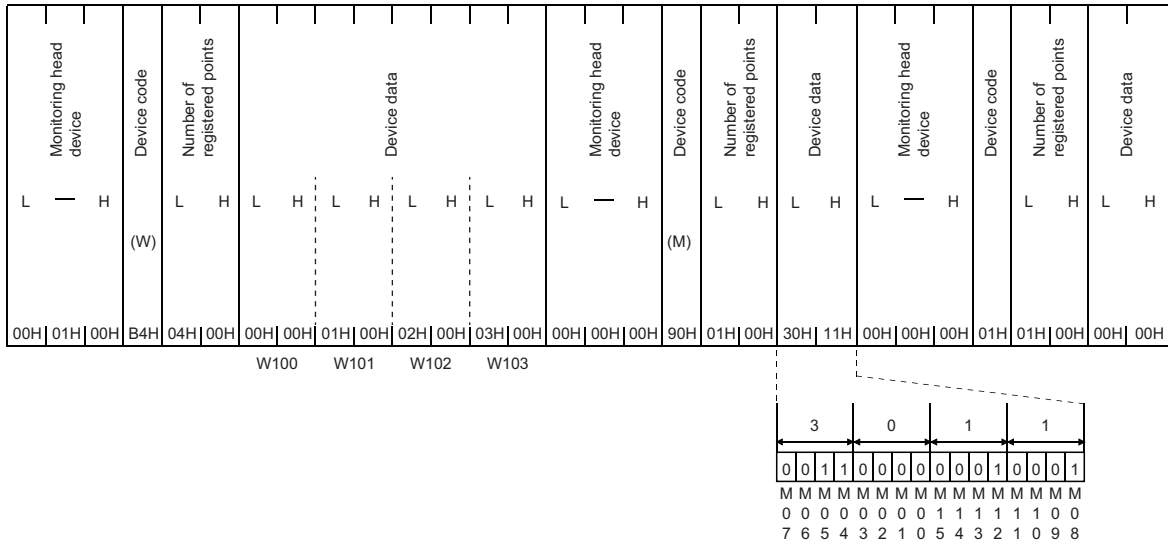
When the word/byte unit designation is word
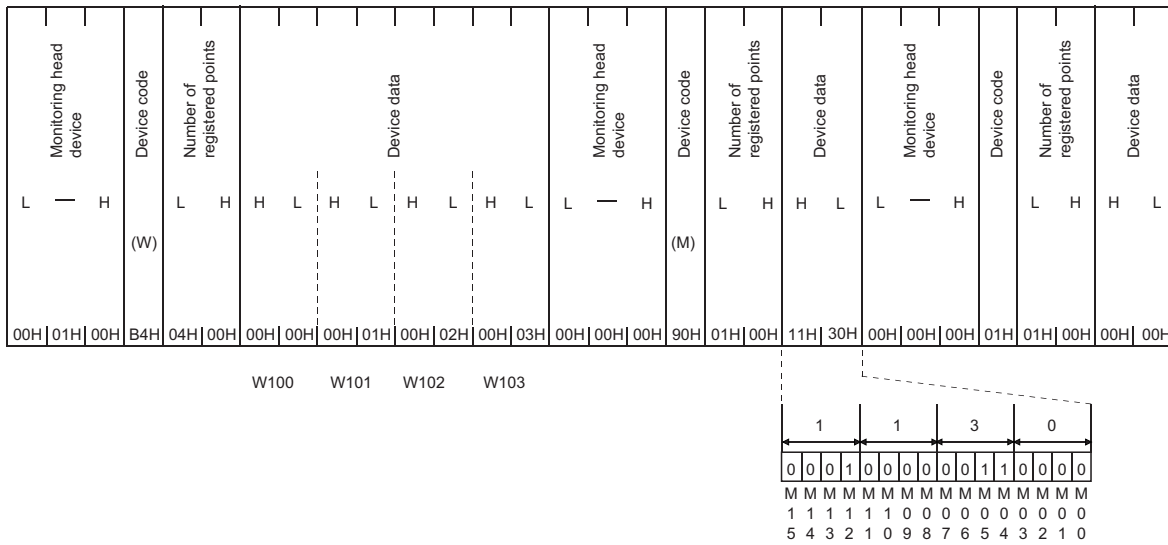
(When ASCII-BIN conversion is performed)

The total number of bytes for the device data section is the number of device points × 4.

When the word/byte unit designation is byte
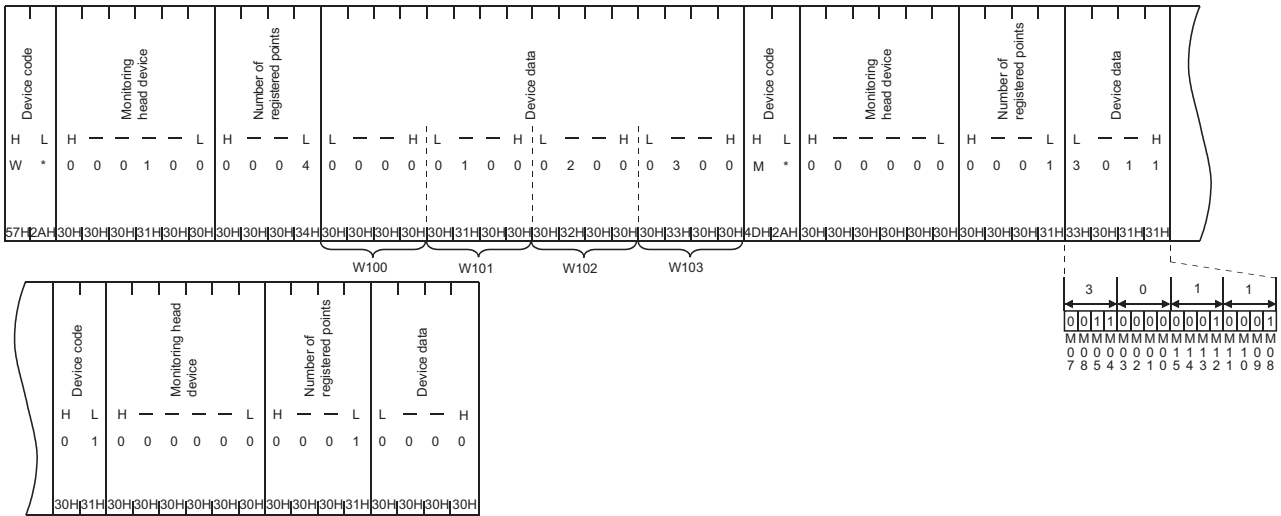
When the word/byte unit designation is word
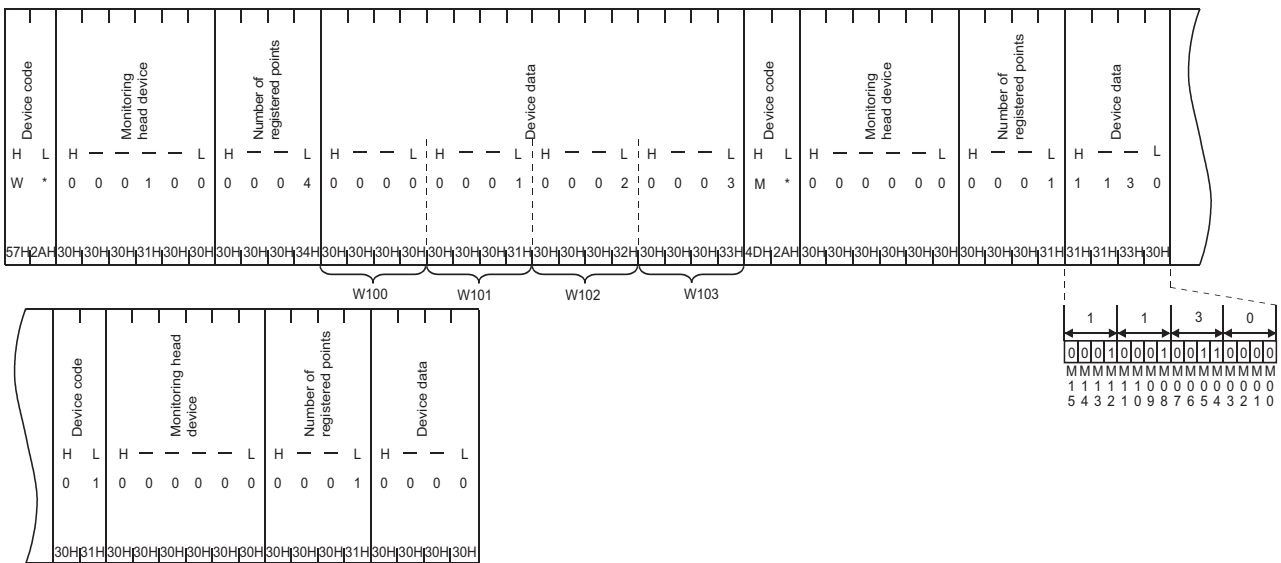
• When user frame No. B082H is designated

Information on the monitoring results for the condition agreement blocks are sent for each block.

Transmission is performed in the following order: the programmable controller CPU status information, then the device information registered in the word block, and then the device information registered in the bit block.

Ex. Number of registered word blocks: 2 (D0 to D3 (4 points), W100 to W103 (4 points))

Number of registered bit blocks: 1 (M0 to M15 (1 point))

When the condition satisfied monitoring device is W100 = 0 and M0 ≠ ON

(When ASCII-BIN conversion is not performed)

The total number of bytes for the device data section is the number of device points × 2.

When the word/byte unit designation is byte	
For W100 to W103 block data	**For M0 to M15 block data**

For W100 to W103 block data (byte):

Monitoring head device — Device code (W) — Number of registered points — Device data

| L | — | H | | L | H | L | H | L | H | L | H | L | H |
| 00H | 01H | 00H | B4H | 04H | 00H | 00H | 00H | 01H | 00H | 02H | 00H | 03H | 00H |

W100 | W101 | W102 | W103

For M0 to M15 block data (byte):

Monitoring head device — Device code (M) — Number of registered points — Device data

| L | — | H | | L | H | L | H |
| 00H | 00H | 00H | 90H | 01H | 00H | 30H | 11H |

| 3 | 0 | 1 | 1 |
| 0 0 1 1 | 0 0 0 0 | 0 0 0 1 | 0 0 0 1 |

M M M M M M M M M M M M M M M M
0 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0
7 6 5 4 3 2 1 0 5 4 3 2 1 0 9 8

When the word/byte unit designation is word	
For W100 to W103 block data	**For M0 to M15 block data**

For W100 to W103 block data (word):

Monitoring head device — Device code (W) — Number of registered points — Device data

| L | — | H | | L | H | H | L | H | L | H | L | H | L |
| 00H | 01H | 00H | B4H | 04H | 00H | 00H | 00H | 00H | 01H | 00H | 02H | 00H | 03H |

W100 | W101 | W102 | W103

For M0 to M15 block data (word):

Monitoring head device — Device code (M) — Number of registered points — Device data

| L | — | H | | L | H | H | L |
| 00H | 00H | 00H | 90H | 01H | 00H | 11H | 30H |

| 1 | 1 | 3 | 0 |
| 0 0 0 1 | 0 0 0 1 | 0 0 1 1 | 0 0 0 0 |

M M M M M M M M M M M M M M M M
1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0
5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0

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(When ASCII-BIN conversion is performed)

The total number of bytes for the device data section is the number of device points × 4.

When the word/byte unit designation is byte

For W100 to W103 block data	For M0 to M15 block data

Device code H L / W *
57H 2AH

Monitoring head device H — L / 0 0 0 1 0 0
30H 30H 30H 31H 30H 30H

Number of registered points H — L / 0 0 0 4
30H 30H 30H 34H

Device data L — H / L — H / L — H / L — H
0 0 0 0 / 0 1 0 0 / 0 2 0 0 / 0 3 0 0
30H 30H 30H 30H / 30H 31H 30H 30H / 30H 32H 30H 30H / 30H 33H 30H 30H

W100 W101 W102 W103

For M0 to M15 block data:

Device code H L / M *
4DH 2AH

Monitoring head device H — L / 0 0 0 0 0 0
30H 30H 30H 30H 30H 30H

Number of registered points H — L / 0 0 0 1
30H 30H 30H 31H

Device data L — H / 3 0 1 1
33H 30H 31H 31H

3 0 1 1
0 0 1 1 0 0 0 0 0 0 1 0 0 0 1
M M M M M M M M M M M M M M M M
0 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0
7 6 5 4 3 2 1 0 5 4 3 2 1 0 9 8

When the word/byte unit designation is word

For W100 to W103 block data	For M0 to M15 block data

Device code H L / W *
57H 2AH

Monitoring head device H — L / 0 0 0 1 0 0
30H 30H 30H 31H 30H 30H

Number of registered points H — L / 0 0 0 4
30H 30H 30H 34H

Device data H — L / H — L / H — L / H — L
0 0 0 0 / 0 0 0 1 / 0 0 0 2 / 0 0 0 3
30H 30H 30H 30H / 30H 30H 30H 31H / 30H 30H 30H 32H / 30H 30H 30H 33H

W100 W101 W102 W103

For M0 to M15 block data:

Device code H L / M *
4DH 2AH

Monitoring head device H — L / 0 0 0 0 0 0
30H 30H 30H 30H 30H 30H

Number of registered points H — L / 0 0 0 1
30H 30H 30H 31H

Device data H — L / 1 1 3 0
33H 30H 31H 31H

1 1 3 0
0 0 1 1 0 0 0 0 0 0 1 0 0 0 1
M M M M M M M M M M M M M M M M
1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0

(3) Notification to the interface side using the modem function

(a) The notification message (text string data) contained in the user registered data for connecting the modem function is conveyed using the modem function.

The device information and the CPU status information read from the programmable controller CPU are not sent to the external device in the notification message.

Include the device information and the CPU status information by which the programmable controller CPU status can be checked in the preregistered notification message.

(b) The method for message notification is functionally the same as the notification using the modem function described in Page 69, CHAPTER 3.

The difference is that notification is performed with Y14 OFF when using the modem, whereas for notification using programmable controller CPU monitoring, notification is performed for whenever the programmable controller CPU error is detected or the designated device status is matched with the monitoring conditions. (☞ Page 41, Section 2.2.4)

(c) During constant-cycle transmission, a notification message for one connection data registered for notifying constant-cycle transmission is sent.

(d) During condition agreement transmission, a notification message for connection data registered in the block where the monitoring conditions match is sent in block units.

When there are multiple blocks where the monitoring conditions match, notification is performed at the "Wait time of notification" interval (notification interval) set by the user for use with the modem function. The programmable controller CPU monitoring stops until notification has been performed to all blocks where the monitoring conditions match.

Point

● When performing message notification using the programmable controller CPU monitoring function, set the corresponding interface side as the target of the modem function.

● When setting data for the programmable controller CPU monitoring function with GX Configurator-SC, programmable controller CPU monitoring begins immediately when the Q series C24 starts up.

2.2.6 Execution sequence for using the programmable controller CPU monitoring function

The following explains the execution sequence for using the programmable controller CPU monitoring function.

(1) When transmitting the monitoring results through data transmission/notification messages using the modem function, perform the following settings in order to use the modem function.

Setting item	Reference section
Initial setting by GX Configurator-SC	Page 131, Section 3.4.2
Registration of data No. for initialization and data No. for connection	Page 134, Section 3.4.3, Page 139, Section 3.4.4
Initialization of the Q series C24 modem/TA	Page 144, Section 3.4.5

(2) Register programmable controller CPU monitoring for the Q series C24 using one of the methods described in Page 36, Section 2.2.1.

(3) By registering programmable controller CPU monitoring, the Q series C24 monitors the local station's programmable controller CPU regardless of the RUN/STOP status and sends the monitoring information to the external device.

(4) When reregistering programmable controller CPU monitoring in order to change the registration data for the programmable controller CPU monitoring, reregister after canceling the programmable controller CPU monitoring.

   (a) When registering with communication using the MC protocol
   (📖 MELSEC Communication Protocol Reference Manual)

   (b) When registering with the programmable controller CPU's "CSET" instruction (☞ Page 203, CHAPTER 7)
   To cancel when using GX Configurator-SC, change the programmable controller CPU to the STOP status, redo the settings, and then restart the QCPU.

2.3 Settings for Using the Programmable Controller CPU Monitoring Function

This section describes system settings required for constant cycle transmission and condition agreement transmission.

2.3.1 System setting items for the programmable controller CPU monitoring function

The following explains system setting items for the programmable controller CPU monitoring function.

> **Point**
>
> ● Register transmission user frames by GX Configurator-SC, after checking the specifications and setting methods explained in Page 220, CHAPTER 9 and Page 252, CHAPTER 11 of this manual.
>
> ● Register connection data for the modem function by GX Configurator-SC, after checking the specifications described in Page 139, Section 3.4.4 of this manual.

(1) Setting items and requirement when performing communication using the MC protocol

Setting item		Constant cycle transmission		Condition agreement transmission		Reference section
		Data transmission	Notification[1]	Data transmission	Notification[1]	
Cycle time units		○		○		Page 61, Section 2.3.1 (3) (a)
Cycle time		○		○		Page 61, Section 2.3.1 (3) (b)
PLC CPU monitoring function		○ (1H: Constant cycle)		○ (2H: Condition agreement)		Page 61, Section 2.3.1 (3) (c)
PLC CPU monitoring transmission measure		○ (Data)	○ (Notification)	○ (Data)	○ (Notification)	Page 61, Section 2.3.1 (3) (b)
Constant cycle transmission	Transmission pointer	×	×	×	×	Page 38, Section 2.2.2 (4) Page 288, Section 11.4.2
	Output count	×	×			
	Data No. for connection	○	○			Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4

Setting item			Constant cycle transmission		Condition agreement transmission		Reference section
			Data transmission	Notification[*1]	Data transmission	Notification[*1]	
Number of registered word blocks			○		○	○	Page 61, Section 2.3.1 (3) (e)
Number of registered bit blocks							
PLC CPU abnormal monitoring							Page 61, Section 2.3.1 (3) (f)
No. n block monitoring device	Monitoring device						Page 62, Section 2.3.1 (3) (g)
	Head device No.						
	Read point						
	Condition agreement transmission	Monitoring condition	×	×			Page 62, Section 2.3.1 (3) (h)
		Monitoring condition value					Page 62, Section 2.3.1 (3) (i)
		Transmission pointer			×	×	Page 63, Section 2.3.1 (4) Page 288, Section 11.4.2
		Output count					
		Data No. for connection			○	○	Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4
PLC CPU abnormal monitoring designation Condition agreement transmission	Transmission pointer				×	×	Page 63, Section 2.3.1 (4) Page 288, Section 11.4.2
	Output count						
	Data No. for connection				○	○	Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4

○: Setting required, ×: Setting not required

*1   Cannot be used for the LJ71C24(-R2).

Point

While using the notification function, the device information and the CPU status information cannot be transmitted.

2.3 Settings for Using the Programmable Controller CPU Monitoring Function

(2) Setting items and requirement when performing communication using the non procedure protocol

Setting item			Constant cycle transmission		Condition agreement transmission		Reference section
			Data transmission	Notification	Data transmission	Notification	
Cycle time units			○		○		Page 61, Section 2.3.1 (3) (a)
Cycle time			○		○		Page 61, Section 2.3.1 (3) (b)
PLC CPU monitoring function			○ (1H: Constant cycle)		○ (2H: Condition agreement)		Page 61, Section 2.3.1 (3) (c)
PLC CPU monitoring transmission measure			○ (Data)	○ (Notification)	○ (Data)	○ (Notification)	Page 61, Section 2.3.1 (3) (d)
Constant cycle transmission	Transmission pointer		○	×	×	×	Page 63, Section 2.3.1 (4) Page 288, Section 11.4.2
	Output count		○	×	×	×	
	Data No. for connection		○	○	×	×	Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4
Number of registered word blocks			○	○	○	○	Page 61, Section 2.3.1 (3) (e)
Number of registered bit blocks							
PLC CPU abnormal monitoring							Page 61, Section 2.3.1 (3) (f)
No. n block monitoring device	Monitoring device				○	○	Page 62, Section 2.3.1 (3) (g)
	Head device No.						
	Read point						
	Condition agreement transmission	Monitoring condition	×	×			Page 62, Section 2.3.1 (3) (h)
		Monitoring condition value					Page 62, Section 2.3.1 (3) (i)
		Transmission pointer			○	×	Page 63, Section 2.3.1 (4) Page 288, Section 11.4.2
		Output count					
		Data No. for connection			○	○	Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4
PLC CPU abnormal monitoring designation Condition agreement transmission	Transmission pointer				○	×	Page 63, Section 2.3.1 (4) Page 288, Section 11.4.2
	Output count						
	Data No. for connection				○	○	Page 56, Section 2.2.5 (3) Page 139, Section 3.4.4

○: Setting required, ×: Setting not required

Point

While using the notification function, the device information and the CPU status information cannot be transmitted.

(3) Contents of setting items

The data items to be set using GX Configurator-SC to use the programmable controller CPU monitoring function and the setting contents are explained below.

(a) Cycle time units

- Designates the unit for cycle time (☞ Page 61, Section 2.3.1 (3) (b)) for reading information from the programmable controller CPU using the programmable controller CPU monitoring function.
- The cycle time units and the cycle time designated using this unit can also be used as the transmission time interval for constant cycle communication.

(b) Cycle time

Designates the time for one cycle when reading information from the programmable controller CPU in order to perform programmable controller CPU monitoring.

(c) Programmable controller CPU monitoring function

Designates the timing (constant cycle transmission or condition agreement transmission) when sending/notifying information on the programmable controller CPU monitoring results (device information/CPU status information) to the external device.

- The time interval designated in data items of Page 61, Section 2.3.1 (3) (a) and Page 61, Section 2.3.1 (3) (b) for reading information from the programmable controller CPU can also be used as the transmission time interval for constant cycle communication.
- The conditions for condition agreement transmission are designated using data items of Page 62, Section 2.3.1 (3) (h) and Page 62, Section 2.3.1 (3) (i).

(d) Programmable controller CPU monitoring transmission measure

Designates the means by which the programmable controller CPU monitoring results are conveyed to the external device.

- Data transmission

The device information and the programmable controller CPU status information are sent as the monitoring results.

- Notification

Notification message is sent as the monitoring results.

(e) Number of registered word blocks, number of registered bit blocks

Designates the number of word device blocks (number of registered word blocks) and the number of bit device blocks (number of registered bit blocks) registered in the Q series C24 as the target when performing device data monitoring or transmission.

(f) CPU abnormal monitoring

Designates whether or not the Q series C24 monitors abnormality of the local station programmable controller CPU (status monitoring) in the programmable controller CPU monitoring.

(g) Monitoring device, head device No., read point (Number of registered points)

When performing device data monitoring or transmission, designate the device range for each block for the number of blocks designated by number of registered word blocks and number of registered bit blocks (☞ Page 61, Section 2.3.1 (3) (e)).[1]

[1] The target of device data monitoring for condition agreement transmission is the head device for each block.
Word device designated block: Head word device (for one word)
Bit device designated block: Head bit device (for one bit)

- The monitored device is the item that indicates the target device of the corresponding block and designated with the codes listed in Page 38, Section 2.2.2 (4).
- The head device is the data that designates the head of the target device range for the corresponding block.
- The read point is the item that indicates the target device range for the corresponding block which designate points from the head device No. The bit device designates points in word units (1 point = 16 bits)
- The methods for designating these data are the same as the designation methods used when reading from or writing to the device memory, which are described in the MELSEC Communication Protocol Reference Manual.

Remark •

When the user performs the programmable controller CPU monitoring registration, the device will designate either a decimal or hexadecimal device No. The read points (registration points) are designated as hexadecimal.
However, if this is done by either MC protocol communication (form 1) to 4)) or non procedure protocol communication, when ASCII-BIN conversion of the communication data has been designated, the head device No. for all devices to be sent to external devices as the monitoring results will be converted to hexadecimal ASCII data and sent.

• •

(h) Monitoring condition

When condition agreement transmission is designated with the programmable controller CPU monitoring function (☞ Page 61, Section 2.3.1 (3) (c)), designate the conditions for transmitting information for the monitoring condition value (☞ Page 62, Section 2.3.1 (3) (i)).

(i) Monitoring condition value

When condition agreement transmission is designated with the programmable controller CPU monitoring function (☞ Page 61, Section 2.3.1 (3) (c)), this item designates the status/numeric value of the monitoring condition (☞ Page 62, Section 2.3.1 (3) (h)).

- When the monitoring device is a word device: Designate the monitoring condition value with a numeric value
- When the monitoring device is a bit device: Designate the monitoring condition with a numeric value (1/0) corresponding to ON/OFF.

(4) Setting items for sending monitoring results

The following is an example of setting items and data transmission when sending the monitoring results of the programmable controller CPU monitoring function execution to the external device using the non procedure protocol.

Ex| This example shows a case in which the D0 to D3 device information and user frame data are sent by the edge trigger method using a condition of D0 = 0.

Perform the settings on the "PLC CPU monitoring system setting" screen and the "###" screen of GX Configurator-SC.

• PLC CPU monitoring system setting

Setting item			Setting data	Remarks
Cycle time units			min	
Cycle time			3	
PLC CPU monitoring function			Condition agreement	
PLC CPU monitoring transmission measure			Data transmission	
Number of registered word blocks			1	
Number of registered bit blocks			0	
PLC CPU abnormal monitoring			0	
No. 1 block monitoring device	Monitoring device		D	Settings other than those listed at left are not required
	Head device No.		0	
	Read point		4	
	Condition agreement transmission	Monitoring condition	Edge =	
		Monitoring condition value	0	
		Transmission pointer	49	
		Output count	3	

• Setting the transmission user frames

Transmission frame No. designation 46th	User frame number
Transmission frame No. designation 47th	User frame number
Transmission frame No. designation 48th	User frame number
Transmission frame No. designation 49th	User frame number (02H)
Transmission frame No. designation 50th	User frame number (B001H)
Transmission frame No. designation 51st	User frame number (03H)
Transmission frame No. designation 52nd	User frame number
Transmission frame No. designation 53rd	User frame number
Transmission frame No. designation 54th	User frame number
Transmission frame No. designation 55th	User frame number
Transmission frame No. designation 56th	User frame number
Transmission frame No. designation 57th	User frame number

← Set the user frame data (STX)
← Set the first block (from D0 to D3)
← Set the user frame data (ETX)

Data sent when the condition D = 0 is satisfied

ETX	Device data (D3)	Device data (D2)	Device data (D1)	Device data (D0)	Number of registered points	Device code	Monitoring head device	ETX

External device
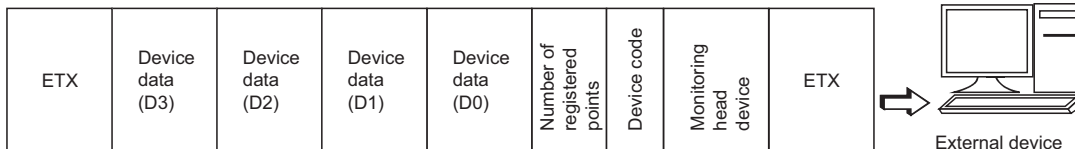
2.3.2 How to register and cancel the programmable controller CPU monitoring function

The following describes the method for registering and canceling the programmable controller CPU monitoring function from the programmable controller CPU.

$Point\mathcal{P}$

● For details on the method for registering and canceling the programmable controller CPU monitoring function with GX Configurator-SC, refer to the Q Corresponding Serial Communication Module User's Manual (Basic).

● For details on the method for registering or canceling the programmable controller CPU monitoring with a command of MC protocol, refer to the MELSEC Communication Protocol Reference Manual.

(When registering or canceling from the programmable controller CPU)

For details on the CSET command, see Page 375, Section 17.3.
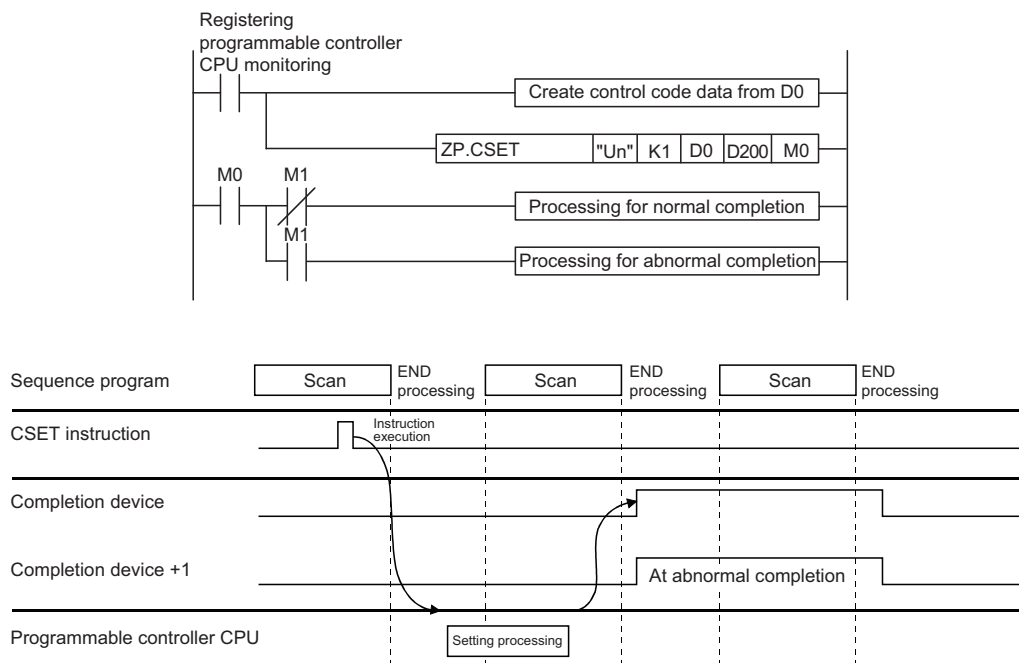
(1) Stores the data for programmable controller CPU monitoring registration in the device that designates the control data for the CSET instruction.

(2) Executes the CSET instruction.
At the end of the scan in which the CSET instruction was completed, the completion device (M0) designated by (D2) turns ON and then turns OFF at the next END processing.

(3) When there is an error, (D2)+1 turns ON and the error code in stored in the completion status (S2)+1.

(a) Example of a program for performing programmable controller CPU monitoring registration

This example shows a program that registers programmable controller CPU monitoring for the CH1 side interface.

This registration is for transmitting the contents of M0 to M15 and D100 to D109 to the external device using constant cycle transmission (cycle time is 3 min).

Ladder	Description
X24 —[PLS M30]	Converts registration command to pulses
M30 M35 —[MOV K0 D0]	Sets execution type
—[MOV K2 D2]	Sets request type (programmable controller CPU monitoring registration)
—[MOV K2 D3]	Sets cycle time unit to minutes
—[MOV K3 D4]	Sets cycle time to 3 (min)
—[MOV K1 D5]	Sets the monitoring function to constant cycle transmission
—[MOV K0 D6]	Sets the means of transmission to data transmission
—[MOV K1 D7]	Sets the output head pointer
—[MOV K2 D8]	Sets the transmission count of the user frame
—[SET M31]	Sets data set complete flag -1
M31 —[MOV K1 D10]	Sets the number of registered word blocks to 1
—[MOV K1 D11]	Sets the number of registered bit blocks to 1
—[MOV H0A8 D13]	
—[MOV K100 D14]	Registers the devices for D100 to D109 as the first block
—[MOV K0 D15]	
—[MOV K10 D16]	
—[MOV H90 D22]	
—[MOV K0 D23]	Registers the devices for M0 to M15 as the second block
—[MOV K0 D24]	
—[MOV K1 D25]	
—[SET M32]	Sets data setting complete flag -2
—[RST M31]	
M32 —[ZP. CSET "U0" K1 D0 D200 M0]	Executes programmable controller CPU monitoring registration
M0 M1 —[SET M35]	Normal completion
M1 —[SET M36]	Abnormal completion
—[RST M32]	

(b) Example of a program for executing programmable controller CPU monitoring cancellation

This example shows a program that cancels programmable controller CPU monitoring for the CH1 side interface.

Ladder element	Description
X25 —[PLS M37]	Sets pulse command
M37 M35 —[MOV K0 D0]	
—[MOV K3 D2]	
—[ZP. CSET "U0" K1 D0 D200 M0]	Executes programmable controller CPU monitoring registration reset
M0 M1 —[SET M35]	Normal completion
M1 —[SET M36]	Abnormal completion
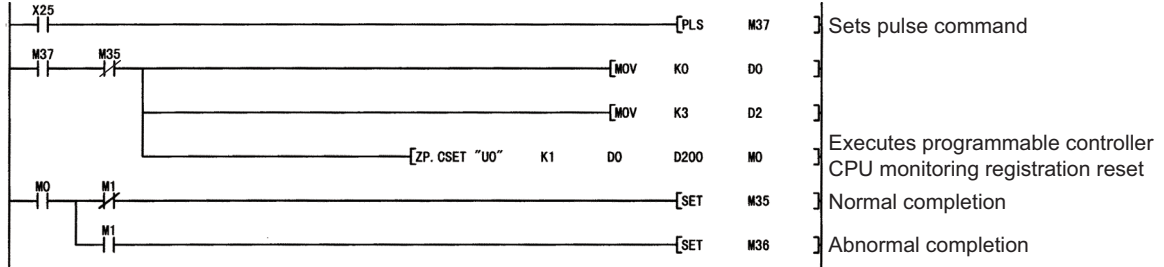
2.4 Precautionary Notes for Using the Programmable Controller CPU Monitoring Function

(1) The cycle time will be affected by the following factors.

Keep these in mind when setting the cycle time.

(a) When the programmable controller CPU is accessed by a module other than the Q series C24.

(b) When a data communication function other than the programmable controller CPU monitoring function is used.

(c) When transmission stops by DTR/DSR control.

(2) Both the constant cycle transmission and the condition agreement transmission cannot be designated together for the same interface.

(3) Only the local station's programmable controller CPU can be the target for the programmable controller CPU monitoring function.

(4) A new programmable controller CPU monitoring registration cannot be performed while the programmable controller CPU monitoring function is in operation.

(a) Perform the new programmable controller CPU monitoring registration after canceling the programmable controller CPU monitoring.

(b) If the new programmable controller CPU monitoring registration is performed without canceling the programmable controller CPU monitoring, an error will occur.

Also, for programmable controller CPU monitoring registration using GX Configurator-SC, perform the registration after placing the programmable controller CPU in the STOP status, and then restart QCPU.

(5) While the programmable controller CPU monitoring function is in operation, even if an error occurs with transmission/notification of the programmable controller CPU monitoring results or reading of data from the programmable controller CPU, the programmable controller CPU monitoring function operation will not stop.

(6) The programmable controller CPU monitoring function can only be used when the system configuration is 1:1.

(7) The following describes how the Q series C24 operates when the programmable controller CPU monitoring result information cannot be sent to the external device due to line disconnection or other reasons.

Even if an error occurs while the programmable controller CPU monitoring function is in operation, the ERR LED does not light up. (This is the same as when using the on-demand function of the MC protocol.)

(a) When the setting for the transmission monitoring time designation (timer 2) is an infinite wait (0H)

- Reading of monitoring data from the programmable controller CPU stops until the transmission of monitoring data completes.
- When transmission resumes, reading of monitoring data from the programmable controller CPU resumes and monitoring data and information are transmitted.

(b) When the setting for the transmission monitoring time designation (timer 2) is other than an infinite wait (0H)

- A transmission timeout error occurs, monitoring information read from the programmable controller CPU, and transmission of monitoring information resumes.
- The error code is stored in the programmable controller CPU monitoring function error code storage area (address: 2205H).

(8) When device data for the programmable controller CPU cannot be read because of a programmable controller CPU error (hardware failure, etc.), the error code is stored in the programmable controller CPU monitoring function error code storage area and the Q series C24 performs the monitoring processing based on previously read data.

(9) When the monitoring information is transmitted as data using the modem function, a modem connection error will occur if a modem connection is requested for the following reasons.

- A connection request by Y11
- A notification-issued request by Y14

If possible, provide a dedicated Q series C24 for using the programmable controller CPU monitoring function. When using both the programmable controller CPU monitoring function and data communication function with a single Q series C24 and one of the above modem connection errors occurs, re-execute a connection request in consideration of the transmission timing set by the user for the programmable controller CPU monitoring function.

CHAPTER 3 COMMUNICATIONS BY THE MODEM FUNCTION

This chapter explains the overview and how to use the modem function, which can be used for data communication with remote external devices and paging pager terminals.

3.1 Overview

The overview of the modem function is described below:

(1) The modem function easily performs data transmission/reception to remote devices via public lines/office telephone systems/digital lines (ISDN) by connecting a modem or TA (terminal adapter) to the Q series C24's RS-232 interface.

   (a) Communicating arbitrary data with an external device

   (b) Call pager receiver (beeper) to notify the programmable controller system maintenance information.

(2) Initialization of the modem or TA, line connection (dialing), and line disconnection are performed using the programmable controller CPU.

(3) Once the line is connected, data communication with the external device via public line/office telephone system/digital line, or a call to pager receiver can be made.
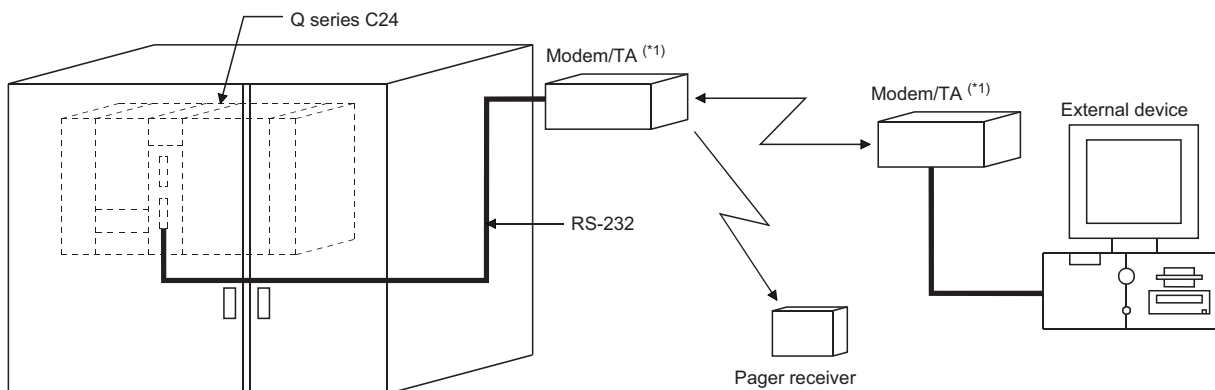
*1 TA: terminal adapter

3.1.1 Features

The following explains the features of the modem function.

(1) Interface that can use the modem function

(a) The modem function can be used with the Q series C24 using an RS-232 interface.

(b) For the QJ71C24(N)-R2 and LJ71C24-R2, the modem function can be used for only one of the two RS-232 interfaces.

Through the other interface of the Q series C24, direct data communication with an external device can be performed using MC protocol, non procedure protocol or bidirectional protocol (independent operation).
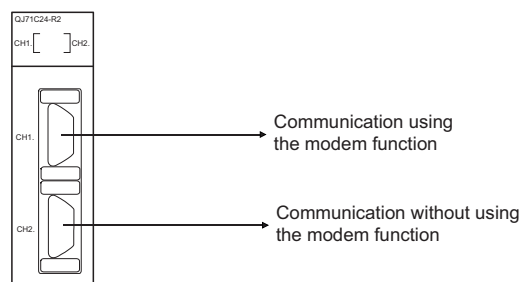
(2) Initialization, line connection and disconnection of the modem or TA

(a) The following set values for line connection can be used by storing to the Q series C24 Flash ROM in multiple sets.

• Modem/TA initialization data (AT command)
User setup: 30 sets (78 bytes/set); default value: 13 sets
• Connection data
User setup: 30 sets (80 bytes/set)
(Telephone number of the connection destination and display message to the pager receiver.)

(b) By registering the above data to the Q series C24 ahead of time, the modem/TA (terminal adapter) initialization, line connection (dialing), and line disconnection can be performed with ease.

(c) When the no-communication interval time (1 min to 120 min) is set, the Q series C24 disconnects the line when a no-communication condition has occurred for the set period of time following the line connection.

(3) Communication between a remote external device and programmable controller CPU

    (a) Data communication can be performed via full-duplex communication.

    (b) From the external device to the programmable controller CPU, communication using the MC protocol, non procedure protocol and bidirectional protocol can be performed.

    (c) From the programmable controller CPU to the external device, communication using the MC protocol (transmission by the on-demand dedicated-protocol function only), the non procedure protocol and bidirectional protocol can be performed.

3

3.1 Overview

(4) Notification to the pager receiver

    (a) In order to notify to the pager receiver of the programmable controller system maintenance information, the Q series C24 performs calling and message transmission according to the user-designated connection data when the output signal from programmable controller CPU is turned from ON to OFF.

    (b) Because Q series C24 notification processing is performed while the output signals from programmable controller CPU are turned OFF from ON, dedicated notification can be performed when the programmable controller CPU enters the STOP state due to an error, etc.
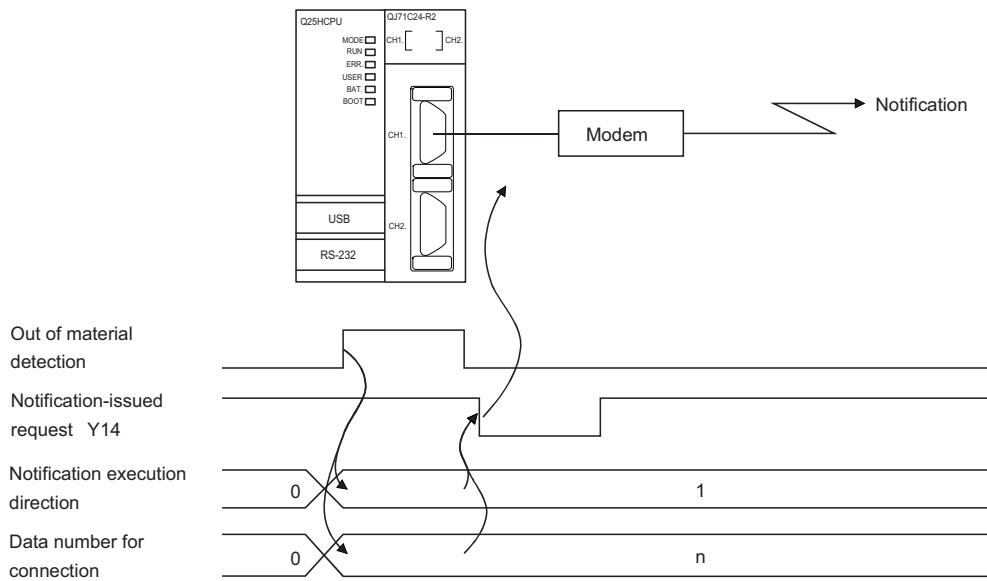
(5) Communication from GX Developer

    (a) Access from GX Developer to the remote programmable controller CPU can be made. (read and write from/to the device data and sequence program)

    (b) The QCPU can be accessed after reconnection from the Q Series C24 side using the callback function.[1]
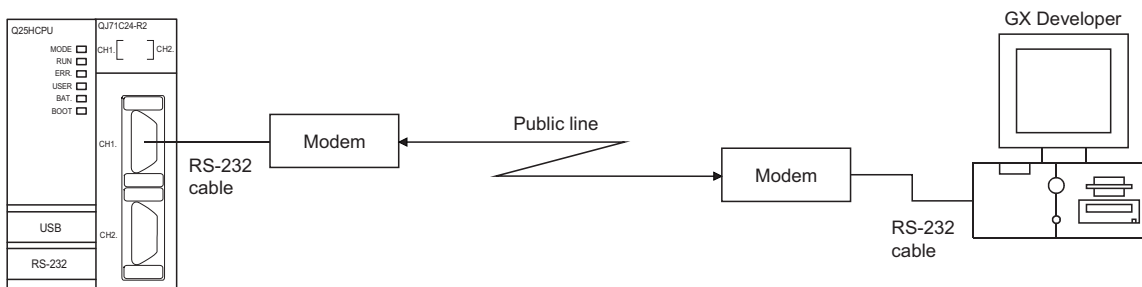
*1   Transmission costs after line connection by callback from the Q Series C24 side are borne by the Q Series C24 side.

(6) Remote password check

If the remote password check has been set for the Q series C24 installed in the QCPU, the Q series C24 executes a remote password check when the programmable controller is accessed from an external device using the Q series C24 modem function.

The following is an overview of the QCPU remote password function. For more details, see Page 86, Section 3.3.3.

(a) Remote password function

The remote password function allows / prohibits access to the QCPU from an external device via the following modules.

- Q series C24
- Ethernet module
- Built-in CPU of Ethernet port

*1   In the case of the Ethernet module, the remote password function can be used for data communications connections with an external device. For details, see the User's Manual (Basic) for the Ethernet module.

(b) Station where the remote password and remote password check are set

- In the case of a programmable controller system with one QCPU station
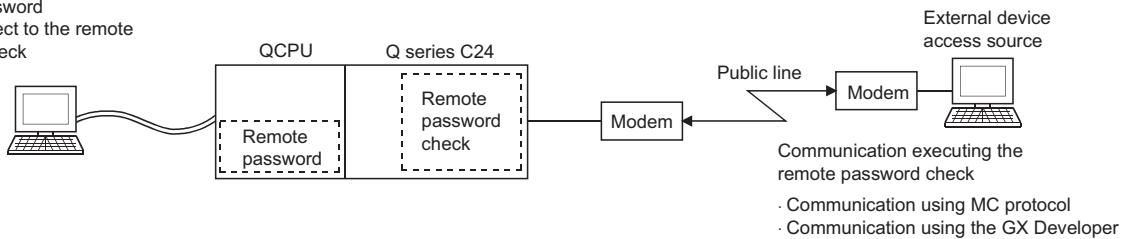
- In the case of a programmable controller system consisted of multiple QCPU stations

Set in the QCPU station which is the entrance of the programmable controller system as viewed from the external device (the local station QCPU in the diagram below).*1
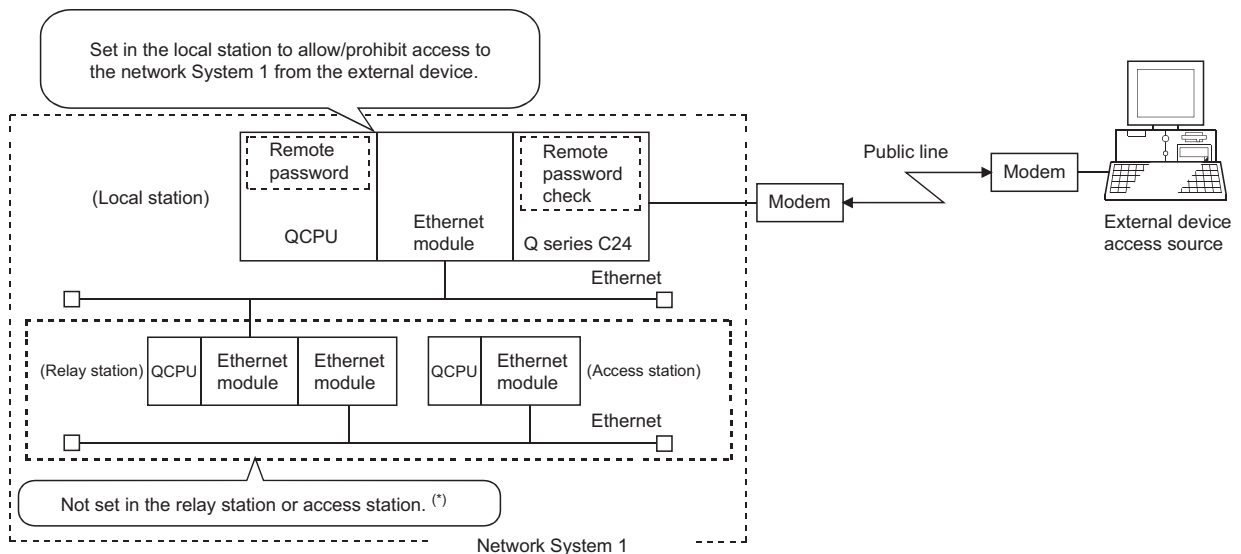
*1   When set in a station other than the QCPU which is the entrance of the programmable controller system (relay station or access station in the above diagram), access to other stations beyond the set station is prohibited.

3.1.2 Function list

The following lists the overview of the modem function:

Function	Overview	
Modem/TA initialization	Initializes the modem/TA using the user-designated initialization data (AT command). (Auto initialization of the modem / TA is possible.)	
Line connection (dialing)	Dials the partner telephone number according to the user-designated connection data and enables data communication after establishing the line connection. When the modem/TA is not initialized, performs initialization.	
Data communication	Performs communication with an external device using the MC protocol, non procedure protocol or bidirectional protocol.	Communication method: full-duplex communication Synchronization method: start-stop synchronous system (asynchronous)
	Performs communication with the partner Q series C24-installed station by modem/TA connection using non procedure protocol or bidirectional protocol. (Station-to-station communication)	
	Enables the communication between GX Developer and programmable controller via Q series C24.	
Notification	Calls and transmits messages to the pager receiver.	
Line disconnection	Forcefully disconnects the line from the connected destination device.	
Flash ROM reading, writing (registration) and deletion	Reads, writes (registers) and deletes the initialization data (AT command) and data for connection from/to the Flash ROM in the Q series C24 according to the request from programmable controller CPU.	
Remote password check	Allows the Q series C24 to execute the remote password check set in the QCPU when there is communication from the external device to the Q series C24 using MC protocol or the programmable controller is accessed using GX Developer.	
Callback	After line connection from GX Developer, access to the QCPU from GX Developer is made possible through line reconnection from the Q Series C24 (callback). Transmission costs after line connection from the Q Series C24 side are borne by the Q Series C24 side.	

3.1.3 Comparisons with related devices

The following lists the comparison with the related products which supports data communication with the programmable controller using the modem and public line, etc., similarly to the communication performed via the modem function.

Communication function name		QJ71C24N(-R2/R4), QJ71C24(-R2) (function version)		QC24N (modem function)	Q6TEL (for QnACPU/ACPU)	A6TEL (for ACPU)
		B	A			
Modem/TA initialization	Sequence program	○		○	○	
	GX Configurator-SC	○*1	×	—	—	
Line connection (dialing)		○		○	(Performed on the external device side)	
Communication between same products (such as C24-C24)	MC protocol	×		×	×	
	Nonprocedural protocol	○		○	×	
	Bidirectional protocol	○		○	×	
Communication between Q series C24 and other products		—		○	—	—
Remote communication from GX Developer		○		○	○	○
Remote communication from GX Developer (Callback function)		○	×	×	×	×
Remote communication from peripheral device for GPPQ		×		○	○	×
Remote communication from peripheral device for GPPA		×		×	○	○
Notification	Pager receiver	○		○	○	○
Remote password check		○*2	×	×	×	×
Line disconnection		○		○	(Performed on the external device side)	
Data setting (data for modem initialization, data for connection)	Sequence program	○		○	×	×
	GX Developer	×		×	○	○
	GPPQ	×		×	○	×
	GPPA	×		×	×	○
	GX Configurator-SC	○		—	—	—
Number of connectable modems/TAs		1				
Transmission type		Pulse/tone				
Connectable lines	Analog 2-line method	○		○	○	○
	Analog 4-line method	○		○	×	×
	Digital line (ISDN)	○		○	○	×

○: enable, ×: disable

*1 Modem initialization is executed automatically when the Q Series C24 starts up.
*2 Prior to data communication, the Q series C24 checks whether the remote password specified by the user and the remote password set in the QCPU agree or not. If they agree, it allows access to the specified station.

3

3.1 Overview

3.2 System Configuration

This section describes system configurations when the modem function is used to call a pager receiver or to perform data communication with an external device via public lines.

3.2.1 System configuration when performing data communication with an external device

The following describes the system configuration examples used when performing data communication between the external device and programmable controller using the Q series C24's MC protocol/non procedure protocol/bidirectional protocol.

(1) Connection example with an external device[1][2]
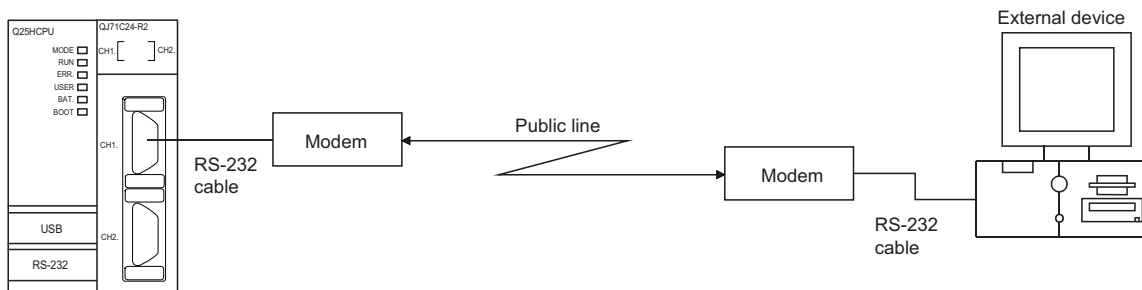
(2) Connection example with a Q series C24[1][2]
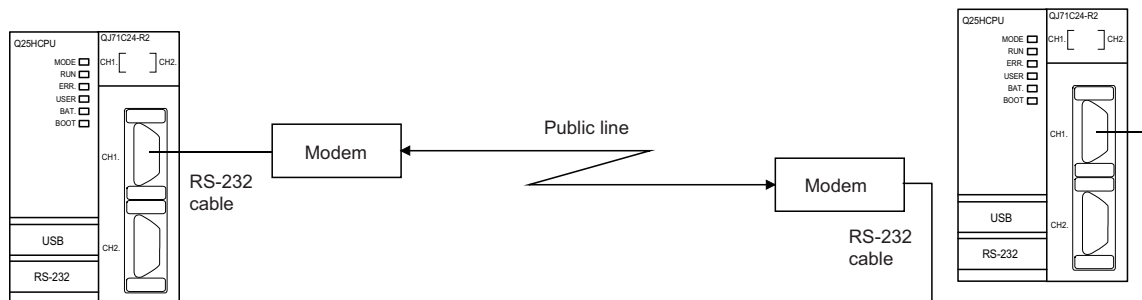
(3) Connection example with a Q series C24 via cellular phone[1]
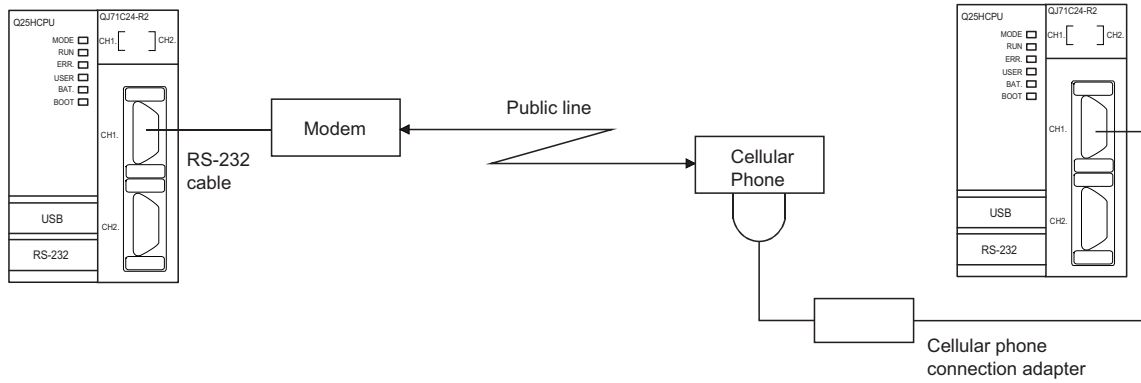
*1 The public line is compatible with the office telephone system as well.
*2 The digital line (ISDN) can replace the public line.
When connecting via a digital line, a TA (terminal adapter) and a DSU (digital service module) are used instead of a modem.

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3.2 System Configuration

3.2.2 System configuration when using the notification function

The following describes the system configuration example when calling the pager receiver by the notification function.[1]
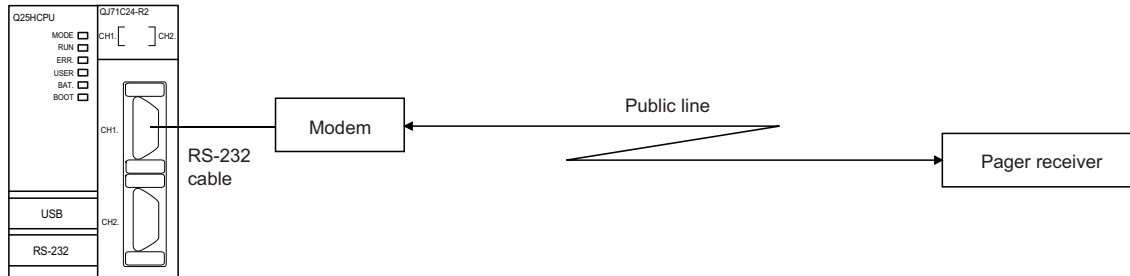
    *1   The public line is compatible with the office telephone system as well.

3.2.3 System configuration when connecting GX Developer

The following describes the system configuration when GX Developer performs data communication with a remote station programmable controller via Q series C24.[1][2]
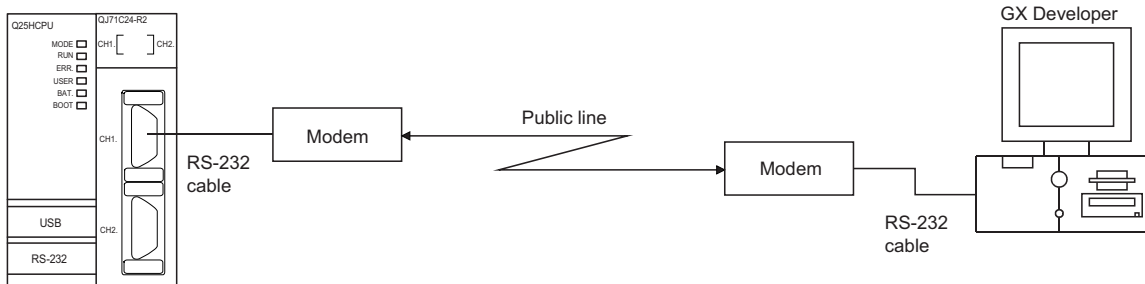
*1 The public line is compatible with the office telephone system as well.
*2 Set items as below for "Transfer Setup" screen using GX Developer.
   • PC side I/F: Serial
   • PLC side I/F: C24
   • Telephone line connection (Q/A6TEL, C24): Data for line connection
Set the other items corresponding to the access destination station.
For how to display the "Transfer Setup" screen, refer to manuals for GX Developer.

Point

When GX Developer is connected, perform the settings and operations described in Page 120, Section 3.3.7 to prevent a line to the modem from disconnecting even if communication between the GX Developer and programmable controller is interrupted.

3.2.4 Precautions for system configurations

The following describes the precautionary items when configuring the system to perform data communication with an external device or call a pager receiver via public line, an office telephone system or digital line (ISDN) using the Q series C24 modem function.

(1) Usable Q series C24 interface

    (a) The modem function can be used for the RS-232 interface only.

    (b) For the QJ71C24(N)-R2 and LJ71C24-R2, the modem function can only be used for only one of the two RS-232 interfaces.

    (c) Interactive data communication via two interface of Q series C24 (linked operation) is not possible.

(2) Connectable modem/TA

    (a) Only the modems/TA indicated in Page 83, Section 3.3.2 can be used for the Q series C24 RS-232 interface using the modem function.

(3) Number of connectable modems/TA's

    (a) Only one modem/TA can be connected to the Q series C24 RS-232 interface that uses the modem function.

(4) Modem/TA connection cables

    (a) The RS-232 cable supplied with the modem/TA or the designated modem/TA cable can be used for connection between the Q series C24 and modem/TA.

    (b) For the RS-232 interface of the Q series C24, a D-sub 9-pin connector (female) is used. For the connection cable of the Q series C24 side, refer to the User's Manual (Basic).

(5) Modem/TA installation

    (a) Install the modem/TA according to the modem/TA manual. When installed in an area in which a lot of noises exists, malfunctions may occur.

    (b) In order to prevent the effects of noise and power surges, do not connect near or tie the cable together with a main circuit line, high-voltage line or load line other than for the programmable controller with the modem/TA connection cable.

(6) Connectable lines

(a) The connections can be made with the following lines.

Perform connection tests beforehand and confirm that connection is possible.
- Public line or office telephone system of analog two-line method
- Digital line (ISDN)

(b) It is not possible to connect to call-waiting lines, in order to avoid data errors or automatic line disconnection due to the call-waiting interrupt tone.

(c) Avoid connections with party-line telephones to avoid interrupted calls during communication.

(d) If an alert sound is sent at fixed intervals from the communication machine to prevent long-term calls, data may experience errors.

It is recommended to check the normality/abnormality of data reception between devices, and perform transmission-retry processing when an abnormality is detected.

(e) See the modem/TA manual regarding the connection from a modem to public line/office telephone system, or from a TA (terminal adapter) to a digital line.

(7) Communication system

Communication via the modem function is performed using full-duplex communication.
Connections cannot be made devices designed for half-duplex communication.

(8) Data communication and notification to external devices

(a) Data communication with external devices and notification to a pager receiver are performed using the public line or electric wave transmitted from the electric wave transmission base.

There might occur a condition in which correct data communication or notification cannot be carried out due to an error from the system's setup environment, electric-wave transmission status, error in the partner device, etc. Perform connection tests beforehand and confirm that connection is possible.

(b) In notification processing via electric-wave transmission, errors from the pager receiver cannot be detected. Setup a separate call circuit with a lamp display or buzzer to ensure the safety of the programmable controller system.

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3.2 System Configuration

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3.3 Specifications

This section explains the transmission specification on the Q series C24 side, connectable modems/TA's (terminal adapter), I/O signals related to the modem function, and buffer memory for the usage of the modem function.

3.3.1 Transmission specifications

The transmission specifications on the Q series C24 side for use of the modem function are as listed below.
The transmission specifications between Q series C24 and a modem/TA (local station Q series C24) that are not provided in this table are listed in the User's Manual (Basic).

Item		QJ71C24N QJ71C24 LJ71C24	QJ71C24N-R2 QJ71C24-R2 LJ71C24-R2	QJ71C24N-R4
Modem function		Available		Not available
Interface that can use the modem function		RS-232		
Linked operation between CH1 and CH2 of the Q series C24		Not available		
Communication method		Full-duplex communications		
Synchronization method		Asynchronous method		
Transmission speed[1]		1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 (bps)		
Data format	Start bit	1		
	Data bit	7 / 8		─
	Parity bit	1 (On) / 0 (Off)		
	Stop bit	1 / 2		
Error detection	Parity check	On (odd/even selectable) / Off		
	Sum check code	On / Off		
Transmission control		RS/CS control yes/no (selectable)		
Data communication	Nonprocedural protocol	Available		
	Bidirectional protocol	Available		
	MC protocol	Available		
	Pre-defined protocol	Not available		
Line connection (Q series C24: modem)		1:1		

*1 When the first five digits of the serial No. are 03042 or earlier, the transmission speed cannot be set to 115200 bps for connection between the Q series C24 and GX Developer via a modem.

3.3.2 Specification of connectable modems/TAs (terminal adapters)

The following table lists the specification of modems/TAs that can be connected to the Q series C24 side when the modem function is used.

(1) Specification and precautions for the connectable modems

(a) Modem specification

Item			Specifications		Remarks
			When using the subscriber's telephone line/office telephone system	When using a manual line connection/cellular phone	
Modem-to-modem communication specification	Connection line		Analog 2-line		—
	Initialization		Hayes AT command compatible		☞ Page 134, Section 3.4.3
	Telephone line		A line compatible with NTT communication protocol		☞ Page 80, Section 3.2.4 regarding the restrictions
	Communication standard	ITU-T	V.34/V.32bis/V.32/V.22bis/V.22/V.21/V.fc		—
		Bell	212A/103		
	Error correction[*1]	MNP	Class 4 and 10 compliant		
		ITU-T	V.42 compliant		
	Data compression[*1]	MNP	Class 5 compliant		
		ITU-T	V.42bis compliant		
	ANS-ORG mode switch		—	Mode switching required	
Q series C24-to modem communication specification	Q series C24-side connector (RS-232)		9-pin (female) D sub		📖 User's Manual (Basic)
	DR signal control		Only the DR (DSR) signal must be able to turn on		*2
	Other		Compatible with the Q series C24 specification		☞ Page 82, Section 3.3.1, 📖 User's Manual (Basic)

*1 The following are the functions of the modem itself that become available by issuing the AT commands to the modem. See the modem manual for details.
· Error correction
  • When a noise occurs on the line, scrambled data may appear due to interrupted communication data. The error correction function is intended to suppress effects from such noises.
  • If an error such as scrambled data is detected by the error correction, the modem retries the transmission. When the number of retries has exceeded the modem's limit, the modem determines that communication cannot be performed in that environment and disconnects the line.
  • Both modems must support the MNP4 or V.42 protocol.
· Data compression
  • This function compresses data to be sent prior to transmission, and inflates the compressed data upon reception, then forwards to the terminal.
  • The data compression is effective for the execution speed at a maximum of 200% for the MNP5 and 300% for the V.42bis.
  • Both modems must support the MNP5 or V.42bis protocol.
· Flow control (RS/CS control)
When communication between a modem and terminal is faster than between two modems, the flow control is performed in the following order:
  • The modem transmits data to the partner by storing the data from the terminal in the modem buffer.
  • When the buffer in the modem becomes almost full, the modem outputs a data-transmission temporary stop request (CS (CTS) signal = OFF) to the terminal. The terminal then stops data transmission to the modem when the data-transmission temporary stop request (CS (CTS) signal = OFF) is received. Even while the terminal pauses data transmission, the modem continues to send data to the partner.
  • When a free space is present in the modem buffer, the modem outputs the data-transmission resume request (CS (CTS) signal = ON) to the terminal. The terminal then resumes data transmission to the modem when the data-transmission resume request (CS (CTS) signal = ON) is received.
*2 Modems that turn on the CD (DCD) signal simultaneously cannot be used.

(b) Precautions for selecting a modem

- When using a cellular phone

A modem with the error correction function of MNP class-10 is recommended. However, note that communication may not be established depending on the line condition.

- Modem setting
  - Set the modem on the Q series C24 side as shown below:

Setting item		Setting range
Communication rate		Depends on the modem in use[1]
Modem command		Hayes AT command
SI/SO control		None
Communication method		No procedure
Data format	Data bit	Match the Q series C24[2][3]
	Stop bit	
	Parity bit	

[1]   When using different modems, the slower communication rate will be in effect.
[2]   Some modems may transmit one character as 10 bits.
         Check the modem specifications when setting the Q series C24 transmission specifications.
[3]   Some modems may switch the communication rate following the start of data communication.
         Since the Q series C24 cannot switch the communication rate, set the modem side so that its communication rate does not switch.

  - When using a modem whose DR terminal (signal) is set by a switch, set the DR-terminal (modem output) switch level to high. When using a modem requiring DR terminal setting with software, write the command that turns on the DR (DSR) signal into the data for initialization. Set the "Modem initialization time DR signal valid/invalid designation" to "Invalid" during modem function system settings with GX Configurator-SC.

(2) Specification and precautions for the connectable TA's (terminal adapters)

(a) TA specification

Item		Specifications	Remarks
TA-to-TA communication specification	Connection line	ISDN (INS net 64) equivalent, High-speed digital dedicated line	DSU and TA are required
	Initialization	Hayes AT command compatible	☞ Page 134, Section 3.4.3
	Communication standard	B-channel line exchange (V.110), D-channel packet exchange	—
	Electrical condition	V.28 compliant	
Q series C24-to-TA communication specification	Circuit definition	V.24 compliant	
	Q series C24-side connector (RS-232)	9-pin (female) D sub	📖 User's Manual (Basic)
	DR signal control	Only the DR (DSR) signal must be able to turn on	*1
	Other	Compatible with the Q series C24 specification	☞ Page 82, Section 3.3.1, 📖 User's Manual (Basic)

*1   TA's that turn on the CD (DCD) signal simultaneously cannot be used.
        Use a TA capable of flow control as described in Page 83, Section 3.3.2 (1) (a) also for the communication between the TA and terminal. Flow control is a function of the TA itself that becomes available by issuing the AT commands to the modem. See the TA manual for details.

(b) Precautions for selecting a TA

• Set the TA on the Q series C24 side as listed below:

Setting item		Setting range
Communication rate		Depends on the TA in use
TA command		Hayes AT command
SI/SO control		None
Communication method		No procedure
Data format	Data bit	Match the Q series C24[*1*2]
	Stop bit	
	Parity bit	

*1   Some TAs may transmit one character as 10 bits. Check the TA specifications when setting the Q series C24 transmission specifications.
*2   Some TAs may switch the communication rate following the start of data communication. Since the Q series C24 cannot switch the communication rate, set the TA side so that its communication rate does not switch.
• When using a TA whose DR terminal (signal) is set by a switch, set the DR-terminal (TA output) switch level to high. When using a TA requiring DR terminal setting with software, write the command that turns on the DR (DSR) signal into the data for initialization. Set the "Modem initialization time DR signal valid/invalid designation" to "Invalid" during modem function system settings with GX Configurator-SC.

3.3.3 Compatibility with the QCPU remote password function

This section explains the Q series C24 data communication for the QCPU remote password function.
Refer to Page 70, Section 3.1.1 for an overview of the Q series C24 check function for the QCPU remote password.

Point

● The remote password function is a function that has been added to the QCPU as a means of preventing improper access (such as destroying a program or data) from an external device. However, this function cannot completely prevent improper access.

● The user should incorporate his/her own safeguards when it is necessary to protect the security of the programmable controller system from improper access from an external device.

● The company cannot assume any responsibility for any problems that may arise from system troubles caused by improper access.
An example of a safeguard on the programmable controller CPU with respect to improper access
One example is shown in Page 105, Section 3.3.6, in which the programmable controller CPU disconnects a line to the external device when the number of times a "remote password mismatch" is detected exceeds the number set by the user with regard to the Q series C24 remote password check explained in this section.

(1) Data communication during remote password setting

This section explains the use and setting of the QCPU remote password function and data communication between the external device and the QCPU when a remote password has been set.

(a) Allowing/prohibiting access to the programmable controller from the external device

1) Access allow processing (unlock processing)

   • To access the specified QCPU, the external device performs the remote password unlock processing with respect to the Q series C24[*1] of the directly connected station (local station) after line connection for the modem function.

   • If the unlock processing has not been performed, the remote password check performed by the Q series C24[*1] that has received a communication request prohibits access to the specified station. (☞ Page 88, Section 3.3.3 (2))

   • All data communication before the unlock processing is performed will be processed as an error.

   *1 The Q series C24 of the QCPU station for which a remote password is set will be indicated.

2) Access processing

   • Normal completion of the remote password unlock processing allows the specified station to be accessed.

   • Perform communication using MC protocol. (Perform on-line operation when GX Developer is connected.)

3) Access prohibition processing (lock processing)

   • When the specified station access is completed, the process for disconnecting the line for the modem function is performed in order to disable further access.

   • When line disconnection is completed, the remote password lock processing is performed automatically.

(When accessing the local station QCPU)

A station (*1)

1) Unlock processing

Modem → ← Modem

2) Access   3) Lock processing (*2)

Remote password   Remote password check   (Local station)

QCPU   Q series C24

(When accessing other station QCPU)

A station (*1)

1) Unlock processing

Modem → ← Modem

3) Lock processing (*2)

Remote password   Remote password check   (*3)   Ethernet module   (Local station)

QCPU   Q series C24

Ethernet

QCPU   Ethernet module   Ethernet module   (Relay station)

Ethernet

2) Access

QCPU   Ethernet module   (Access station)

*1 Unlock and lock processing for the local station remote password is possible.
   Remote password unlock and lock processing for the relay station
   and access station cannot be performed

*2 Lock processing is performed when a line for the modem function is disconnected.

*3 Even if the Ethernet module that transmits a communication request
   to other Ethernet is set as a module subject to the remote password check,
   unlock and lock processing is not necessary.

Point

● The remote password unlock and lock processing can be performed only for the Q series C24 of the local station directly connected to the external device. The remote password unlock and lock processing cannot be performed for the Ethernet module of the other stations (relay station and access station).

● The remote password unlock processing from the external device is performed using dedicated commands for MC protocol communication.

● See Page 121, Section 3.3.7 (8) for what to do when the remote password unlock processing is completed abnormally.

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(2) Remote password check processing performed by the Q series C24

(a) Communication in which a remote password check is performed

1) When the following parameters are set for the Q series C24 installed in the QCPU station, the Q series C24 performs a remote password check for communication requests listed below.

- When a remote password is set in the QCPU
- When the Q series C24 that is communicating data with the external device has been set as a module subject to the remote password check

2) The Q series C24 performs a remote password check with respect to a communication request to the local station/other station received from the external device.

3) The Q series C24 does not perform a remote password check for the following communication requests.

- Transmission request from the local station QCPU (such as transmission using non procedure protocol)
- Communication request from the external device (including GX Developer connected to the local station QCPU) transmitted to other station upon request from the QCPU
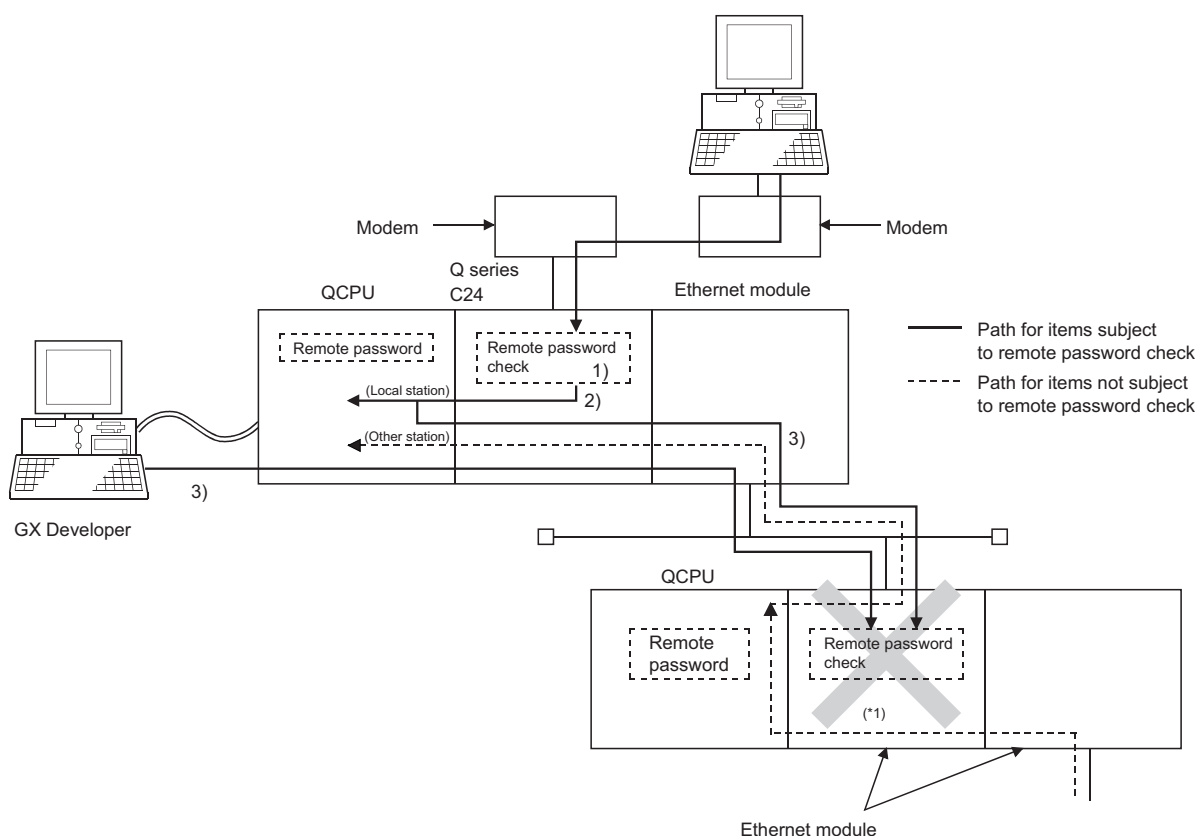
*1   In the above diagram, a communication request from the external device cannot be received since the remote password check setting has been executed.
If the remote password check setting has not been executed, a communication request can be received and data communication from the external device is possible.

(b) Selecting modules subject to the remote password check

The user can select any Q series C24 to perform the remote password check and set this using QCPU parameters. (This is set on the GX Developer remote password setting screen.)

(c) Stations that can be accessed when the remote password check is performed

- If the external device performs the remote password unlock processing with respect to the Q series C24 of the directly connected station (local station) after line connection for the modem function, it can access the local station QCPU.
- When accessing the programmable controller of another station via the Ethernet module of a relay station or access station, the following settings determine whether access is allowed/prohibited.
  - To prohibit access to other station from an external device using the CC-Link IE Controller Network, MELSECNET/H or MELSECNET/10 relay communication function of the Ethernet module, place a check mark at the following setting items in the remote password setting for the relay station or access station.

"GX Developer communication port (UDP/IP)[1], dedicated commands, CC IE Control, MNET/10(H) relay communication port"

*1   Set on the GX Developer remote password setting screen.
- If a check mark is not placed at the above setting items, access to other station will be allowed.
- See the user's manual (Basic) for the Ethernet module for stations that can be accessed when accessing other station programmable controllers via the Ethernet module. (When reading the manual, substitute the Q series C24 with the station connected to the external device).

(3) Data communications procedure

This section explains the procedure when the external device performs data communication via the Q series C24 in which the remote password check is performed.

(a) Initialization of the modem of the Q series C24 side and external device side is performed at each device sides.

(b) The line is connected from the external device.

(c) The external device performs the remote password unlock (release) processing for the QCPU of the station where the Q series C24 is installed using dedicated commands for MC protocol communication.[1] (The unlock processing cannot be performed for the QCPU of other station.)

*1   See Page 121, Section 3.3.7 (8) for what to do when the remote password unlock processing is completed abnormally.

(d) Data communication is performed from the external device using MC protocol.

(e) When data communication using MC protocol is completed, a line for the modem is disconnected from the external device.

When line disconnection is completed, the remote password lock processing is performed automatically.

Remark

- Refer to the MELSEC Communication Protocol Reference Manual for the unlock processing command for the remote password.
- When accessing the programmable controller from GX Developer connected to the Q series C24, the remote password unlock processing is performed when on-line operation begins.

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3.3 Specifications

(4) How to set the remote password

On the screen below for setting parameters (remote password) using GX Developer, set the remote password in the QCPU and specify the Q series C24 that performs the check.

Set the remote password as the following instructions.

[Starting procedure]

"GX Developer" → [Remote password] → "Remote password setting" screen

[Setting screen]

[Setting item]

Item name		Set data	Setting range/choices
Password settings		Enter the remote password to be set in the QCPU[*1]	4 bytes
Password active module settings	Model name	Select the type of module that checks the remote password set in the QCPU	QJ71C24/CMO
	Start XY	Set the head address of the module that checks the remote password	0000H to 0FE0H
	Conditions	(No setting required)	—

*1   Consider the following when setting the remote password.
- Avoid using a character string of simple numbers or letters only.
- Mix numbers, letters and special characters (?, ., !, &, %, etc.).
- Avoid using a character string that represents the user's name or date of birth.

Point

● When using the Q series C24 in a multiple CPU system, write the remote password setting in the control CPU of the Q series C24.

● After setting the remote password in the QCPU, reboot the QCPU (CPU No. 1 in a multiple CPU system). (Reset/power reset using the RESET/L.CLR switch) By rebooting the QCPU, the remote password becomes valid.

● The password supported by the QCPU function version A is used to prohibit reading/writing of file data in the QCPU using GX Developer.
Dual access control can be provided by using the remote password described in this section and password for file access.

(5) Setting from GX Configurator-SC

When the Q series C24 performs a remote password check for the remote password set in the QCPU, the remote password check setting as well as the present check results can be monitored with respect to the screen items listed in the table below.

See Page 105, Section 3.3.6 for an explanation of each area.

GX Configurator-SC setting/monitor screen	Setting/monitor items for the remote password check	Buffer memory address
"Modem function system setting" screen	Remote password mismatch notification count designation	8204 (200CH)
	Remote password mismatch notification accumulated count designation	8205 (200DH)
"Modem function monitor/test" screen	Remote password mismatch notification count designation	8204 (200CH)
	Remote password mismatch notification accumulated count designation	8205 (200DH)
	Accumulated count of unlock process normal completion	8955 (22FBH)
	Accumulated count of unlock process abnormal completion	8956 (22FCH)
	Accumulated count of lock process based on circuit line disconnection	8959 (22FFH)

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3.3 Specifications

3.3.4 Compatibility with the callback function

The following describes the Q Series C24 callback function that can be used when accessing the QCPU from GX Developer connected to the Q Series C24.

(1) About the Callback function

(a) What is the Callback function

The callback function is a function that makes it possible to access the QCPU from GX Developer by reconnection (callback) of the line from the Q Series C24. Transmission costs after line connection from the Q Series C24 side are borne by the Q Series C24 side.

(b) Settings in order to use the callback function

The callback function can be used by setting it through GX Configurator-SC, then registering it in the Q Series C24. (☞ Page 96, Section 3.3.4 (4))

(c) Selecting the callback destination GX Developer

GX Developer that can be called back in accordance with the settings in the Q Series C24 can be selected as described below.

• If the callback destination GX Developer is fixed (1 module)[1]

(Callback connection (during fixed))

Connection can be made to only fixed GX Developer (1 module) registered in the Q Series C24.

• If it is being made possible to change the callback destination GX Developer[1]

(Callback connection (during designated number))

It is possible to connect to GX Developer when the callback destination telephone number (Call number) is specified.

• If the maximum number of callback destination GX Developer is limited to 10 modules[1]

(Callback connection (during max. designated number is 10))

Connection is possible with only those pieces of GX Developer (max. 10 modules) with a callback destination telephone No. registered in the Q Series C24.

*1   A description of the callback operation in 1) to 3) is shown in Page 97, Section 3.3.4 (4) (b).

Setting of callback function designation settings by the GX Configurator-SC

Selection of the connection system and line connections

1) Line Connection
2) Temporary line disconnection
3) Line connection
4) Access to the QCPU
5) Line disconnection

Modem

Modem

Q Series C24

GX Developer

——— Processing for the GX Developer to access the QCPU

----- Processing by the callback function
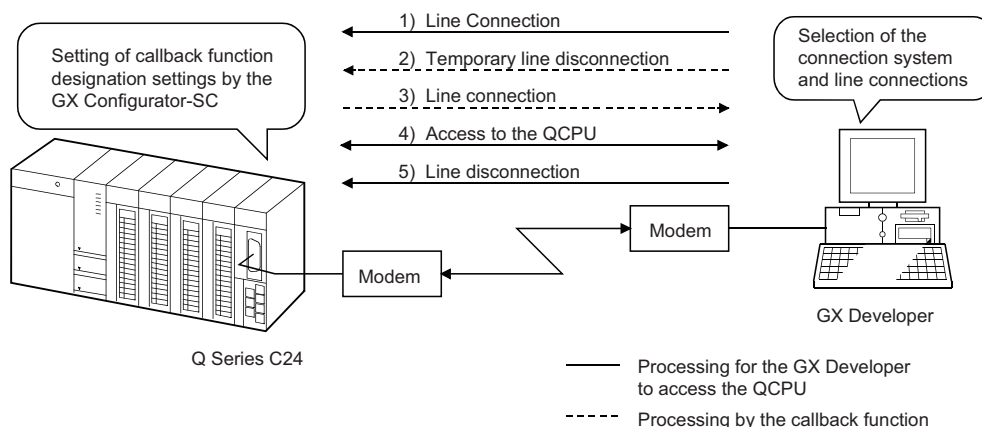
(2) Data communications procedure

Here, the procedure for data communications when using the callback function is shown.

(a) Q series C24 side procedure

Carry out procedure of starting the modem function and data communications in accordance with Page 126, Section 3.4.1.

- Set the callback function by GX Configurator-SC. (☞ Page 96, Section 3.3.4 (4))
- Initialize the Q Series C24 side modem. (☞ Page 126, Section 3.4)
- The modem's initialization completed signal (X10) goes On when modem initialization is completed. Wait for the line connection from GX Developer.[1][2]

*1   Select the connection system (connect way) from GX Developer, then make line connection.
*2   When the Q Series C24 callback processing is completed normally, the line connection signal (X12) is in the ON state.

Point

See the GX Developer's Operating Manual for details of the line connection screen from the GX Developer when using the callback function.

(3) Cautions during data communications

(a) Set the GX Developer side modem which the Q Series C24 is to reconnect to (callback) on "with Auto Reception". (With Auto Reception: This setting enables line connection from the external device.)

(b) When a request is issued for a line connection from another GX Developer during a temporary line disconnection from the GX Developer side by callback processing, the Q Series C24 executes a callback operation for the latter connection request.

The Q Series C24 terminates callback processing to GX Developer that it received a connection request from earlier.

(c) If you are making a line connection to the GX Developer by the following connection system, select "callback reception waiting" as the connection system for GX Developer that the Q Series C24 is reconnecting to (callback) and make the connection.

• Callback request (during fixed/during designated number)

Ex. In the case of line connections with "Callback request (during designated number)" as the connection system.

Registration in the Q Series C24	
Callback data No. 1	Telephone No. 1)
Callback data No. 2	Telephone No. 2)
Callback data No. 3	Telephone No. 3)
to	to
Callback data No. 10	Telephone No. 10)
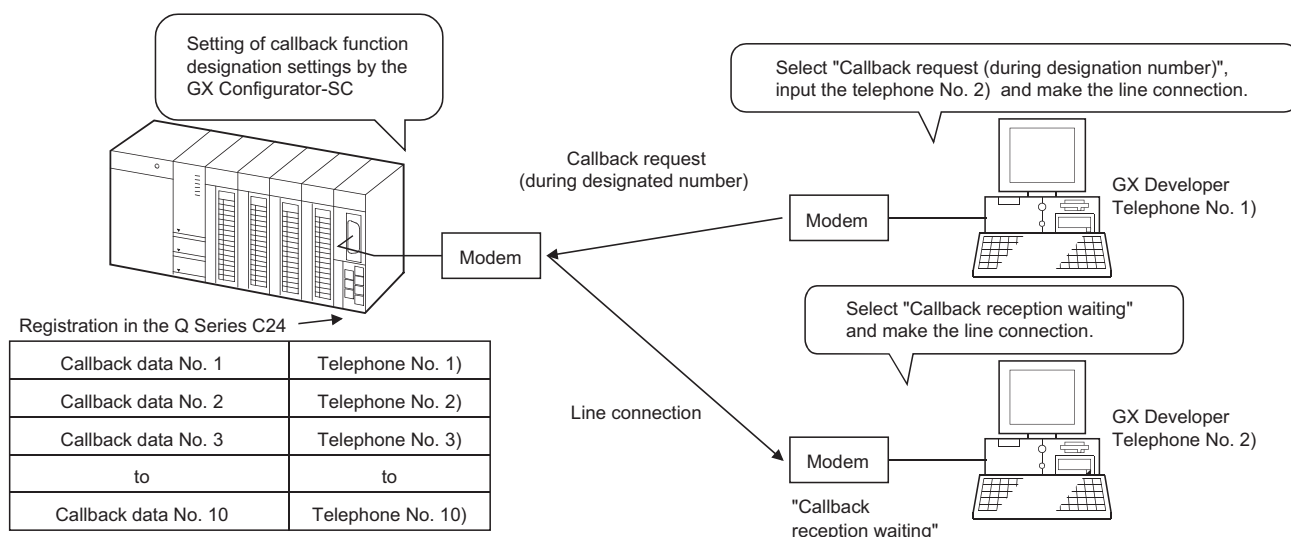
(d) If callback processing was not executed normally, an error message screen is displayed on the GX Developer side. Perform the processing operation (reconnection operation, etc.) corresponding to the displayed message.

The operating state on the Q Series C24 side can be confirmed by the following items in the GX Configurator-SC monitor/test screen.

GX Configurator-SC Monitor / test screen	Monitor item	Buffer memory address	Reference
X·Y monitor/test	X10: Modem initialization completion	—	Page 102, Section 3.3.5
	X12: Connection in progress	—	
Modem function monitor/test	Modem function sequence status	222H	Page 105, Section 3.3.6

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(e) Set the settings related to the callback function in the following areas of GX Developer.

[Starting procedure]

GX Developer → [Tools] → [Options] → [TEL]

• Line callback cancel wait time (Setting range: 1 to 180 s. (Default: 90 s.))

This specifies the waiting time after sending a response to a callback request from the Q Series C24, until the line is disconnected from GX Developer.

If the line is not disconnected from GX Developer within the specified time in this area, the Q Series C24 forcibly disconnects the line, terminating callback processing.

• Callback delay time (Setting range: 1 to 999s. (Default: 20s.))

This specifies the time from the temporary line disconnect on the GX Developer side until the Q Series C24 reconnects (callback).

Point

Refer to the Q Corresponding Serial Communication Module User's Manual (Basic) for the symptoms, causes, and actions of problems that may occur during access from GX Developer to the QCPU when using the callback function.

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3.3 Specifications

(4) Setting and monitoring by GX Configurator-SC for use of the callback function

(a) Setting, monitoring / test items

Carry out setting, monitoring and testing of the callback function using the following GX Configurator-SC screen.

• Setting items through the "Modem function system setting" screen

This shows the callback function setting items.

See Page 105, Section 3.3.6 for the modem function setting items, including the following items.
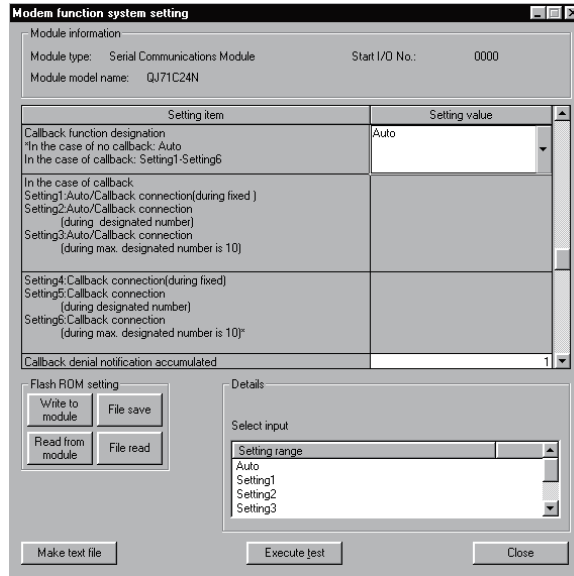
Setting item	Setting value	Setting possible / impossible	Description
GX Developer connection designation	Connect	●	Be sure so specify "Connect" when using the callback function.
Callback function designation	Settings 1 to 6 (☞ Page 97, Section 3.3.4 (4) (b))	●	Select according to the callback operation.
Callback denial notification accumulated count designation	0 to 65535	○	Specify the accumulated count value informed to the user.
Data No. for Callback designation 1 to 10	BB8H to 801FH	●	Specify the connection data No. See Page 139, Section 3.4.4 for setting values.

●: Must be set, ○: Set as necessary

• Monitoring / Testing through the "modem function monitor / test" screen

This shows the callback function monitoring and testing.

See Page 105, Section 3.3.6 for monitoring and testing of the modem function, including the following items.

Callback function monitoring / test items	Buffer memory address
Callback permit accumulated count	8944 (22F0H)
Callback denial accumulated count	8945 (22F1H)
Auto (callback) connection permit accumulated count	8946 (22F2H)
Auto (callback) connection denial accumulated count	8947 (22F3H)
Accumulated count of callback receive procedure cancel	8948 (22F4H)

(b) Callback function designation and callback operation outline

Here the setting values for "Callback function designation" items in the "Modem function system setting" screen and an outline of the corresponding Q Series C24 callback operation are explained.

Function	Setting values for "Callback function designation" items.	
	If you desire to set the connection system on "auto" and carry out line connection	If you set the connection system on "auto" and do not carry out line connection
1) If the callback function is not used	Auto (0H)[*1]	—
2) If the callback destination GX Developer is fixed (1 module) (Callback connection (during fixed))	Setting 1 (9H)[*1*2]	Setting 4 (1H)[*1]
3) If it is being made possible to change the callback destination GX Developer (Callback connection (during designated number))	Setting 2 (BH)[*1*2]	Setting 5 (3H)[*1]
4) If the maximum number of callback destination GX Developer is limited to 10 modules (Callback connection (during max. designated number is 10))	Setting 3 (FH)[*1*2]	Setting 6 (7H)[*1]

*1   Values in parentheses are values when the set values are stored in buffer memory (Address: 2001H).
*2   If the connection system is set on "Auto (Callback: during fixed/Callback: during designated number)" and line connection is executed, (Setting 1 to Setting 3) are explained in 5).

1) If the callback function is not used (Auto (0H) (Default Value)

- Select this if the callback function is not being used.
- Data communications becomes possible after line connection from GX Developer.

2) If the callback destination GX Developer is fixed (1 module) (Setting 1 (9H) or setting 4 (1H))

- Select this if the Q Series C24 fixes the telephone No. (1 module) of the GX Developer side that is being called back.
- The Q Series C24 executes callback to the GX Developer side using connection data set in the following data No. 1 for callback, shown below. At this time, the external line dialing, line types and telephone number in the connection data become valid.
- Set callback data No. 1 in the "Modem function system settings" screen.

Ex.   If line connections are being made with "Callback connection (during fixed)" as the connection system
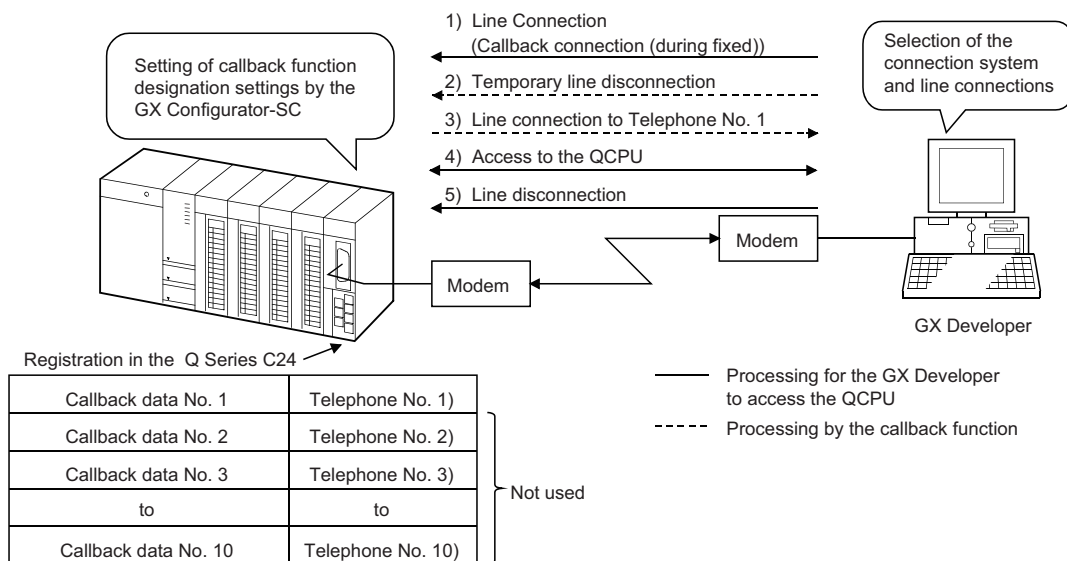
3) If it is being made possible to change the callback destination GX Developer (Setting 2 (BH) or Setting 5 (3H))

- Select the callback destination telephone No. if it is being specified at the time when line connections are being made from the initial GX Developer side.
- The Q Series C24 calls back GX Developer with the callback destination telephone No. received from the GX Developer side. At this time, the external line dialing, line types and the connection data set in the following callback data No. 1 are used.
- If the callback destination is not specified when line connections are made from the initial GX Developer side, the connection data set in the following callback data No. 1 are used to call back the GX Developer side. At this time, the external line dialing, line types and telephone number in the connection data become valid.
- Set callback data No. 1 in the "Modem function system settings" screen.

Ex. If line connections are being made with "Callback connection (during designated number)" as the connection system

Registration in the Q Series C24

Callback data No. 1	Telephone No. 1)
Callback data No. 2	Telephone No. 2)
Callback data No. 3	Telephone No. 3)
to	to
Callback data No. 10	Telephone No. 10)

Not used

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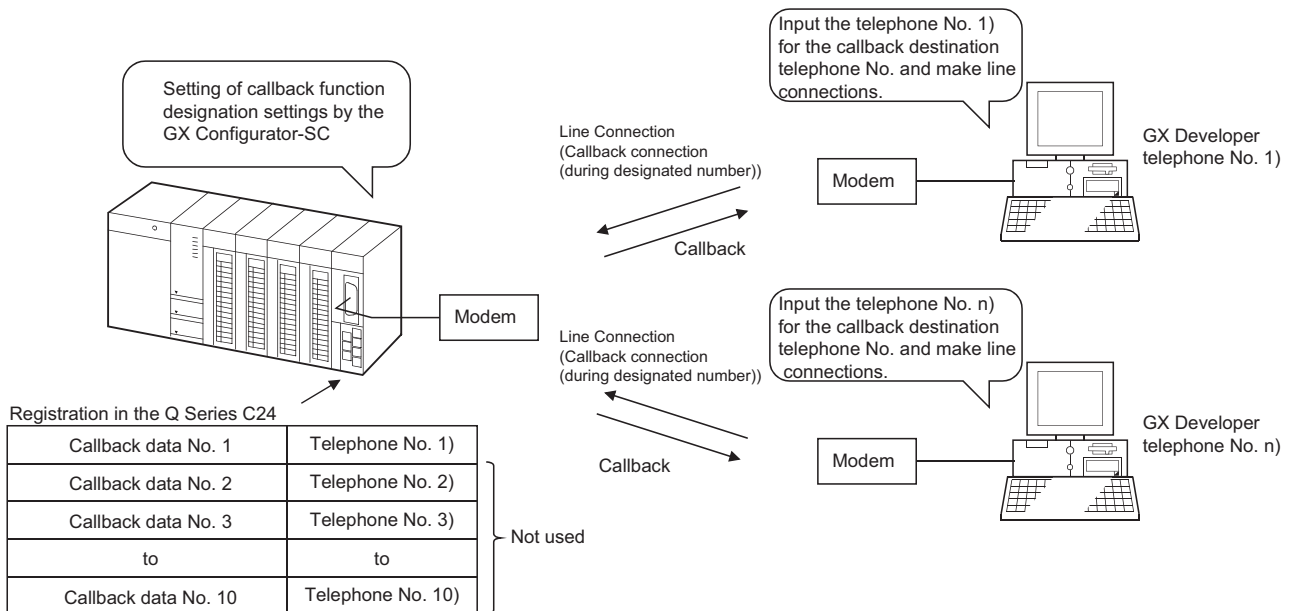
4) If the maximum number of callback destination GX Developer is limited to 10 modules (Setting 3 (FH) or Setting 6 (7H))

- Select GX Developer to be called back if the Q Series C24 limits the callback destination to a maximum of 10 modules.
- Specify the callback destination telephone No. when making line connection from the initial GX Developer side.
- If the Q Series C24 checks the callback destination telephone No. received from the GX Developer side and it is a telephone No. that is registered in the Q Series C24, callback is executed. If a telephone No. that is not registered in the Q Series C24 is received from the GX Developer side, the Q Series C24 disconnects the line and does not execute callback.
- Data for checking the callback destination telephone No. by the Q Series C24 are registered in callback Data No. 1 to 10. Set the data registered in callback data No. 1 to 10 in the "Modem function system setting" screen.

Ex. If line connections are being made with "Callback connection (during designated number)" as the connection system

Set the Callback function designation by the GX Configurator-SC.

* Check the received telephone No. If it is registered, make the line connection.

Line Connection (Callback connection (during designated number))

Callback

Input the telephone No. 1) for the callback destination telephone No. and make line connections.

GX Developer telephone No. 1)

Line Connection (Callback connection (during designated number))

Callback

Input the telephone No. 2) for the callback destination telephone No. and make line connections.

GX Developer telephone No. 2)

Registration in the Q Series C24

Callback data No. 1	Telephone No. 1)
Callback data No. 2	Telephone No. 2)
Callback data No. 3	Telephone No. 3)
to	to
Callback data No. 10	Telephone No. 10)

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5) If line connections from GX Developer are made with "Auto (Callback: during fixed/Callback: during designated number)" as the connection system (Setting 1 (9H) to Setting 3 (FH))

- When accessing the QCPU from GX Developer, select whether to use the callback function to make line connections or to make line connections without using the callback function.

- If the following is selected for the GX Developer connection system and line connections made, it is possible to access the QCPU from the GX Developer by that method only on that occasion.[3]

●Auto (callback: during fixed)

●Auto (callback: during designated number)

*3   The procedure is the same as when accessing the QCPU by selecting "Auto" for the connection system and making line connections.

- If line connections are made with the callback destination GX Developer limited to a maximum of 10 modules set, (setting 3 (FH)), select "Auto (Callback: during designated number)" as the connection system and specify the telephone No. The Q Series C24 checks the telephone No. received from the GX Developer side and if it is registered in the Q Series C24, the line connection status is held and it becomes possible to access the QCPU from GX Developer. If a telephone No. is received from GX Developer that is not registered in the Q Series C24, the Q Series C24 disconnects the line.

- Data for checking the callback destination telephone No. by the Q Series C24 are registered in callback Data No. 1 to 10. Set the data registered in callback data No. 1 to 10 in the "Modem function system setting" screen.

Ex. If line connections are being made with "Auto (Callback: during designated number)" as the connection system

Registration in the Q Series C24	
Callback data No. 1	Telephone No. 1)
Callback data No. 2	Telephone No. 2)
Callback data No. 3	Telephone No. 3)
to	to
Callback data No. 10	Telephone No. 10)

100
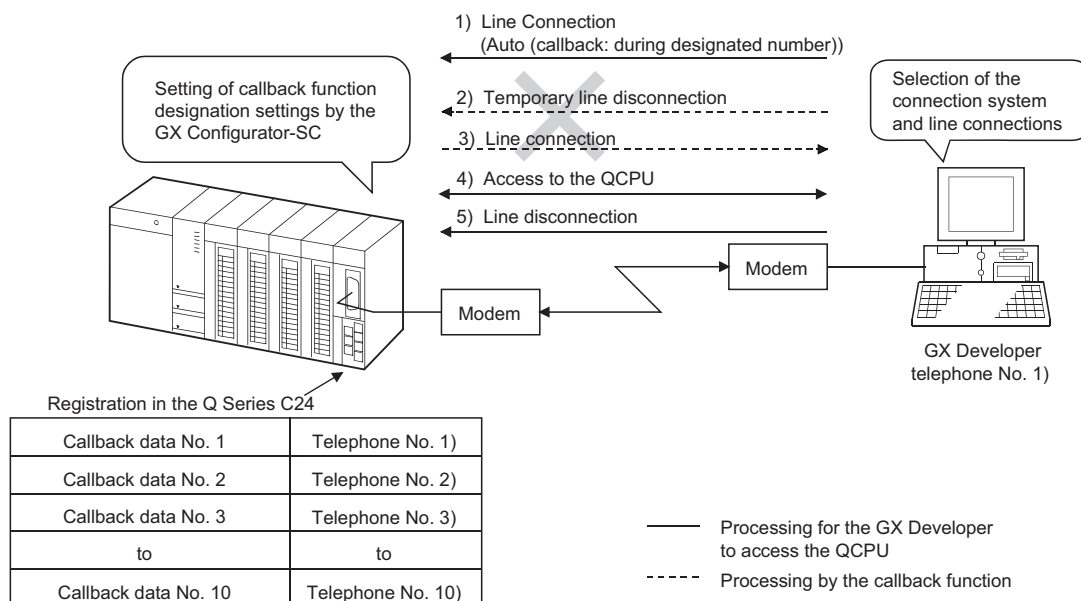
Remark •

I If the GX Configurator-SC's "Callback function designation" setting is performed in the Q Series C24, line connections to GX Developer are possible by the connection system listed below.
The correspondence between the GX Configurator-SC "Callback function designation" setting items and the GX Developer connection system setting items is listed.

• •

Q Series C24 Side Callback function specification	GX Developer connection system[1]								
	1)	2)	3)	4)	5)	6)	7)	8)	9)
Auto	○	—	—	—	—	—	—	—	○
Setting 1: Auto/Callback connection (during fixed)	—	○	—	○	—	○	—	○	—
Setting 2: Auto/Callback connection (during designated number)	—	○	○	○	○	○	○	○	—
Setting 3: Auto/Callback connection (during max. designated number is 10)	—	—	○	—	○	—	○	○	—
Setting 4: Callback connection (during fixed)	—	—	—	○	—	○	—	○	—
Setting 5: Callback connection (during designated number)	—	—	—	○	○	○	○	○	—
Setting 6: Callback connection (during max. designated number is 10)	—	—	—	—	○	—	○	○	—

○: Connection possible

[1] This shows the GX Developer connection system. See the GX Developer Operating Manual for details about line connection from GX Developer.
1) Auto
2) Auto (callback: during fixed)
3) Auto (callback: during designated number)
4) Callback connection (during fixed)
5) Callback connection (during designated number)
6) Callback request (during fixed)
7) Callback request (during designated number)
8) Callback reception waiting
9) Manual

3

3.3 Specifications

3.3.5　List of I/O signals for the modem function

The I/O signals with the programmable controller CPU for the modem function are described.
Refer to the User's Manual (Basic) for the other I/O signals.

(1) I/O signal list

Device number	Signal description	Device number	Signal description
X0	CH1 Transmission normal completion, ON: Normal completion	Y0	CH1 Transmission request, ON: Requesting transmission
X1	CH1 Transmission abnormal completion, ON: Abnormal completion	Y1	CH1 Reception data read completion, ON: Data read completed
X2	CH1 Transmission processing, ON: Transmission in progress	Y2	CH1 Mode switching request, ON: Requesting switch
X3	CH1 Reception data read request, ON: Requesting read	Y3	(Use prohibited)
X4	CH1 Reception abnormal detection, ON: Abnormal detection	Y4	
X5	(Use prohibited)	Y5	
X6	CH1 Mode switching, ON: Switching	Y6	
X7	CH2 Transmission normal completion, ON: Normal completion	Y7	CH2 Transmission request, ON: Requesting transmission
X8	CH2 Transmission abnormal completion, ON: Abnormal completion	Y8	CH2 Reception data read completion, ON: Data read completed
X9	CH2 Transmission processing, ON: Transmission in progress	Y9	CH2 Mode switching request, ON: Requesting switch
XA	CH2 Reception data read request, ON: Requesting read	YA	(Use prohibited)
XB	CH2 Abnormal reception detection, ON: Abnormal detection	YB	
XC	(Use prohibited)	YC	
XD	CH2 Mode switching, ON: Switching	YD	
XE	CH1 ERR occurrence, ON: Error occurring	YE	CH1 ERR. information clear request, ON: Requesting error clear
XF	CH2 ERR occurrence, ON: Error occurring	YF	CH2 ERR. information clear request, ON: Requesting error clear
X10[*1*3]	Modem initialization completion, ON: Initialization completed	Y10[*1*3]	Modem initialization request (standby request), ON: Requesting initialization
X11[*1*3]	Dialing, ON: Dial in progress	Y11[*1*3]	Connection request, ON: Requesting connection
X12[*1*3]	Connection, ON: Connection in progress	Y12[*1*3]	Modem disconnection request, ON: Requesting disconnection
X13[*1*3]	Initialization/connection abnormal completion, ON: Initialization/connection abnormal completed	Y13	(Use prohibited)
X14[*1*3]	Modem disconnection completion, ON: Disconnection completed	Y14[*1*2*3]	Notification-issued request, OFF: Requesting notification issuance
X15[*1*2*3]	Notification normal completion, ON: Normal completion	Y15	(Use prohibited)
X16[*1*2*3]	Notification abnormal completion, ON: Abnormal completion	Y16	
X17	Flash ROM read completion, ON: Completed	Y17	Flash ROM read request, ON: Requesting
X18	Flash ROM write completion, ON: Completed	Y18	Flash ROM write request, ON: Requesting
X19	Flash ROM system setting write completion, ON: Completed	Y19	Flash ROM system setting write request, ON: Requesting
X1A	CH1 Global signal, ON: Output directed	Y1A	(Use prohibited)
X1B	CH2 Global signal, ON: Output directed	Y1B	

Device number	Signal description	Device number	Signal description
X1C	System setting default completion, ON: Completed	Y1C	System setting default request, ON: Requesting
X1D	Pre-defined protocol ready, ON: Ready	Y1D	(Use prohibited)
X1E	Q series C24 ready, ON: Accessible	Y1E	
X1F	Watchdog timer error (WDT error) ON: Module error occurred OFF: Module being normally operated	Y1F	

*1   Cannot be used for the QJ71C24N-R4. (Signal for the modem function.)

*2   Cannot be used for the LJ71C24(-R2).

*3   Signal for the modem function.

Point

● Of the input/output signals to the programmable controller CPU, the signals marked with "Use prohibited" must not be output (ON). If any of the "Use prohibited" signals is output, the programmable controller system may malfunction.

● When the modem function is not used or the QJ71C24N-R4 is used, X10 to X16 are used for the system and Y10 to Y16 cannot be used.

3

3.3 Specifications

(2) Function and description of each I/O signal

I/O signal	Signal name	Function/description	Reference
X10	Modem initialization completion	Indicates normal completion of the Q series C24's initialization of the modem/TA connected to itself according to the initialization data designated.	Page 144, Section 3.4.5
X11	Dial in progress	Indicates that the Q series C24 is dialing (connection processing) the partner side according to the data for connection designated.	Page 148, Section 3.4.6
X12	Connection in progress	• Indicates normal completion of the line-connection processing from or to the partner side. • When this signal is on, data communication with the destination is possible (notification is not possible).	
X13	Initialization/connection abnormal completion	• Indicates abnormal completion of the modem/TA initialization or line connection processing (dialing) to the destination. • Check the cause of the abnormal completion in the modem error code storage area (address: 221H) and remove the cause.	Page 144, Section 3.4.5, Page 148, Section 3.4.6
X14	Modem disconnection completion	Indicates that the line for data communication with the destination has been disconnected.	Page 161, Section 3.4.8
X15	Notification normal completion	Indicates the normal completion when performing the notification processing to the destination.	Page 154, Section 3.4.7
X16	Notification abnormal completion	• Indicates abnormal completion when the notification processing is performed with the destination. • Check the cause of the abnormal completion in the modem error code storage area (address: 221H) and remove the cause.	
Y10	Modem initialization request (standby request)	• Indicates the initialization request to the modem connected to the local station Q series C24. • Turn on the initialization-request signal after designating the initialization data to the buffer memory when it is not set with GX Configurator-SC.	Page 144, Section 3.4.5
Y11	Connection request	• Indicates the connection request (dialing) to enable data communication with the destination. • Turn on the connection request signal after designating the data for connection to the buffer memory when it is not set with GX Configurator-SC. • If the modem/TA connected to the local station is not initialized, the Q series C24-side modem is initialized as well prior to dialing, according to the initialization data designated.	Page 148, Section 3.4.6
Y12	Modem disconnection request	Indicates a line-disconnection request from the partner side upon completion of data communication.	Page 161, Section 3.4.8
Y14	Notification-issued request	• Indicates the notification request to the partner side. • Turns on before completing the Q series C24-side modem/TA initialization is complete. • Turns off the notification-issued request signal after designating the data for connection in the buffer memory when it is not set with GX Configurator-SC.	Page 154, Section 3.4.7

Point

The descriptions hereafter show an example in which I/O numbers of the Q series C24 are assigned to X/Y00 to X/Y1F.

3.3.6 Buffer memory

The buffer memory that can be used with the modem function is described.

Refer to the User's Manual (Basic) for the buffer memory not related to the modem function.

> $Point\mathcal{P}$
>
> The writing and reading of setting values to and from the buffer memory are performed using the special utility package ("GX Configurator-SC") of the Q series C24.
> This section provides supplementary explanations on setting values used to perform settings and monitoring with GX Configurator-SC.

(1) Buffer memory list

Address Dec. (Hex.)		Application	Name	Default value	Correspondence protocol		
CH1	CH2				MC	Non	Bi
0 (0H)		For LED and communication error clear	Communication error clear request for CH1 and to turn LED off	0		RW	
1 (1H)			Communication error clear request for CH2 and to turn LED off				
2 (2H)		For Flash ROM access	Register/read/delete directions	0		RW	—
3 (3H)			Frame No. direction				
4 (4H)			Register/read/delete result storage				
5 (5H)			Number of data bytes registration designation				
6 to 45 (6H to 2DH)			User frame				
46 (2EH)		For modem functions designation-1[3]	Modem connection channel directions 0: None, 1: CH1, 2: CH2	0		RW	
47 (2FH)			Notification execution designation[2] 0: Does not execute, 1: Execute				
48 (30H)			Number of connection retries designation 1 to 5: Number of retries	3			
49 (31H)			Connection retry interval designation 90 to 300: Connection retry interval (unit: s)	180			
50 (32H)			Initialization/connection timeout designation 1 to 60: Time out (unit: s)	60			
51 (33H)			Number of initialization retries designation 1 to 5: Number of retries	3			
52 (34H)			Data number for initialization designation 0H: Sends initialization data designated by the transmission user frame designation area 7D0H to 801FH: Data No. for initialization	7D0H (2000)			
53 (35H)			Data number for connection designation BB8H to 801FH: Data number for connection	0			
54 (36H)			[When using Q series C24] GX Developer connection designation 0: Does not connect, 1: Connects				
			[When using L series C24] MELSOFT connection designation 0: Does not connect, 1: Connects				
55 (37H)			No-communication interval time designation 0: Waits infinitely 1 to 120: Non-communication interval time (Line disconnection wait time) (Unit: min)	30			
56 (38H)			RS/CS control yes/no designation 0: Does not control, 1: Controls	1			

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3.3 Specifications

Address Dec. (Hex.)		Application	Name	Default value	Correspondence protocol		
CH1	CH2				MC	Non	Bi
57 to 127 (39H to 7FH)		(Use prohibited)	System area				
128 (80H)		For programmable controller CPU information clear[1]	Programmable controller CPU information clear request 0000H: No request 4C43H: Requested				
129 to 143 (81H to 8FH)		(Use prohibited)	System area				
144 (90H)	304 (130H)	For specifying mode switching	Switching mode number designation	0	RW		
145 (91H)	305 (131H)		Transmission specification designation after switching				
146 (92H)	306 (132H)	Signal setting[1]	RS and DTR signal status designation	0005H	RW		
183 (B7H)	343 (157H)	Transmission user frame	CR/LF output designation	0	—	RW	—
184 (B8H)	344 (158H)		Output head pointer designation				
185 (B9H)	345 (159H)		Output count designation				
186 to 285 (BAH to 11DH)	346 to 445 (15AH to 1BDH)		Transmission frame No. designation (A maximum of 100 frames can be designated.)				
544 (220H)		Flash ROM	Flash ROM system parameters write result	0	RW		
545 (221H)		For modem function confirmation[3]	Modem function error code 0: Normal completion 1 or more: Abnormal completion (error code)	0	RW		
546 (222H)			Modem function sequence status 0: Idle status 1: Waiting for initialization 2: Initializing modem 3: Standby in progress 4: Checking password 5: Communication in progress 6: Notification in progress (Valid for Q series C24 only, not for L series C24.) 7: Modem disconnection 8: Callback Request reception waiting 9: Callback Modem disconnect waiting 10: Callback Delay time waiting 11: Callback Reconnecting 12: Callback Rechecking password	0	R		
547 (223H)			Number of data registrations for connection 0: No registration, 1 or more: Number of registration	The values vary depending on the registration status			
548 to 549 (224H to 225H)			Data registration status for connection (for conformation of registration No.) 0: No registration, 1: Registered • Bits for registration number are 0 (ON)/1 (OFF) Registration number BB8H (3000): Address 224H (b0) to Registration number BD5H (3029): Address 225H (b13)				
550 (226H)			Number of data registrations for initialization 0: No registration, 1 to 30: The number of registrations				
551 to 552 (227H to 228H)			Data registration status for initialization 0: No registration, 1: Registered • Bits for registration number are 0 (ON)/1 (OFF) Registration number 9C4H (2500): Address 227H (b0) to Registration number 9E1H (2529): Address 228H (b13)				

Address Dec. (Hex.)		Application	Name			Default value	Correspondence protocol		
CH1	CH2						MC	Non	Bi
553 (229H)		Notification status confirmation[*2][*3]	Number of notification executions 0: Not executed, 1 or more: Number of executions			0		R	
554 (22AH)			Data storage area 1	Notification execution data number 0: No notification execution BB8H or more: Notification executed (Notification executions number)				R	
555 to 557 (22BH to 22DH)				System area (Use prohibited)				—	
:			:			0			
570 (23AH)			Data storage area 5	Notification execution data number 0: No notification execution BB8H or more: Notification executed (Notification executions number)		0		R	
571 to 573 (23BH to 23DH)				System area (Use prohibited)				—	
574 to 590 (23EH to 24EH)		(Use prohibited)	System area						
3072 to 6911 (C00H to 1AFFH)		For user	User free area (3840 words) • Application is determined by the user.			0		RW	
6912 to 6952 (1B00H to 1B28H) (For registration No. 8001H)		For user registration[*3]	User registration area (Registration No. 8001H to 801FH) The user registration area has the following combined uses, with data written by the user according to the purpose of use by the TO instruction, etc. See each explanation item concerning the configuration of each area, the data written, etc.			0		RW	—
:									
8142 to 8182 (1FCEH to 1FF6H) (For registration No. 801FH)		*3	If data communications is being carried out by user registration frame • User frame (☞ Page 220, CHAPTER 9) If data communications is being carried out by the modem function • Initialization Data (☞ Page 134, Section 3.4.3) • Connection Data (☞ Page 139, Section 3.4.4)			0		RW	—
8183 to 8191 (1FF7H to 1FFFH)		(Use prohibited)	System area						
8192 (2000H)		System designation	Flash ROM writing allow/prohibit designation 0: Write prohibited, 1: Write allowed			0		RW	
8193 (2001H)		For callback function[*3]	Callback function designation 0H: Auto 1H: Callback connection (during fixed) (Setting 4) 3H: Callback connection (during designated number) (Setting 5) 7H: Callback connection (during max. designated number is 10) (Setting 6) 9H: Auto/Callback connection (during fixed) (Setting 1) BH: Auto/Callback connection (during designated number) (Setting 2) FH: Auto/Callback connection (during max. designated number is 10) (Setting 3)			0		RW	—
8194 (2002H)			Callback denial notification accumulated count designation 0H: Not specified 1H to FFFFH: Notification accumulated number count			1			
8195 to 8198 (2003H to 2006H)		(Use prohibited)	System area						

Address Dec. (Hex.)		Application	Name	Default value	Correspondence protocol		
CH1	CH2				MC	Non	Bi
8199 (2007H)		For modem function designation-2 [3]	Auto modem initialization designation 0: No auto initialization, 1: Auto initialization	0	RW		
8200 (2008H)			Modem initialization time DR (DSR) signal valid/invalid designation 0: DR signal is not ignored., 1: DR signal is ignored.	1			
8201 (2009H)			Complete signal handling designation for modem function 0: Does not turn ON/OFF from X13 to X16 1: Turns ON/OFF from X13 to X16	1			
8202 (200AH)			Wait time of notification [2] 0H: No waiting time 1H to FFFFH: Wait time of notification (Notification interval time) (Unit: s)	10			
8203 (200BH)		(Use prohibited)	System area				
8204 (200CH)		For remote password function [3]	Remote password mismatch notification count designation 0H: No designation 1H to FFFFH: Count for notification	0	RW	—	
8205 (200DH)			Remote password mismatch notification accumulated count designation 0H: No designation 1H to FFFFH: Notification accumulated number count	1			
8206 (200EH)		For modem function designation - 3 [3]	Circuit disconnect wait time (programmable controller CPU watch use) 0000H to FFFH: Wait time (Unit: s)	0	RW		—
8207 (200FH)		(Use prohibited)	System area				
8449 to 8458 (2101H to 210AH)		For callback function [3]	Data No. for callback designation 1 to 10 0BB8H to 0BD5H, 8001H to 801FH: Data number for callback	0	RW	—	
8944 (22F0H)		For callback function [3]	Callback permit accumulated count 0 or more: Accumulated count	0	RW	—	
8945 (22F1H)			Callback denial accumulated count 0 or more: Accumulated count				
8946 (22F2H)			Auto (callback) connection permit accumulated count 0 or more: Accumulated count				
8947 (22F3H)			Auto (callback) connection denial accumulated count 0 or more: Accumulated count				
8948 (22F4H)			Accumulated count of callback receive procedure cancel 0 or more: Accumulated count				
8949 to 8954 (22F5H to 22FAH)		(Use prohibited)	System area				
8955 (22FBH)		For remote password function [3]	Accumulated count of unlock process normal completion 0 or greater: Accumulated count of normal completion	0	RW	—	
8956 (22FCH)			Accumulated count of unlock process abnormal completion 0 or greater: Accumulated count of abnormal completion				
8957 to 8958 (22FDH to 22FEH)		(Use prohibited)	System area				
8959 (22FFH)		For remote password function [3]	Accumulated count of lock process based on circuit line disconnection 0 or greater: Accumulated count of lock process based on circuit line disconnection	0	RW	—	
9216 (2400H)		(Use prohibited)	System area				
9728 to 16383 (2600H to 3FFFH)		For user [1]	User free area 2 (6656 words) (Communication data monitoring function default buffer) • Application is determined by the user.	0	RW		

*1   Only the QJ71C24N (-R2/R4) are usable. (System area when using QJ71C24 (-R2))
*2   Only the Q series C24 is usable. (System area when using the L series C24)
*3   Buffer memory areas that can be used with the modem function

Point

Do not write data in the system area of the buffer memory.
If data is written in the system area, the programmable controller system may operate abnormally.
There is also a partial system area in the user's area. Be careful when reading and writing from and to the buffer memory.

(2) Details of the buffer memory (for modern function)

(a) Modem connection channel designation area (address 46 (2EH))

The interface on the Q series C24 side to which a modem/TA is connected is designated.

(b) Notification execution designation area (address 47 (2FH))

Whether or not to perform notification (message transmission) to the pager receiver during the fall of the notification-issued request signal Y14 is designated.

(c) Number of connection retries designation area (address 48 (30H))

- Designates the number of retries for the notification/connection request when the connection could not be made to the partner device by the notification request/connection request.
- The default value is recommended to use for the number of connection retries.

(d) Connection retry interval designation area (address 49 (31H))

- Designates the interval time of the retry processing for the notification/connection request when the connection could not be made to the partner device by the notification request/connection request.
- The default value is recommended to use for the connection retry interval.

(e) Initialization/connection timeout time designation area (address 50 (32H))

- The following wait times are designated.
  - Wait time until the modem/TA initialization is complete.
  - Wait time per wait when the connection could not be made to the destination by the notification/connection request.
- The default value is recommended to use for the initialization/connection retry timeout.[1]

*1   Shown below is the relationship of the number of connection retries designation, connection retry interval designation and the time for initialization/connection timeout time designation used for the notification/connection request to the partner device.
- Number of connection retries: 3 times
- Connection retry interval: 180s
- Initialization/connection retry timeout: 60s
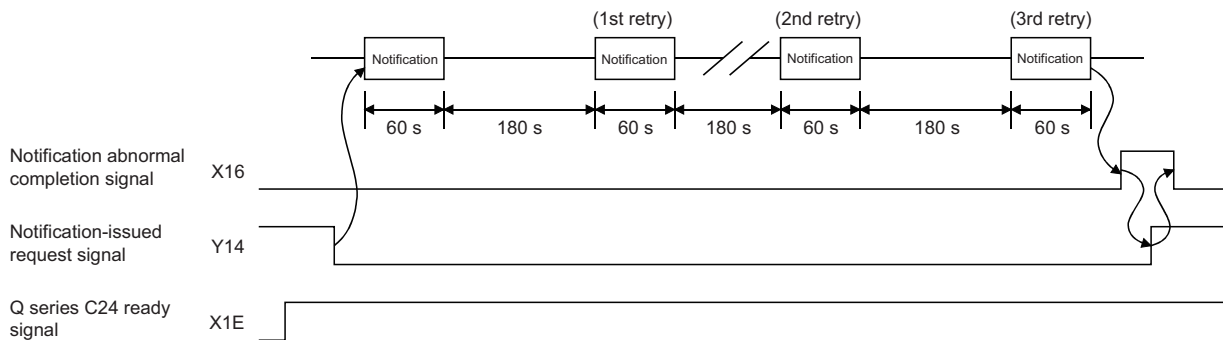
(f) Number of initialization retries designation area (address 51 (33H))

The number of retries when the initialization per the initialization request to the modem on to the Q series C24 side has failed.

3

(g) Data number for initialization designation area (address 52 (34H))

- The registration number for the initialization data transmitted with the initialization request to the modem on the Q series C24 side is designated. The registration number for the Q series C24 is used.
- For details on the designation using GX Configurator-SC, refer to Q Corresponding Serial Communication Module User's Manual (Basic).

An example of designations using the program is shown in Page 144, Section 3.4.5.

(h) Data number for connection designation area (address 53 (35H))

- Designates the registration number of the data for connection used by the Q series C24 for the connection processing to the partner device in order to perform data communication/notification. The registration number for the Q series C24 is used.
- For details on the designation using GX Configurator-SC, refer to Q Corresponding Serial Communication Module User's Manual (Basic).

An example of designations using the program is shown in Page 148, Section 3.4.6.

(i) GX Developer connection designation area (address 54 (36H))

- Whether to access the programmable controller from GX Developer by connecting the Q series C24 and GX Developer using the Q series C24 modem function is designated.
- When connecting the Q series C24 and GX Developer using the Q series C24 modem function, select "PLC side I/F = via telephone line connection (Q/A6TEL, C24)" in the "Transfer Setup" screen of GX Developer. (When connecting direct shown in Page 79, Section 3.2.3). When this GX Developer designation is performed, designate "1" in this area on the Q series C24 side.

(j) No-communication interval time designation area (address 55 (37H))

- Designates the wait time until the line is closed when the data communication has ceased with the destination device after the line connection.
- The Q series C24 automatically performs the line disconnection processing when no data communication is performed with the destination device for a designated time. The connection in progress signal (X12) and the modem initialization completion signal (X10) turn off and the modem disconnection completion signal (X14) turns on when the line disconnection processing is performed.

(k) RS/CS control yes/no designation area (address 56 (38H))

- Designates whether to use the RS/CS signals for controls to notify local station-side data reception capability to the partner side during data transmission between the Q series C24 and modem/TA.
- This setting is for the interface designated by the modem connection channel indicated in Page 110, Section 3.3.6 (2) (a). The control of the other interface that does not use the modem function is performed by the settings in the buffer memory DTR/DSR and DC control designation area (address: 93H/133H).

(l) Modem function error code storage area (address 545 (221H))

• Stores the error code when an error occurs during the modem function or abnormal signal (such as the initialization/connection abnormal completion signal X13) turns on.

• Refer to the User's Manual (Basic) for the error codes.

(m) Modem function sequence status storage area (address 546 (222H))

• The current status during use of the modem function is stored as a number.

• See Page 126, Section 3.4.1 for storage values for the modem function sequence status when using the modem.

(n) Number of data registrations for connection storage area (address 547 (223H))

• Stores in Flash ROM the number of registered data for connection used by the Q series C24 for the connection processing with the partner device in order to perform data communication/notification. The number of registrations is the number of data for connection registered to the Flash ROM by the user.

• The registration of data for connection is described in Page 139, Section 3.4.4.

(o) Data registration status for connection storage area (address 548 to 549 (224H to 225H))

- Stores in Flash ROM registration status of data for connection used by the Q series C24 in the connection processing with the partner device in order to perform data communication/notification.
- The registration status of each data for connection with registration numbers of No.BB8H to BD5H (3000 to 3029) is indicated in the corresponding bit in the range shown in the figure below.
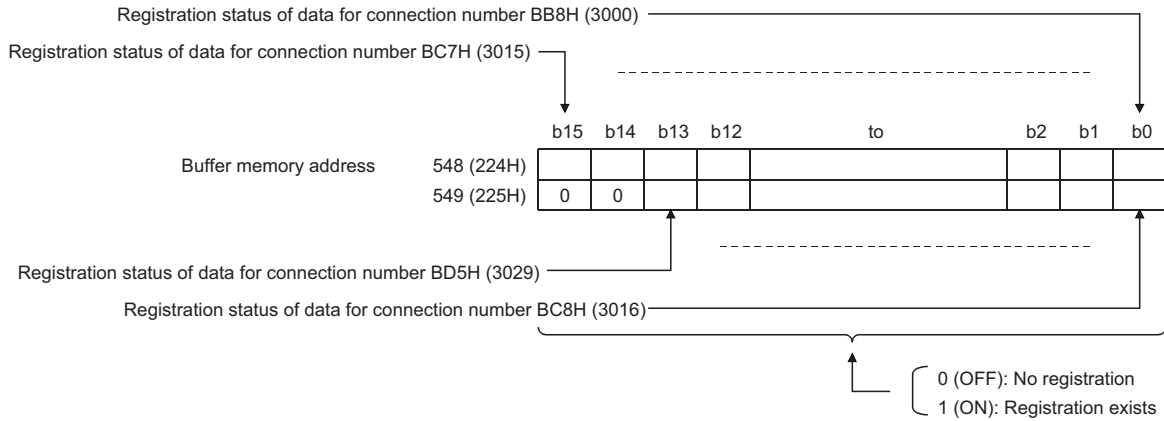
(p) Number of data registrations for initialization storage area (address 550 (226H))

- Stores in Flash ROM the number of data registrations for initialization, sent to the modem on the Q series C24 side with the initialization request. The number of registrations indicates the number of data for initialization registered to the Flash ROM by the user.

(q) Data registration status for initialization storage area (address 551 to 552 (227H to 228H))

- Stores in Flash ROM registration status for initialization of data for initialization transmitted with the initialization request to the modem on the Q series C24 side.
- The registration status of each data for initialization with registration numbers of No.9C4H to 9E1H (2500 to 2529) is indicated in the corresponding bit in the range shown in the figure below.
- The registration of data for initialization is described in Page 134, Section 3.4.3.
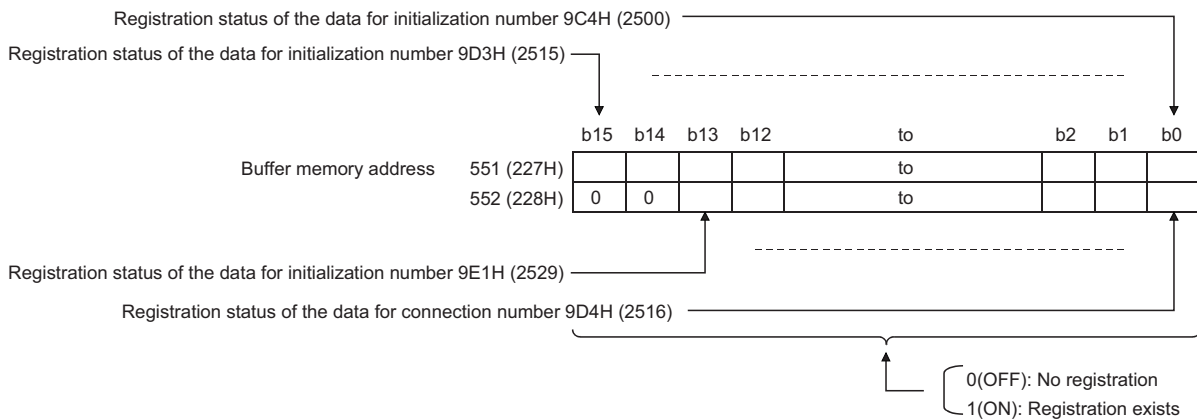
(r) Number of notification execution storage area (address 553 (229H))

- Stores the number of execution of the Q series C24 notification (message transmission) processing for the pager receiver.
- The storage value when the number of notification execution exceeds 32767 remains at 32767.
- The value for this area can be changed by the user in the range of 0 to 32767. When the storage value is changed by the user, the number of execution is stored according to the changed value.

(s) For notification execution data storage: Notification execution data number storage area (address 554, 558... (22AH, 22EH...))

- Stores the registration number of the data for connection used in the Q series C24 notification (message transmission) processing to the pager receiver as log information.
- The latest five data is stored in order at the corresponding areas (data 1, data 2, ...). (The latest information is stored in the data 1 notification execution data number storage area.) The old notification execution data number other than the latest five are deleted in order.


```
                                   b15            to            b0
Buffer memory address   554(22AH)  | 0H, BB8H to BD5H, 8001H to 801FH (Data 1) |
                                   :              :
                        570(23AH)  | 0H, BB8H to BD5H, 8001H to 801FH (Data 1) |
```
0: Notification not executed
BB8H or more: Notification executed (execution number)

* BB8H to BD5H (3000 to 3029)
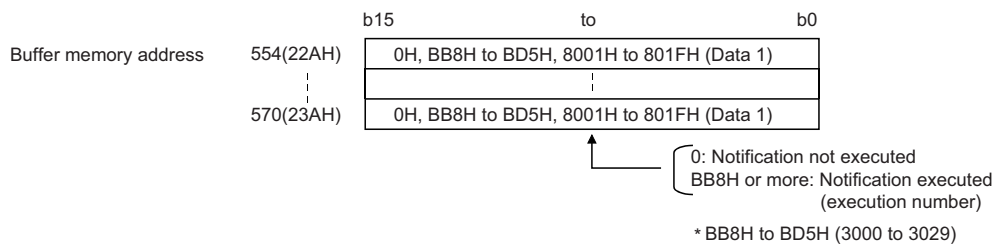
(t) For user registration frame registration: Number of bytes in registration data designation area (address 6912, 6953... (1B00H, 1B29H...))

- The initialization data or data for connection can be stored into the buffer memory as well as the Q series C24's Flash ROM.

Data type	Registration destination		Registration number (Decimal (hexadecimal))
Initialization data	Flash ROM	Data registered by the OS	2000 to 2013 (7D0H to 7DDH)
		User-registered data	2500 to 2529 (9C4H to 9E1H)
	Buffer memory	(All registered by user)	-32767 to -32737 (8001H to 801FH)
Data for connection	Flash ROM	(All registered by user)	3000 to 3029 (BB8H to BD5H)
	Buffer memory	(All registered by user)	-32767 to -32737 (8001H to 801FH)

A registration number for the initialization data or the data for connection to the buffer memory is in the range of -32767 to -32737 (8001H to 801FH), and determined by the used area.

- In this area, the number of bytes for the initialization data or data for connection (for 1 data) to be registered to the buffer memory is designated.
- The registration of data for initialization is described in Page 134, Section 3.4.3. The registration of data for connection is described in Page 139, Section 3.4.4.


```
                                   b15            to            b0
Buffer memory address   6912 (1B00H)  |        0 to 78/80        |
                                      |                          |
                        8142 (1FCEH)  |        0 to 78/80        |   (Number of bytes)
```
0: No registration data
1 to 78: Registration data exists (for initialization)
80: Registration data exists (for connection)

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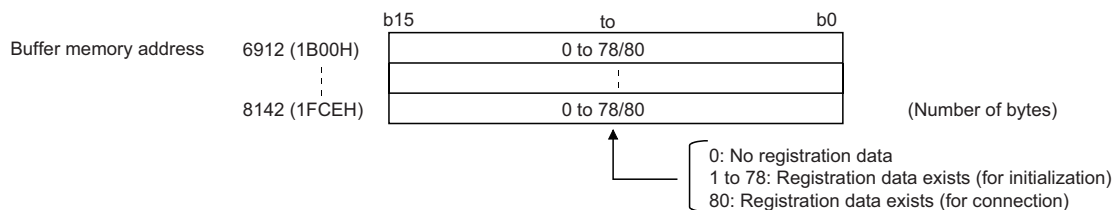
(u) For user frame registration: User frame designation area (address 6913 to 6952, 6954 to 6993... (1B01H to 1B28H, 1B2AH to 1B51H...))

- When registering the initialization data or data for connection to the buffer memory, the number of registration data bytes (for 1 data) is designated.
- The registration of data for initialization is described in Page 134, Section 3.4.3. The registration of data for connection is described in Page 139, Section 3.4.4.

Buffer memory address	6913 (1B01H) to 6952 (1B28H)	Data for initialization or data for connection (Area for registration number 8001H)
	⋮	⋮
	8143 (1FCFH) to 8182 (1FF6H)	Data for initialization or data for connection (Area for registration number 801FH)

(v) Auto modem initialization designation area (Address 8199 (2007H)

- This designates whether the Q Series C24 side modem is initialized automatically or not.
- Registration of this area is done through the GX Configurator-SC. The modem is initialized automatically when the Q Series C24 starts up after the QCPU restarts.

(w) DR (DSR) signal valid/invalid designation area during modem initialization (address 8200 (2008H))

Set this setting to "DR signal valid."[1]

[1] This setting is used to designate how the DR (DSR) signal is treated when only modem initialization is performed. Following the completion of modem initialization, data is sent according to the status of the DR (DSR) signal.

(x) Modem function completed signal handling designation area (address 8201 (2009H))

Set this setting to "turn ON/OFF X13 to X16" (default value).

(y) Wait time of notification designation area (address 8202 (200AH))

- Designates the waiting time from the moment the present notification is executed until the next notification is executed (Unit: s), when performing more than one notification continuously. (Unit: s)
- Designates wait time of notification after checking the time required during debugging.

(z) Circuit disconnect wait time designation area (programmable controller CPU watch use) (address 8206 (200EH))

- When sending data using the programmable controller CPU monitoring function, designates the time it takes to complete data transmission from the local station side modem to the external device after data transmission from the Q series C24 (wait time until the circuit is disconnected).
- Specify the circuit disconnect wait time to match the specifications of the modem that is being used.

(3) Details of buffer memory (for the remote password function)

Each of the areas described below is valid when the Q series C24 performs the remote password check.

(a) Remote password mismatch notification count designation area (address 8204 (200CH))

- Use 0 to FFFFH to designate the count that will be the notification timing to the QCPU when a remote password mismatch occurs during the user/external device unlock processing after the modem line has been connected.
- It cannot confirm the accumulated number of times a remote password mismatch occurred up to the present after the line connection.

(b) Remote password mismatch notification accumulated count designation area (address 8205 (200DH))

- Use 0 to FFFFH to designate the accumulated count that will be the notification timing to the QCPU when a remote password mismatch occurs during the user/external device unlock processing after the Q series C24 has been started up.
- The accumulated number of times up to the present a remote password mismatch occurred (accumulated count value in the Q series C24) after starting up can be checked in the area where the accumulated count of unlock process abnormal completion is stored (address 8956 (22FCH)).

(c) Storage area for accumulated count of unlock process normal completion (address 8955 (22FBH))

The accumulated number of times the remote password unlock process has been completed normally is stored.

(d) Storage area for accumulated count of unlock process abnormal completion (address 8956 (22FCH))

The accumulated number of times the remote password unlock process has been completed abnormally is stored.

(e) Storage area for accumulated count of lock process based on circuit line disconnection (address 8959 (22FFH))

The accumulated number of times the Q series C24 has automatically performed the lock process due to a modem line disconnection is stored.

Point

Each of the accumulated count values stored in Page 116, Section 3.3.6 (3) (c) to Page 116, Section 3.3.6 (3) (e) above are further explained below:

- ● The user can clear the values using either of the following:
  - Set the accumulated count to "0" using the GX Configurator-SC modem function monitor/test screen.
  - Write "0" to the applicable area of the buffer memory.

- ● The accumulated count will be stored as 0H → 1H → 2H... → FFFFH → 0H → 1H →...

(4) Details of buffer memory (for the callback function)

The areas shown below are valid if the Q Series C24 uses the callback function.

(a) Callback function designation area (Address 8193 (2001H))

- If communications are done by connecting to the GX Developer via a modem, specify whether the callback function is to be used or not. Also specify the callback operation in the case that the callback function is used.
- This specification becomes valid if "Connection" is entered in the GX Developer connection designation area (Address 54 (36H).
- Show the setting value (the value stored in this area) in the GX Configurator-SC and show the corresponding Q Series C24's callback operation. This becomes invalid if any setting values other than those shown below are specified, and the callback function does not operate.
  - When the callback function is not to be used: Auto (0H)
  - When the callback function is to be used: Setting 1 (9H) to setting 6 (7H)

Setting 1 (9H): Auto/Callback connection (during fixed)

Setting 2 (BH): Auto/Callback connection (during designation number)

Setting 3 (FH): Auto/Callback connection (during max. designation number is 10))

Setting 4 (1H): Callback connection (during fixed)

Setting 5 (3H): Callback connection (during designation number)

Setting 6 (7H): Callback connection (during max. designation number is 10))

(b) Callback denial notification accumulated count designation area (Address 8194 (2002H))

- Use 0 to FFFFH to designate the accumulated count that will be the notification timing to the QCPU when a denial of the callback occurs during access from GX Developer after the Q series C24 has been started up.
- The accumulated number of times up to the present a denial of the callback occurred (accumulated count value in the Q series C24) after starting up can be checked in the area where the accumulated count of denial of the callback is stored (address 8945 (22F1H)).

(c) Data No. for Callback designation area (Addresses 8449 to 8458 (2101H to 210AH))

- This specifies the connection data registration No. where the callback destination GX Developer side's telephone No. is registered. Connection data are data that have been registered in the Q Series C24's flash ROM or buffer memory. See Page 139, Section 3.4.4 for connection data registration.
- In the following case, the connection data telephone No. specified in callback data No. 1 becomes the callback destination.[1]
  - If the callback destination GX Developer is fixed (1 module)

[1]   The external line dialing, line types and telephone number in the connection data become valid.

- In the following cases, when the callback destination telephone No. from the GX Developer is specified and connection made, callback is performed using the external line dialing and line types in the connection data for the registration No. specified in callback data No. 1.
  - If it is being made possible to change callback destination GX Developer
  - If the maximum number of callback destination GX Developer is limited to 10 modules
- If the callback destination GX Developer is limited to a maximum of 10 modules, specify the connection data registration No. that specify the callback destination telephone No. for a maximum of 10 modules.
  - The external line dialing, line types and telephone number in callback data No. 1 become valid.
  - The telephone No. only becomes valid in callback data No. 2 to 10. The external line dialing and line types in the connection data for callback data No. 1 are used for these.
- If "0H" is specified in this specification, the callback data No. after that become "unspecified."

> Ex. If callback data No. 4 is specified as "0H," the callback data No. 4 to 10 registrations become invalid.

(d) Callback permit accumulated count storage area (Address 8944 (22F0H))

The accumulated count value when the Q Series C24 executed callback is stored here.

(e) Callback denial accumulated count storage area (Address 8945 (22F1H))

The accumulated count value for callbacks which the Q Series C24 did not executed due to callback error detection is stored here.

(f) Auto (callback) connection permit accumulated count storage area (Address 8946 (22F2H))

The accumulated count value for normal line connections from GX Developer by the connection system listed below is stored here.
- Auto (callback: during fixed)
- Auto (callback: during designated number)

(g) Auto (callback) connection denial accumulated count storage area (Address 8947 (22F3H))

The accumulated count value for line connections from GX Developer by the connection system shown below that were not connected normally is stored here.
- Auto (callback: during fixed)
- Auto (callback: during designated number)

(h) Accumulated count of callback receive procedure cancel storage area (Address 8948 (22F4H))

The accumulated count value for the number of callback procedures that were terminated from the initial GX Developer by the Q Series C24 when a line connection request by another GX Developer was executed during temporary line disconnect from the GX Developer side through callback specification is stored here.[1]

*1   The Q Series C24 performs the callback operation with respect to the latest connection request.

Point

Each of the accumulated count values stored in Page 118, Section 3.3.6 (4) (d) to Page 119, Section 3.3.6 (4) (h) above are further explained below:

● The user can clear the values using either of the following:
   • Set the accumulated count to "0" using the GX Configurator-SC modem function monitor/test screen.
   • Write "0" to the applicable area of the buffer memory.

● The accumulated count will be stored as 0H → 1H → 2H...→ FFFFH → 0H → 1H →...

3.3.7 Precautions when using the modem function

Precautions when using the modem function to perform data communication with an external device via public line or call to the pager receiver are described.

(1) Line connection and disconnection

When performing data communication with an external device, it must be predetermined which station is to perform the line connection (dialing) and disconnection processing with the partner device as well as the timings.

(2) Reception data before connection completion

Before the connection processing to the modem is completed the reception data other than modem commands is ignored (read and disposed) at the interface that uses the modem function.

> Ex. The Q series C24 will ignore the data even when an MC protocol command message is received.

(3) Transmission control

Delays may occur in transmission controls to notify the data reception capability at the local station to the partner device.
In order not to have a state in which the partner device cannot receive the transmission data, the amount of transmission/reception data and intervals should be determined beforehand.
When transmission/reception data in the non procedure protocol, the procedure must also be predetermined.

(4) Priority of data communication and notification

After line connection is established, the data transmission/reception processing with the partner device is performed in the order of the processing request occurrence.
At the same time, when the line disconnect processing or data transmission reception (including data transmission processing, reception processing and Flash ROM access processing) occurs, the line disconnect processing has the priority.

(5) Data communication time

The data transmission/reception time after line connection has been established with the partner device is the total time of the transmission time between the Q series C24 and modem/TA, between modem and TA, and between modem/TA and partner device.
When communicating via the MC protocol, the transmission time (such as T0 and T3) indicated in the MELSEC Communication Protocol Reference Manual must include the transmission time between the Q series C24-side modem/TA and the destination device.

(6) Initial Settings

The connection data used for modem functions can be registered as follows using setting procedures.

Set the telephone number and message within the permissible number of registration characters for modem/TA.

- If registered using GX Configurator-SC
  - Comments can be set to a maximum of 254 bytes. (These are not used for control.)
  - Telephone numbers can be set to a maximum of 62 bytes.
  - Messages can be set to a maximum of 254 bytes.
- If registered from the programmable controller CPU (sequence program)
  - Comments cannot be set.
  - Telephone numbers can be set to a maximum of 18 bytes.
  - Messages can be set to a maximum of 30 bytes.

(7) Programmable controller CPU monitoring function

See Page 67, Section 2.4 for precautions when transmitting monitoring results using the modem function.

(8) Remote password check

(a) How to unlock the remote password

- When the Q series C24 has been set as a module subject to the remote password check with the QCPU parameter, a remote password unlock processing must be performed from the external device after line connection before starting data communication.
- The unlock processing for the QCPU remote password is performed as follows:
  - When communicating using MC protocol

Perform the unlock processing from the external device using dedicated commands.

  - When accessing the programmable controller from GX Developer

Perform the unlock processing on the GX Developer screen when access begins.

(b) When the remote password unlock processing is completed abnormally

- Repeat the unlock processing after checking the remote password set in the QCPU.
- Start with the line connect processing again if the Q series C24 line connect signal (X12) turns OFF due to the unlock processing abnormal completion.
- The user should clear the accumulated count stored in the following buffer memory before repeating the line connect processing if the Q series C24 CHn side ERR occurrence signal (XE/XF) turns ON and the ERR LED lights up due to the unlock processing abnormal completion.

(Applicable buffer memory)

Storage area for accumulated count of unlock process abnormal completion accumulated: Address 8756 (22FCH)

(How to clear) Cleared by the user using one of the following:

- Set the accumulated count to "0" using the GX Configurator-SC modem function monitor/test screen.
- Write "0" to the applicable area of the buffer memory.

(c) When the number of times remote password mismatch occurs is large

- When the number of times notification of a remote password mismatch is received exceeds the number of times specified in buffer memory address 8204 (200CH), the Q Series C24 disconnects the line automatically. (The connection signal (X12) turns OFF.) After confirming the remote password registered in the QCPU and the remote password specified in the external device execute line connection again.
- When the number of times notification of a remote password mismatch is received exceeds the accumulated count value (buffer memory address 8205 (200DH)), the Q Series C24 executes the following processing. (The line and modem are not disconnected.)

(when communicating using MC protocol)

- An error code (7FE8H) is stored in the buffer memory's MC protocol transmission error code storage area (address 602/618 (25AH/26AH).
- The CHn side error occurrence signal (XE/XF) turns ON and the ERR LED lights up.

(When communicating using GX Developer)

- An error code (7FE8H) is stored in the buffer memory's modem function error code storage area (address 545 (221H).
- The CHn side error occurrence signal (XE/XF) turns ON and the ERR LED lights up.
- The accumulated number of times up to the present a remote password mismatch occurred (accumulated count value in the Q series C24) can be checked in the area where the accumulated count of unlock process abnormal completion is stored (address 8956 (22FCH)).
- The user should clear the accumulated number of times up to the present a remote password mismatch occurred using one of the following methods.
  - Set the accumulated count of unlock processing abnormal completion to "0" on the GX Configurator-SC's modem function monitor/test screen.
  - Write "0" in the buffer memory area where the accumulated count of unlock process abnormal completion is stored (address 8956 (22FCH)).

Point

If the CHn side ERR occurrence signal (XE/XF) for the Q series C24 turns ON and the ERR LED lights up, this could indicate improper access from the external device.
See also an example of measures taken on the programmable controller CPU side described in Page 124, Section 3.3.7 (12).

Remark ●

Refer to the User's Manual (Basic) for the method for turning off the Q Series C24's ERR LED when it lights up.

● ●

(9) Number of modules for which the remote password check can be set

A maximum of eight modules can be registered with remote passwords in the QCPU.[1]

To set the remote password in a module, use the GX Developer remote password setting screen.

   *1   The remote password modules are as follows:
   - Q series C24
   - Q series Ethernet module
   - Built-in CPU of Ethernet port

(10)Callback function

(a) When the number of callback processing denials exceeds callback denial notification accumulated count (buffer memory address 8194 (2002H), the following processing is executed each time the Q Series C24 issues another refusal.

- An error code (7FE9H) is stored in the buffer memory's modem function error code storage area (address 545 (221H).
- The CHn side error occurrence signal (XE/XF) turns ON and the ERR LED lights up.

(b) When the number of callback processing refusals exceeds callback denial notification accumulated count, after performing the following checks and clearing processing, make the line connection again from GX Developer.

- Check the setting contents of the callback function set in the Q Series C24.
- Check the setting contents of the callback function set in GX Developer.
- The user should clear the accumulated counts stored in the following buffer memory areas.

(Applicable buffer memory)

Callback denial accumulated count: Address 8945 (22F1H)

(How to clear) Cleared by the user using one of the following:

- Set the accumulated count to "0" using the GX Configurator-SC modem function monitor/test screen.
- Write "0" to the applicable area of the buffer memory.

Remark •

Refer to the User's Manual (Basic) for the method for turning off the Q Series C24's ERR LED when it lights up.

• •

(11)Preventing a line disconnect when GX Developer is connected

Perform the following settings and operations to prevent a line to the modem from disconnecting even if communication between GX Developer and programmable controller is interrupted.

(a) Initial setting by GX Configurator-SC

- Setting screen: Modem function system setting screen
- Setting item: No-communication interval time designation
- Setting value: 0 (infinite wait)

(b) Operation using GX Developer

Always perform the line disconnect operation when the GX Developer on-line operation is completed after the line to the Q series C24 side is connected.

(12)An example of what to do on the programmable controller CPU side for improper access from the external device

The following is an example of performing, on the programmable controller CPU side, the line disconnect processing with respect to the opposite device and prohibiting receive via a modem when the number of "remote password mismatch" detected by the Q series C24 remote password check function exceeds the number set by the user.

- The user should determine the count and accumulated count of notification given when a remote password mismatch occurs during the unlock processing from the external device with respect to the remote password set in the QCPU. (☞ Page 116, Section 3.3.6 (3) (a), ☞ Page 116, Section 3.3.6 (3) (b))
- In the GX Configurator-SC system settings, in order for the Q series C24 to operate, set the count determined above in the following item on the "Modem function system setting" screen and register this to the Q series C24.
  - Set in the item "Remote password mismatch notification count."
  - Set in the item "Remote password mismatch notification accumulated count."
- In addition to initialization commands used in normal modem initialization, specify "No automatic receive" and additionally register the modem initialization command for this step to the Q series C24. (No automatic receive: This is the setting to prohibit line connection from the opposite device.) Use the "Modem function initialization data" screen to set.
- Constantly monitor the rise (OFF → ON) of the ERR occurrence signal (XE or XF) when connecting the line to the opposite device using the modem function after the system begins operating.
- Monitor the following buffer memory when the ERR occurrence signal turns ON.
  - Storage area for MC protocol transmission error codes (address: 602 (25AH))
- Perform the line disconnect processing with respect to the opposite device when the error code stored in the above buffer memory is 7FE8H. (Use the modem disconnection request signal (Y12).)
- After the above line disconnect processing is completed, specify the modem initialization command for which "No automatic receive" has been specified and perform modem initialization only. (☞ Page 154, Section 3.4.7)
- Describe the above occurrence to the system manager and take necessary measures.

Ex. When the number of times a remote password mismatch occurred exceeds the notification accumulated count setting value during the remote password unlock processing in communication using MC protocol with the Q series C24 CH1 side interface used.

Ladder	Comment
X1E X1F ———————————————————(M0)	Access enabled flag is turned ON
—————[MOVP K6 D200]	Register initialization data for "No automatic
—————[MOVP K5 D201]	receive" to the buffer memory
—————[$MOVP "ATS0=0" D202]	
—————[TOP H0 H1BA4 D200 K5]	
X0E ———————————————————[PLS M201]	CH1 side ERR occurrence is detected
M201 M0 —————[FROM H0 H25A D250 K1]	Read the CH1-side error code
[= H7FE8 D250]———————[SET M203]	If the error code indicates that
—————[SET Y12]	the accumulated count of remote password mismatch is exceeded, the modem disconnect request signal is set
M203 M0 Y12 X10 X12 X14 —————[RST Y12]	Modem disconnection completed
Y12 X10 X12 X14 —————[TO H0 H34 H8005 K1]	When the modem disconnection completed signal turns OFF, the No. for the modem
—————[SET Y10]	initialization data (for "No automatic receive") is specified and initialization requested
—————[SET M204]	The modem initialization data setting flag is set
—————[RST M203]	
M204 Y10 X10 —————[SET M205]	The modem initialization normal completion flag is set
—————[RST Y10]	The modem initialization request signal is reset
—————[RST M204]	
X13 M0 —————[FROMP H0 H221 D100 K1]	Error code is read if the modem initialization completes abnormally
[<> K0 D100]—————[SET M206]	The modem initialization ERR occurrence flag is set
—————[RST Y10]	The modem initialization request signal is reset
—————[RST M204]	
M205 X10 Y10 —————[TO H0 H22FB K0 K2]	The unlock processing accumulated count is cleared
—————[SET M207]	The modem initialization processing normal completion flag is set
—————[RST M205]	
X27 —————[RST M206]	An instruction from the user resets the flag
—————[RST M207]	

3

3.3 Specifications

3.4 Start-up of the Modem Function

This section explains the start-up procedures, processing methods and programming when the modem function of the Q series C24 is to be used.

3.4.1 Start-up procedures when communicating data with external devices

This section shows the procedure for starting the modem function and up to the point when data communications is started.

(1) Procedure up to initialization of the Q Series C24's modem / TA

This initializes the modem / TA connected to the Q Series C24 in order to use the modem function. It becomes possible to carry out all kinds of communications when the modem / TA is initialized.

```
                    ┌──────────────────┐
                    │      Start       │
                    └──────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ · Determine the configuration of      │ ···  *1
         │   the system.                         │
         │ · Verify the Q series C24             │
         │   specifications.                     │
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ · Installation to the base unit       │
         │ · Supplying power to the Q series     │
         │   C24 loading station                 │
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Unit test of the Q series C24         │ ···  *2
         └───────────────────────────────────────┘     * After the unit test, turn off the power
                             │                            supply to the Q series C24 loading station.
         ┌───────────────────────────────────────┐
         │ Connecting the Q series C24 and       │ ···  After setting the modem/TA switch, connect it with
         │ modem/TA                              │      the included RS-232 cable or any designated cables.
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ · Supplying power to the modem/TA     │ ···  Supply power from the modem/TA side.
         │ · Supplying power to the Q series     │
         │   C24 loading station                 │
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Setting and registration with GX      │      Transmission setting
         │ Developer                             │ ···  (Other than operation setting (OFF)
         │ · Switch setting of Q series C24      │      should be set according to the modem/TA.)
         └───────────────────────────────────────┘
                             │                            Communication protocol setting (set accordingly)
         ┌───────────────────────────────────────┐      Station number setting (0 to 31)
         │ Registration to QCPU (Write to PLC)   │      See User's Manual (Basic)
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Initial setting of Q series C24       │ ···  *3
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Registration of the data for          │ ···  *4
         │ initialization                        │
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Registration of connection data       │ ···  *5
         └───────────────────────────────────────┘
                             │
         ┌───────────────────────────────────────┐
         │ Initialization of the modem/TA        │ ···  *6
         │ (modem function system setting)       │
         └───────────────────────────────────────┘
                             │
         ┌───────────────┬─────────────────┬──────────────┐
         ▼               ▼                 ▼
  (2) For data    (3) For notification   (4) Access from GX
  communication                          Developer to QCPU
```

Parameter setting of the Q series C24 to QCPU

Initial setting of Q series C24 (Setting with GX Configuration-SC)

*1   ☞ Page 76, Section 3.2, ☞ Page 82, Section 3.3, 📖 User's manual (Basic)
*2   📖 User's Manual (Basic)
*3   ☞ Page 131, Section 3.4.2, 📖 User's Manual (Basic) for settings of the modem function.
*4   ☞ Page 134, Section 3.4.3, 📖 User's Manual (Basic)
*5   ☞ Page 139, Section 3.4.4, 📖 User's Manual (Basic)
*6   ☞ Page 144, Section 3.4.5, 📖 User's Manual (Basic)

3

3.4 Start-up of the Modem Function

(2) Procedure when executing data communications

indicates processing performed by the user.

Line connection waiting side

Line connection side

Q Series C24
or
External device

Q Series C24   Modem   Modem

| 0 | Perform the processing up to the modem/TA initialization by the procedure in (1). |
| 1 | Modem initialization |

Perform the processing up to the modem/TA initialization by the procedure in (1).

Modem initialization

Modem initialization

| 2 | Line connection wait state Modem initialization completion signal (X10 = ON) |

Modem initialization
Modem initialization completed signal
(X10)=ON

Execute line connection.

| 3 | Line connection *1 |

Line connection request signal (Y11)=ON

Line connection completed
Line connect signal (X12)=ON

Line connection completed
Line connect signal (X12)=ON

Execute data communications.

Execute data communications.

Remote password unlock processing

* If MC protocol communications are carried out with the external device, when a remote password is set in the QCPU, unlock the remote password.

| 5 | Data communications *2 |

The line is disconnected after data communications are completed.

Line disconnection *3

Line disconnect request signal (Y12)=ON

Line disconnection completed
Line connect signal (X12)=OFF

Line disconnection completed
Line disconnect signal (X14)=ON
Line connect signal (X12)=OFF
Modem initialization completed signal (X10)=OFF

Remote password lock processing

* By completing the line disconnection, lock processing of the remote password is executed automatically.

| 3 | Line connection wait state Modem initialization completed signal (X10)=ON |

If data communications is to be executed again, carry out communications after line connection from the external device.

If data communications are to be executed again, start the procedure from the modem initialization.

* Shows the value stored for the modem function sequence status (Address 546 (221H)).

*1   ☞ Page 148, Section 3.4.6
*2   ☞ Page 154, Section 3.4.7
*3   ☞ Page 161, Section 3.4.8

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(3) If notification is made

indicates processing performed by the user.

Pager receiver   Modem   Q Series C24 (Line connection side)

0 / **1** (1) Perform the processing up to the point where the modem/TA is initialized by the procedure in (1).

Modem initialization

2 Modem initialization completed signal (X10)=ON.

3 Make notification

Line connection
Line connection normally completed.

Notification-issued request signal (Y14)=OFF.

Line connection normally completed
Connection in progress signal (X12)=ON

Notification *1

Notification data reception.

6

Line disconnect

Line disconnect completed.

Line disconnect completed
Notification-issued request (Y14)=ON
Modem initialization completion signal (X10)=ON

3

* Shows the value stored for the modem function sequence status (address 546 (221H))

(4) If accessing the QCPU from GX Developer

* Shows the value stored for the modem function sequence status (address 546 (221H))

3.4.2 Initial settings of the serial communication module

This section explains the initial settings of the Q series C24 when data communicating with external device, remotely notifying a pager receiver and accessing from GX Developer using the modem function.

(1) Switch settings by GX Developer

Switch setting by GX Developer		Data communication	Notification	GX Developer access (For connection to MELSOFT products)	Remarks
Communication protocol setting		**1 to 7**	**1 to 7**	**5**	—
Transmission specifications Communication rate Setting data	Operation setting	OFF (Independent operation)			Set both CH1 and CH2 OFF
	Data bit setting	(Set according to modem/ TA on local station)		ON	OFF = 7 bit, ON = 8 bits
	Parity/non-parity setting			OFF	OFF = Non-parity, ON = Parity
	Even/odd parity setting			OFF	OFF = Odd, ON = Even
	Stop bit setting			OFF	OFF = 1 bit, ON = 2 bits
	Sum check enable/disable setting	(Set according to system specification)	OFF/ON	ON	OFF = Disabled, ON = Enabled
	Write during RUN enable /disable setting		OFF/ON	ON	OFF = Disabled, ON = Enabled
	Setting modification enable /disable setting		OFF/ON	OFF/ON	OFF = Disabled, ON = Enabled
	Transmission rate setting	(Set according to modem/TA on local station)[1]			(bps)
Station number setting		00 to 31			—

> [1] When the first five digits of the serial No. are 03042 or earlier, the transmission speed cannot be set to 115200 bps for connection between the Q series C24 and GX Developer via a modem.

Remark •

This gives an example of the switch setting when the modem function is used to connect GX Developer to the Q series C24 CH1 side and the programmable controller is accessed. Perform the switch setting similar to this example also when performing data communication or notification.
[Starting procedure]
"GX Developer" → "PLC parameter" → "I/O assignment" → Switch setting
[Setting example]

	Slot	Type	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	PLC	PLC						
1	0(*-0)	Intelli.	QJ71C24-R2	07E2	0005	0000	0000	0000

Switch No.	Bit		Description		Setting value
	Position	Specified value			
Switch 1	b0	OFF	CH1 transmission setting	Operation setting — Independent	07E2
	b1	ON		Data bit — 8 bits	
	b2	OFF		Parity bit — No	
	b3	OFF		Odd/even parity — Odd	
	b4	OFF		Stop bit — 1 bit	
	b5	ON		Sum check code — Yes	
	b6	ON		Write during RUN — Allowed	
	b7	ON		Setting modification — Enable	
	b8 to b15	—	CH1 communication rate setting	19200bps	
Switch 2	—		CH1 communication protocol setting	5	0005
Switch 5	—		Station number setting	0th station	0000

• •

(2) Initial settings by GX Configurator-SC (set in the setting screen for modem function system)

(a) Perform initial settings on the interface side that use the modem function as described in Page 105, Section 3.3.6:

The following table shows the default settings in the "Modem function system setting" screen and whether setting is possible or impossible in each type of communications.

"Modem function system setting" screen setting items	Data communications (MC non procedure, bidirectional)	Notification	GX Developer (For connection to MELSOFT products)	Buffer memory address
Modem connection channel designation	●	●	●	46 (2EH)
Notification execution designation	×	●	×	47 (2FH)
Number of connection retries	○	○	○	48 (30H)
Connection retry interval designation (unit: s)	○	○	○	49 (31H)
Initialization/connection timeout time designation (unit: s)	○	○	○	50 (32H)
Number of initialization retries designation	○	○	○	51 (33H)
Data No. for initialization designation[1]	●	●	●	52 (34H)
Data No. for connection designation[1]	●	●	×	53 (35H)
GX Developer connection designation	×	×	●	54 (36H)
No-communication interval time designation (Unit: m)[3]	○	○	○	55 (37H)
RS/CS control yes/no designation	○	○	○	56 (38H)
Modem initialization time DR signal valid/invalid designation[2]	○	○	○	8200 (2008H)
Wait time of notification (Unit: s)	×	○	×	8202 (200AH)
Circuit disconnect wait time (PLC CPU watch use) (Unit: s)	○	×	×	8206 (200EH)
Remote password mismatch notification count designation	○	×	○	8204 (200CH)
Remote password mismatch notification accumulated count designation	○	×	○	8205 (200DH)
Auto modem initialization designation	○	○	○	8199 (2007H)
Callback function designation	×	×	○	8193 (2001H)
Callback denial notification accumulated count designation	×	×	○	8194 (2002H)
Data No. for Callback designation 1 to 10	×	×	○	8449 to 8458 (2101H to 210AH)

●: Required item, ○: Setting possible, ×: Setting not required

*1　For details on how to register the data No. for initialization, see Page 134, Section 3.4.3.
　　For details on how to register the data No. for connection, see Page 139, Section 3.4.4.
*2　The "Modem initialization time DR signal valid/invalid designation" designates whether the status of the DR (DSR) signal output is valid or invalid at the startup of the Q series C24. When the DR (DSR) signal = ON is output from the modem, register "valid" for this item. When the DR (DSR) signal = ON is not output from the modem, register "invalid" for this item.
*3　Even if the programmable controller CPU on the Q series C24 loading station (local station) becomes STOP status under the following circumstances, the line (telephone) with the partner devices will be left connected.
　　In order to prevent the line from being left connected when the line is not in use, be sure to make the appropriate settings.
　　　• When the programmable controller CPU is stopped when the connected signal (X12) is at the ON status. This occurs because the program write after remote stop is enabled.
　　　• When the programmable controller CPU performs an error stop during self-diagnosis, etc.

Point

When setting the No-communication interval time as infinite wait (set value = 0), be sure to perform line disconnection processing after the data has been communicated.
If the line is left connected for long periods of time without performing line disconnection after data has been communicated, not only will telephone bills be applied, but it may violate electronic communication business laws.

(b) All transmissions using the modem function are transmitted in full-duplex.

Leave the following initial settings for the interface side that uses the modem function as default.

(Default value)

- CD terminal check: Not checked
- Communication method: full-duplex communication

(c) The processes that correspond to the following output signals may not be aborted.

Output signal	Requesting process name
Y10	Initialization request (standby request)
Y11	Connection request
Y12	Disconnection request
Y14	Notification-issued request

It is recommended to leave the following initial settings for the modem functions as default. (Upon error, it will end due to time out.)

(Default value)

- Number of connection retries: 3 times
- Connection retry interval: 180s
- Initialization/connection time out: 60s

Point

Also perform the settings for a remote password check described in Page 116, Section 3.3.6 (3) (a) and Page 116, Section 3.3.6 (3) (b) when a remote password check is executed with respect to the remote password set in the QCPU.

3.4.3 Register/read/delete of the initialization data

The section explains the register/read/delete of the data for initialization such as initialization commands for the modem/TA connected to the Q series C24 side for data communication with the external device, pager receiver notification and accessing from GX Developer using the modem functions.

(1) Registration destination of the data for initialization

- The data for initialization may be used by registering to the Q series C24 Flash ROM or buffer memory.
- The buffer memory may register the data for connection shown in Page 139, Section 3.4.4 and will register the data for initialization or data for connection in the designated area.
- It is recommended that the data for initialization during the debug process is stored in the buffer memory. The registration data in the buffer memory will be erased after starting up the Q series C24 loading station again. It is necessary to register the data for initialization in the buffer memory after each start-up of the Q series C24.
- It is recommended to store the data for initialization to the Flash ROM after completing the debug process. By registering it to the Flash ROM, the registration process of the data for initialization will be unnecessary thereafter.

(2) Types of data for intialization

- There are data for initialization that are registered in the Flash ROM of the Q series C24 upon shipping and data for initialization that are set by the user.
- The number of times registered/number of possible registrations are shown in the chart below.

(3) Data for initialization registration number

- The registration numbers shown in the table below are used by the memory of the registration destination.
- The registration number of the data for initialization is determined by the area of registration.

Registration data	Registration destination		Registration number (Decimal (hexadecimal))	Number of registrations
Data for initialization data	Flash ROM	Data registered by the OS	2000 to 2013 (7D0H to 7DDH)	13
		Data registered by the user	2500 to 2529 (9C4H to 9E1H)	30
	Buffer memory	(All are set by the user)	-32767 to -32737 (8001H to 801FH)	31

(4) Precautions during the registration of data for initialization

- The maximum size of the initialization commands that may be registered as one data for initialization is 78 bytes.
- Do not include CR/LF (data code: 0DH/0AH) in the data for initialization to be registered to the Q series C24. The CR/LF is output at the end of the AT command by the Q series C24 when processing initialization (automatically added).
- The registration status of the data for initialization stored in the Flash ROM may be checked in "data registration for modem initialization" screen for GX Configurator-SC or the buffer memory (address: 226H to 228H (550 to 552). When newly registering, register by designating an unregistered number. When designating a registration number that has already been registered, first delete the registration data in the preoccupied registration number prior to registration.
- When connecting the Q series C24 to an external device using a cellular phone and a modem, set the transmission rate supported by the cellular communication module on the modem side.

(5) Registration contents at shipment

• The data for initialization registered in the Flash ROM of the Q series C24 are listed below:

Registration number		Initialization command
Hexadecimal	Decimal	
7D0H	2000	ATQ0V1E1X1\J0\Q2\V2\N3S0=1
7D1H	2001	ATQ0V1E1X1\Q2\V2\N3S0=1
7D2H	2002	ATQ0V1E1X1&K3\N3S0=1
7D3H	2003	ATQ0V1E1X1&H1&R2&A3&D2S0=1
7D4H	2004	ATQ0V1E1X1\J0\Q2\N3S0=1
7D5H	2005	ATE1Q0V1&C1&D2&H1&I0&R2&S0S0=1
7D6H	2006	ATE1Q0V1&C1&D2&K3&S0S0=1
7D7H	2007	ATE1Q0V1&C1&D2&K3&S1S0=1
7D8H	2008	ATE1Q0V1&C1&D2&K3&S0S0=1
7D9H	2009	ATE1Q0V1&C1&D1\Q2&S0S0=1
7DAH	2010	ATE1Q0V1&C1&D2\Q3&S0S0=1
7DCH	2012	AT&S0S0=1
7DDH	2013	ATX1&S0S0=1

• If initialization commands other than listed above are needed, the data for initialization needs to be registered to the Flash ROM or the buffer memory of the Q series C24.

Remark •

● Perform the following setting in respect to the modem/TA connected to the Q series C24 side.
For settings other than listed below, perform the setting as designated by the modem/TA.

Setting contents	Setting command example
—	AT
Display the result code (or, return the result code).	Qn
Set the result code as a word.	Vn
Perform character echo.	En
Dial tone and busy tone detection + X1	Xn
Set register 0 at 2	Sr=n
The modem and the serial speed are not equal.	\Jn
Control RTS/CTS.	\Qn
Control DSR.	&Sn
Control DTR.	&Dn
Enable extension result code (display MNP class).	\Vn
MNP mode/normal mode auto selection	\N3

● The following shows an specification example of the transmission rate supported by the cellular communication module using the modem initialization command, when connecting the Q series C24 to an external device using a cellular phone and a modem. (Transmission rate = 9600bps is set)
For the details, see the manual of the modem used.
(Setting example for the initialization command of the registration No.7D3H)
ATQ0V1E1X1&H1&R2&A3&D0S0=1&N6
(Setting example for the initialization command of the registration No.7D4H)
ATQ0V1E1X1\J0\Q2\N3&D0+MS=, 9600, 9600S0=1

• •

(6) Procedures for register/read/delete of the initialization data

(a) For the flash ROM in the Q series C24

Register/read/delete operations are executed on the GX Configurator-SC's "Data registration for modem initialization" screen.[1]

 *1 The factory setting of initialization data stored in the Flash ROM of the Q series C24 cannot be deleted.

(Registration example)

Remark •

Use \\ code to specify a field to register "\" if GX Configurator-SC is used for data for modem initialization.

• •

Ex. To register the \Q2 of data: \\Q2

(b) For the buffer memory of the Q series C24

- The initialization data write (registration) and read operations are performed by designating an applicable area that corresponds to registration numbers 8001H to 801FH for the user frame registration area (addresses: 1B00H to 1FF6H). When deleting the initialization data, write "0" to the number of registration data bytes designation area.
- The table below shows an overview of the buffer memory used in the write, read, and delete operations of the initialization data as well as the designated values for each area. For more details, see Page 220, CHAPTER 9. (Use the table by replacing the user frame with the initialization data.)

Address		Name		Designated/stored value	Specification required (○)/not required (×)		
Hexadecimal	Decimal				Write	Read	Delete
1B00H	6912	Registration number 8001H	Registration data byte number designation	0: When deleting 1 to 78: Number of bytes in the registration data (Only for the initialization command section)	○	× (Read processing not required)	○
1B01H	6913		User controlled data	Any data used by the user to manage the registration data (manufacturer code, control number, etc.)			×
1B02H	6914		Initialization command	Data code for the initialization command for registration			
⋮	⋮						
1B28H	6952						
1B29H	6953	Registration number 8002H	Registration data byte number designation	0: When deleting 1 to 78: Number of bytes in the registration data (Only for the initialization command section)	○	× (Read processing not required)	○
1B2AH	6954		User controlled data	Any data used by the user to manage the registration data (manufacturer code, control number, etc.)			×
1B2BH	6955		Initialization command	Data code for the initialization command for registration			
⋮	⋮						
1B51H	6993						
1FCEH	8142	Registration number 801FH	Registration data byte number designation	0: When deleting 1 to 78: Number of bytes in the registration data (Only for the initialization command section)	○	× (Read processing not required)	○
1FCFH	8143		User controlled data	Any data used by the user to manage the registration data (manufacturer code, control number, etc.)			×
1FD0H	8144		Initialization command	Data code for the initialization command for registration			
⋮	⋮						
1FF6H	8182						

- The contents of the data to be written into the designated area that corresponds to registration numbers 8001H to 801FH are the same as those for the Flash ROM.

- The following shows an example of a sequence program used to write the initialization data (registration).
  - Example of writing the initialization data to the area having registration number 8001H

X1E: Q series C24 ready signal
X1F: WDT error signal

```
X1E  X1F
─┤├──┤/├────────────────────────────────────(M0 )   Turns the ready flag ON

X23
─┤├──────────────────────────────[PLS   M10 ]   Data registration for initialization
                                                 instruction

M10
─┤├──┬───────────────────────[MOV  K30   D0 ]   Sets the number of registration
     │                                           data bytes
     │
     ├───────────────────────[MOV  K1    D1 ]   Sets the user control data
     │                                           (control number)
     │
     ├──────────────["$MOV  "ATE1Q0V1&C1&D2&H"  D2 ]   Sets the AT command for initialization
     │
     ├──────────────["$MOV  "1&I0&R2&S0S0=1"    D10 ]
     │
     │   M0
     └──┤├──┬──────[TO  H0  H1B00  D0  K17 ]   Sets the AT command for initialization
           │                                     to the buffer memory
           │
           └───────────────────[SET   M1 ]   Sets the initialization completed flag
```

(Item name)		Data register		(Address)		Buffer memory

Area for registration
No. 8001H

Number of registration data bytes	D0	30	→	1B00H	30
User control data	D1	1	→	1B01H	1
	D2			1B02H	
Initialization command	to	Initialization command	→	to	Initialization command
	D13			1B0DH	
				to	
				1B28H	

Data for initialization

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3.4.4 Register/read/delete of the data for connection

This section explains the registration/reading/deletion of data for connection such as the telephone number of the partner device and notification messages that are used for communicating data with external devices, notify pager receivers and accessing from GX Developer using the modem functions.

(1) Registration destination of data for connection

- The data for connection can be used by registering to the Q series C24's Flash ROM or buffer memory.
- The buffer memory can register the data for initialization shown in Page 134, Section 3.4.3. The data for initialization or data for connection will be registered in the applicable area.
- It is recommended to store the data for connection during the debug process in the buffer memory. The registration data in the buffer memory will be erased after the starting up the Q series C24 loading station again. It is necessary to register the data for connection in the buffer memory after each start-up of the Q series C24.
- It is recommended to store the data for connection to the Flash ROM after completing the debug process. By registering it to the Flash ROM, the registration process of the data for connection will be unnecessary thereafter.

(2) Types of data for connection

- All data for connection are registered and used as defined by the user.
- The number of possible registrations are shown in the table below.

(3) Data for connection registration number

- The registration numbers shown in the table below are used by the memory of the registration destination.
- The registration number of the data-for-connection is determined by the area of registration.

Registration data	Registration destination		Registration number (Decimal (hexadecimal))	Number of registrations
Data for connection	Flash ROM	(All are set by user)	3000 to 3029 (BB8H to BD5H)	30
	Buffer memory		-32767 to -32737 (8001H to 801FH)	31

(4) Precautions during the registration of data for connection

- The maximum size of data that can be registered as one data for connection is 80 bytes. Do not deviate from the following data sizes for the following items:
  - Message area for notification = 36 bytes, data-for-connection area = 44 bytes
- Designate the messages for notification accordingly with the display designation of the partner devices.
- The registration status of the data for initialization stored in the Flash ROM can be checked in "data registration for modem connection" screen for GX Configurator-SC or the buffer memory (address: 223H to 225H (547 to 549) When newly registering, register by designating an unregistered number. When designating a registration number that has already been registered, first delete the registration data in the preoccupied registration number prior to registration.

(5) Procedures for register/read/delete of the data for connection

(a) For the flash ROM in the Q series C24

Register/read/delete operations are executed on the GX Configurator-SC's "Data for modem connection" screen.

Set the required items with the table below.

"Data for modem connection" screen setting item		Data communications (MC non procedure, bidirectional)	Notification	GX Developer (For connection to MELSOFT products)
Data for modem connection 1 to 30	Pager receiver designation	×	●	×
	Telephone number	●	●	● (for callback)
	External line dialing	○	○	○ (for callback)
	Line types	○	○	○ (for callback)
	Wait time for message transmission unit: s	×	○	×
	Message	×	○	×
	Comment	○	○	○

●: Required item, ○: Setting possible, ×: Setting not required

(Registration example) Setting example to perform data communication
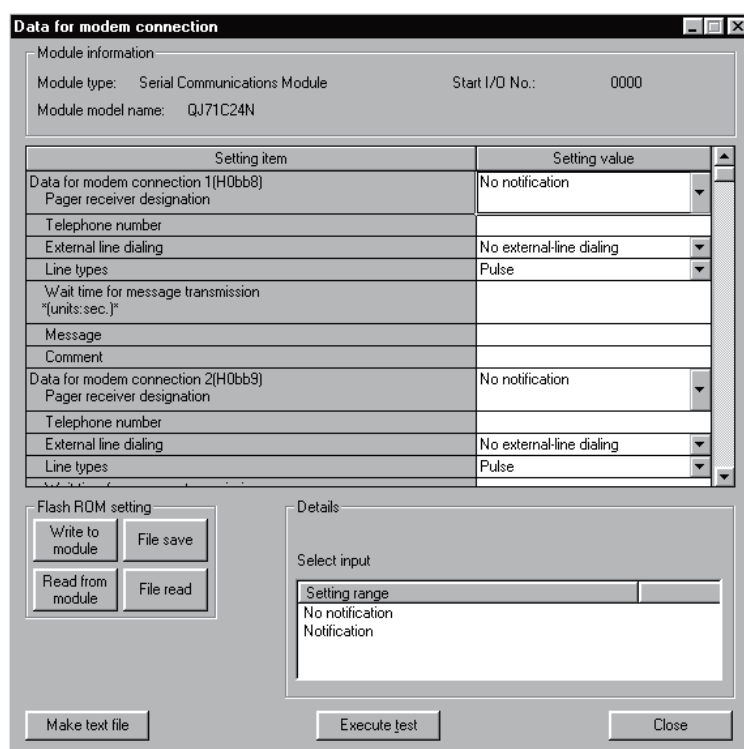
(b) For the buffer memory of the Q series C24

- The connection data write (registration) and read operations are performed by designating an applicable area that corresponds to registration numbers 8001H to 801FH for the user frame registration area (addresses: 1B00H to 1FF6H). When deleting the connection data, write "0" to the number of registration data bytes designation area.
- The table below shows an overview of the buffer memory used in the write, read, and delete operations of the connection data as well as the designated values for each area are. For more details, see Page 220, CHAPTER 9. (Use the table by replacing the user frame with the connection data.)

Address		Name		Designated/stored value	Specification required (○)/not required (×)		
Hexadecimal	Decimal				Write	Read	Delete
1B00H	6912	Registration number 8001H	Registration data byte number designation	0: When deleting 80: Number of registration data bytes	○	× (Read processing not required)	○
1B01H	6913		Connection data	Notification message for connection data to be registered, and connection data			×
⋮	⋮						
1B28H	6952						
1B29H	6953	Registration number 8002H	Registration data byte number designation	0: When deleting 80: Number of registration data bytes	○	× (Read processing not required)	○
1B2AH	6954		Connection data	Notification message for connection data to be registered, and connection data			×
⋮	⋮						
1B51H	6993						
1FCEH	8142	Registration number 801FH	Registration data byte number designation	0: When deleting 80: Number of registration data bytes	○	× (Read processing not required)	○
1FCFH	8143		Connection data	Notification message for connection data to be registered, and connection data			×
⋮	⋮						
1FF6H	8182						

- The following shows the data arrangement of the connection area data (area corresponding to registration numbers 8001H to 801FH) in the buffer memory that is used for the register, read and delete operations of the connection data, as well as the designated values and stored values.

Data for connection

(H) (L)

Message area for notification (36 bytes)   Connection data area (44 bytes)

Pager receiver designation (2)

Telephone number (18)

External line dialing (2)

Line types (2)

(Open) (20)

Wait time for Message transmission (2)

Message (30)

Message length (2)

(Open) (2)

(Data name (number of bytes))
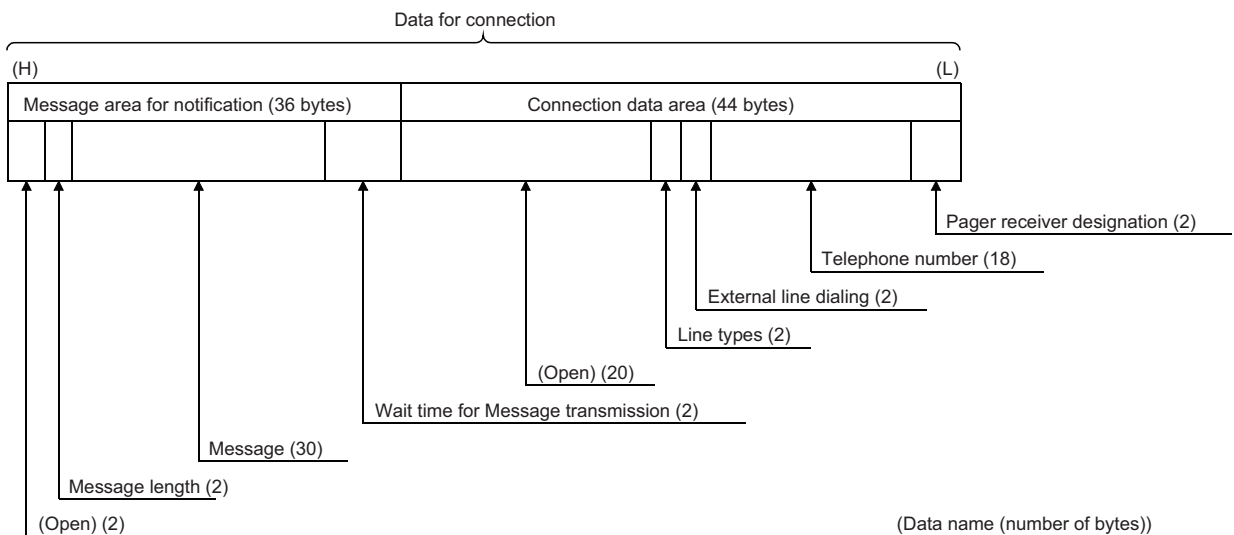
(Data for connection area): 44 bytes

Data name	Designated/stored value and contents	Number of bytes	Data type
Pager receiver designation	Whether or not notification is performed, and the notification target module are designated. 0: No notification 3: Notification performed • In the case of 3 above, the wait time for message transmission in the notification message must be designated.	2	Binary
Telephone number	• The other party's phone number used to establish line connection when communicating data or performing notification is designated. • When phone number is less than 18 characters, a space (code: 20H) must be entered for the remainder.	18	ASCII
External line dialing number	The external-line access number on Q series C24 side when performing data communication/notification to the partner device is designated. 0 to 9, 10 (*), 11 (#): External-line access number on the Q series C24 side 255: No external-line access number required on the Q series C24 side	2	Binary
Line types	The line type used to perform data communication/notification with the partner device is designated. 0: Pulse 1: Tone 2: ISDN	2	Binary
(Open)	Designate "0".	20	Binary

(Notifying message area): 36 bytes (Designated when performing notification)

Data name	Designated/stored value and contents	Number of bytes	Data type
Wait time for message transmission	The wait time after line connection until message transmission is designated. (Unit: s) 0 to 255: Wait time • Valid when the pager receiver designation in data connection is "3".	2	Binary
Message	Designate the notification message according to the display specification on the other party's device.	30	Binary
Message length	The number of designated message bytes shown above is designated. 0: No message designation 1 to 30: Number of message bytes	2	Binary
(Open)	Designate "0".	2	Binary

- An example of a sequence program used for writing (registering) of data for connection is shown below.
  - Example of writing data for connection to the registration number 8002H area

X1E: ready signal
X1F: WDT error signal

X1E X1F		(M0)	Turns the ready flag ON
X27		[PLS M20]	Connection data registration command
M20		[MOV K80 D0]	Set the number of registration data bytes
		[FMOV K0 D1 K40]	Clear the data storage device for connection
		[MOV K0 D1]	Set the pager receiver designation (Notification is not executed)
		[$MOV "052nnnnnnn" D2]	Set the telephone number to be connected
		[$MOV " " D7]	
		[MOV H0 D11]	Set the external line dialing number (0)
		[MOV K1 D12]	Sets the line type to tone
M0		[TO H0 H1B29 D0 K41]	Writes the connection data in the buffer memory
		[SET M2]	Sets the connection data registration completion flag

(Item name)		Data register	(Address)	Buffer memory
				Area for registration No. 8002H
Number of registration data bytes	D0	80	→ 1B29H	80
	D1		1B2AH	
Data for connection	to	(Connection data)	→ to	(Connection data)
	D22		1B3FH	
	D23		1B40H	
	to	(Data for notification)	→ to	(Data for notification)
	D40		1B51H	

3

3.4 Start-up of the Modem Function

3.4.5 Initialization of modem/TA (terminal adapter)

This section explains the initialization of the modem/TA connected to the Q series C24, used for communicating data with the external device, performing notifications to pager receivers and accessing from GX Developer using the modem function.

(1) Requirements for initialization

Perform the following setting and registration:
- The initial settings for the Q series C24 as shown in Page 134, Section 3.4.3
- The data for initialization registration shown in Page 134, Section 3.4.3, when initializing the modem/TA with the data for initialization set by the user.

> **Remark** •
>
> It is possible to initialize and connect at the same time by performing the connection process by designating the data for initialization and data for connection. (🖝 Page 148, Section 3.4.6)
>
> •

(2) Registering initialization data using GX Configurator-SC (Settings on the modem function system setting screen)

The number of the initialization data used to initialize the modem connected to the Q series C24 is registered on the GX Configurator-SC's "Modem function system setting" screen.

The following explains the number designated by the "Initialization data number" item on the GX Configurator-SC's "modem function system setting" screen and the related buffer memory when the initialization data number = 0 is designated.

Buffer memory used			The number of data for initialization used and buffer memory designated value	
Name	**Address (CH1/CH2)**			
	Hexadecimal	**Decimal**	**When number used = 1**	**When number used = 2 or more**
Data number for initialization designation	34H	52	7D0H to 801FH: Data for initialization registration number[1]	0H
User frame being transmitted number	B6H/156H	182/338	(Unused)	(During initialization, the data registration number currently being sent is stored.)
CR/LF output designation	B7H/157H	183/339		0 (default value)
Output head pointer designation	B8H/158H	184/340		1 to 100 (See 1))
Output count designation	B9H/159H	185/341		1 to 100 (See 2))
Transmission frame number designation — First	BAH/15AH	186/342		7D0H to 801FH: Data for initialization registration number[1]
Transmission frame number designation — Second	BBH/15BH	187/343		
Transmission frame number designation — ⋮	⋮	⋮		
Transmission frame number designation — Hundredth	11DH/1BDH	285/445		

*1   The data for initialization registration number to be used is designated.
7D0H to 7DDH (2000 to 2013): Data registered by the OS
9C4H to 9E1H (2500 to 2529): Data registered in the Flash ROM by the user
8001H to 801FH (-32767 to -32737): Data registered to the buffer memory by the user

1) Output head pointer designation area (address: 184/344 (B8H/158H)): Designate the location of the head position (n-th unit) in the transmission frame number designation area to which the registration number of the data for initialization to be sent is written.
- 1: Transmitted form the first unit to 100: Transmitted from the 100th unit

2) Output count designation area (address: 185/345 (B9H/159H)): The number of data for initialization units to be transmitted starting from the location set by the output head pointer designation area is designated here.
- 1: Transmitted form the first unit to 100: Transmitted from the 100th unit

(3) Precautions during modem/TA initialization

If the DSR signal from the modem/ TA goes OFF when modem/TA initialization is completed (X10 goes ON), the Q Series C24 executes initialization processing automatically in accordance with the following.
- If the auto modem initialization is specified

Modem / TA initialization processing is executed in the initialization / connection timeout time interval while the DSR signal is OFF without relation to the ON/OFF status of the modem initialization request signal Y10.
- If the auto modem initialization is not specified

The modem / TA initialization processing is executed when the DSR signal restarts without relation to the ON/OFF status of the modem initialization request signal Y10.

(4) If modem / TA initialization is executed automatically (Set by the GX Configurator-SC)

By having the GX Configurator-SC perform the settings for automatic modem initialization, modem initialization is executed automatically when the Q Series C24 starts up.
The modem initialization completion signal (X10) goes ON.

(a) Settings for auto initialization of the modem / TA

Select "auto initialize" for the auto modem initialization designation in the GX Configurator-SC's "Modem function system setting" screen.

(b) Cautions when initializing the modem / TA automatically

- If the modem's initialization processing is completed abnormally, the Q Series C24 executes the following processing.
  - The initialization / connection abnormal completion signal (X13) does not go ON.
  - An error code is stored in the buffer memory's modem function error code storage area (Address: 545 (221H)).
  - Modem initialization is retried automatically using the initialization / connection timeout time stored in the buffer memory (address: 50 (32H), and is repeated until initialization is completed normally.[1]

*1   When modem initialization is not completed normally, the user should perform the following, and restart the station where the Q Series C24 is installed.
Check the set initialization data No.
Check the registered contents of the initialization data corresponding to the set initialization data No. (If they are abnormal, correct them and register them again.)
Check if the modem's power is turned on.
- When the line is disconnected from the Q Series C24 side (using Y12), the initialization completion signal (X10) goes off together with the connection in progress signal (X12). When connecting to the line again, do so after first initializing the modem.

Point

When the line to the Q Series C24 is disconnected from the external device side, the Q Series C24's initialization completion signal (X10) does not go OFF.
When desiring to disable reception by the Q Series C24 side's modem, execute line disconnect by the modem disconnection request signal (Y12).

(5) If the modem/TA is initialized by a sequence program

(a) I/O signals used in initialization

The initialization request signal (Y10), initialization complete signal (X10) and initialization/connection abnormal complete signal (X13) are used.

Ex When initializing the modem connected to CH1 of the Q series C24 using two set of data for initialization (registration numbers 8001H and 8002H) that are registered in the buffer memory

Address	Buffer memory		(Designated value)
B6H	Frame number being transmitted		0
B7H	CR/LF output designation		0
B8H	Output head pointer designation		3
B9H	Number of outputs		2
BAH	Transmission frame number	1st unit	9C4H
BBH		2nd unit	9C5H
BCH		3rd unit	8001H
BDH		4th unit	8002H
BEH		5th unit	9D0H
BFH		6th unit	9D1H

······ Out of the transmission frame numbers, from which one the transmission will be initiated is designated.

······ Out of the transmission frame numbers, the number of units to be transmitted is designated.

······ Data for initialization registration number is designated.

Must be designated prior to the modem initialization request.

* The Q series C24 will transmit the data for initialization in the designated order.

Initialization request Y10

Initialization completion X10 (Normal completion)

Initialization/connection abnormal completion X13 (Abnormal completion)

After the designated number of initialization retries have been executed

Q series C24

Initialization data   Registration No.8002

Initialization data   Registration No.8001

Modem

(b) Modem/TA initialization program example

An example of the modem/TA initialization program on the Q series C24 side by the programmable controller CPU is shown below.[1]

[1] When the initialization data has been registered from GX Configurator-SC or from the programmable controller CPU.

X12: Connection in progress signal
X1E: Ready signal
X1F: WDT error signal
M0: Accessible flag
M1: Data registration complete flag
 for initialization
M30: Initialization enabled flag
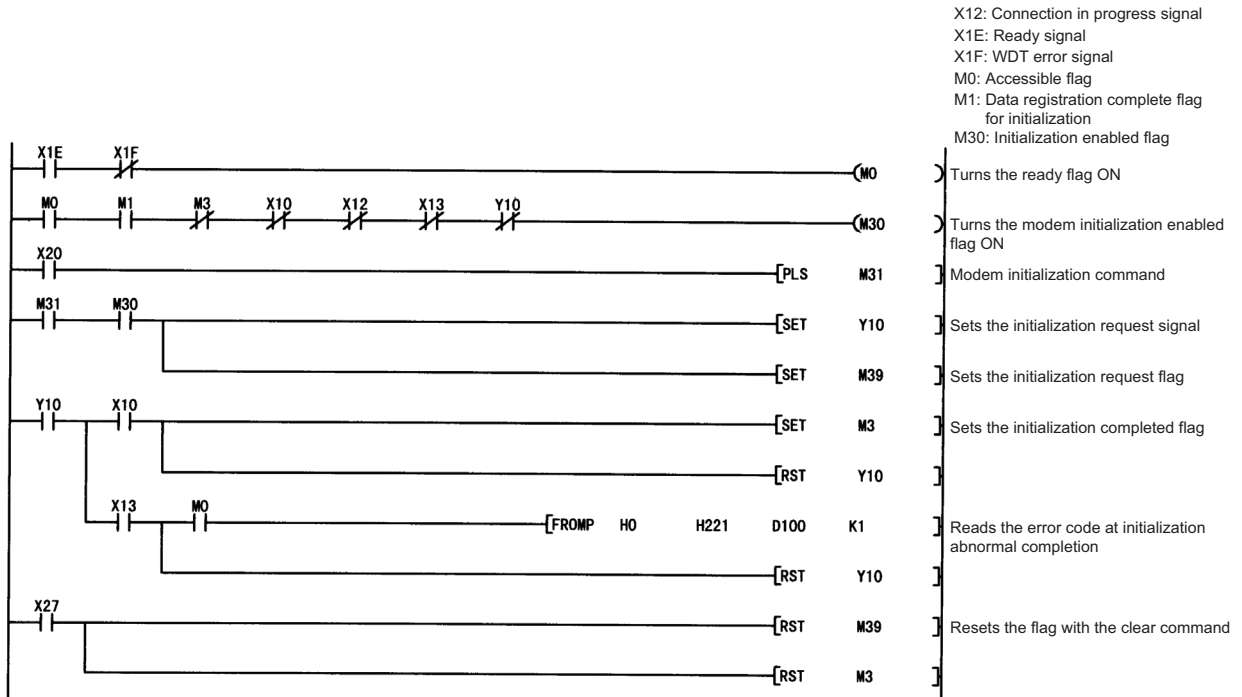
3.4.6　Line connection

This section explains the connection (dialing) with the partner devices for the purpose of data communication with external devices using the modem functions.

In case of notification to a pager receiver, the line is connected while the notification is being processed. The connection processing such as a connection request (Y11) to I/O signal is, therefore, unnecessary.[1]

>　[1]　The data for connection indicated in this section should be set to perform the notification processing

(1) Requirements for connection

Complete the following settings and registrations in advance.

- The initial settings for the Q series C24 as shown in Page 131, Section 3.4.2
- The registration of the data for initialization as shown in Page 134, Section 3.4.3
- The registration of the data for connection as shown in Page 139, Section 3.4.4
- The initialization of the modem/TA connected to the Q series C24 side as shown in Page 144, Section 3.4.5
  - In addition, both the initialization and line connection can be conducted simultaneously by designating the data for initialization and data for connection to perform connection processing. For the data setting for initialization to perform initialization and line connection simultaneously, see Page 131, Section 3.4.2, Page 144, Section 3.4.5. Explanation on the above-mentioned setting is omitted in this section.

(2) Registering the data for connection using GX Configurator-SC (Settings on the modem function system setting screen)

The number of the data for connection that is used for line connection in order to perform data communication with the external device is registered on the GX Configurator-SC's "Modem function system setting" screen. The following explains the number designated by the "Connection data number" item on the GX Configurator-SC's "Modem function system setting" screen.

- When line connecting from the Q series C24 side[1]
  - Data number for connection designation area (address: 35H (53))

The data for connection registration number is designated.

BB8H to BD5H (3000 to 3029): Data registered to the Flash ROM by the user

8001H to 801FH (-32767 to -32737): Data registered to the buffer memory by the user

>　[1]　The addresses shown in parentheses below indicate the addresses of the buffer memory where the setting values for this item on the "Modem function system setting" screen are stored.

- When line connecting from the external device

Since the line connection processing is not necessary on the Q series C24 side, connecting data registration for line connection and data number setting for connection are not needed.

(3) I/O signals used in line connection

Connection request signal (Y11), dial in progress signal (X11), connection in progress signal (X12) and initialization/connection abnormal completion signal (X13) are used.

Ex. When performing the line connection from the Q series C24 side only following the completion of initialization
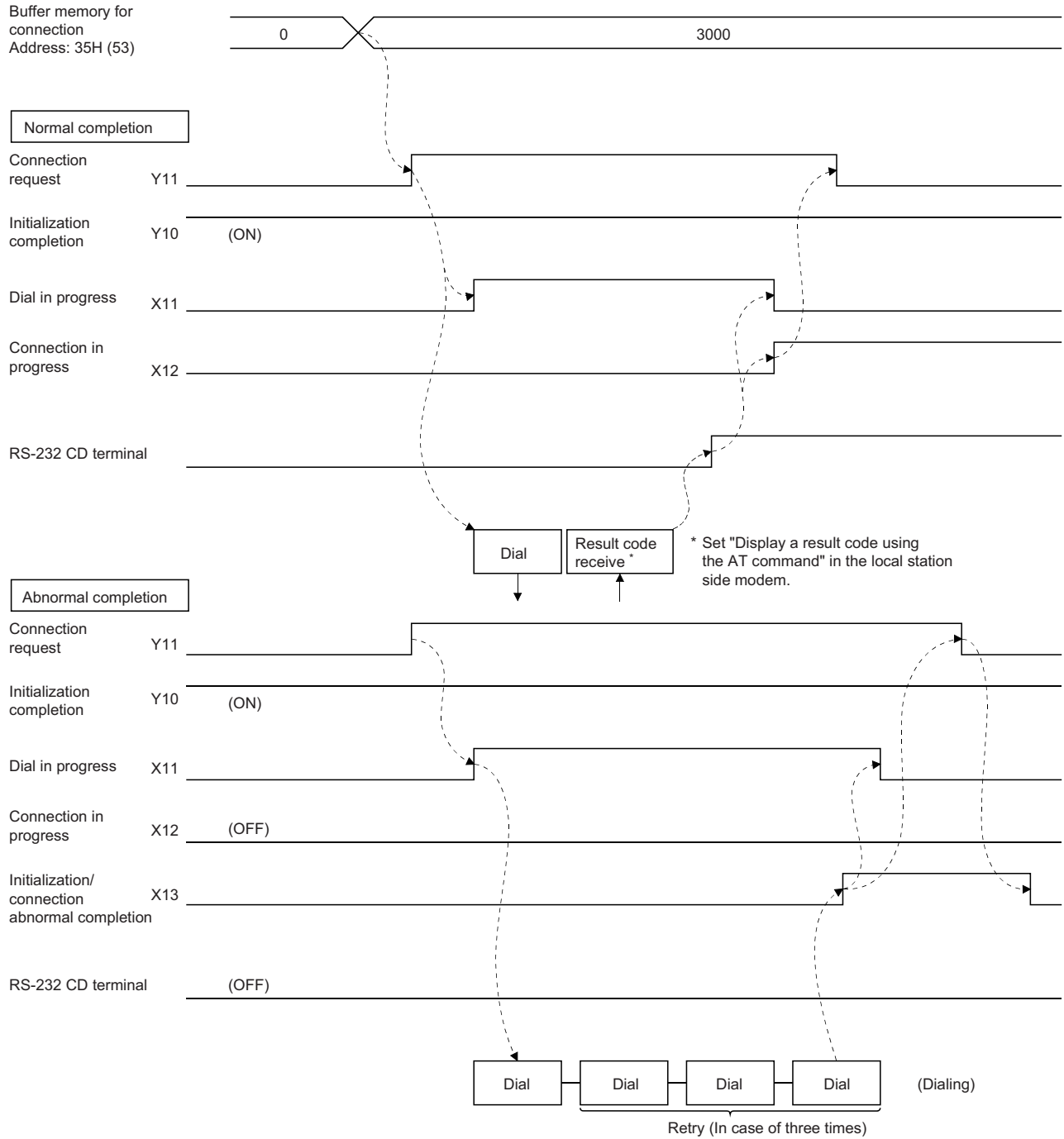
* Set "Display a result code using the AT command" in the local station side modem.

Retry (In case of three times)

* Connection channel and retry operation are performed using the buffer memory setting.

Ex. When performing the initialization and the line connection from the Q series C24 side simultaneously

Buffer memory for initialization — *1

Buffer memory for connection Address: 35H (53) — 0 / 3000

Normal completion

Connection request Y11

Initialization completion X10

Dial in progress X11

Connection in progress X12

RS-232 CD terminal

* Set "Display a result code using the AT command" in the local station side modem.

Modem initialization *1

Dial

Result code receive *

Abnormal completion

Connection request Y11

Initialization completion X10

Dial in progress X11

Connection in progress X12 (OFF)

Initialization/ connection abnormal completion X13

RS-232 CD terminal (OFF)

Modem initialization *1

Dialing

Dial — Dial — Dial — Dial

Retry (In case of three times)

* Connection channel and retry operation are performed using the buffer memory setting.

Ex. When initiating the line connection from the partner device after the completion of initialization

Buffer memory for connection Address: 35H (53) — 0

Connection request Y11 (OFF)

Initialization completion X10 (ON)

Dial in progress X11 (OFF)

Connection in progress X12 (Normal connection)

RS-232 CD terminal (Normal connection)

Reception | Result code receive *

* Set "Display a result code using the AT command" in the local station side modem.

Unlock processing for the remote password

Password (for system) | Response
Communication only when connected with GX Developer

Remote password | Response
Communication using MC protocol When connecting to the GX Developer

Point

- The connection channel on the Q series C24 side is set in the "modem function system setting" screen of GX Configurator-SC.
- Abnormal processing when the partner device initiate the line connection is left entirely to the partner device. There is no method on the Q series C24 side to check a line connection error occurrence at the partner device.
- When a remote password check is performed for the QCPU, normal completion of the unlock processing allows access to data communication/ programmable controller thereafter.

(4) Precautions during the line connection

- Prior to data communication with external devices, determine when and which station will perform the line connection (dialing) and line disconnection processing to the external device.
- Use the following method to perform the unlock processing for the QCPU remote password from the opposite device.
  - During communication using MC protocol, transmit the dedicated command to the Q series C24 side.
  - When accessing the programmable controller using the GX Developer, perform the unlock processing on the GX Developer screen when access begins. See Page 121, Section 3.3.7 (8) for what to do when the unlock processing is completed abnormally.
- When reconnecting the line after disconnection, allow several seconds for the modem before turning on the Connection request (Y11). If it (Y11) is turned on immediately after line disconnection, the modem may not accept the first connection request, resulting in connection failure, and the user may be forced to wait for the retry time to elapse.

(5) Line connection program example

An example of a line connection program is shown below.

(a) Example of initiating line connection from the Q series C24 side following the initialization completion

When the data for connection has been registered from GX Configurator-SC or from the programmable controller CPU.
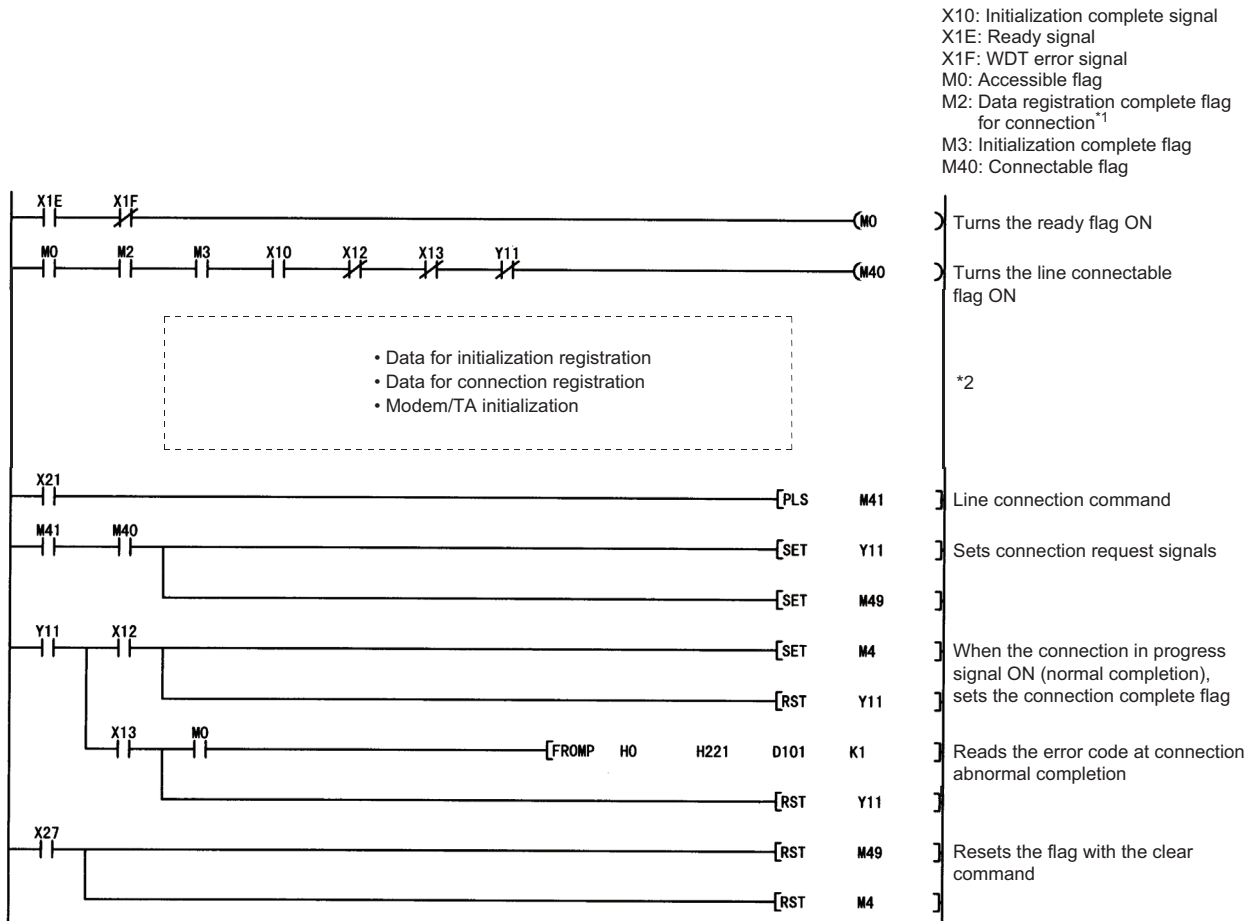
X10: Initialization complete signal
X1E: Ready signal
X1F: WDT error signal
M0: Accessible flag
M2: Data registration complete flag for connection[1]
M3: Initialization complete flag
M40: Connectable flag

*1   ☞ Page 139, Section 3.4.4
*2   ☞ Page 134, Section 3.4.3, ☞ Page 139, Section 3.4.4, ☞ Page 144, Section 3.4.5

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(b) Example of simultaneous execution of initialization and line connection from the Q series C24 side

When the initialization and connection data have been registered from GX Configurator-SC or from the programmable controller CPU

X10: Initialization complete signal
X1E: Ready signal
X1F: WDT error signal
M0: Accessible flag
M1: Data registration complete flag for initialization
M2: Data registration complete flag for connection[1]
M3: Initialization complete flag
M40: Connectable flag

Ladder program:

Contacts	Output	Description
X1E ┤ X1F ┤/├	(M0)	Turns the ready flag ON
M0 ┤ M1 ┤ M2 ┤ M3 ┤/├ X10 ┤/├ X12 ┤/├ X13 ┤/├ Y10 ┤/├ Y11 ┤/├	(M40)	Turns the line connectable flag ON
• Data for initialization registration • Data for connection registration		*2
X21 ┤├	[PLS M41]	Line connection command
M41 ┤├ M40 ┤├	[SET Y11] [SET M49]	Sets connection request signals
Y11 ┤├ X12 ┤├	[SET M3] [SET M4] [RST Y11]	When the connection in progress signal ON (normal completion), sets the connection complete flag
X13 ┤├ M0 ┤├	[FROMP H0 H221 D101 K1] [RST Y11]	Reads the error code at connection abnormal completion
X27 ┤├	[RST M49] [RST M3] [RST M4]	Resets the flag with the clear command

*1 ☞ Page 139, Section 3.4.4
*2 ☞ Page 134, Section 3.4.3, ☞ Page 139, Section 3.4.4

Remark ●

When the line connection is initiated from the partner device, neither registration, setting nor connection processing is necessary.
As shown in example of Page 149, Section 3.4.6 (3), data communication is possible if the connection in progress signal (X12) turns ON after the completion of Q series C24 modem/TA initialization.
For an example of the modem/TA program for initialization, see Page 144, Section 3.4.5.
● ●

3.4 Start-up of the Modem Function

3.4.7 Data communication and notification

This section explains the cautions for data communication with the partner device using modem function and procedures for notification to pager receivers.

(1) Requirements for data communication and notification

(a) When communicating data with external devices

Perform the appropriate processing up to line connection or modem/TA initialization, depending on whether or not the line connection is initiated from the Q series C24 side.

After line connection, data communication can be performed using an MC protocol/non procedure protocol/bidirectional protocol in full-duplex communication.

• When line connecting from the Q series C24 side

Processing up to line connection as shown in Page 148, Section 3.4.6.

• When line connecting from the external device

Processing up to the initialization of the modem/TA as shown in Page 144, Section 3.4.5.

(b) When notifying to pager receivers

Perform processing up to the initialization of the modem/TA as shown in Page 144, Section 3.4.5.[1]

[1] In notification to pager receiver, since the line connection is performed during notification processing, line connection processing is unnecessary. However, be sure to register data for connection.

(2) Buffer memory used and I/O signals

(a) When communicating data with the external device

Only buffer memory and I/O signals the user uses for data communication (MC protocol/non procedure protocol/bidirectional protocol). Communicate data using the connection in progress signal (X12)ON as the interlock signal.
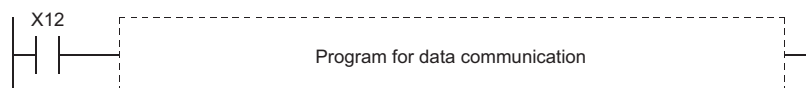
There is no I/O signal or buffer memory for modem functions used in data communication.
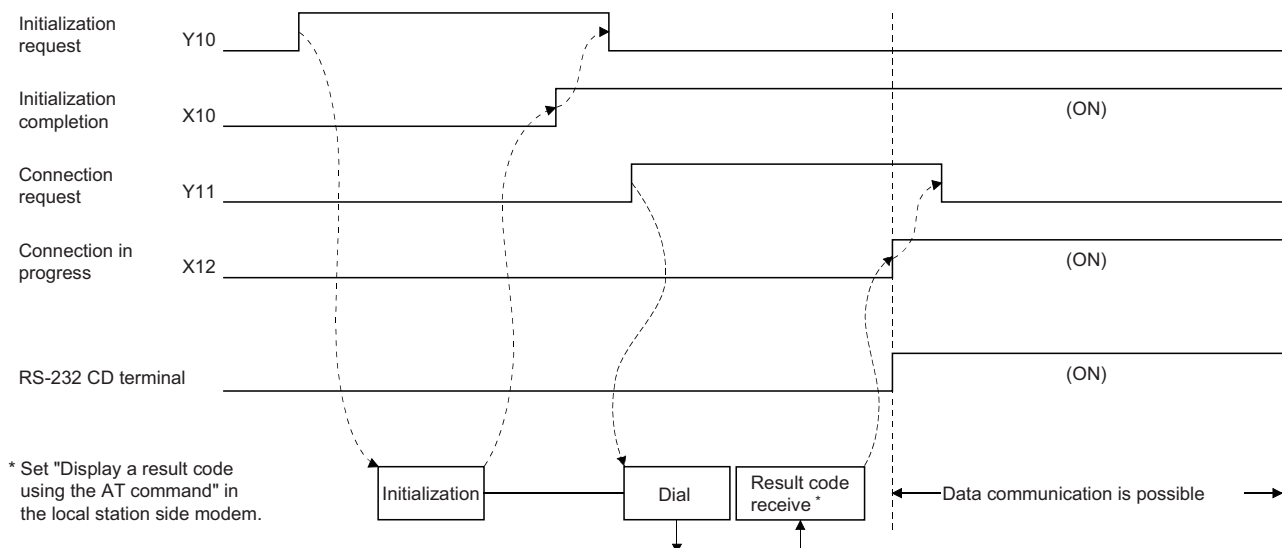
Remark •

This section explains the general procedure for non procedure protocol/bidirectional protocol (executed in full-duplex communication) data communication using the modem function between the programmable controller CPU with Q series C24 installed.

• •
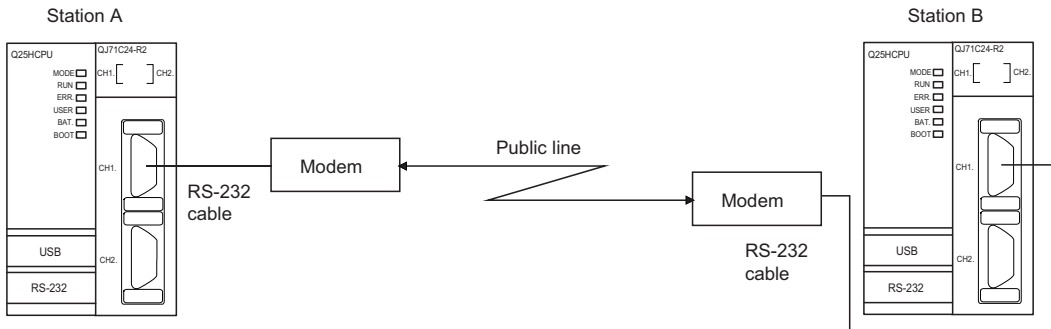
(General Procedure)

1) Perform initial setting for Q series C24 at both station A and station B.

2) Perform modem/TA initialization in station B.

3) Perform modem/TA initialization and line connection in station A.

4) Communicate data using the non procedure protocol/bidirectional protocol.

5) In order to end the communication, disconnect line from station A that initiated the line connection.

3

3.4 Start-up of the Modem Function
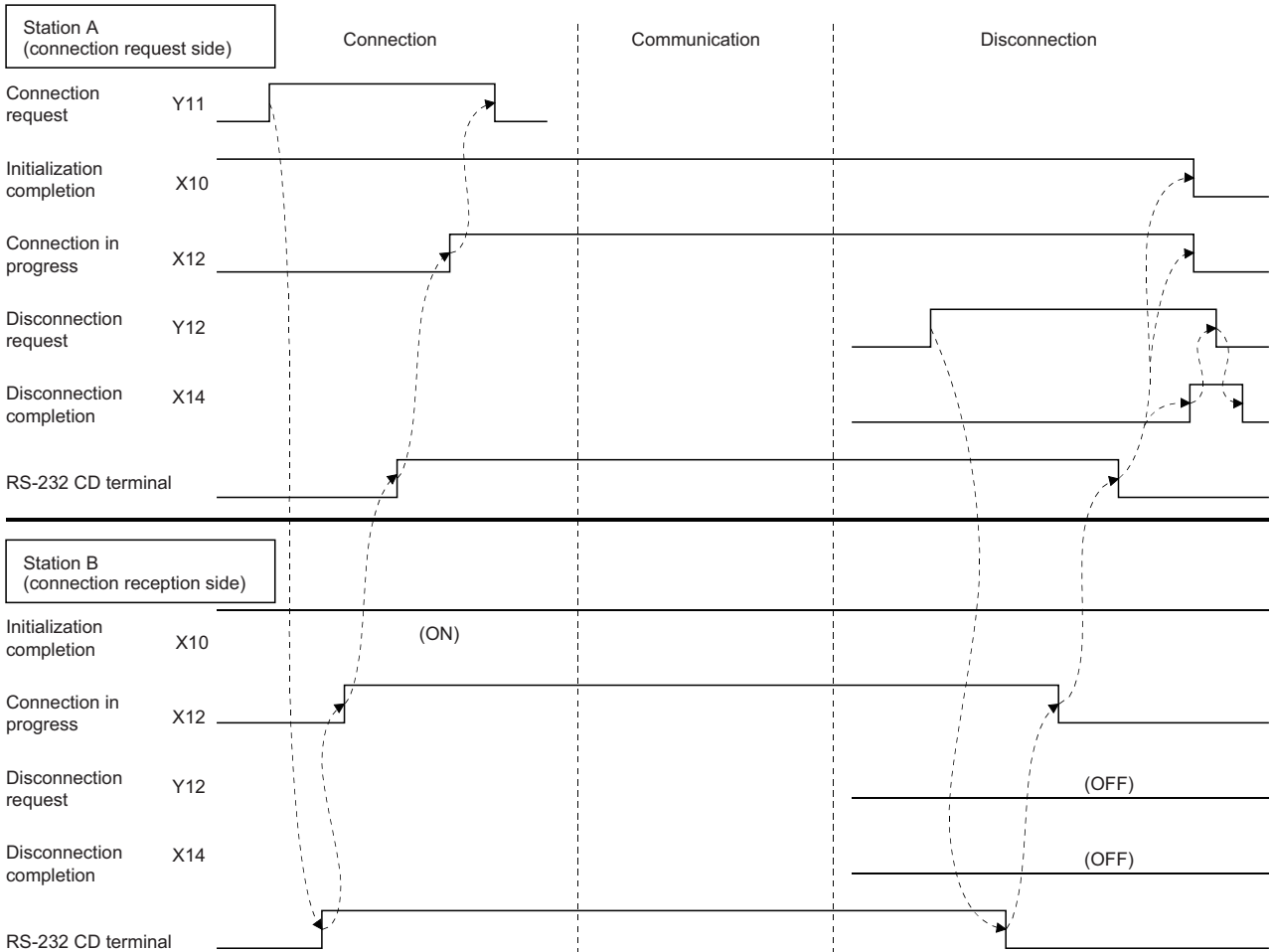
* It is possible to disconnect line from Station B, as well.

(b) When notifying to pager receiver

• Initial setting by GX Configurator-SC

Register the data number registration area for connection below in the "Modem function system setting" screen.

BB8H to BD5H (3000 to 3029): Data registered to the Flash ROM by the user

8001H to 801FH (-32767 to -32737): Data registered to the buffer memory by the user

• I/O signal

Use notification-issued request signal (Y14), notification normal complete signal (X15), notification abnormal complete signal (X16).

Ex. When normal completion

Buffer memory for Q series C24 initial setting	
Notification execution designation area (Address: 2FH (47))	0 ⟩⟨ 1

⋮

Buffer memory for notification	
Data number for connection designation area (Address: 35H (53))	0 ⟩⟨ 3000

Modem function error code storage area (Address: 221H (545))	0

Notification execution data storage area (Address: 22AH (554))	0 ⟩⟨ 3000

⋮

Initialization completion	X10	(ON)
Connection in progress	X12	
Notification normal completion	X15	
Notification abnormal completion	X16	(OFF)
Notification-issued request	Y14	
RS-232 CD terminal		(OFF)

Dial — Notification — Disconnection

Ex. When abnormal completion
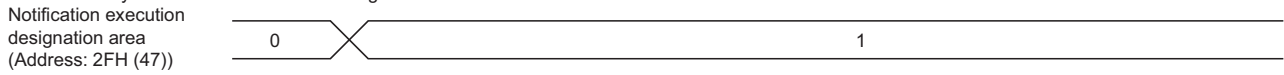
Buffer memory for Q series C24 initial setting
Notification execution
designation area
(Address: 2FH (47))

0 ⟩⟨ 1

Buffer memory for notification
Data number designation
area for connection
(Address: 35H (53))

0 ⟩⟨ 3000

Modem function error code
storage area
(Address: 221H (545))

0 ⟩⟨ (Error code)

Notification execution data
storage area
(Address: 22AH (554))

0
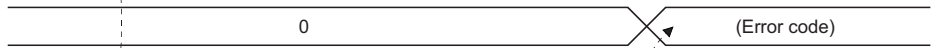
Initialization
completion   X10   (ON)

Connection in
progress   X12   (OFF)

Notification
normal completion   X15   (OFF)

Notification   X16
abnormal completion

Notification-
issued request   Y14

RS-232 CD terminal   (OFF)

| Dial | Dial | Dial | Dial | (Dialing)

Retry (In the case of three times)
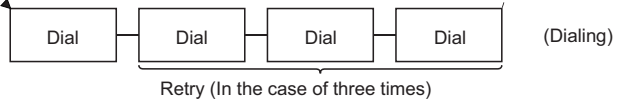
* Retry processing is conducted according to the values for the connection retry number
  to initialization/connection timeout registered in the initial setting for GX Configurator-SC.

(3) Precautions for performing data communication and notification

(a) When communicating data with the external device

- When setting the no-communication interval time to infinite wait (set value=0) in the initial setting of Q series C24, be sure to perform line disconnection after the completion of data communication.
- Only the no procedure protocol/bidirectional protocol data communication can be performed in the programmable controller CPU with Q series C24 installed.
- The Q series C24 automatically performs line disconnection processing if no data exchange is performed during the no-communication interval time. The connection in progress signal (X12) and the modem initialization completion signal (X10) turn off and the modem disconnection completion signal (X14) turns on when the line disconnection processing is performed.

(b) When notifying to pager receivers

- Turn on the notification-issued request signal (Y14) before the Q series C24 modem/TA initialization is completed.
- Notification processing is conducted when the notification-issued request signal (Y14) turns from ON to OFF after the completion of modem/TA initialization. Therefore, notification processing is conducted when the programmable controller CPU of the station with Q series C24 installed is in stop status, or the programmable controller CPU stops due to error, since the notification-issued request signal (Y14) is turned off in either case. Write the data number for connection in the initial setting for GX Configurator-SC.
- When the notification-issued request signal (Y14) is turned OFF from ON before initialization of the Q series C24 modem/TA, the processing will end abnormally.
- When the notification-issued request signal (Y14) is turned OFF from ON during initialization of the Q series C24 modem/TA, notification processing will be conducted after the completion of the modem/TA initialization.
- Notification processing is completed in the order of line connection, message transmission, and line disconnection from Q series C24 for the transmission station of the radio wave to the notification destination. Therefore, even if the power to the notification destination equipment is off, the notification processing will end normally as long as the above processing is completed.
- When the notification-issued request signal (Y14=ON) is turned ON before notification processing is complete, some messages may not be sent.

Point

Turn on the notification-issued request signal (Y14) before the initialization processing of the Q series C24 modem/TA is completed, and turn it off after the initialization complete signal (X10) is turned ON (notification request).

(4) Program for notification example

An example of program for notification is shown below.[1]

*1   When the initialization and connection data have been registered from GX Configurator-SC or from the programmable controller CPU

X10: Initialization complete signal
X1E: Ready signal
X1F: WDT error signal
M0: Accessible flag
M2: Data registration complete flag for connection[2]
M3: Initialization complete flag
M40: Notification enable flag


```
X1E   X1F                                                              (M0      )   Turns the ready flag ON
 │├─────┤/├──────────────────────────────────────────────────────────
 
 M0    M2    M3    X10   X12   X13   Y11                               (M40     )   Turns the notification enable
 │├────┤├────┤├────┤├────┤/├───┤/├───┤/├─────────────────────────────               flag ON

        ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
        │         • Data for initialization registration          │                *3
        │         • Data for connection registration              │
        └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘

 M40                                                          [PLS   M68 ]
 │├─────────────────────────────────────────────────────────

 M68                                                          [SET   Y14 ]   Sets the notification-issued
 │├─────────────────────────────────────────────────────────               request signal

        ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
        │                • Modem/TA initialization                │                *4
        └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘

 X22                                                          [PLS   M61 ]   Notification command
 │├─────────────────────────────────────────────────────────

 M61   M40                                                    [RST   Y14 ]   Resets the notification-issued
 │├────┤├─────────────────────────────────────────────────                 request signal (notification-issued)
       │                                                      [SET   M69 ]   Sets the notification-issued
       │                                                                     request flag
 Y14   X15                                                    [SET   M6  ]   Sets the flag at notification
 │/├───┤├─────────────────────────────────────────────────                 normal completion
       │                                                      [SET   Y14 ]
       │
       │ X16   M0
       ├─┤├────┤├────────────────────[FROMP   H0    H221   D102   K1  ]   Reads the error code at
       │                                                                     notification completion
       │                                                      [SET   Y14 ]

 X27                                                          [RST   M6  ]   Resets the flag with the clear
 │├────────────────────────────────────────────────────────                command
       │                                                      [RST   M69 ]
```

*2   Page 139, Section 3.4.4
*3   Page 134, Section 3.4.3, Page 139, Section 3.4.4
*4   Page 144, Section 3.4.5

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3.4.8 Line disconnection

This section explains the line disconnection upon communication completion when communicating data with the external device using the modem functions.

In case of notification to pager receivers, since the line will be disconnected at the end of the notification processing, the disconnection processing such as I/O signal disconnection request (Y12) is unnecessary.

(1) I/O signal used

Uses modem disconnection request signal (Y12) and modem disconnection completion signal (X14).
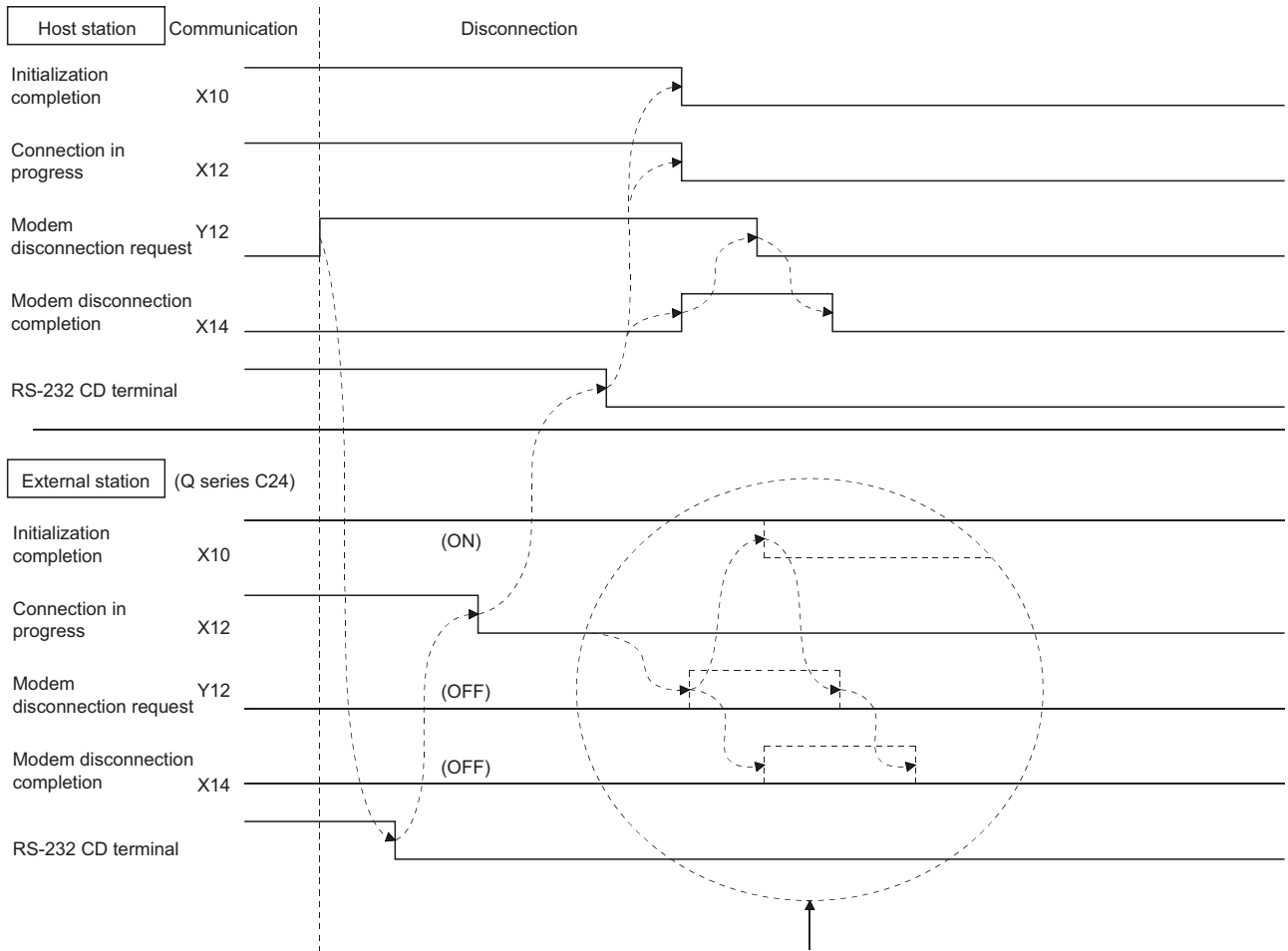
This is the procedure to take in order to turn off the initialization complete signal (X10).

* In the case of Q series C24, when the line is disconnected from the external device, the initialization complete signal (X10) at the local station is not turned OFF.

3.4 Start-up of the Modem Function

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Point

● Line disconnection processing can be conducted from either device as long as the connection is in progress.

● The line disconnection processing disconnects the line connection with the external device as well as the connection with the Q series C24 modem.

● Even when an error occurs during the line disconnection, the disconnection processing will be forced.

● If data communication is to be resumed after line disconnection, either one of the following processing will be initiated depending on the initialization complete signal (X10).
  • If the initialization complete signal is OFF: Start from the initialization of the modem/TA.
  • If the initialization complete signal is ON: Start from the line connection with the external device.

Remark •

There is no buffer memory for line disconnection processing.

• •

(2) Precautions during the line disconnection

• Prior to data communication with external devices, determine when and which station will perform the line connection (dialing) and line disconnection processing to the external device.

• If the line is disconnected during data transmission, transmission processing will be performed depending on the signal status of the Q series C24 RS-232 interface.

• If the line is disconnected during data reception, data reception will be disabled. This may cause an error occurrence such as a reception time out.

• If the data communication is not performed during the designated noncommunication interval time, the Q series C24 automatically disconnects line. When the line is disconnected, the connection in progress signal (X12) and the modem initialization completion signal (X10) turn off and the modem disconnection completion signal (X14) turns on. To turn off the modem disconnection completion signal (X14), turn on the modem disconnection request signal (Y12) and keep it for a second after the modem disconnection completion signal (X14) turns on.

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(3) Program example for line disconnection

A program example for line disconnection is shown below.

X0: Normal transmission completion signal
X1: Abnormal transmission completion signal
X3: Reception data read request signal
X4: Abnormal reception detection signal
X10: Initialization complete signal
X12: Connection signal
X1E: Ready signal
X1F: WDT error signal

Y0: Transmission request signal
Y1: Reception data read complete signal
M0: Accessible flag
M50: Data communication enable flag
M70: Line disconnection enable flag
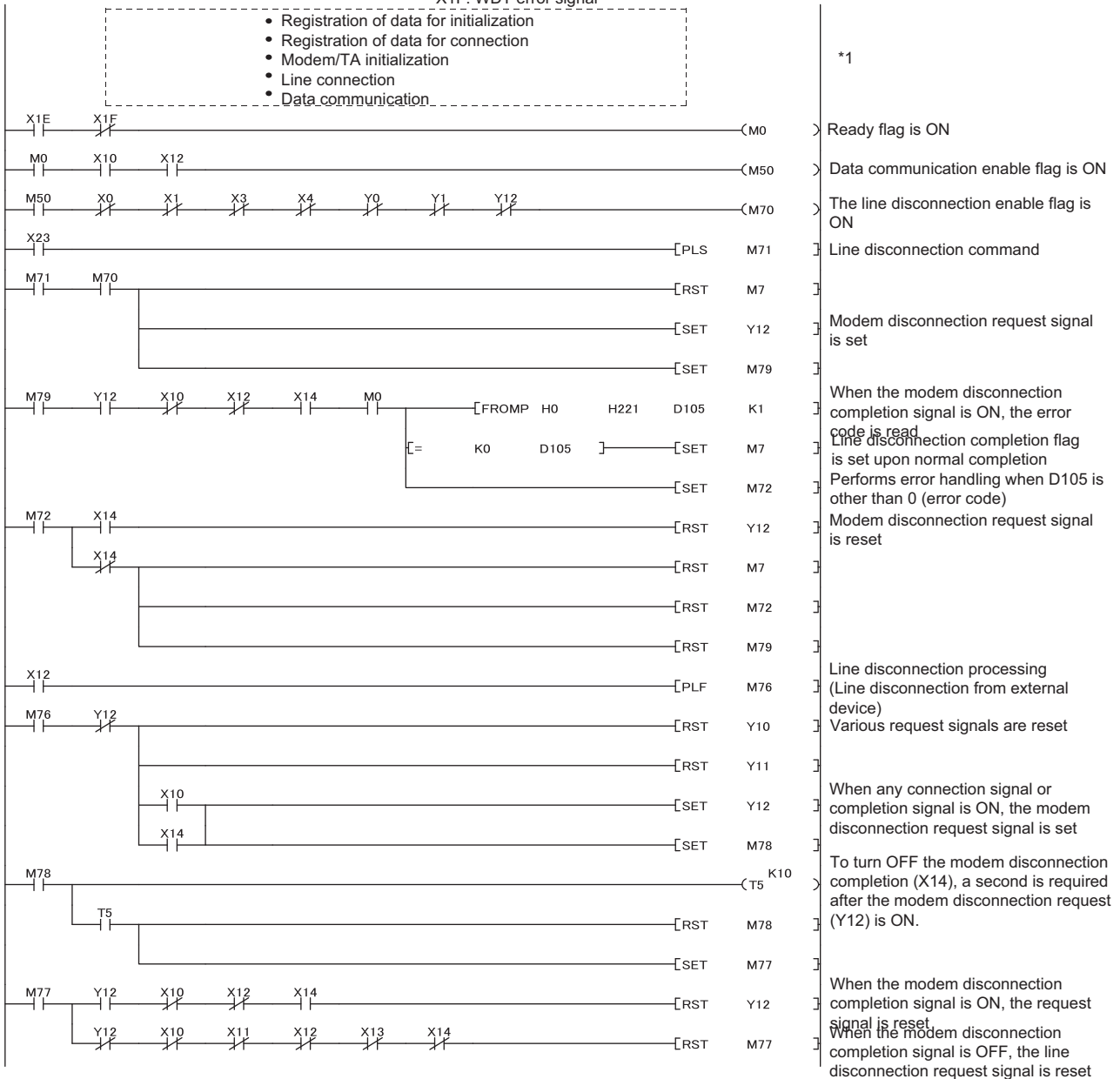
*1   ☞ Page 134, Section 3.4.3, ☞ Page 139, Section 3.4.4, ☞ Page 144, Section 3.4.5, ☞ Page 148, Section 3.4.6, ☞ Page 154, Section 3.4.7

3

3.4 Start-up of the Modem Function

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3.5 Sample Programs

This section shows sample programs to test the connection with the remote station's programmable controller CPU to which Q series C24 is installed.

Each program contains a minimum set of processing necessary for performing a exchange test.
Modify the data for initialization and data for connection to match each system environment. When adding error-handling procedures, add them separately by seeing the explanation in this chapter.

The uses of major devices that are used in these sample programs are listed below.

Application of device (comment list)					
Device	**Application**	**Device**	**Application**	**Device**	**Application**
X3	Reception data read request	Y64	Line connection completion	M100	Initialization request execution
X4	Reception abnormal detection	Y66	Notification completion	M101	Connection request execution Notification execution
X10	Initialization completion	Y67	Line disconnection completion	M102	Transmission execution in progress
X11	Dial in progress	—	—	M103	Reception data read execution in progress
X12	Connection in progress	M0	Q series C24 accessible	—	—
X13	Initialization/connection abnormal completion	M1	Initialization data registration completion	SM400	Always ON
X14	Modem disconnection completion	M2	Data registration completion for connection	—	—
X15	Notification normal completion	M3	Initialization completion	D0	Number of registration data bytes
X16	Notification abnormal completion	M4	Line connection completion	D1	Control number designation Receiver designation
X1E	Q series C24 ready	M6	Notification completion	D2	Initialization command/telephone number
X1F	WDT error	M7	Line disconnection completion	D11	External line dialing number, etc.
X20	Initialization command	M10	Convert the registration command into pulse	D12	Line type, etc.
X21	Line connection command	M20	Convert the registration command into pulse	D23	Wait time for message transmission
X22	Data communication command	M30	Initialization enabled	D24	Message
X23	Line disconnection command	M31	Convert the initialization command into pulse	D39	Message length
X24	Notification command	M40	Connectable	D50	Number of transmission data
—	—	M41	Convert the connection command into pulse	D51	Transmission data
Y10	Initialization request	M50	Data communication enabled	D60	Number of reception data
Y11	Connection request	M51	Transmission enabled	D61	Reception data
Y12	Modem disconnection request	M52	Convert the transmission command into pulse	D100	Initialization error code
Y14	Notification-issued request	M60	Convert the notification command into pulse	D101	Line connection error code
Y60	Q series C24 accessible	M70	Line disconnection enabled	D102	Notification error code
Y61	Initialization data registration completion	M71	Convert the line disconnection command into pulse	D103	Data transmission error code
Y62	Data registration completion for connection	M80	Line disconnection (request) occurrence	D104	Data reception error code
Y63	Initialization completion	M91	Reception processing in progress flag	D105	Line disconnection error code
—	—	M92	Transmission processing in progress flag	—	—

3.5.1 Sample program for data communication-1

(1) Sample program system configuration

The configuration of a system using this sample program is shown below.
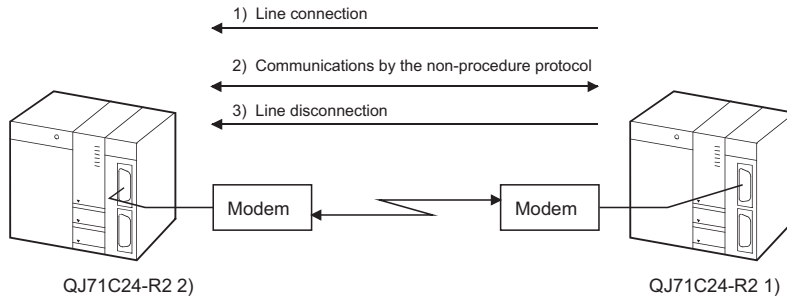
(2) Connection request station side (QJ71C24-R2 1)) sample program

The modem connected to the CH1 side interface is initialized, the line is connected, data are transmitted by the non-procedure protocol and the line is disconnected through commands from the user.

Perform the following settings before running this program.

(a) GX Developer switch settings (☞ Page 131, Section 3.4.2)

Switch No.	Setting value
Switch 1	07E2
Switch 2	0006
Switch 5	0000

(b) Settings by GX Configurator-SC (☞ Page 131, Section 3.4.2)

Perform the following settings in each setting screen.

Use the default settings in screens and setting items other than those listed below.

• Modem function system settings

"Modem function system setting" screen setting items	Setting value
Modem connection channel designation	1CH
Data No. for initialization designation	07D5
Data No. for connection designation	0BB8

• Modem connection data registration

"Data for modem connection" screen setting item		Setting value
Data for modem connection 1 (H0BB8)	Telephone number[1]	0123456789

[1] Specify the external party's telephone No.

<Status confirmation>

```
     X1E    X1F
     ─┤├────┤/├──────────────────────────────────────────────( M0 )    Access possible

     M0     X10    X12    X13    Y10    Y11
     ─┤├────┤├────┤/├────┤/├────┤/├────┤/├────────────────────( M40 )   Modem initialization, line connection
                                                                         possible
            X10    X12
            ─┤├────┤├──────────────────────────────────────────( M50 )   Data communications possible

     M50    M92
     ─┤├────┤/├──────────────────────────────────────────────( M51 )   Data transmission possible

            X3     X4     Y12    M92    M93
            ─┤/├───┤/├───┤/├────┤/├────┤/├─────────────────────( M70 )   Line disconnect possible
```

<Modem initialization, line connection processing>

```
     X21
     ─┤├──────────────────────────────────────────────[PLS   M41  ]   Conversion of modem initialization,
                                                                       line connection commands to pulses

     M41    M40
     ─┤├────┤├────────────────────────────────────────[SET   M42  ]

     M42
     ─┤├──────────────────────────────────────────────[CALL  P4   ]   Modem initialization, line connection
                                                                       processing to sub routine
```

<Data transmission processing (non procedure protocol)>

```
     X22
     ─┤├──────────────────────────────────────────────[PLS   M52  ]   Conversion of data communications
                                                                       (transmission) commands to pulses

     M52    M51
     ─┤├────┤├────────────────────────────────────────[SET   M53  ]

     M53
     ─┤├──────────────────────────────────────────────[CALL  P51  ]   To the data transmission processing
                                                                       sub routine
```

<Data reception processing (non procedure protocol)>

```
     X3
     ─┤├──┐
          │
     X4   │
     ─┤├──┴────────────────────────────────────────────[SET   M55  ]   Setting of the receive data reading
                                                                        request

     M55
     ─┤├──────────────────────────────────────────────[CALL  P52  ]   To the data reception processing rub
                                                                       routine
```

<Line disconnect processing>

```
     X23
     ─┤├──────────────────────────────────────────────[PLS   M71  ]   Conversion of line disconnect
                                                                       commands to pulses
     X12
     ─┤├──────────────────────────────────────────────[PLF   M80  ]   Conversion of turning connected
                                                                       signals OFF to pulses
     M71    M70
     ─┤├────┤├──┐
               │
     M80        │
     ─┤├────────┴──────────────────────────────────────[SET   M72  ]

     M72
     ─┤├──────────────────────────────────────────────[CALL  P7   ]   To the line disconnect processing sub
                                                                       routine

     ──────────────────────────────────────────────────[FEND      ]
```

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[Modem initialization, line connection processing]

P4　M41
├─┤├───[SET　　Y11　]　Set the connection request signal

Y11　X10　X12
├─┤├──┤/├──┤├─────────────────────────────────────[RST　　Y11　]　With the initialization completed signal ON
　　　　│X13　│　　　　　　　　　　　　　　　　　　　　　　and the connected signal ON, reset
　　　　├─┤├──┘　　　　　　　　　　　　　　　　　　　　　　the request signal
　　　　　　　　　　　　　　　　　　　　　　　　　　　[RST　　M42　]　With the initialization/connection
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　abnormally completed signal ON,
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　read the error code and reset
Y11　X13　　　　　　　　　　　　　　　　　　　　　　　　　　　the request signal
├─┤├──┤├──────────────────────[FROMP　H0　　H221　D101　K1　]

　　　　　　　　　　　　　　　　　　　　　　　　　　　[RET　]

[Data transmission processing]

P51　M52
├─┤├───────────────────────────────[$MOV　"NO1 TO NO2"　D51　]　Set the transmission data

　　　　　　　　　　　　　　　　　　　　　[MOV　　H0A0D　D56　]

　　　　　　　　　　　　　　　　　　　　　[MOV　　K1　　D150　]　Set the transmission channel on CH1

　　　　　　　　　　　　　　　　　　　　　[MOV　　K0　　D151　]

　　　　　　　　　　　　　　　　　　　　　[MOV　　K6　　D152　]　Set the transmission data count

　　　　　　　　　　　　[G.OUTPUT　　U0　　D150　D51　M150　]　Execute the transmission request

　　　　　　　　　　　　　　　　　　　　　　　　　[SET　　M92　]

M150　M151
├─┤├──┤/├──────────────────────────────────────[INC　　C50　]　Transmission normally completed

　　　M151
　　├─┤├──────────────────────────────────────[INC　　C51　]　Transmission abnormally completed

　　　　　　　　　　　　　　　　　　　　　　　　　[RST　　M92　]

　　　　　　　　　　　　　　　　　　　　　　　　　[RST　　M53　]

　　　　　　　　　　　　　　　　　　　　　　　　　[RET　]

[Data reception processing]

P52　M55
├─┤├───────────────────────────────────[MOVP　　K1　　D160　]　Set the data reception channel on CH1

　　　　　　　　　　　　　　　　　　　　[FMOVP　K0　　D161　K2　]

　　　　　　　　　　　　　　　　　　　　　[MOVP　　K10　D163　]

　　　　　　　　　　　　　　[G.INPUT　U0　　D160　D61　M160　]　Execute reading of receive data

　　　　　　　　　　　　　　　　　　　　　　　　　[SET　　M93　]

M160　M161
├─┤├──┤/├──────────────────────────────────────[INC　　C60　]　Reading of receive data normally
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　completed
　　　M161
　　├─┤├──────────────────────────────────────[INC　　C61　]　Reading of receive data abnormally
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　completed
　　　　　　　　　　　　　　　　　　　　　　　　　[RST　　M93　]

　　　　　　　　　　　　　　　　　　　　　　　　　[RST　　M55　]

　　　　　　　　　　　　　　　　　　　　　　　　　[RET　]

3.5 Sample Programs

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[Line disconnection processing]

```
P7  M72
    ─┤├──────────────────────────────────────────────────────[PLS    M74    ]

    M74
    ─┤├──────────────────────────────────────────────────────[SET    Y12    ]   Modem disconnection request signal is set

    Y12   X10   X12   X14
    ─┤├───┤/├───┤/├───┤├────────────────[FROMP   H0    H221   D105   K1  ]   When the modem disconnection completion
                                                                             signal is ON, the error code is read
                            └──────────────────────────────[SET    M73    ]   When the normal completion signal is ON,
                                                                             the line disconnection completion flag is set
    M73   X14
    ─┤├───┤├──────────────────────────────────────────────[RST    Y12    ]   Modem disconnection request signal is reset

          X14
          ┤/├──────────────────────────────────────────────[RST    M73    ]

                └──────────────────────────────────────────[RST    M72    ]

    ─────────────────────────────────────────────────────────[RET    ]

    ─────────────────────────────────────────────────────────[END    ]
```

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(3) Sample program for a connection receiving station side (QJ71C24-R2 2))

After the connection in progress signal (x12) = ON, data communications are carried out by the non procedure protocol through a command from the user.

Perform the following settings before running this program.

(a) GX Developer switch settings (☞ Page 131, Section 3.4.2)

Switch No.	Setting value
Switch 1	07E2
Switch 2	0006
Switch 5	0000

(b) Settings by GX Configurator-SC (☞ Page 131, Section 3.4.2)

Perform the following settings in each setting screen.

Use the default settings in screens and setting items other than those listed below.

• Modem function system settings

"Modem function system setting" screen setting items	Setting value
Modem connection channel designation	1CH
Data No. for initialization designation	07D5
Auto modem initialization designation	Auto initialize

\<Status confirmation\>

```
      X1E    X1F
   ───┤├─────┤/├────────────────────────────────────────────────(M0  )──  Access possible

      M0     X10    X12    M92
   ───┤├─────┤├─────┤├─────┤/├──────────────────────────────────(M51 )──  Data transmission possible
```

\<Data transmission processing (non procedure protocol)\>

```
      X22
   ───┤├──────────────────────────────────────────────[PLS    M52  ]

      M52    M51
   ───┤├─────┤├──────────┬──────────────────[$MOV    "NO2 TO NO1"  D51  ]   Set the transmission data
                         │
                         ├──────────────────[MOV     H0A0D   D56  ]
                         │
                         ├──────────────────[MOV     K1      D150 ]   Set the transmission channel
                         │                                            on CH1
                         ├──────────────────[MOV     K0      D151 ]
                         │
                         ├──────────────────[MOV     K6      D152 ]   Set the transmission data count
                         │
                         ├──────[G. OUTPUT       U0      D150    D51    M150 ]   Execute transmission request
                         │
                         └──────────────────────────────[SET    M92  ]

      M150   M151
   ───┤├─────┤/├──────────────────────────────────────[INC    C50  ]   Transmission normally completed

             M151
          ───┤├─────────────────────────────────────────[INC    C51  ]   Transmission abnormally completed

          ─────────────────────────────────────────────[RST    M92  ]
```

\<Data reception processing (non procedure protocol)\>

```
      X3
   ───┤├──────────────────────────────────────────────[MOVP   K1      D160 ]   Set the data reception channel
                                                                                on CH1
      X4
   ───┤├─────────────────────────────────────[FMOVP   K0      D161    K2   ]

          ────────────────────────────────────────────[MOVP   K10     D163 ]

          ──────────────────────[G. INPUT    U0      D160    D61    M160 ]   Execute reading of receive data

      M160   M161
   ───┤├─────┤/├──────────────────────────────────────[INC    C60  ]   Reading of receive data normally
                                                                        completed
             M161
          ───┤├─────────────────────────────────────────[INC    C61  ]   Reading of receive data abnormally
                                                                          completed
```

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3.5.2 Sample program for data communication-2

(1) Sample program on the connection request station side

Initialization for the modem connected to CH1 interface, line connection, data communication by the non procedure protocol and line disconnection are executed by commands from the user.

Before executing this program, perform the following settings (changing the default values) on the GX Configurator-SC's "Modem function system setting/registration" screen and register them in the Q series C24. (Settings other than the items shown below are not required.)

Settings on the GX Configurator-SC's "Modem function system setting" screen

Setting item	Setting value
Modem connection channel designation	CH1
No-communication interval time designation	2 (min)
Data No. for initialization designation	8001H
Data No. for connection designation	8002H

Remark ●

Registration of the modem's initialization data and line connection data, modem initialization, line connection, data communications by the non procedure protocol and line disconnection are all performed by the sequence program.

● ●

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3.5 Sample Programs

Ladder program

```
X1E   X1F
─┤├───┤/├──────────────────────────────────────────────────( M0 )   Accessible flag is turned ON

M0    M1    M3    X10   X12   X13   Y10
─┤├──┬─┤├──┤/├──┤/├──┤/├──┤/├──┤/├────────────────────────( M30 )   Modem initialization enabled flag is turned ON
     │ M2   M3    M4    X10   X12   Y11
     ├─┤├──┤├──┤/├──┤/├──┤/├──┤/├──────────────────────────( M40 )   Line connectable flag with the remote station is turned ON
     │      M4    X10   X12
     └──────┤├──┤/├──┤/├────────────────────────────────────( M50 )   Exchangeable flag with the partner station is turned ON

M50   X0    X1    Y0
─┤├──┤/├──┤/├──┤/├─────────────────────────────────────────( M51 )   Data transmission enabled flag to the partner station turned ON
      X3    X4    Y0    Y1    Y12
     ┤/├──┤/├──┤/├──┤/├──┤/├──────────────────────────────( M70 )   Line disconnection enabled flag with the partner station is turned ON

M1
─┤├────────────────────────────────────────────────[CALL  P1  ]   To the data registration processing for initialization subroutine

M1    M2
─┤├──┤/├───────────────────────────────────────────[CALL  P2  ]   To the data registration processing for connection subroutine

X20
─┤├────────────────────────────────────────────────[PLS   M31 ]   Convert the initialization command into pulse

M31   M30
─┤├──┤├──┬─────────────────────────────────[MOV  K0   K1M3]   Various complete flags after the modem initialization processing is reset
         ├─────────────────────────────────────────[RST   M7  ]
         └─────────────────────────────────────────[SET   M32 ]

M32
─┤├────────────────────────────────────────────────[CALL  P3  ]   To the modem initialization processing subroutine

X21
─┤├────────────────────────────────────────────────[PLS   M41 ]   Convert the line connection command into pulse

M41   M40
─┤├──┤├──┬─────────────────────────────────[MOV  K0   K1M4]   Various complete flags after the line connection processing is reset
         └─────────────────────────────────────────[SET   M42 ]

M42
─┤├────────────────────────────────────────────────[CALL  P4  ]   To the line connection processing subroutine

X22
─┤├────────────────────────────────────────────────[PLS   M52 ]   Convert the data communication (transmission) command into pulse

M52   M51
─┤├──┤├─────────────────────────────────────────────[SET   M53 ]

M53
─┤├────────────────────────────────────────────────[CALL  P51 ]   To the data transmission processing subroutine

X3
─┤├──┬──────────────────────────────────────────────[PLS   M55 ]   Convert the reception data read request into pulse
X4   │
─┤├──┘

M55
─┤├────────────────────────────────────────────────[SET   M56 ]

M56   M0
─┤├──┤├─────────────────────────────────────────────[CALL  P52 ]   To the reception data read processing subroutine

X23
─┤├────────────────────────────────────────────────[PLS   M71 ]   Convert the line disconnection command into pulse
                                                                   (Line disconnection from local station)
M71   M70
─┤├──┤├──┬─────────────────────────────────────────[RST   M7  ]   Line disconnection complete flag is reset
         └─────────────────────────────────────────[SET   M72 ]

M72
─┤├────────────────────────────────────────────────[CALL  P7  ]   To the line disconnection processing subroutine

X12
─┤├────────────────────────────────────────────────[PLF   M80 ]   Convert the connection in progress signal OFF into pulse
                                                                   (Line disconnection from partner side)
```

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```
      X27
   ─┤↑├────────────────────────────────────[PLS    M81  ]   Convert the reset command of various
                                                            request signal into pulse
      M80
   ─┤ ├──┬─────────────────────────────────[SET    M82  ]
      M81 │
   ─┤ ├──┘

      M82
   ─┤ ├────────────────────────────────────[CALL   P8   ]   To the various request signal and
                                                            the complete signal OFF subroutine
      SM400
   ─┤ ├──────────────────────────────[MOV   K2M0   K2Y80 ]  Output the various complete flag status
                                                            (LED display)

   ────────────────────────────────────────[FEND        ]

P1    M1
   ─┤/├──────────────────────────────[MOV   K30    D0    ]  Data registration processing for initialization
                                                            subroutine
                                                            • Set the number of bytes of
                                                              the registration data
                                      [MOV   K1     D1    ]  • Set the user control data (control number)

                               [$MOV   "ATE1Q0V1&C1&D2&H"   D2   ]  • Set the initialization command

                                   [$MOV   "1&I0&R2&S0S0=1"   D10   ]

      M0
   ─┤ ├──┬──────────────────[TO   H0   H1B00   D0   K17   ]  • Write the data for initialization
         │                                                     (Data  No. 8001H)
         │                                                     (Registration to buffer memory)
         └──────────────────────────────────[SET    M1   ]  • Data registration complete flag
                                                              for initialization is set

   ────────────────────────────────────────[RET         ]

P2    M2
   ─┤/├──────────────────────────────[MOV   K80    D0    ]  Data registration processing for connection
                                                            subroutine
                                                            • Set the number of bytes of
                                                              the registration data
                            [FMOV   K0     D1     K40     ]  • Clear the data storage device
                                                              for connection

                                      [MOV   K0     D1    ]  • Set the pager receiver designation
                                                              (Notification is not executed)

                                  [$MOV   "052nnnnnnn"   D2   ]  • Set the telephone number

                                  [$MOV   "         "    D7   ]  • Set the space to the remainder of
                                                                  the telephone number designation area

                                      [MOV   H0     D11   ]  • Set the external line dialing number (0)

                                      [MOV   K1     D12   ]  • Set the line type (tone)

      M0
   ─┤ ├──┬──────────────────[TO   H0   H1B29   D0   K41   ]  • Write the data for connection
         │                                                     (Data No.8002H)
         │                                                     (Registration to buffer memory)
         └──────────────────────────────────[SET    M2   ]  • Data registration complete flag
                                                              for connection set

   ────────────────────────────────────────[RET         ]

P3    M31
   ─┤ ├──┬───────────────────────────────────[SET    Y10  ]  Modem initialization processing subroutine
         │                                                     • Set the initialization request signal
         └───────────────────────────────────[SET    M100 ]  • Initialization request execution flag is set

      Y10   X10
   ─┤ ├──┤ ├────────────────────────────────[SET    M3   ]  • When the initialization complete
         │                                                     signal ON, the initialization complete flag
         │ X13   M0                                            is set and the request signal is reset
         └─┤ ├──┤ ├──────────[FROMP   H0   H221   D100   K1 ]  • When the initialization/connection
                                                                abnormal complete signal ON,
      Y10   X10                                                the error code is read and the request
   ─┤ ├──┤ ├──┬───────────────────────────────[RST    Y10  ]  signal is reset
         │    │
         │ X13 │
         └─┤ ├─┴───────────────────────────────[RST    M32 ]

   ────────────────────────────────────────[RET         ]
```

Ladder diagram:

P4 — Line connection processing subroutine

```
P4  M41  M40                                              [SET   Y11 ]   • Connection request signal is set
    ─┤├──┤├─                                              [SET   M101]   • Connection request execution flag is set
    Y11  X12                                              [SET   M4  ]   • When the connection in progress
    ─┤├──┤├─                                                               signal ON, the connection complete flag
         X13  M0                                                           is set and the request signal is reset
         ─┤├──┤├──────────────────[FROMP  H0   H221  D101  K1 ]          • When the initialization/connection
    Y11  X12                                              [RST   Y11 ]     abnormal complete signal ON, the error
    ─┤├──┤├─                                                               code is read and request signal is reset
         X13                                               [RST   M42 ]
         ─┤├─
                                                          [RET      ]
```

P51 — Data communication processing subroutine (Non procedure protocol, transmission)

```
P51 M52  M92                              [$MOV  "NO1 TO NO2"  D51 ]   • Set the transmission data
    ─┤├──┤/├─                             [MOV   H0A0D         D56 ]
                                          [MOV   K1            D150]   • Sets the transmission channel to CH1
                                          [MOV   K0            D151]
                                          [MOV   K6            D152]   • Set the number of transmission data
                                          [SET                 M92 ]   • Sets the transmitting flag
    M92  M0                   [GP.OUTPUT  U0   D150   D51   M150]      • Executes the transmission request
    ─┤├──┤├─                                            [SET   M102]   • Transmission request execution flag is
                                                                         set
    M150 M151                                            [SET   M155]  • Transmission normal completion
    ─┤├──┤/├─                                            [RST   M156]
         M151                                            [SET   M156]  • Transmission abnormal completion
         ─┤├─                                            [RST   M155]
                                                         [RST   M92 ]
                                                         [RST   M53 ]
                                                         [RET      ]
```

P52 — Data reception processing subroutine

```
P52 M55  M91                                   [MOV   K1    D160]   • Sets the data reception channel to CH1
    ─┤├──┤/├─
    M91  M55                          [FMOV  K0    D161   K2  ]
    ─┤/├──┤├─
                                      [MOV   K10          D163]
                                                  [SET   M91 ]      • Reception data read execution flag is
                                                                      set
    M91  M0                 [G.INPUT  U0   D160   D61   M160]       • Executes the reception data reading
    ─┤├──┤├─                                      [SET   M103]
```

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Ladder element	Comment
M160 M161 —[SET M165]	·Received data read normally completed
—[RST M166]	
M161 —[SET M166]	·Received data read abnormally completed
—[RST M165]	
—[RST M91]	
—[RST M56]	
—[RET]	

P7 M71 —[SET Y12] · Line disconnection processing subroutine (Line disconnection from local station) — Modem disconnection request signal is set

Y12 X10 X12 X14 M0 —[FROMP H0 H221 D105 K1] ·When the modem disconnection completion signal is ON, the error code is read

[= K0 D105]—[SET M7] ·When the normal completion signal is ON, the line disconnection completion flag is set

—[SET M73]

M73 X14 —[RST Y12] ·Modem disconnection request signal is reset

X14 —[RST M7]

—[RST M73]

—[RST M72]

—[RET]

P8 M80 Y12 —[RST Y10] Subroutine resetting various request signals and completion signals ·Various request signals are reset

M81 —[RST Y11]

X10 —[SET Y12] ·When any completion signal is ON, the modem disconnection request signal is set

X14 —[SET M84]

M84 —(T5 K10) ·To turn OFF the modem disconnection completion signal, a second is required after the modem disconnection request signal is ON.

T5 —[RST M84]

—[SET M83]

M83 Y12 X10 X12 X14 —[RST Y12] ·When the initialization complete signal is OFF and the modem disconnection completion signal is ON, the request signal is reset

Y12 X10 X11 X12 X13 X14 —[MOV K0 K1M3] ·When the related signals are OFF, the flag is reset

—[RST M7]

—[RST M32]

—[RST M42]

—[RST M72]

—[MOV K0 K1M100]

—[RST M83]

—[RST M82]

—[RET]

—[END]

3.5 Sample Programs

(2) Sample program on the connection reception station side

The modem initialization and data communication by the non procedure protocol are executed by commands from the user.

Before executing this program, perform the following settings (changing the default values) on the GX Configurator-SC's "Modem function system setting" screen and register them in the Q series C24.
(Settings other than the items shown below are not required.)

Settings on the GX Configurator-SC's "Modem function system setting/registration" screen

Setting item	Setting value
Modem connection channel designation	CH1
No-communication interval time designation	2 (min)
Data No. for initialization designation	8001H

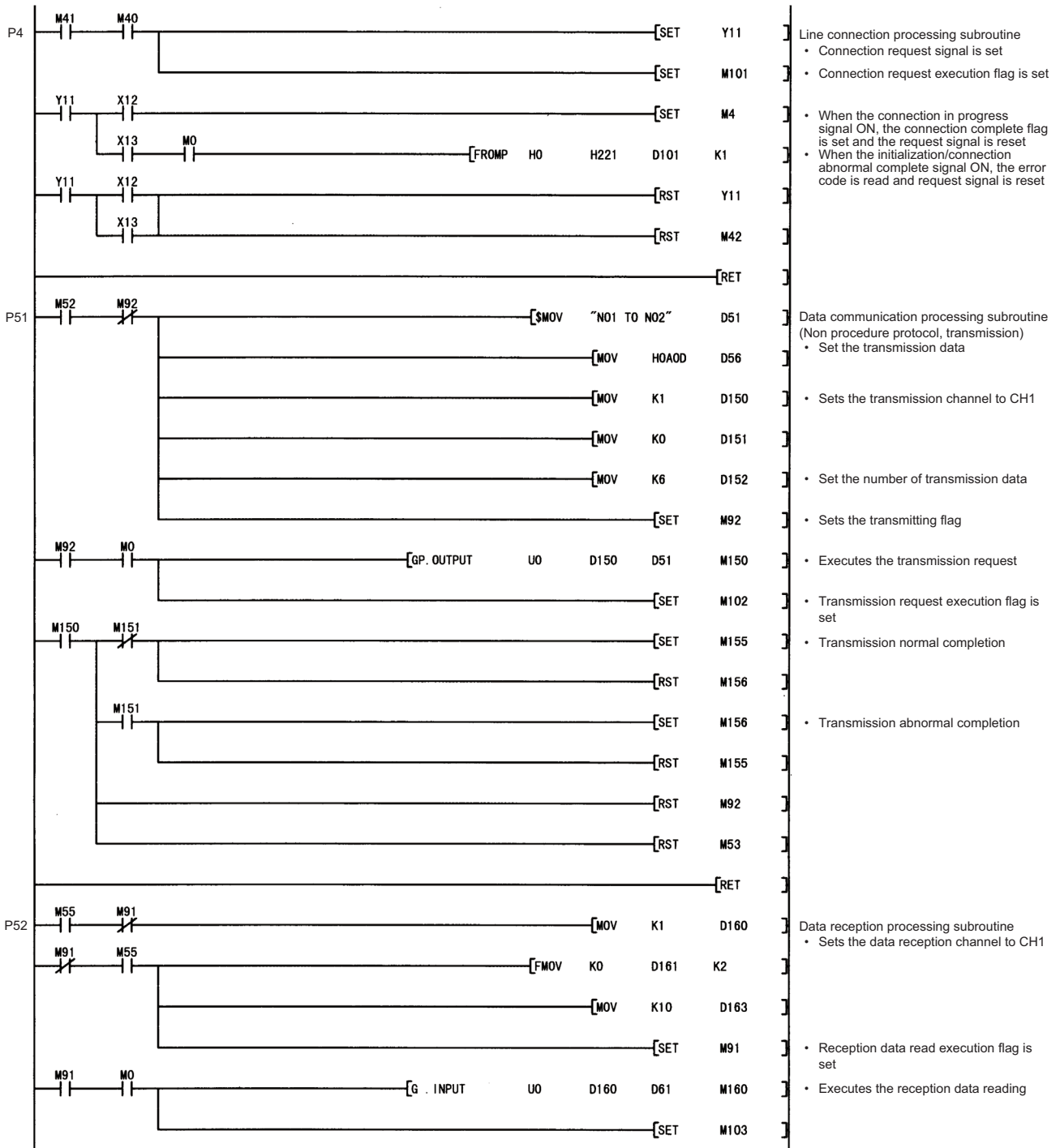| Ladder	Description
`X1E X1F ─┤├──┤/├───────────(M0 )`	Accessible flag is turned ON
`M0 M1 M3 X10 X12 X13 Y10 ─┤├─┬─┤├─┤/├─┤/├─┤/├─┤/├─┤/├──(M30 )`	Modem initialization enabled flag is turned ON
` X10 X12 └─┤/├─┤/├──(M50 )`	Exchangeable flag with the partner station is turned ON
`M50 X0 X1 Y0 ─┤├──┤/├─┤/├─┤/├──────(M51 )`	Data transmission enabled flag to the partner station turned ON
`M1 ─┤/├──────────────[CALL P1 ]`	To the data registration processing for initialization subroutine
`X20 ─┤├───────────────[PLS M31 ]`	Convert the initialization command into pulse
`M31 M30 ─┤├─┬─┤├──────[MOV K0 K1M3 ]`	Various complete flags after the modem initialization processing is reset
` ├──────────────[RST M7 ]`	
` └──────────────[SET M32 ]`	
`M32 ─┤├────────────────[CALL P3 ]`	To the modem initialization processing subroutine
`X22 ─┤├────────────────[PLS M52 ]`	Convert the data communication (transmission) command into pulse
`M52 M51 ─┤├──┤├──────────[SET M53 ]`	
`M53 ─┤├────────────────[CALL P51 ]`	To the data transmission processing subroutine
`X3 ─┤├─┬───────────────[PLS M55 ]`	Convert the reception data read request into pulse
`X4 ─┤├─┘`	
`M55 M0 ─┤├──┤├──────────[SET M56 ]`	
`M56 ─┤├────────────────[CALL P52 ]`	To the reception data read processing subroutine
`X12 ─┤├────────────────[PLF M80 ]`	Convert the connection in progress signal OFF into pulse (Line disconnection from partner side)
`X27 ─┤├────────────────[PLS M81 ]`	Convert the reset command of various request signal into pulse
`M80 ─┤├─┬──────────────[SET M82 ]`	
`M81 ─┤├─┘`	
`M82 ─┤├────────────────[CALL P8 ]`	To the various request signal and the complete signal reset subroutine
`SM400 ─┤├──────────────[MOV K2M0 K2Y80 ]`	Output the various complete flag status (LED display)
` ───────────────────[FEND ]`	

```
P1    M1
      ─┤↑├─────────────────────────────────────────────[MOV    K30              D0    ]
                                                                                          Data registration processing for initialization
                                                                                          subroutine
                                                        ─────────────────────────[MOV    K1               D1    ]      • Sets the number of bytes of the
                                                                                                                            registration data
                                                                                                                        • Sets the user control data
                                              ─[$MOV    "ATE1Q0V1&C1&D2&H"       D2    ]                                      (control number)
                                                                                                                        • Sets the initialization command
                                                        ─[$MOV    "1&I0&R2&S0S0=1"      D10   ]

      M0
      ─┤ ├──────────────────────[TO    H0    H1B00    D0     K17 ]                                                       • Write the data for initialization
                                                                                                                            (Data No. 8001H)
                                                                                                                            (Registration to buffer memory)
                                ─────────────────────────────[SET    M1    ]                                            • Data registration complete flag
                                                                                                                            for initialization is set

                                                                         ─[RET  ]

P3    M31
      ─┤ ├──────────────────────────────────────────────[SET    Y10   ]                                                 Modem initialization processing subroutine
                                                                                                                        • Initialization request signal is set
                                                        ─[SET    M100  ]                                                • Initialization request execution flag is set
      Y10   X10
      ─┤ ├──┤ ├─────────────────────────────────────────[SET    M3    ]                                                 • When the initialization complete signal
                                                                                                                            ON, the initialization complete flag is set
            X13   M0                                                                                                         and the request signal is reset
            ─┤ ├──┤ ├──────────────[FROMP   H0    H221    D100    K1  ]                                                   • When the initialization/connection
                                                                                                                            abnormal complete signal ON, the error
      Y10   X10                                                                                                              code is read and the request signal is reset
      ─┤ ├──┤ ├─────────────────────────────────────────[RST    Y10   ]
            X13
            ─┤ ├────────────────────────────────────────[RST    M32   ]

                                                                         ─[RET  ]

P51   M52   M92
      ─┤ ├──┤↑├──────────────────────────[$MOV    "N02 TO N01"         D51   ]                                           Data communication processing subroutine
                                                                                                                        (Non procedure protocol, transmission)
                                                        ─[MOV    H0A0D            D56   ]                                • Set the transmission data
                                                        ─[MOV    K1               D150  ]
                                                        ─[MOV    K0               D151  ]
                                                        ─[MOV    K6               D152  ]                                • Sets the number of transmission data
                                                                                                                            (words)
                                                        ─[SET    M92   ]                                                • Transmission request execution flag is set
      M92   M0
      ─┤ ├──┤ ├──────────────[GP.OUTPUT   U0    D150    D51     M150]                                                    • Transmission request execution
      M150  M151
      ─┤ ├──┤↑├─────────────────────────────────────────[SET    M155  ]                                                 • Transmission request normal completion
                                                        ─[RST    M156  ]
            M151
            ─┤ ├──────────────────────────────────────────[SET    M156  ]                                               • Transmission request abnormal completion
                                                        ─[RST    M155  ]
                                                        ─[RST    M92   ]
                                                        ─[RST    M53   ]
                                                        ─[SET    M102  ]

                                                                         ─[RET  ]
```

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3.5.3 Sample program for notification

Modem initialization and notification are executed by commands from the user.
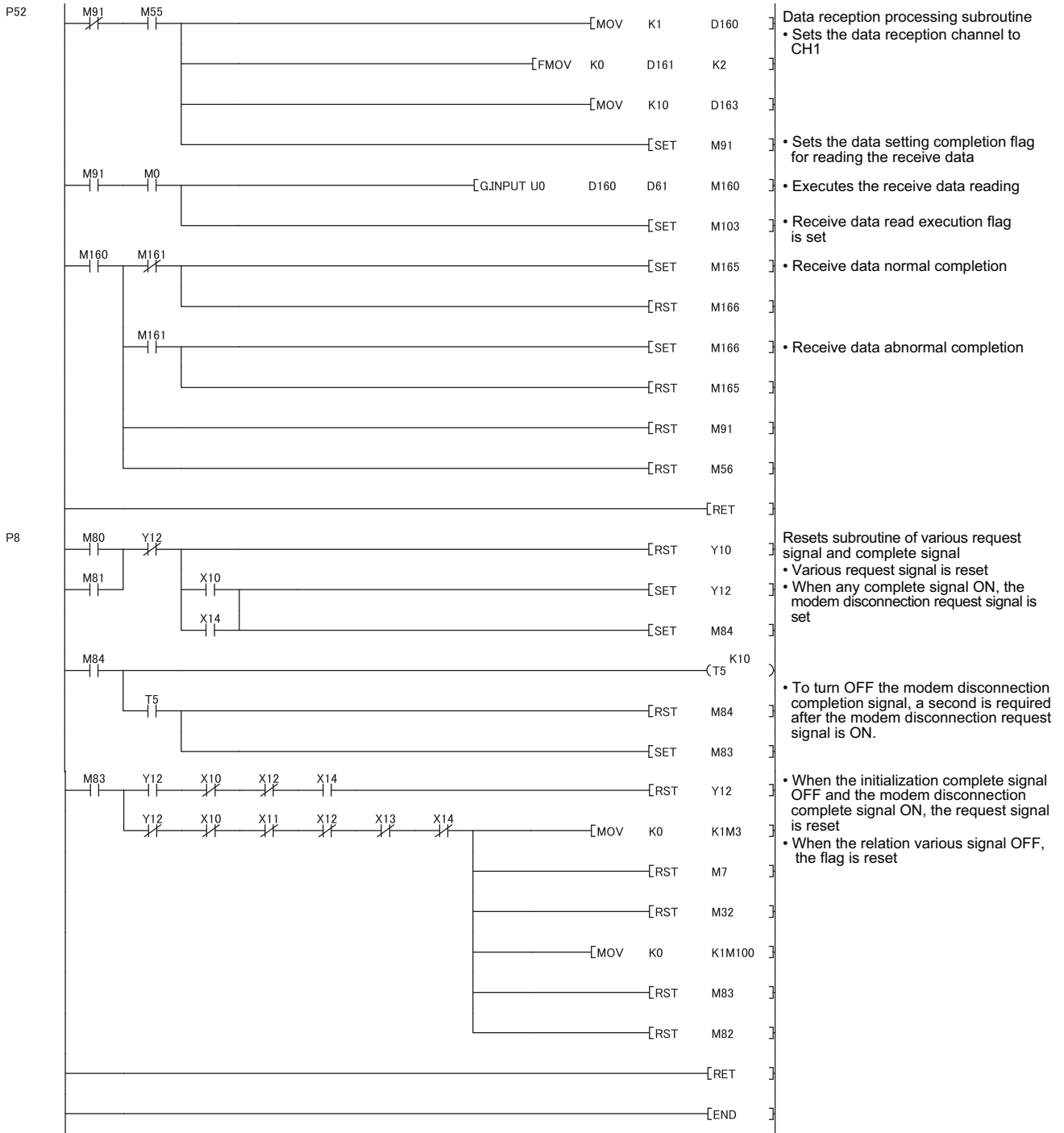
Before executing this program, perform the following settings (changing the default values) on the GX Configurator-SC's "Modem function system setting" screen and register them in the Q series C24.
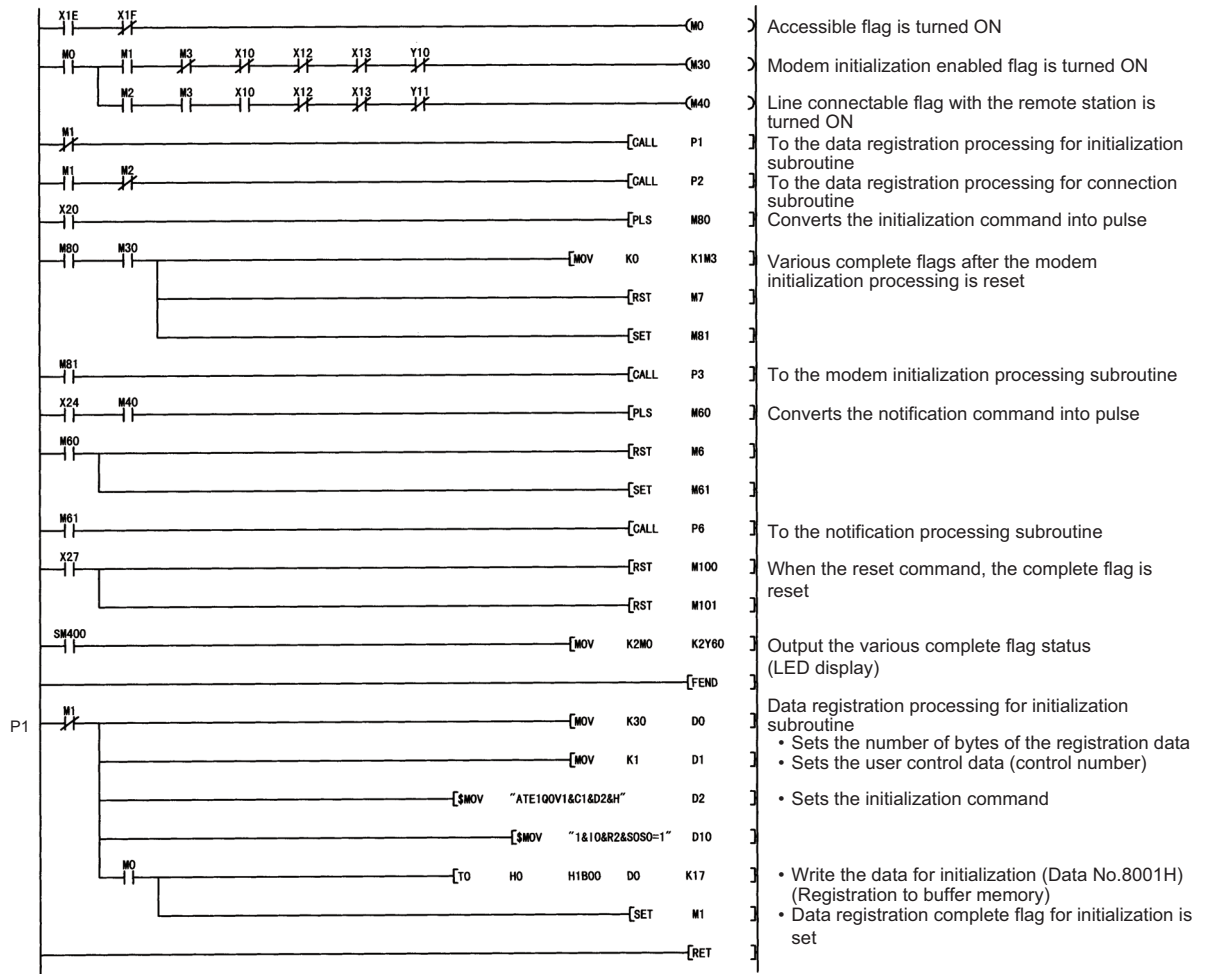(Settings other than the items shown below are not required.)

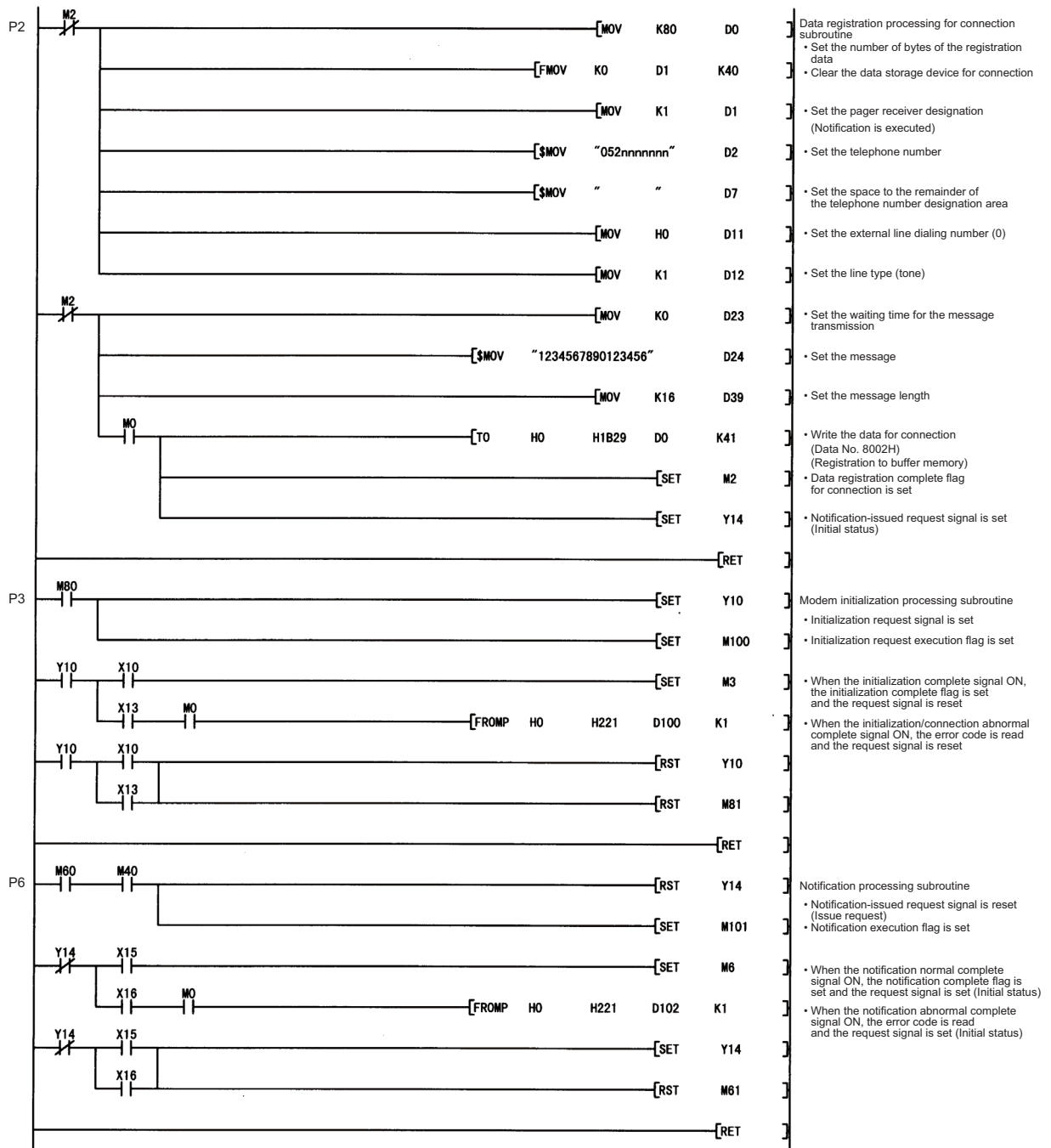Settings on the GX Configurator-SC's "Modem function system setting/registration" screen

Setting item	Setting value
Modem connection channel designation	CH1
Notification execution designation	Perform notification
No-communication interval time designation	2 (min)
Data No. for initialization designation	8001H
Data No. for connection designation	8002H

Remark ●

Registration of the modem's initialization data and line connection data, modem initialization, line connection and notifications are all performed by the sequence program.

● ●

3

Ladder	Description
X1E X1F ──┤├──┤╱├──────────(M0)	Accessible flag is turned ON
M0 M1 M3 X10 X12 X13 Y10 ──┤├──┤╱├──┤╱├──┤╱├──┤╱├──┤╱├──┤╱├──(M30)	Modem initialization enabled flag is turned ON
M2 M3 X10 X12 X13 Y11 ──┤├──┤╱├──┤╱├──┤╱├──┤╱├──┤╱├──(M40)	Line connectable flag with the remote station is turned ON
M1 ──┤╱├──────────[CALL P1]	To the data registration processing for initialization subroutine
M1 M2 ──┤╱├──┤├──────────[CALL P2]	To the data registration processing for connection subroutine
X20 ──┤├──────────[PLS M80]	Converts the initialization command into pulse
M80 M30 ──┤├──┤├──────────[MOV K0 K1M3]	Various complete flags after the modem initialization processing is reset
──────────[RST M7]	
──────────[SET M81]	
M81 ──┤├──────────[CALL P3]	To the modem initialization processing subroutine
X24 M40 ──┤├──┤├──────────[PLS M60]	Converts the notification command into pulse
M60 ──┤├──────────[RST M6]	
──────────[SET M61]	
M61 ──┤├──────────[CALL P6]	To the notification processing subroutine
X27 ──┤├──────────[RST M100]	When the reset command, the complete flag is reset
──────────[RST M101]	
SM400 ──┤├──────────[MOV K2M0 K2Y60]	Output the various complete flag status (LED display)
──────────[FEND]	
P1 M1 ──┤╱├──────────[MOV K30 D0]	Data registration processing for initialization subroutine • Sets the number of bytes of the registration data
──────────[MOV K1 D1]	• Sets the user control data (control number)
──────────[$MOV "ATE1Q0V1&C1&D2&H" D2]	• Sets the initialization command
──────────[$MOV "1&I0&R2&S0S0=1" D10]	
M0 ──┤├──────────[TO H0 H1B00 D0 K17]	• Write the data for initialization (Data No.8001H) (Registration to buffer memory)
──────────[SET M1]	• Data registration complete flag for initialization is set
──────────[RET]	

P2 — Data registration processing for connection subroutine

```
P2  M2
    ─┤/├──┬──────────────────────────────────────[MOV   K80   D0  ]    Data registration processing for connection
          │                                                            subroutine
          │                                                            • Set the number of bytes of the registration
          ├──────────────────────────────[FMOV  K0   D1   K40 ]             data
          │                                                            • Clear the data storage device for connection
          │
          ├──────────────────────────────────[MOV   K1   D1  ]        • Set the pager receiver designation
          │                                                              (Notification is executed)
          │
          ├──────────────────────[$MOV  "052nnnnnn"   D2  ]            • Set the telephone number
          │
          ├──────────────────────[$MOV     "    "      D7  ]           • Set the space to the remainder of
          │                                                              the telephone number designation area
          │
          ├──────────────────────────────────[MOV   H0   D11 ]        • Set the external line dialing number (0)
          │
          └──────────────────────────────────[MOV   K1   D12 ]        • Set the line type (tone)

    M2
    ─┤/├──┬──────────────────────────────────────[MOV   K0   D23 ]    • Set the waiting time for the message
          │                                                              transmission
          │
          ├──────────────[$MOV  "1234567890123456"   D24 ]            • Set the message
          │
          ├──────────────────────────────────[MOV   K16   D39 ]       • Set the message length
          │
          │  M0
          └──┤├──┬──────────────────[TO    H0   H1B29   D0   K41 ]    • Write the data for connection
             │                                                          (Data No. 8002H)
             │                                                          (Registration to buffer memory)
             ├──────────────────────────────────────[SET   M2  ]      • Data registration complete flag
             │                                                          for connection is set
             └──────────────────────────────────────[SET   Y14 ]      • Notification-issued request signal is set
                                                                        (Initial status)

                                                     ─[RET ]
```

P3 — Modem initialization processing subroutine

```
P3  M80
    ─┤├──┬──────────────────────────────────────[SET   Y10 ]         Modem initialization processing subroutine
         │                                                           • Initialization request signal is set
         └──────────────────────────────────────[SET   M100]         • Initialization request execution flag is set

    Y10   X10
    ─┤├───┤├──────────────────────────────────[SET   M3  ]           • When the initialization complete signal ON,
          │                                                            the initialization complete flag is set
          │  X13   M0                                                  and the request signal is reset
          └──┤├───┤├──────────────[FROMP  H0   H221   D100   K1 ]     • When the initialization/connection abnormal
                                                                        complete signal ON, the error code is read
                                                                        and the request signal is reset
    Y10   X10
    ─┤├──┬┤├──────────────────────────────────[RST   Y10 ]
         │
         │  X13
         └──┤├──────────────────────────────────[RST   M81 ]

                                                     ─[RET ]
```

P6 — Notification processing subroutine

```
P6  M60   M40
    ─┤├───┤├──────────────────────────────────[RST   Y14 ]           Notification processing subroutine
          │                                                           • Notification-issued request signal is reset
          │                                                            (Issue request)
          └──────────────────────────────────────[SET   M101]         • Notification execution flag is set

    Y14   X15
    ─┤/├──┤├──────────────────────────────────[SET   M6  ]           • When the notification normal complete
          │                                                            signal ON, the notification complete flag is
          │  X16   M0                                                  set and the request signal is set (Initial status)
          └──┤├───┤├──────────────[FROMP  H0   H221   D102   K1 ]     • When the notification abnormal complete
                                                                        signal ON, the error code is read
                                                                        and the request signal is set (Initial status)
    Y14   X15
    ─┤/├──┬┤├──────────────────────────────────[SET   Y14 ]
         │
         │  X16
         └──┤├──────────────────────────────────[RST   M61 ]

                                                     ─[RET ]
```

Memo

CHAPTER 4 RECEIVING DATA WITH AN INTERRUPT PROGRAM

In data communication between the Q series C24 and the external device, an interrupt program can be used to receive data for the following data communication functions.

- Data reception during communication using the non procedure protocol
- Data reception during communication using the bidirectional protocol

This chapter explains a case in which data reception using the following data communication functions is performed with an interrupt program.
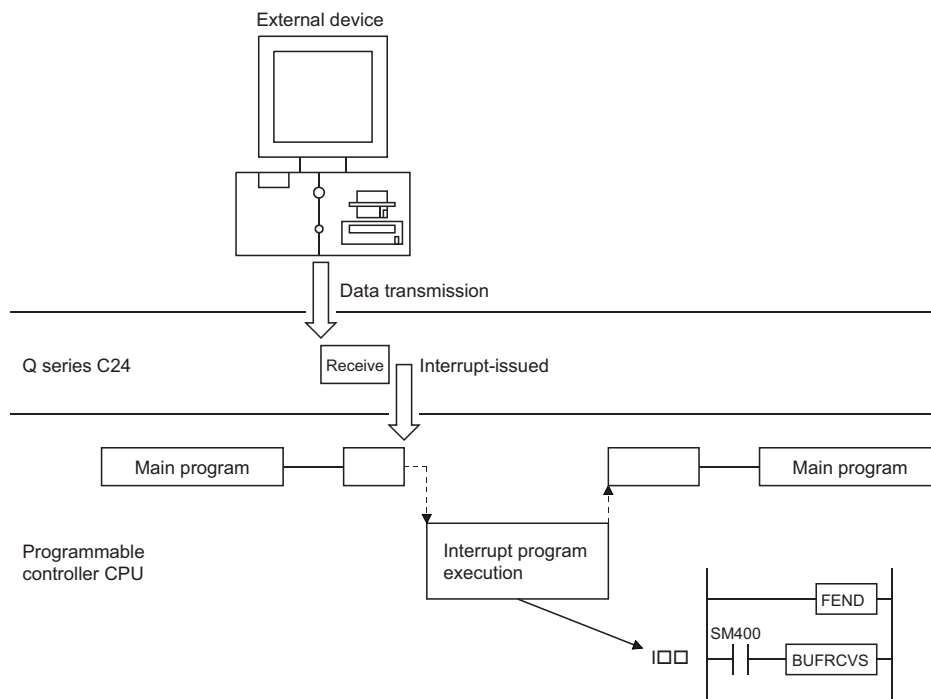
Point

Receiving data with an interrupt program expedites data reception by the programmable controller CPU.

4.1 Settings for Receiving Data Using an Interrupt Program

The following explains the settings for performing data reception with an interrupt program during communication using the non procedure protocol or bidirectional protocol.

(1) Setting by GX Developer

The following settings are performed with the interrupt pointer No. of module screen.
  • The interrupt pointer number and quantity (quantity is fixed at 2) for the programmable controller CPU used for the Q series C24.
  • Assigning correspondence between the programmable controller CPU interrupt pointer number and the Q series C24 control number (fixed at 0).

(2) Setting by GX Configurator-SC

Perform the following settings in the transmission control and other system setting screens.
  • Specify "Interrupt-issued" in Receive interrupt-issued designation.

Point

To start the interrupt program, the settings of the "Interrupt pointer No. of module" in GX Developer and the "System setting" in GX Configurator-SC are required.

4.2 Interrupt Program Startup Timing

The following explains the startup timing for interrupt program when performing data reception with an interrupt program during communication using the non procedure protocol or bidirectional protocol.

(1) The startup timing is the same for communication using either the non procedure protocol or bidirectional protocol.

(2) Receive data from the external device is stored in the reception area of the buffer memory. When the next input signal rises, the interrupt program is started.

Input signal name	CH1	CH2
CHn reception data read request signal	X3	XA
CHn reception abnormal detection signal	X4	XB

4.3 Reception Control Method Using an Interrupt Program

The following explains the reception control method when receiving data with an interrupt program during communication using the non procedure protocol or bidirectional protocol.
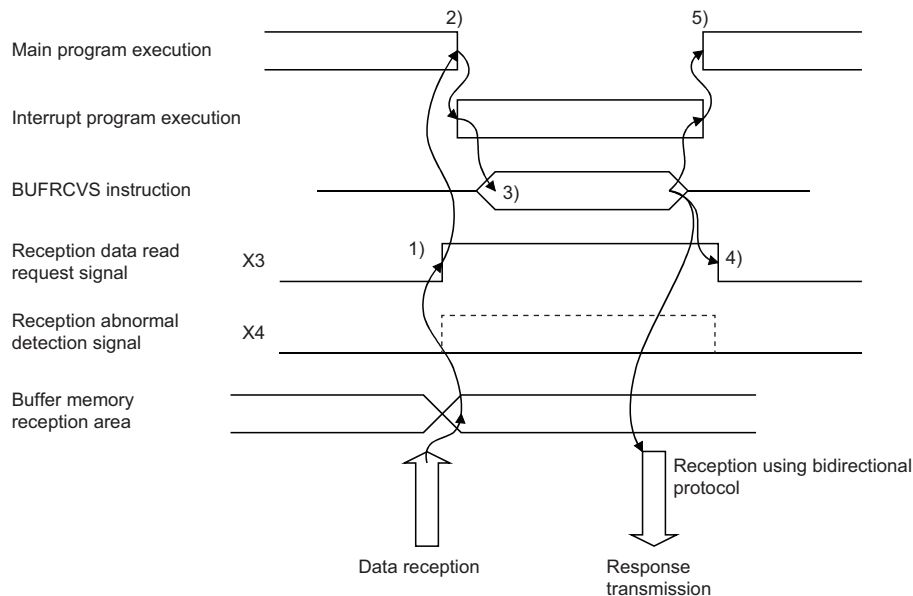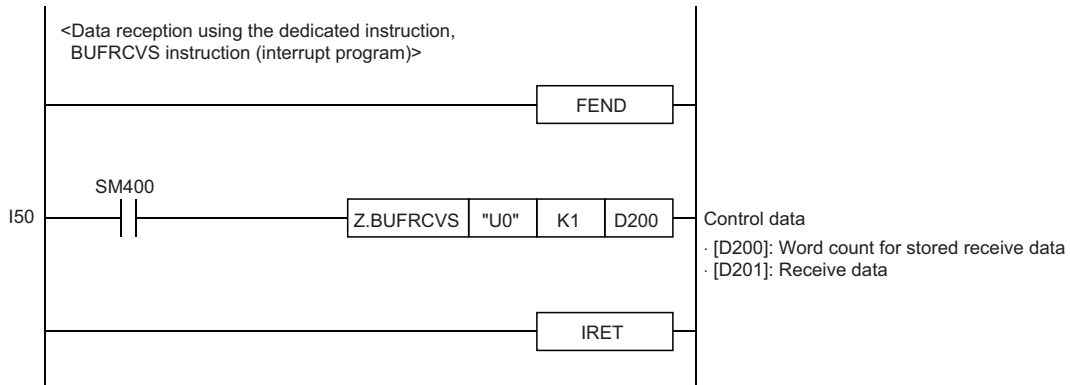
1) When data is received from the external device, the receive data is stored in the buffer memory and the reception data read request signal turns ON.

2) The main program stops executing and the interrupt program starts.

3) The data reception dedicated instruction, BUFRCVS, for the interrupt program is executed and data is received.*1

4) When execution of the BUFRCVS instruction is complete, the reception data read request signal turns OFF.

5) When execution of the interrupt program is finished, execution of the main program restarts.

*1   When the reading of receive data using the BUFRCVS instruction is finished, the following processes are performed.
At normal completion: Programmable controller CPU error flag (SM0) turns OFF.
At abnormal completion: Programmable controller CPU error flag (SM0) turns ON.
The error code is stored in the programmable controller CPU error code (SD0).
For more details on the programmable controller CPU error flag (SM0) and error codes (SD0), see the programmable controller CPU Manual.

4.4 Programming

This section explains the programming when data reception is performed with an interrupt program during communication using the non procedure protocol or bidirectional protocol.

4.4.1 Program example

The following shows a program example for receiving data using an interrupt program.

(Program condition)

- Interrupt pointer setting with GX Developer
  - PLC side: Interrupt pointer Start No. = 50, Interrupt pointer No. of module = 2 (fixed)[*1]
  - *1   CH1 side interrupt pointer = I50, CH2 side interrupt pointer = I51
  - Intelli. module side: Start I/O No. = 0, Start SI No. = 0 (fixed)
- Interrupt program start enable/disable setting with GX Configurator-SC
  - CH1 side: Issues interrupt (performs communication via the non procedure protocol.)
  - CH2 side: Does not issue interrupt

(Program example)

When the Q series C24 I/O signals are X/Y00 to X/Y1F
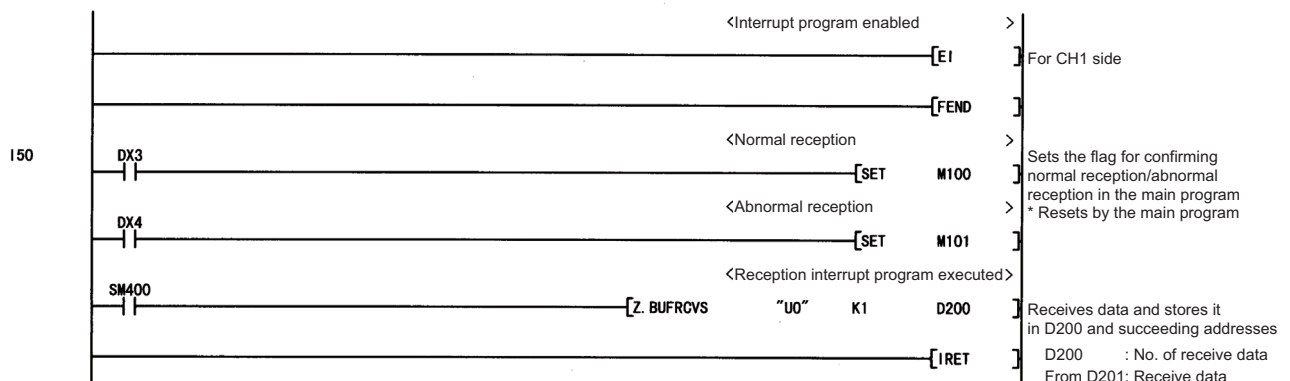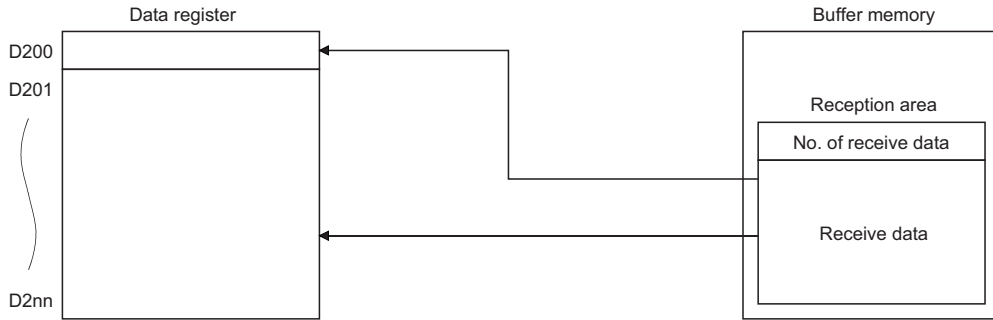
Point

● When data reception is performed with an interrupt program, the dedicated BUFRCVS instruction is used regardless of whether the communication uses the non procedure protocol or bidirectional protocol. For more details on the BUFRCVS instruction, see Page 371, Section 17.2.

● Create a program that enables/disables interrupts during execution of the main program in order to start the interrupt program. Use the EI, DI, and IMASK instructions.

4.4.2 Precautions when receiving data with an interrupt program

The following shows the precautionary notes when receiving data with an interrupt program.

(1) Create an interrupt program for data reception for each interface.

(2) Use GX Configurator-SC to set whether or not the interrupt program is started. Whether or not the interrupt program is started can also be set with direct writing to the buffer memory. However, if it is specified during data reception, the interrupt program will not start.

(3) Do not use the INPUT and BIDIN instructions during execution of the interrupt program. Always use the BUFRCVS instruction to receive data.

(4) Do not turn the reception data read completion signal (Y1/Y8) ON/OFF during execution of the interrupt program.

(5) Use always ON (SM400) or direct input signal (DX3, DX4) as the contact signal when executing the BUFRCVS instruction. (☞ Page 371, Section 17.2)

(6) After the power supply turns from OFF to ON or the programmable controller CPU is reset, data cannot be received because the interrupt program is invalidated during the initial processing of the programmable controller CPU. For asynchronous data communication with the Q series C24 from the external device without communication procedure setting, read the data as shown in the following program.

When the input/output signals of the Q series C24 are X/Y00 to X/Y1F

After RUN, 1 scan only INPUT instruction execution	
CH1 error information is initialized	
Received interrupt program execution	
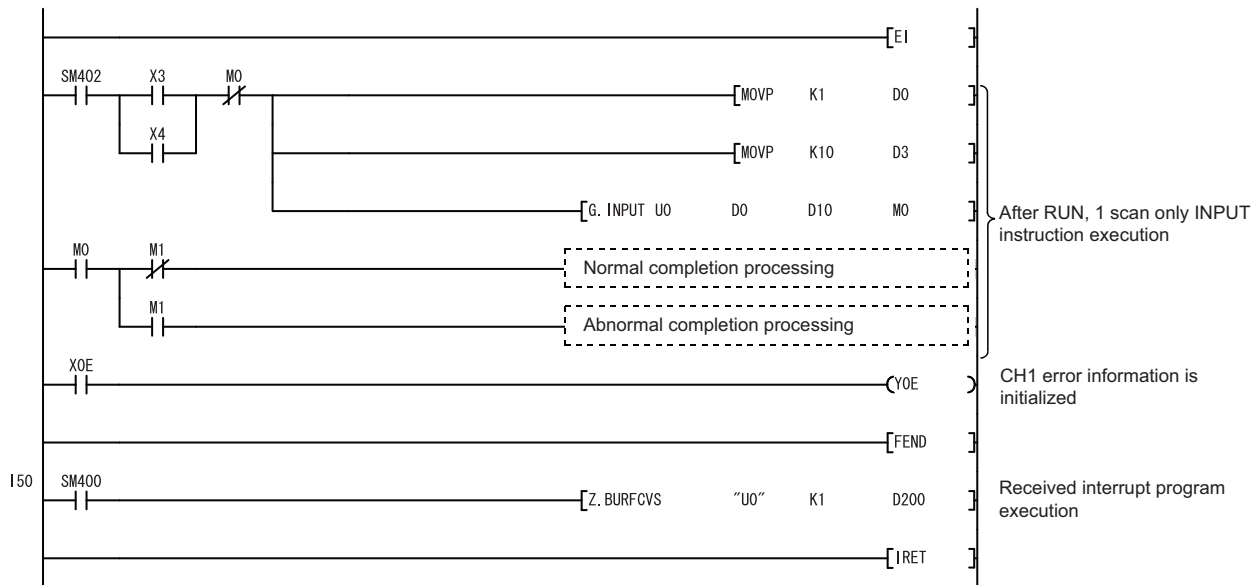
CHAPTER 5   CHANGING SEND AND RECEIVE DATA LENGTH UNITS TO BYTE UNITS (WORD/BYTES UNITS SETTING)

The word units are used for the data length (count) of the amount of data sent/received using the following data communication functions in data communication between the Q series C24 and the external device.

This chapter explains how to change the units (word to byte, byte to word) of the data length (count) sent/received with the following data communication functions.

The data length units can be set for each Q series C24 interface. The Q series C24 controls the number of data to be transmitted to the external unit and the number of data when it requests the programmable controller CPU to read the data received from the external device according to the units set by the user.

(1) Data communication functions and buffer memory related to data length units

The following lists the data communications functions and buffer memory related to the data length units.
(The buffer memory addresses in the table are the default value.)

Data communications function		Name of buffer memory related to data length units (Address CH1, CH2)	Reference manual
MC protocol	On-demand function	On-demand data length designation area (A1H, 141H)	(📖 MELSEC Communication Protocol Reference Manual)
Nonprocedural protocol	Data transmit function	Send data count storage area (400H, 800H)	📖 User's manual (Basic)
	Data receive function	Received data count designation area (A4H, 144H) Receive data count storage area (600H, A00H)	
Bidirectional protocol	Data transmit function	Send data count storage area (400H, 800H)	📖 User's manual (Basic)
	Data receive function	Receive data count storage area (600H, A00H)	

(2) How to change the units of the data length (count)

The units of the data length (count) can be changed using one of the following procedures.

- Changing via GX Configurator-SC: The units can be changed on the GX Configurator-SC's system setting screen.
- Changing via the programmable controller CPU: The units can be changed with the CSET instruction. Change the units of the data length (count) according to the explanation in Page 384, Section 17.4 of this manual.

Memo

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CHAPTER 6 CHANGING THE DATA COMMUNICATIONS MONITORING TIMES

The monitoring times are timers used by the Q series C24 to monitor the receiving interval time between each byte when receiving data from the external device, the programmable controller CPU processing time, and the time it takes to transmit to the external device.

The monitoring times can be set for each interface. The Q series C24 uses the monitoring time set by the user to control data transmission to and reception from the external device.

Set the monitoring times to match the specifications of the external device.

The Q series C24 monitoring times are listed below.

Monitoring time		Q series C24 default value	Protocol that can monitor the time			Remarks
			MC	Non procedure	Bidirectional	
No-reception monitoring time (timer 0)	Format 0	0 byte (Infinite wait)	○	○	○	Transmission time for the set number of bytes (depends on the transmission rate)
	Format 1		×	○	×	
Response monitoring time (timer 1)		5s	○	—	○	For bidirectional protocol, this is valid for transmission only.
Transmission monitoring time (timer 2)		3min	○	○	○	—
Message wait time		0ms	○	—	—	No wait time

Ex. Data communications using an MC protocol

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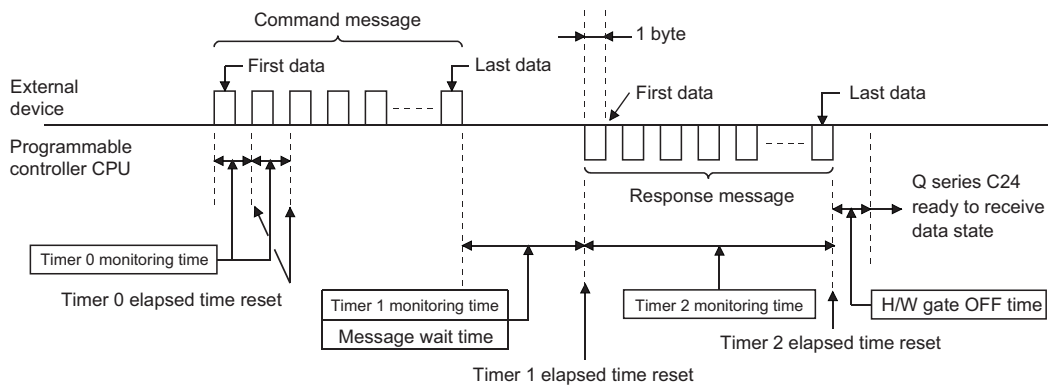
6.1 No-reception Monitoring Time (timer 0) Setting

The no-reception monitoring time (timer 0) is the time for clearing the Q series C24 state when the Q series C24 is placed into the data receive wait state by trouble in the external device.
The Q series C24 monitors the reception interval in byte units at the start of data reception from the external device and ends monitoring when the preset last data is received and repeats this operation.
The following explains the no-reception monitoring time (timer 0) operation.
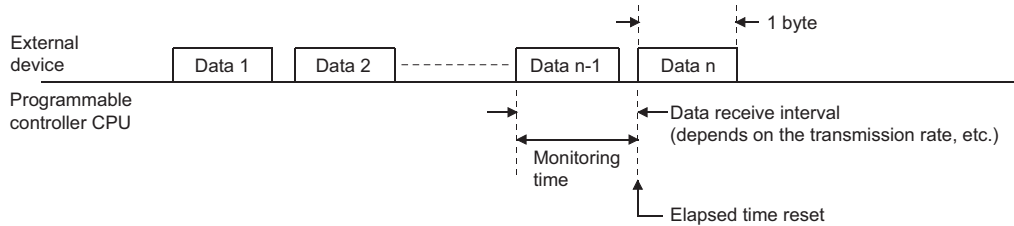
Point

● One byte is always handled as 12 bits in the no-reception monitoring time (timer 0), regardless of the transmission setting.

● If the non-reception monitoring time (timer 0) was changed in the sequence program, execute any of the following to enable the changed value.
   • Mode switching (☞ Page 345, CHAPTER 15)
   • UINI instruction (☞ Page 369, CHAPTER 17)
   • Programmable controller CPU information clear (📖 User's Manual (Basic).)

(1) Q series C24 operation by no reception monitoring time (timer 0)

Monitors the receive interval in byte units and returns the elapsed time to 0 each time one byte is received.
At time-out, the Q series C24 performs the following processing.

(a) Data communication using MC protocol

   • Stores the error code to the MC protocol transmission error code storage area (buffer memory addresses 25AH, 26AH) for the target interface.
   • Transmits a NAK message to the external device and enters the command message receive wait state.

(b) Data communications using non procedure protocol (Format 0)

   • Data communications not using user frames
      • Passes the receive data up to time-out to the Q series C24.
      • Stores the error code to the data receive result storage area (buffer memory addresses 258H, 268H) for the target interface and turns on the reception abnormal detection signal (X4, XB) and waits to receive the next data.

   Ex. Receiving according to the received complete code (Received complete code: CR + LF (0D0AH))
   When the LF is not received within the set time for timer 0 after reception of the CR, the abnormal reception detection signal to the programmable controller CPU turns ON and the received data at the CR is stored in the received data storage area of the buffer memory.

		CR	Timer 0 Set time	

External device

Q series C24

(*1)

Abnormal reception detection signal

(X4/XB)
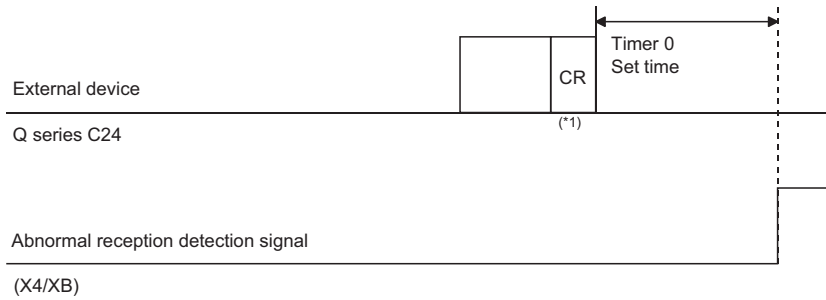
*1 CR is treated as 1 byte of data included in the message.

- Data communications using user frames
  - When designating the last frame, an arbitrary part of data in the area starting from the start of the reception of the current message until time-out is read into the Q series C24, and the data in the last frame area is ignored (deleted).
  - Stores the error code to the data receive result storage area (buffer memory addresses 258H, 268H) for the target interface and turns on the reception abnormal detection signal (X4, XB) and waits to receive the next data.

(c) Data communications using non procedure protocol (Format 1)

The reception monitoring format 1 of the no-reception monitoring time (timer 0) is used for receiving a message for which the receive complete code and receive data count has not been preset. This occurs when the no-reception monitoring time (timer 0) runs out on the non procedure protocol.
- Data is received by the Q series C24 until the time is out, the receive data read request signal (X3, XA) turns ON, and the following data reception waiting condition occurs.

Ex. When receiving using the receive data count (Receive data count: 4 bytes)
After 3 bytes of data is received, the 3-byte data is stored in the received data storage area of the buffer memory by the time out (timer 0) and the receive data read request signal to the programmable controller CPU turns ON.

External device

Q series C24

Receive data read request signal

(X3/XA)
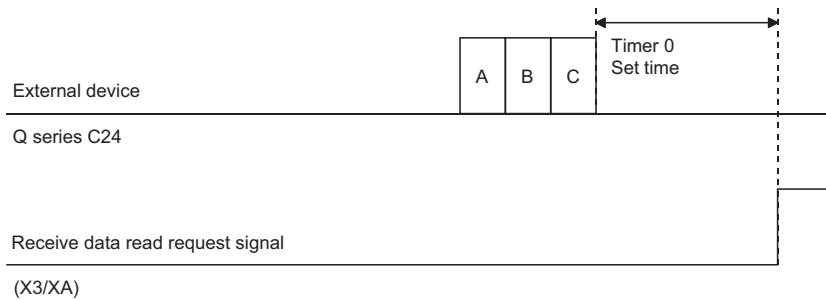
(d) Data communications using bidirectional protocol

- Ignores (deletes) the receive data from the start of reception of the current message to time-out.
- Stores the error code to the data receive result storage area (buffer memory addresses 258H, 268H) for the target interface.
- When the receive data complete, transmits a NAK message to the external device and waits to receive the next data.

(2) Changing the no-reception monitoring time (timer 0)

(a) Changing the no-reception monitoring time (timer 0)

The no-reception monitoring time (timer 0) is designated by the number of transmitted characters (byte count) corresponding to the data communication rate set in the interface, and then it is registered on the GX Configurator-SC's "Transmission control and others system setting" screen.

Adjust or set the value based on the specifications of the external device.

(b) No-reception monitoring time format specification in non procedure protocol (Format 0/Format 1)

The no-reception monitoring time format in non procedure protocol is specified to use the no-reception monitoring time (timer 0) by the non procedure protocol and is registered on the "Non procedure system setting" screen.

Remark •

• When changing the no-reception monitoring time (timer 0)

Find the result using the following expression and set the number of bytes or greater for the no-reception monitoring time (timer 0).

$$\text{No-reception monitoring time (timer 0)} = 1 + \frac{Td \times Vbps}{12000}$$

(Round up fractions below decimal point.)

Td: Maximum delay time for external device output processing (ms)
Vbps: Transmission rate (bps)

Ex. Calculation of no-reception monitoring time (timer 0)

• Transmission rate (Vbps): 9600bps
• Maximum delay time for external device output processing (Td): 50ms

$$\text{No-reception monitoring time (timer 0)} = 1 + \frac{50 \times 9600}{12000} = 41 \text{ bytes}$$

In this case, actual monitoring time is as follows:

41 bytes $\times$ 12[*1] $\div$ 9600 $\times$ 1000 = 51.25ms

*1   Number of transmit bits per byte (Fixed)
• When exchanging data with the external device through the Q series C24 RS-422/485 interface and changing the no-reception monitoring time (timer 0)

Find the result using the following expression and set the number of bytes or greater for the no-reception monitoring time (timer 0).

$$\text{No-reception monitoring time (timer 0)} = 1 + \frac{(Td + T1) \times Vbps}{12000}$$

(Round up fractions below decimal point.)

Td: Maximum delay time for external device output processing (ms)
T1: External device side H/W gate OFF time (ms)
Vbps: Transmission rate (bps)

• •

6

6.2 Response Monitoring Time (timer 1) Setting

The response monitoring time (timer 1) clears the receive wait state of the device that receives the response message when trouble in the device that received the message does not return a response message (result) to the external device.

When the Q series C24 receives a message from the external device, it monitors the programmable controller CPU processing time up to the start of transmission of the response message to the external device.

When a message was received, it monitors the external device processing time up to the start of reception of the response message from the external device.

The following describes the response monitoring time (timer 1) operation.
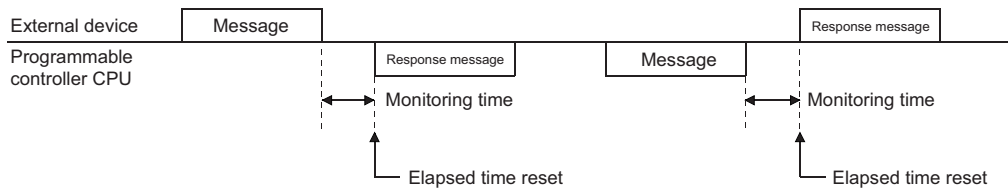
- If on-demand data is transmitted before a response message during data communications using a MC protocol, the time up to the start of transmission of the on-demand data is monitored.
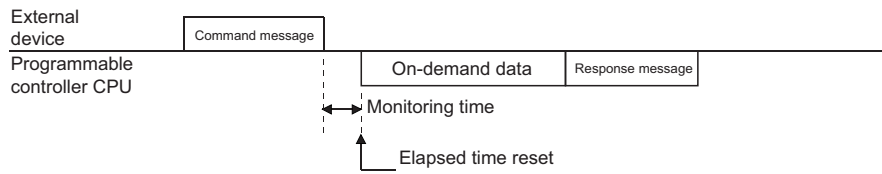
(1) Q series C24 operation by response monitoring time (timer 1)

(a) When response monitoring time (timer 1) set to 0ms

After receiving a message, the Q series C24 does not monitor the time up to the start of transmission of a response message to the external device, but waits infinitely.

After transmitting a message, the Q series C24 does not monitor the time up to the start of reception of the response message from the external device, but waits infinitely.

(b) When response monitoring time (timer 1) is set to 100ms or longer

After receiving a message, the Q series C24 monitors the time up to the start of transmission of a response message to the external device and returns the elapsed time to 0 at the start of transmission.

After transmitting a message, the Q series C24 monitors the time up to the start of reception of the response message from the external device and returns the elapsed time to 0 at the start of reception.

At time-out, the Q series C24 performs the following processing.

- Data communications using a MC protocol
  - Stores the error code to the MC protocol transmit error code storage area (buffer memory addresses 25AH, 26AH) for the target interface.
  - Transmits a response message (NAK message) to the external device and waits to receive the next command message.
- Data communications using bidirectional protocol
  - Stores the error code to the data transmission result storage area (buffer memory addresses 257H, 267H) for the target interface and performs transmission processing abnormal completion.
  - While waiting to transmit a response message, the Q series C24 does not check the response monitoring time.

(2) Changing the response monitoring time (timer 1)

The response monitoring time (timer 1) is registered on the GX Configurator-SC's "Transmission control and others system setting" screen.

For data communication using the MC protocol, set the response monitoring time so that it is longer than the message wait time.[1]

*1 The message wait time is designated at the following locations.
- A compatible 1C frame: Designate in a command message
- QnA compatible 2C/3C/4C frame: GX Configurator-SC "MC protocol system setting" screen

Point

When changing the response monitoring time (timer 1) default value (5 s), observe the following precautions.

(1) Data communications using an MC protocol
In any of the following cases make the default value the message wait time described in Page 202, Section 6.4, or longer.

● When designating the monitor conditions with the following functions, set the maximum time matched to system operation.
- Word units random read (📖 MELSEC Communication Protocol Reference Manual)
- Device memory monitor (📖 MELSEC Communication Protocol Reference Manual)

● Access other than (a) above
- When accessing a station connected (including multidrop link) to an external device, set the following value, or longer.

Response monitoring time >= Maximum number of scans required to process the command used × connected station scan time

- When accessing another station over a network system, set the default value to infinity or the following time, or longer.

Response monitoring time >= Maximum number of scans required to process the command used × communications time

When setting the default value to infinity, check the external device response wait time and initialize the Q series C24 transmission sequence when time-out is generated. (📖 MELSEC Communication Protocol Reference Manual)

Refer to the MELSEC Communication Protocol Reference Manual for the maximum number of scans and the communication time required by processing.

(2) Data communications using bidirectional protocol
Set the default value to the following time, or longer.
(Sequence scan time × 2) + 100ms

6

6.3 Transmission Monitoring Time (timer 2) Setting

The transmission monitoring time (timer 2) clears the wait state when the Q series C24 that is to transmit a message or response message (result) has entered the transmission end wait state due to trouble in the external device.
When the Q series C24 transmits a message, it monitors the wait time up to the end of transmission of the message.
When the Q series C24 received a message from the external device, it monitors the wait time up to the end of transmission of the response message.
The following explains the transmission monitoring time (timer 2) operation.
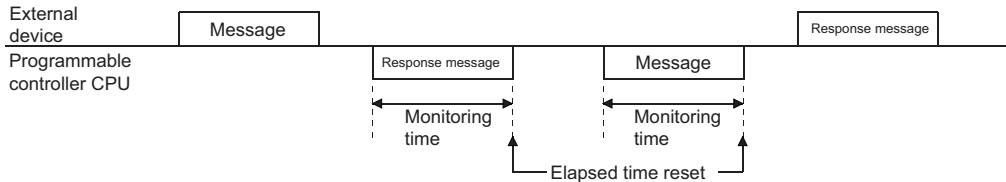
- If on-demand data is transmitted before a response message during data communications using an MC protocol, each time is monitored.
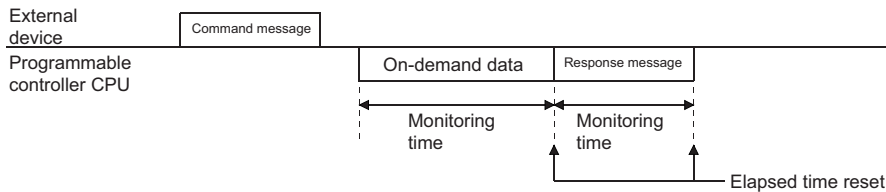
(1) Q series C24 operation by transmission monitoring time (timer 2)

(a) When transmission monitoring time (timer 2) is set to 0ms

The time until transmission of the message or response message is not monitored. If the Q series C24 cannot transmit, it waits infinitely.

(b) When transmission monitoring time (timer 2) is set to 100ms or longer

Monitors the time from completion of message or response message transmission preparations to the end of transmission and returns the elapsed time to 0 at the end of transmission.
At time-out, the Q series C24 performs the following processing.
- Data communications using MC protocol
  - While waiting for the end of transmission of the response message, the Q series C24 stores the error code to the data transmission result storage area (buffer memory addresses 257H, 267H) for the target interface. The Q series C24 enters the state in which it waits to receive the next command message without sending a response message (NAK message) to the external device.
  - During on-demand data transmission, the Q series C24 stores the error code to the on-demand execution result storage area (buffer memory addresses 256H, 266H) for the target interface.
  - If transmission was terminated midway in either of the cases above, the Q series C24 does not transmit the remaining data.

- Data communications using non procedure protocol or bidirectional protocol
  - While waiting for the end of transmission of a message, the Q series C24 stores the error code to the data transmission result storage area (buffer memory addresses 257H, 267H) for the target interface and performs transmission processing abnormal completion. If message transmission was terminated midway, the Q series C24 does not transmit the remaining data.
  - If waiting for the end of transmission of a response message, the Q series C24 stores the error code to the data receive result storage area (buffer memory addresses 258H, 268H) for the target device and turns on the reception abnormal detection signal (X4, XB).[1] When the receive data read complete, the Q series C24 turns off the reception abnormal detection signal (X4, XB) and waits to receive the next command. If transmission of the response message was terminated midway, the Q series C24 does not transmit the remaining data.

[1] When communicating using bidirectional protocol, it stores the error code in the data receive result storage area for the target interface. (The reception abnormal detection signal does not turn on.)

(2) Changing the transmission monitoring time (timer 2)

The transmission monitoring time (timer 2) is registered on the GX Configurator-SC's "Transmission control and others system setting" screen.

Point

The transmission monitoring time (timer 2) monitors the transmission termination time when the following states are generated.
- When DTR/DSR signal control is used and the DR (DSR) signal is turned off (☞ Page 204, Section 7.1)
- When DC1/DC3 receive control is used and DC3 is received (☞ Page 206, Section 7.2)
- When the RS-232 interface CS (CTS) signal is turned off (📖 User's manual (Basic))

Remark

Criteria when changing the transmission monitoring time (time 2) setting
Find the transmission monitoring time (timer 2) time from the maximum delay time of external device message receive processing or response message transmission processing and the transmission time/byte (t) and change the set value.
- Number of bytes transmitted/second (n) = Transmission rate/number of transmit bits/byte
- Transmission time/byte (t) = 1000 (ms)/number of bytes transmitted/s (n)
- Transmission monitoring time (timer 2) = (Maximum external device processing delay time) + (transmission time/byte (t) × transmit byte count)···100ms units truncated

Under the following conditions, the transmission monitoring time (timer 2) is set to 300ms
- Transmission rate: 9600 bps
- Number of transmit bits/byte: 11 (start bit: 1, data bits: 8, stop bits: 2)
- Maximum processing delay time: 200ms
- Transmit byte count: 3 bytes

6.4 Message Wait Time Setting

The message wait time is used during data communications using a MC protocol.

It is the time for an external device that cannot receive the data immediately after it has been transmitted.

When the Q series C24 transmits a response message in reply to a command message received from the external device, transmission of the response message is delayed by the message wait time, or longer.

The following explains the message wait time operation for data communications using QnA compatible 2C/3C/4C frame. (For A compatible 1C frames, the message wait time is designated in the command message.)

```
External
device          ┌─────────────────┐
                │ Command message │
Programmable    └─────────────────┘      ┌──────────────────┐
controller CPU                           │ Response message │
                                         └──────────────────┘
                                  ◄──────────► Message wait time
```
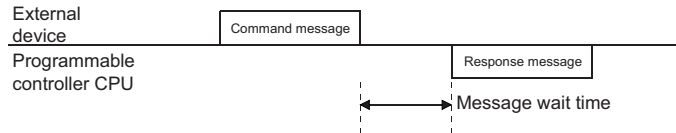
(1) Q series C24 operation by message wait time

- When message wait time is 0ms

If a response message can be transmitted, the Q series C24 immediately transmits the response message. A transmission wait time is not set.

- When the message wait time is 10ms or longer

If a response message can be transmitted, and the message wait time after reception of the command message has elapsed, the Q series C24 transmits the response message.

(2) Changing the transmission wait time

The transmission wait time is registered on the GX Configurator-SC's "MC protocol system setting" screen

Point

- If the external device that must wait a certain time before it can receive a response message after a command message was transmitted, set the message wait time as explained above. Especially, for data communications with an external device connected to the Q series C24 RS-422/485 interface, set the message wait time to the external device hardware gate OFF time or longer.

- The message wait time described here is the time for data communications using QnA compatible 2C/3C/4C frame.

CHAPTER 7　DATA COMMUNICATIONS USING DC CODE TRANSMISSION CONTROL

The transmission control function controls (termination, restart) the transmission and reception of data between the Q series C24 and external device by turning transmission control signals on and off, or by transmitting and receiving DC codes (DC1, DC2, DC3, DC4), or informs the range of validity for the data to the external device.

The transmission control function can be set for each Q series C24 interface. The Q series C24 uses the transmission control function set by the user to control data communications with external devices.

Set the transmission control function to match the specifications of the external device.

The table below lists the Q series C24 transmission control functions.

Transmission control function	Kind of control	Interface that can be controlled		Protocol that can be controlled			Remarks
		232	422/485	MC	Non procedure	Bidirectional	
DTR/DSR signal control[1]	DTR control	○	— (Ignored)	—	○	—	Cannot be used simultaneously with DC control. One is selected.
	DSR control			○	○	○	
RS/CS signal control[2]		○	—	○	○	○	Normal control.
CD signal control[2]		○	—	○	○	○	The cable wiring depends on whether or not control is used. With half-duplex communications, control is necessary.
DC code control[1]	DC1/DC3 transmission control	○	○	—	○	—	Cannot be used simultaneously with DTR/DSR signal control. One is selected.
	DC1/DC3 reception control			○	○	○	
	DC2/DC4 transmission control			○	○	○	
	DC2/DC4 reception control			○	○	○	

○: Possible (transmission control used), —: Invalid

*1　When using full-duplex communications with bidirectional protocol data communications, refer to the User's Manual (Basic).

*2　Refer to the User's Manual (Basic) and check Q series C24 operation according to the RS (RTS) signal and CS (CTS) signal control contents and CD terminal check designation.

Point

When the Q series C24 is started, DTR/DSR signal control and RS/CS signal control are enabled.

7

7.1 Control Contents of DTR/DSR (ER/DR) Signal Control

This control uses the RS-232 interface DTR/DSR signals to inform the external device whether or not the local station is ready to receive data.

The Q series C24 uses the ER (DTR) signal to inform the external device whether or not the local station is ready to receive data and uses the DR (DSR) signal to check if the external device is ready to receive data.

Ex.
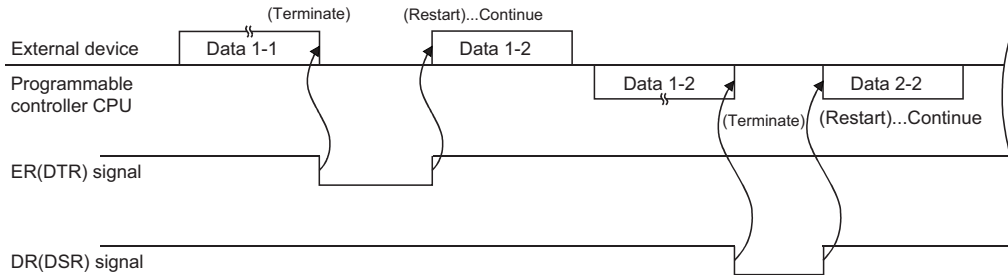
(1) Q series C24 DTR control

(a) Q series C24 DTR control

The Q series C24 uses the ER (DTR) signal to inform the external device whether or not it is ready to receive data.

The data transmitted from the external device by non procedure protocol is stored to the buffer memory receive data storage area through the OS area. (User's manual (Basic))

For the following conditions, the receive data is temporarily stored to the OS area and is transferred to the receive data storage area when the present receive data read processing is complete.

- Receive data size exceeds the size of the buffer memory area when "receive data storage area < receive data length data" was received.
- The data was received before the sequence program read the previously received data.

The Q series C24 turns the ER (DTR) signal on/off as listed below, depending on the size of the vacant OS area.

- Vacant area 64 bytes (default) or less: Off
- Vacant area 263 bytes (default) or more: On
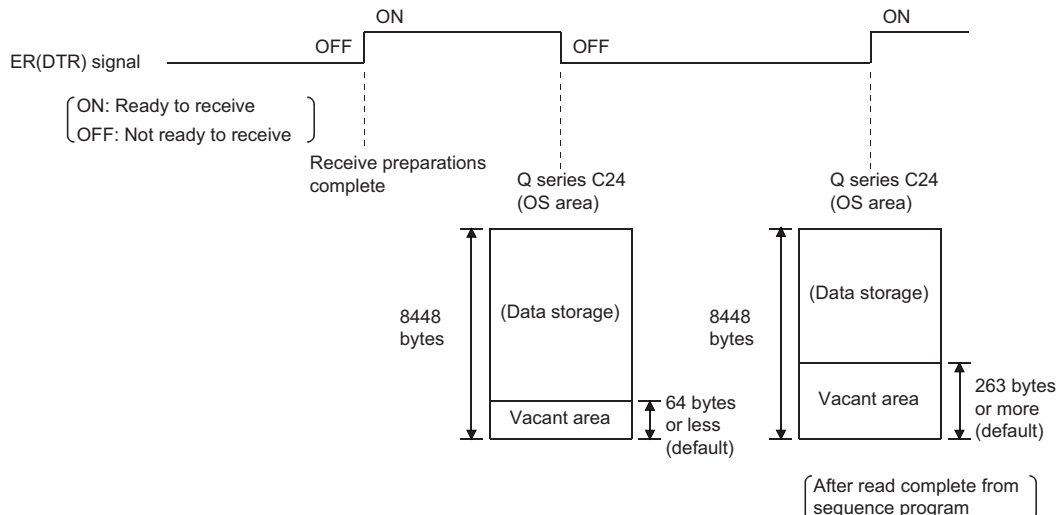
(b) Specification of free OS area

The limit of free OS area for data reception under the DTR/DSR (ER/DR) signal control is specified in GX Configurator-SC's "Transmission control and others system setting". When it reaches the limit, this status is notified to disable data reception.

The set values must satisfy the following condition.

"Transmission control start free area < Transmission control end free area"

• Transmission control start free area specification (Address: 2012H/2112H)

Specifies an available capacity in the OS area so that the full status is notified to disable the data reception (ER (DTR) signal is OFF).

• Transmission control start free area: 64 to 4095 (Default: 64)

• Transmission control end free area specification (Address: 2013H/2113H)

Specifies an available capacity in the OS area so that data reception is enabled by notification (ER (DTR) signal is ON).

• Transmission control end free area: 263 to 4096 (Default: 263)

Remark ●

● "Receive data clear" described in User's Manual (Basic) clears the data stored in the OS area. (The receive area in the buffer memory is not cleared.)

● If more data is received when the OS area mentioned above are 0 byte, an SIO error is generated and the data received until the OS area becomes vacant is ignored. At this time, the SIO signal is turned on. (📖 User's manual (Basic))

● ●

(2) Q series C24 DSR control

The Q series C24 uses the DSR signal to detect whether or not the external device is ready to receive data and to control data transmission to the external device as shown below, depending on whether the DSR is on/off.

• If the DSR signal is ON and there is send data, the Q series C24 transmits it to the external device.

• If the DSR signal is OFF, even if there is send data, the Q series C24 does not transmit it to the external device. When the DSR signal is turned on, the Q series C24 transmits the send data to the external device.

7

7.2 Control Contents of DC Code Control

This control uses the Q series C24 transmission control data to inform the external device whether or not local station is ready to receive data and the valid range of the send and receive data.

The four kinds of Q series C24 DC code control shown below are available. These control functions can be used simultaneously.

(1) DC1/DC3 transmission control, DC1/DC3 reception control

The Q series C24 informs the external device whether or not local station is ready to receive data by transmitting the DC1 and DC3 signals and checks whether or not the external device is ready to receive data by receiving the DC1 and DC3 signals.

DC1: Control data that informs the external device that the Q series C24 is ready to receive data

DC3: Control data that informs the external device that the Q series C24 is not ready to receive data
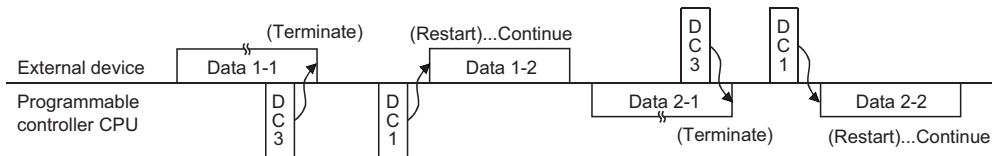
(a) Q Series C24 DC1/DC3 transmission control and free OS area specification

The control is performed in the same as those described in Page 204, Section 7.1 (1), DTR control. The free OS area specification are the same as those described in Page 205, Section 7.1 (1) (b).

The Q series C24 transmits DC1 or DC3 to the external device instead of turning the ER (DTR) signal on/off. For the DC1 and DC3 transmit timing, replace ER (DTR) signal ON/OFF as listed below.

(DTR control) (DC1, DC3 transmission control)

ER (DTR) signal OFF= DC3 transmit: Transmitted when the vacant OS area drops to 64 bytes (default) or less

ER (DTR) signal ON = DC1 transmit: Transmitted when the vacant OS area reaches 263 bytes (default) or more
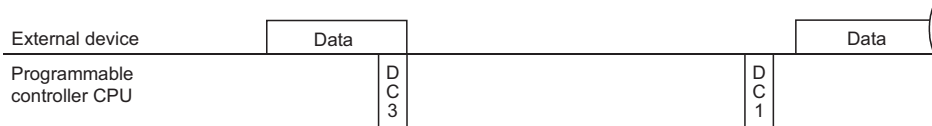
Remark •

● "Receive data clear" described in the User's Manual (Basic) clears the data stored in the OS area.

● If more data is received when the vacant OS area mentioned above is 0 byte, an SIO error is generated and the data received until the OS area becomes vacant is ignored. At this time, the SIO LED is turned on. (📖 User's manual (Basic))

• •

### (b) Q series C24 DC1/DC3 reception control contents

• When the Q series C24 receives DC3 from the external device, it terminates data transmission. The sequence program cannot read the received DC3 signal.

• When the Q series C24 receives DC1 from the external device, it restarts data transmission. (The Q series C24 resumes transmission from the data terminated on DC3 reception.) The sequence program cannot read the received DC1 signal.
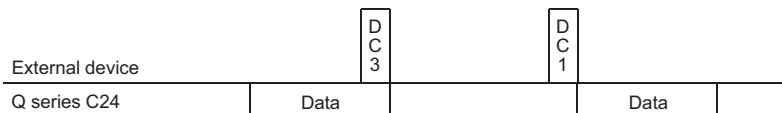
• Once DC1 is received, subsequent DC1 are ignored and are removed from the receive data.

Point

● In the DC1/DC3 transmission/reception control, the state of the Q series C24 is as follows at the time of power-on, reset or mode switching of the CPU, or the UINI instruction execution.

● DC1 is not transmitted to the external device.
  • This is the same state as when DC1 was transmitted.
  • The same state as when DC1 was received even if DC1 is not received from the external device.

7

(2) DC2/DC4 transmission control, DC2/DC4 reception control

The Q series C24 encloses the send data from the local station in the DC2 and DC4 codes and transmits it to the external device and processes the data received from an external device enclosed in the DC2 and DC4 codes as valid data.

DC2: Control data that informs the external device that the data following it is the start of the valid data

DC4: Control data that informs the external device that the data immediately preceding it is the end of the valid data
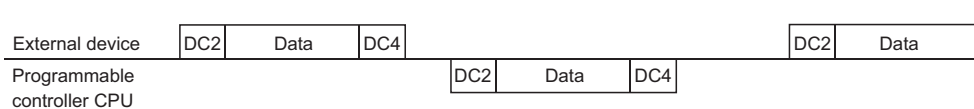
(a) Q series C24 DC2/DC4 transmission control contents

When transmitting data to an external device, the Q series C24 adds the DC2 code to the head of the send data and the DC4 code to the end of the send data.
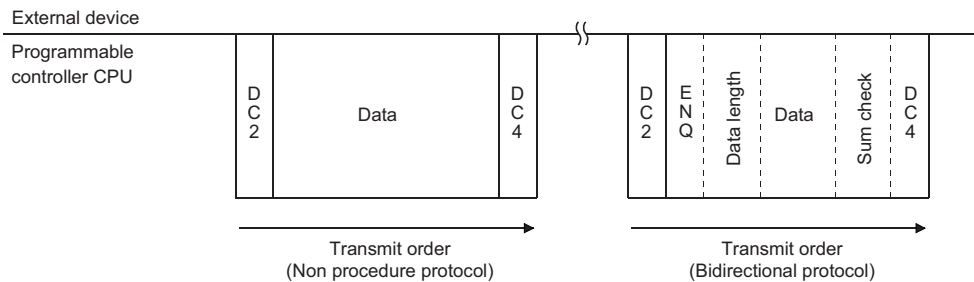
* The DC2 and DC4 code are also added when MC protocol is used.

(b) Q series C24 DC2/DC4 reception control contents

- When the Q series C24 receives DC2 from the external device, it processes the receive data up to DC4 as valid data. The sequence program cannot read the received DC2 code.
- When the Q series C24 receives DC4, it ignores the receive data up to immediately before DC2 as invalid data. The sequence program cannot read the received DC4 code.
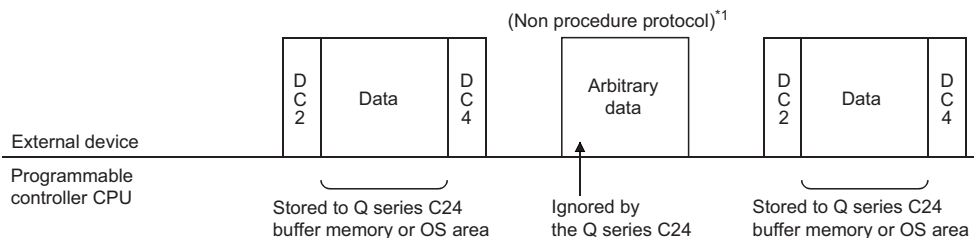
- Once DC2 is received, subsequent DC2 are ignored and are removed from the receive data.
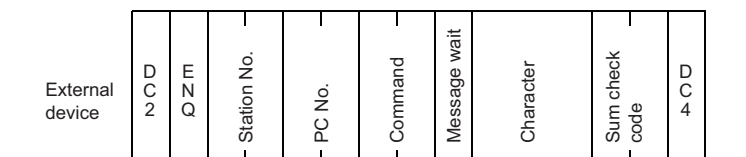
(3) The transmission control method and changing the DC code

Switching between DC code control method and DTR/DSR control as well as changing of the DC code are registered on the GX Configurator-SC's "Transmission control and others system setting" screen.

7.3 Precautions when Using the Transmission Control Functions

The following describes the precautions to be observed when using the Q series C24 transmission control functions.

(1) Agreement between external device and programmable controller CPU

The external device and programmable controller CPU must agree to the following.
- Whether or not a transmission control function is to be used. If a control function is used, which control is to be used for data communications.
- Control timing.
- DC1 to DC4 codes when DC control is performed. (The DC1 to DC4 codes used can be arbitrarily changed.)

(2) Transmission control function usage conditions

- DTR/DSR control and DC code control cannot be used at the same time. Select one of them using the GX Configurator-SC registration.
- When using DTR/DSR control, connect the Q series C24 ER (DTR) and DR (DSR) signals to the external device.

(3) Transmission control function setting

Set a transmission control function that can control the target interface.
If a function that cannot control the target interface is set, the set contents are invalid.

(4) Setting of transmission control function during linked operation

When the two Q series C24 interfaces are linked (📖 User's Manual (Basic)), set the transmission control function of only the interface that must be controlled.
Set the other interface to "Do not use transmission control function" (set value when directly set to the buffer memory: 0001H).

(5) DC code control

- DC1/DC3 transmission control and DC1/DC3 reception control are possible when full-duplex communications is used to communicate data between the Q series C24 and external devices. Do not use DC1/DC3 control with half-duplex communications.
- The same data as the DC1 to DC4 codes cannot be included in the user data. To handle the same data as a DC code as user data, do the following.
  - Use DTR/DSR control.
  - Change the DC code.
  - Do not use the transmission control functions.

Point

If the user data received from the external device includes the relevant DC code when DC1/DC3 reception control and DC2/DC4 reception control are used, the Q series C24 uses the corresponding DC code control.
If the user data transmitted from the programmable controller CPU includes a DC code, it is sent unchanged.

(6) Handling of ER (DTR) and DR (DSR) signals when DTR/DSR control is not used

When the DTR/DSR control function is not used, the Q series C24 handles the ER (DTR) and DR (DSR) signals as described below.

- Leaves the ER (DTR) signal ON.
- Ignores the DR (DSR) signal ON/OFF state.

CHAPTER 8　DATA COMMUNICATIONS USING HALF-DUPLEX COMMUNICATIONS

For data communications between the Q series C24 and an external device using the RS-232 interface, it is set so that the Q series C24 and the external device do not transmit data at the same time.
The QJ71C24 (N)-R2 can be set for each interface.
When the Q series C24 is started, full-duplex communications is set. The user can change the communications method to match the specifications of the external device.

> *Point*
>
> Since half-duplex communications does not have to be set in the following cases, you do not have to read this section.
>
> ● When data is only transmitted or receive during non procedure protocol data communications.
>
> ● When it is designated in the external device that no data transmission is performed from the external device to the Q series C24 unless so directed by the Q series C24.

8.1　Half-duplex Communications

The following describes the differences between full-duplex communications and half-duplex communications.
Since the Q series C24 uses the communications method designated by the user to control programmable controller CPU communications, control by sequence program is unnecessary.

(1) Full-duplex communications

This communication method uses telephone conversation format image to communicate data with the external device.
The Q series C24 can receive data while transmitting data to the external device.
It can also transmit data while receiving data from the external device.

External device	Data A-1		Data A-2
Programmable controller CPU		Data B-1	Data B-2
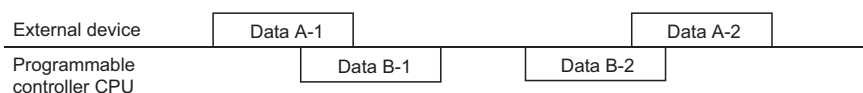
(2) Half-duplex communications

This communications method uses transceiver conversation format image to communicate data with the external device.
If the Q series C24 receives data from the external device while transmitting data to the external device, it controls data transmission and reception according to "Simultaneous transmission priority/non-priority designation".
The Q series C24 does not transmit data while it is receiving data from the external device.

External device	Data A-1		Data A-2
Programmable controller CPU		Data B-1　Data B-2	
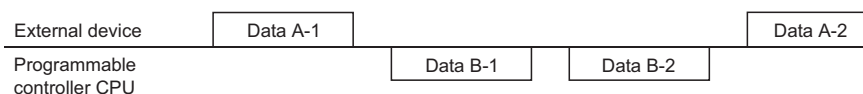
8.2 Data Transmission and Reception Timing

Half-duplex communications uses the Q series C24 RS-232 interface CD (DCD) and RS (RTS) signals to control communications.

If the external device can transmit and receive data according to ON/OFF of the Q series C24 RS (RTS) and CD (DCD) signals as shown below, half-duplex communications is possible.

- RS (RTS) signal: The Q series C24 turns ON/OFF this signal as shown below. When data is transmitted from the Q series C24, this signal is turned ON. When transmission is complete, this signal is turned OFF.
- CD (DCD) signal: Turn ON/OFF this signal using the external device as shown below. To transmit data from the external device, turn ON this signal. When transmission is complete, turn OFF this signal.

The following describes the half-duplex communications data transmission and reception timings by Q series C24 CD (DCD) signal and RS (RTS) signal.

(1) Timing when transmitting data from external device

Transmit data by controlling the Q series C24 CD (DCD) signal according to the "simultaneous transmission priority/non-priority designation" registered in "Transmission control and others system setting" screen of GX Configurator-SC.
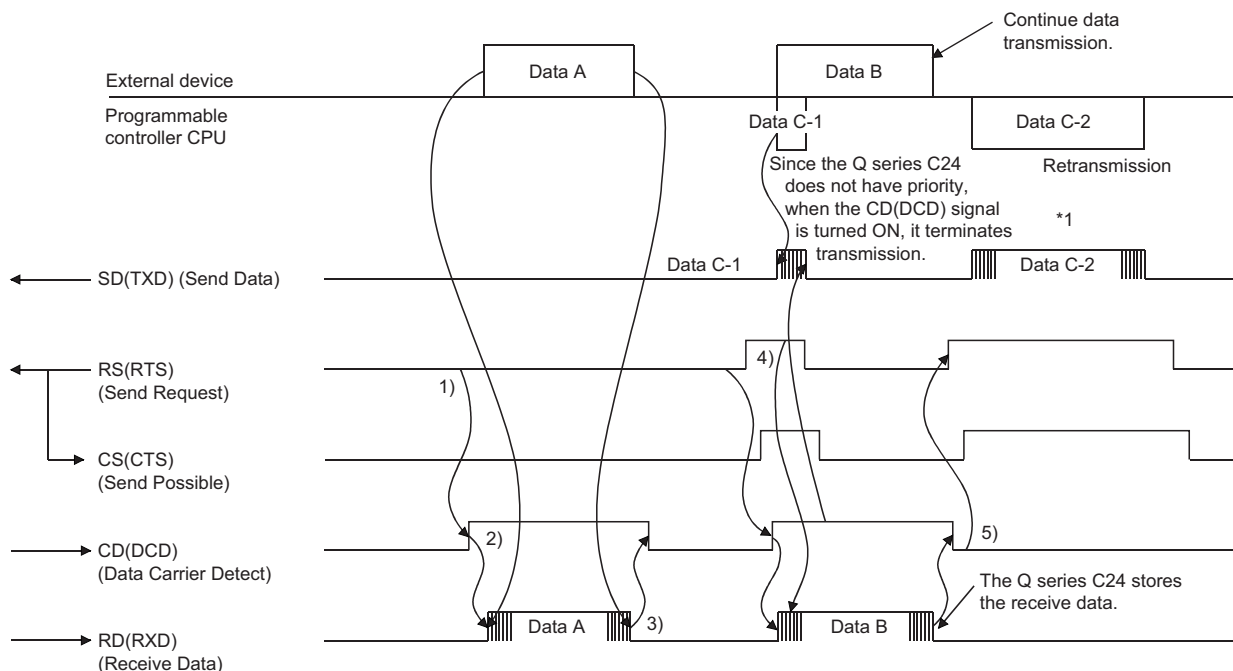
(a) When Q series C24 is designated "priority"
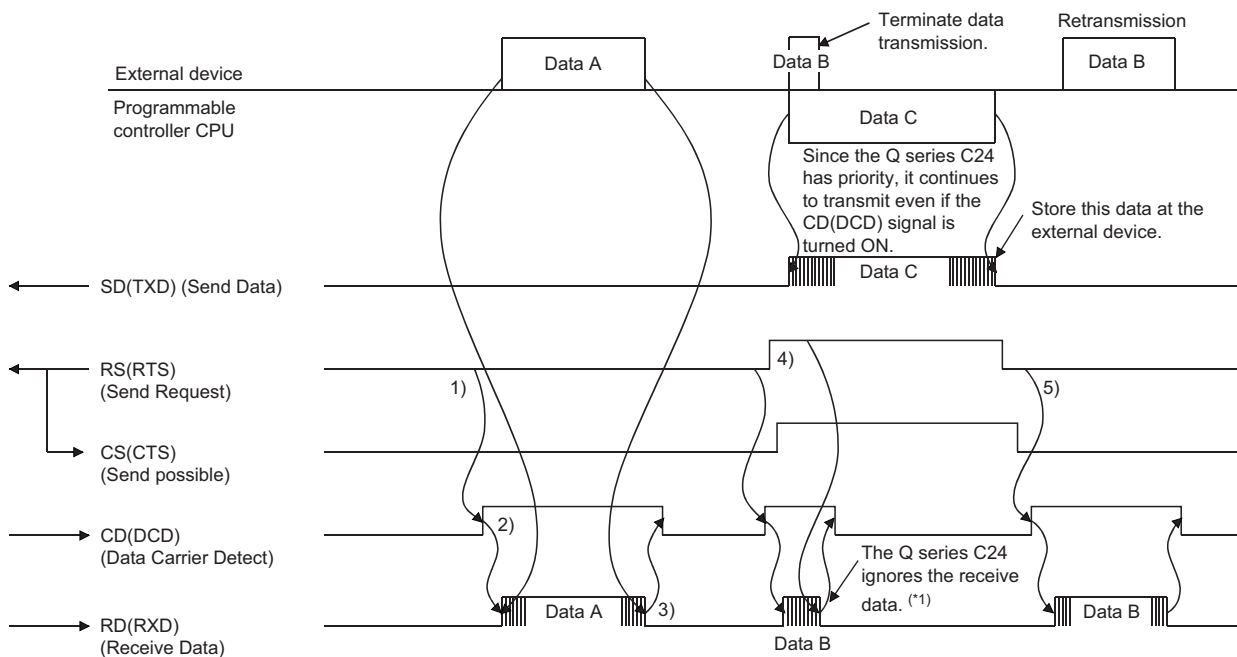
1) If the RS (RTS) signal is OFF, turn ON the CD (DCD) signal. If the RS (RTS) signal is ON, wait until it is turned OFF, then turn ON the CD (DCD) signal.

2) Transmit data after turning ON the CD (DCD) signal.

3) After data transmission is complete, turn off the CD (DCD) signal.

4) If the RS (RTS) signal is turned ON during data transmission, terminate data transmission and turn OFF the CD (DCD) signal and perform data reception processing. (Simultaneous transmission generated)

5) After transmission from the Q series C24 is complete, retransmit all the data terminated at step 4.

*1   Take the following measures between the communicating devices as a countermeasure against ignoring of the receive data by the Q series C24.
- Transmit and receive a response message in reply to data transmission
- Time-out check of the response message and data transmission due to time-out error (external device side).

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(b) When Q series C24 is designated "non-priority"

The contents of steps 4 and 5 below are different from those of Page 213, Section 8.2 (1) (a).

1) If the RS (RTS) signal is OFF, turn ON the CD (DCD) signal. If the RS (RTS) signal is ON, wait until it is turned OFF, then turn ON the CD (DCD) signal.

2) Transmit data after turning ON the CD (DCD) signal.

3) After data transmission is complete, turn off the CD (DCD) signal.

4) Keep transmitting data from the external device to the Q series C24 even if the RS (RTS) signal is turned ON during data transmission. (Simultaneous transmission generated)

5) After transmission from the external device is complete, data is transmitted from the Q series C24 to the external device. (☞ Page 215, Section 8.2 (2))

*1   For transmission data, see Page 215, Section 8.2 (2).

Remark ●

When using the DTR/DSR transmission control function described in Page 203, CHAPTER 7, transmit data from the external device to the Q series C24 as shown below in both cases Page 213, Section 8.2 (1) (a) and Page 214, Section 8.2 (1) (b).
- • When the Q series C24 ER (DTR) signal is turned OFF, terminate data transmission.
- • When the Q series C24 ER (DTR) signal is turned ON after data transmission is terminated, restart data transmission (transmit from the terminated data).

● ●

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(2) Timing when data is transmitted from the Q series C24

The Q series C24 RS (RTS) signal is controlled and data is transmitted according to the "simultaneous transmission priority/non-priority" value registered in "Transmission control and others system setting" screen of GX Configurator-SC.

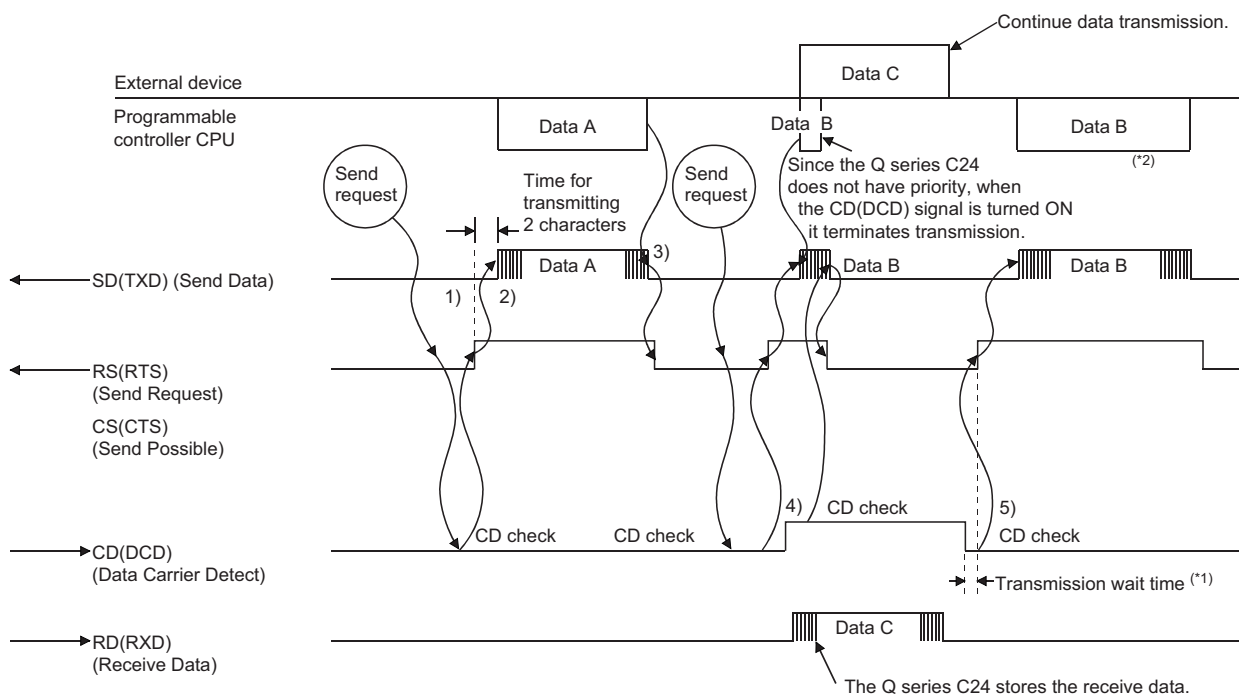### (a) When Q series C24 is designated "priority"
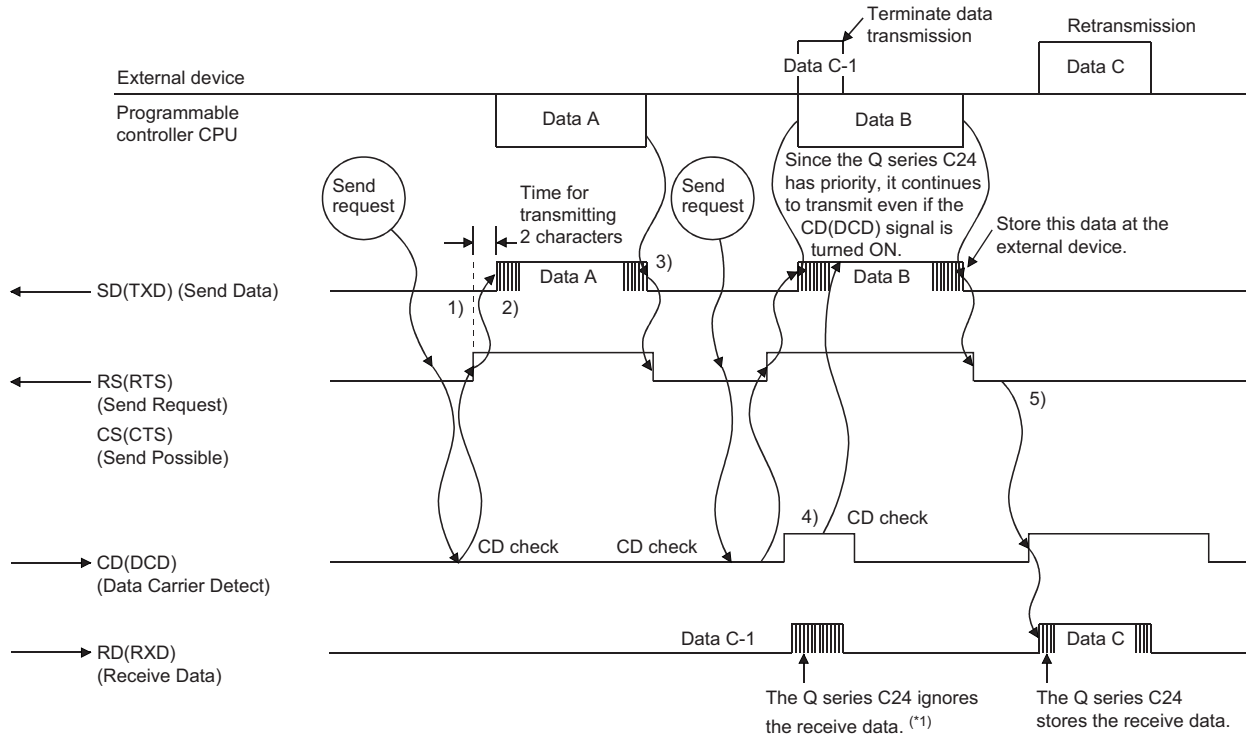
1) When transmitting data, check the Q series C24 CD (DCD) signal. If the CD (DCD) signal is OFF, turn on the Q series C24 RS (RTS) signal. If the CD (DCD) signal is ON, wait until it is turned OFF, then turn ON the RS (RTS) signal.

2) Transmit the data after turning ON the RS (RTS) signal.

3) After data transmission is complete, turn off the RS (RTS) signal.

4) Keep transmitting data from the Q series C24 to the external device even if the CD (DCD) signal is turned ON during data transmission. (Simultaneous transmission generated)

5) After transmission from the Q series C24 is complete, transmit all the data terminated at step 4 from the external device to the Q series C24.

*1 Take the following measures between the communicating devices as a countermeasure against ignoring of the receive data by the Q series C24.
- Transmit and receive a response message in reply to data transmission
- Time-out check of the response message and data transmission due to time-out error (external device side).

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8.2 Data Transmission and Reception Timing

(b) When Q series C24 is designated "non-priority"

The contents of steps 4 and 5 below are different from those of Page 215, Section 8.2 (2) (a).

1) When transmitting data, check the Q series C24 CD (DCD) signal. If the CD (DCD) signal is off, turn on the Q series C24 RS (RTS) signal. If the CD (DCD) signal is ON, wait until it is turned OFF, then turn ON the RS (RTS) signal.

2) Transmit the data after turning ON the RS (RTS) signal.

3) After data transmission is complete, turn off the RS (RTS) signal.

4) If the CD (DCD) signal is turned on during data transmission, terminate data transmission and turn off the RS (RTS) signal and perform the data receive processing. (Simultaneous transmission generated)

5) After transmission from the external device is complete, transmit the data terminated at step 4 from the beginning or from the last data transmitted.[*2]

* *1 The data size set to "Simultaneous transmission priority/non-priority" by GX Configurator-SC is not transmitted.
* *2 Transmit from the beginning or from the data transmitted immediately before transmission was terminated, according to the contents set to "Retransmission time transmission method by GX Configurator-SC".

Remark •

When using the DTR/DSR transmission control function described in Page 203, CHAPTER 7, transmit data from the Q series C24 to the external device as shown below in both cases Page 215, Section 8.2 (2) (a) and Page 216, Section 8.2 (2) (b) above.
* When the Q series C24 DR (DSR) signal is turned OFF, terminate data transmission.
* When the Q series C24 DR (DSR) signal is turned on after data transmission is terminated, restart data transmission (transmit from the terminated data).

• •

8.3 Changing the Communication System

To change the data communication mode from full-duplex communication to half-duplex communication, registration on the GX Configurator-SC's "Transmission control and others system setting" screen is required.
The following explains setting items for changing the communication system.

(1) RS-232 communication system designation

Designate either full-duplex or half-duplex communication.

(2) Simultaneous transmission priority/non-priority designation

When the Q series C24 and the external device start data transmission simultaneously in half-duplex mode, designate whether to continue (priority) or stop (non-priority) transmission from the Q series C24.
Designated values "1" to "255" for setting "non-priority" will be the transmission wait time that elapses from when the resumption of data transmission becomes available until data is actually sent.

(3) Retransmission time transmission method designation

When "half-duplex communication" and "non-priority" are set as indicated above, this setting becomes valid.
When the Q series C24 and the external device begin transmission simultaneously, if the Q series C24 stops and then restarts transmitting, designate whether the stopped message will be transmitted from the beginning ("resend") or whether transmission will continue after the stopped message ("not resend").

(4) RS-232 CD terminal check designation

When using half-duplex communication, set the "CD terminal check designation" to on.

8.4 Connector Connections for Half-duplex Communications

The following explains the functions of the connector that connects the Q series C24 and external device when half-duplex communications are used.
Connect the Q series C24 and external device based on (1) and (2) below.

(1) Connect the Q series C24 RS (RTS) signal to one of the external device half-duplex communications signals (CS (CTS), DR (DSR), or CD (DCD) signal).

(2) Connect the Q series C24 CD (DCD) signal to one of the external device half-duplex communications signals (RS (RTS) or ER (DTR) signal).

(3) The half-duplex communications described in this section cannot be performed when an RS-232 and RS-422 converter is used.

(Connection example)

Q series C24		Cable connection and signal direction	External device
Signal name	Pin No.		Signal name
CD(DCD)	1		CD(DCD)
RD(RXD)	2		RD(RXD)
SD(TXD)	3		SD(TXD)
ER(DTR)	4		ER(DTR)
SG	5		SG
DR(DSR)	6		DR(DSR)
RS(RTS)	7		RS(RTS)
CS(CTS)	8		CS(CTS)
CI(RI)	9		

8.5 Half-duplex Communications Precautions

The following describes the precautions to be observed when using half-duplex communications.

(1) Half-duplex communications system configuration and functions

Half-duplex communications is possible only with a system that connects the programmable controller CPU and external device in a 1: 1 configuration.
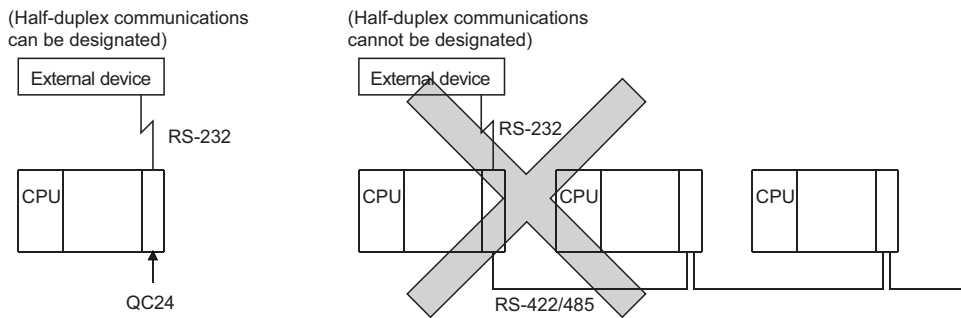
(2) Agreement and confirmation between external device and programmable controller CPU

Agree and confirm the following items between the external device and the programmable controller CPU.
- Whether or not half-duplex communications can be performed by Q series C24 RS (RTS) signal and CD (DCD) signal.
- Q series C24 RS (RTS) signal and CD (DCD) signal ON/OFF timing.
- Q series C24 and external device data transmission timing.
- RS-232 cable connection method.

(3) Transmission control

When the transmission control functions described in Page 203, CHAPTER 7 are used, DC code control DC1/DC3 transmission control and DC1/DC3 reception control cannot be used with half-duplex communications. Therefore, do not designate them.

CHAPTER 9 CONTENTS AND REGISTRATION OF THE USER FRAMES FOR DATA COMMUNICATION

User frames are used to register some, or all, of the messages exchanged between an external device and the Q series C24 in advance and use them to check the send data or receive data.

The following functions can use Q series C24 user frames to transmit and receive data.

- MC protocol on-demand function. (☞ Page 243, CHAPTER 10)
- Non procedure protocol data transmit and receive functions. (☞ Page 252, CHAPTER 11)

Data can be transmitted and received by registering the corresponding user frames to the Q series C24 in advance to match the data contents that are transmitted and received between the external device and the Q series C24.
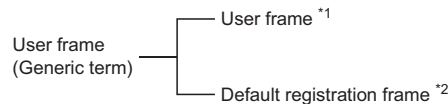
This chapter explains the data that can be registered, the data contents that are transmitted and received, and registering to the Q series C24 of user frames that can be used in data communications with the external device.

See Page 243, CHAPTER 10 and Page 252, CHAPTER 11 for a description of how each data communications function uses the user frames.

9.1 User Frame Types and Contents During Communication

This section explains the kinds of user frames handled by the Q series C24 and the data contents that are transmitted and received.

The following two kinds of user frames are available. Either kind can be used.

```
                                          ┌─── User frame *1
           User frame            ─────────┤
           (Generic term)                 └─── Default registration frame *2
```

*1   Frame described in ☞ Page 221, Section 9.1.1
*2   Frame described in ☞ Page 230, Section 9.1.2

9.1.1 User frames to be registered and used by the user

The following explains the registered data, data contents that are transmitted and received, and how the Q series C24 handles user frames registered the Q series C24 Flash ROM or buffer memory by the user.

(1) General description

User frames registered by the user are frames that contain arbitrary data that matches the specifications of the external device. The data contents are selected by the user.

(2) User frame registering

(a) Up to 231 user frames can be registered, read, and deleted at the Q series C24.

• Q series C24 flash ROM

(number that can be registered: Maximum 200, frame No.: 3E8H to 4AFH)

• Q series C24 buffer memory

(number that can be registered: Maximum 31, frame No.: 8001H to 801FH)

(b) Up to 80 bytes (80 en characters) of data can be registered as 1 user frame.

(c) User frames can include data for handling the variable data (sum check code, Q series C24 station No., etc.) shown in (4) as a part of user frames.

(d) User frames can be overwritten to the Q series C24 buffer memory. (The old contents are destroyed.)

(e) The registration destination for the user frame can be divided into the following usage.

• After data communication has started, register the user frames without changes to buffer memory and use. (Frame No: 3E8H to 4AFH)

• After data communication has started, register the user frames with changes to buffer memory and use. (Frame No: 8001H to 801FH)

(3) Data that can be registered as user frame

Up to 80 bytes of data can be registered by combining 1 byte of register code 01H to FEH data and 2 bytes of register code FFH + 00H to FFH + FFH data.

(a) One byte of register code (01H to FEH) data

This is the register code for transmitting and receiving the register code (01H to FEH) data.

(b) Two bytes of register code (FFH + 00H) to (FFH + FFH) data

This is the register code for transmitting and receiving the variable data (Sum check code, Q series C24 station No., etc.) shown in (4) as part of the user frame.

FFH is the register code of the first byte for handling variable data.

(4) Variable data

"Variable data" is the generic term for the following data.

These variable data can be handled as part of a user frame.

- Sum check code whose objective is an arbitrary range in the transmit and receive messages.
- Horizontal parity code whose objective is a determined range in the transmit and receive messages.
- Two's complement sum check code whose objective is a determined range in the transmit and receive messages.
- Q series C24 station No.
- One byte data in data transmission (NULL: Code 00H) One byte of arbitrary data in data reception. (Used to handle an arbitrary byte of data as part of the user frame during receiving check by the Q series C24.)

(a) Variable data designation method

Variable data is designated by combining write code FFH and the data codes shown in the table below.

The sum check code, Q series C24 station No., and other variable data can be handled according to FFH of the first byte and 00H to FFH of the second byte.

```
 ┌──────┬──────────┐
 │ FFH  │ 00H to FFH│
 └──────┴──────────┘
    ▲        ▲
    │        └──────── 2nd byte
    └───────────────── 1st byte
```
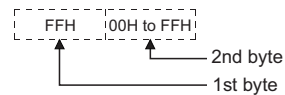
(b) Variable data designation contents, data contents transmitted and received, and handling by the Q series C24

The table below shows the register codes (FFH+00H) to (FFH + FFH) combinations for handling variable data, the data contents that are transmitted and received, and how the Q series C24 handles the data.

Combinations other than those listed in the table cannot be registered.

Changeable data register code		Data contents transmitted and received/Q series C24 handling	Calculation range[3]	Detailed explanation
1st byte	2nd byte			
FFH	00H	Transmission: Transmits the data code 00H (NUL) data (1 byte). Reception: Skips the given part (1 byte) of the receive user frame. (Skips the check and performs receive processing.)	—	1)
	01H	Transmits and receives the station No. set in the GX Developer switch setting as 1-byte binary code data (00H to 1FH).		2)
	04H[1]	Transmits and receives the horizontal parity code in the calculation range using 1 byte of binary code data	Range 1	3)
	05H[1]	Transmits and receives the horizontal parity code in the calculation range using 2-byte ASCII code data		
	0AH[1]	Transmits and receives the horizontal parity code in the calculation range using 1 byte of binary code data	Range 2	
	0BH[1]	Transmits and receives the horizontal parity code in the calculation range using 2-byte ASCII code data		
	11H[1]	Transmits and receives the two's complement sum check code in the calculation range.	Range 1	4)
	17H[1]		Range 2	
	E5H[1]	Transmits and receives the sum check code in the calculation range.[2] (Except the last one frame)	Range 3	6)
	EBH[1]		Range 4	7)
	EEH	Transmits and receives the sum check code in the calculation range.[2]	Range 1	5)
	F0H			
	F1H			
	F3H			
	F4H		Range 2	
	F6H			
	F7H			
	F9H			
	FFH	Transmits and receives the register code FFH data (1 byte).	—	—

*1 For usage of the register code, there are restrictions on versions of QJ71C24N(-R2/R4) and QJ71C24(-R2).
Refer to the Q Corresponding Serial Communication Module User's Manual (Basic) for how to check the version.

*2 During data communication using a user frame that handles the last frame, the contents of the "sum check code" set in the transmission setting using the GX Developer switch setting will be ignored.
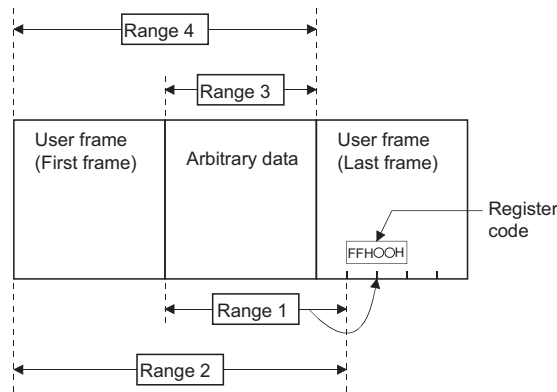
*3 Calculation ranges for the register codes

(Calculation range when transmitting data)
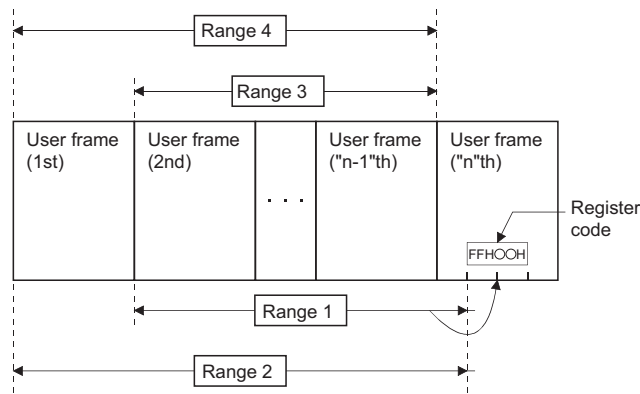
(Calculation range when transmitting data)

(Calculation range when receiving data)

(Calculation range when receiving data)

[Range 1]
- When transmitting: Calculation includes everything from the data following the first frame (first one frame only when multiple user frames have been specified) to the one immediately before the register code. (Except the additional code data of the transparent code designation shown in Chapter 12)
- When receiving: Calculation includes everything from the data following the first frame to the one immediately before the register code. (Except the additional code data of the transparent code designation shown in Chapter 12)

[Range 2]
- When transmitting/receiving: Calculation includes everything from the head of the message to the one immediately before the register code. (Except the additional code data of the transparent code designation shown in Chapter 12)

[Range 3]

- When transmitting: Calculation includes everything from the data following the first frame (user frame (1st) when multiple frames have been specified) to the frame preceding the last one (user frame ("n"th) when there are multiple frames specified). (Except the additional code data of the transparent code designation shown in Chapter 12)
- When receiving: Calculation includes everything from the data following the first frame to the frame preceding the last one. (Except the additional code data of the transparent code designation shown in Chapter 12)

[Range 4]

- When transmitting/receiving: Calculation includes everything from the head of the message to the frame preceding the last one. (Except the additional code data of the transparent code designation shown in Chapter 12)

1) Q series C24 processing corresponding to register codes FFH and 00H

The following uses an example to describe the processing performed by the Q series C24 when it receives a user frame part corresponding to register codes FFH and 00H.

Assume that a user frame containing the data codes 02H, FFH, 00H, and 3BH was set as receive user frame No. 3EAH.

- When the Q series C24 receives the 3 bytes of data "STX, arbitrary data (1 byte), ; ", it processes them as if user frame No. 3EAH was received.
- The Q series C24 does not check the 2 bytes described above.
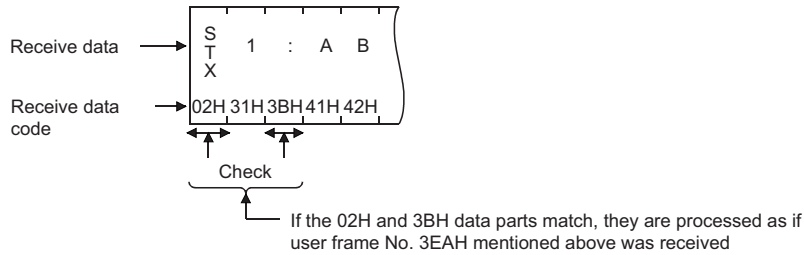
2) Transmission/reception data corresponding to register codes FFH and 01H

The Q series C24 transmits and receives the user frame part corresponding to register codes FFH and 01H by representing the station No. set in the GX Developer switch setting as 1-byte binary data.

See the first frame part shown in the illustration in item 3 for an example.

3) Transmission/reception data corresponding to register codes FFH + 04H, FFH + 05H, FFH + 0AH, and FFH + 0BH.

- For FFH + 04H and FFH + 0AH: The horizontal parity code that calculates the range for the transmission/reception data (message) is expressed as 1 byte of binary data and then transmitted and received. The difference between FFH + 04H and FFH + 0AH is the difference in the calculation range.
- For FFH + 05H and FFH + 0BH: The horizontal parity code that calculates the range for the transmission/reception data (message) is expressed as 2-byte ASCII code data and then transmitted and received from the upper digit. The difference between FFH + 05H and FFH + 0BH is the difference in the calculation range.

Examples of the transmission and reception data arrangement of the horizontal parity codes are shown below. (One first frame and one last frame each)

Ex. For register code FFH + 04H
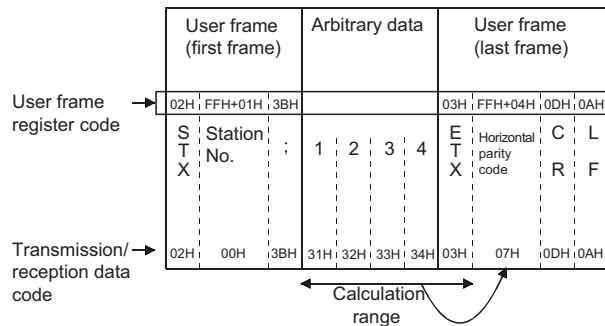
Ex. For register code FFH + 05H
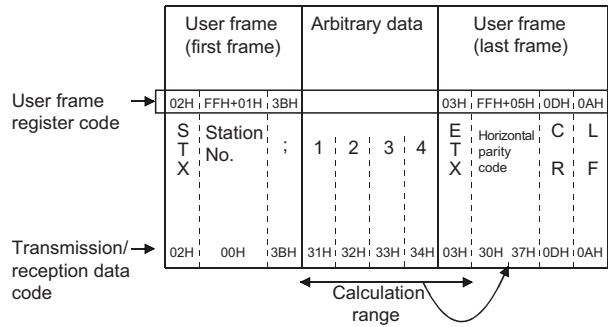
• How to calculate the horizontal parity code

This is a numeric value obtained by calculating the XOR for the subject data and then converting it to ASCII code.

(In the case of the example)

4) Transmission/reception data corresponding to register codes FFH+11H and FFH+17H

The two's complement sum check code that calculates the subject range for transmission/reception data (message) is expressed as two-character data in ASCII code, then transmitted and received from the upper digit.

The difference between (FFH+11H) and (FFH+17H) is the difference between the calculation ranges.

An example of the contents (arrangement) of the transmission and reception of the two's complement sum check code is shown below.

Ex. Arrangement of data transmitted and received with the register code FFH+17H (one first frame and one last frame)

• How to calculate the two's complement sum check code

The lower 1 byte of the value obtained by adding the subject data as binary data is converted to a two's complement, then converted to a hexadecimal ASCII code.

(In the case of the example)

02H+00H+3BH+31H+32H+33H+34H+03H=10AH ----- ● Data in the subject range are added as binary data (hexadecimal)

00001010 ----- ● The lower 1 byte of the above numeric value is expressed as a binary number

11110110 ----- ● Reversed, then converted to a two's complement

F6H ----- ● Converted to a hexadecimal ASCII code

"F"   "6"
(46H) (36H)

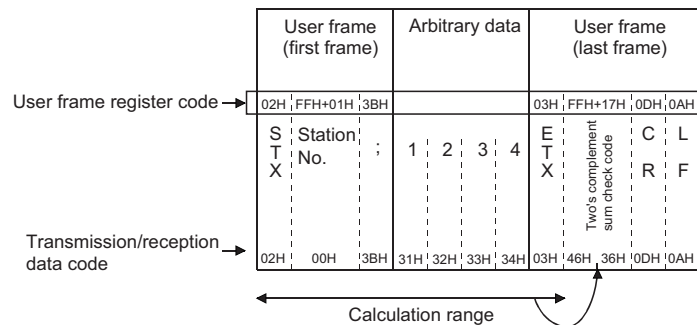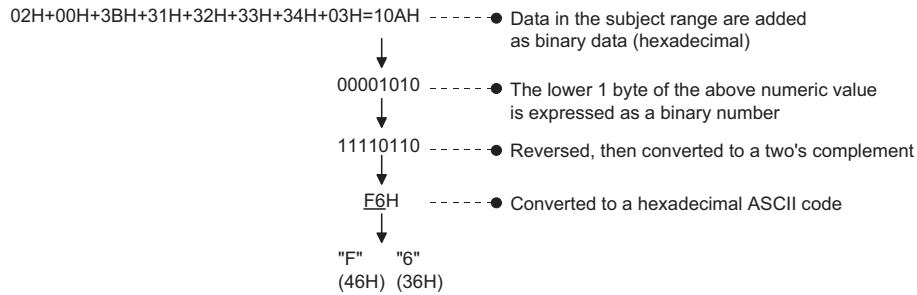5) Transmission/reception data corresponding to register codes FFH+EEH to FFH+F9H

The sum check code that calculates the subject range for transmission/reception data (message) is expressed as the binary code/ ASCII code data listed below, then transmitted and received.

Register code	Data contents transmitted and received
FFH + EEH or FFH + F4H	The lower 2 bytes of the calculated sum check code are transmitted and received as 2-byte binary code data.
FFH + F0H or FFH + F6H	The lower byte of the calculated sum check code is transmitted and received as 1-byte binary code data.
FFH + F1H or FFH + F7H	The lower byte of the calculated sum check code is converted to 2-digit ASCII code, then transmitted and received.
FFH + F3H or FFH + F9H	The lower 4 bits of the calculated sum check code is converted to 1-digit ASCII code, then transmitted and received.

An example of the contents (arrangement) of the transmission and reception of the sum check code is given below.

Ex. Arrangement of data transmitted and received (one first frame and one last frame)
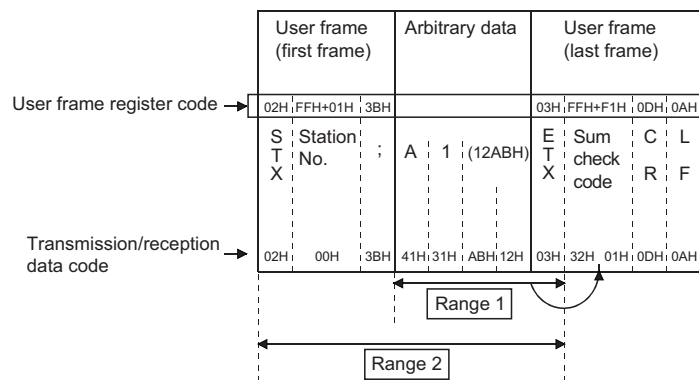
• How to calculate the sum check code and data contents transmitted and received

This is a numeric value obtained by adding data in the above range as binary data.

(In the case of the example [Range 1]) (H) (L)

41H+ 31H + ABH + 12H + 03H = 0132H

Register code	Data contents transmitted and received (arrangement)
FFH + EEH	01H and 32H are transmitted and received, beginning from 32H.
FFH + F0H	32H is transmitted and received.
FFH + F1H	"3" and "2" are transmitted and received, beginning from "3."
FFH + F3H	"2" is transmitted and received.

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(In the case of the example [Range 2]) (H) (L)

02H + 00H + 3BH + 41H + 31H + ABH + 12H + 03H = 016FH

Register code	Data contents transmitted and received (arrangement)
FFH, F4H	01H and 6FH are transmitted and received, beginning from 6FH.
FFH, F6H	6FH is transmitted and received.
FFH, F7H	"6" and "F" are transmitted and received, beginning from "6".
FFH, F9H	"F" is transmitted and received.

6) Transmission/reception data corresponding to register code FFH+E5H

The sum check code resulted from the calculation of the transmission/reception data (message) codes except the first one frame and last one frame is expressed as the ASCII code data and transmitted or received.

　• How to calculate the sum check code

Lower one byte of the sum check value calculated is converted into 2-digit ASCII code data, and used for data transfer.

Ex.　Arrangement of data when received
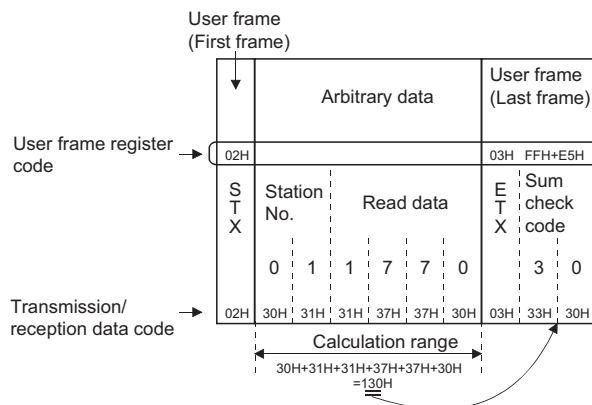
7) Transmission/reception data corresponding to register code FFH+EBH

The sum check code resulted from the calculation of the transmission/reception data (message) codes, including the first one frame and excluding the last one frame, is expressed as the ASCII code data and transmitted or received.

　• How to calculate the sum check code

Lower one byte of the sum check value calculated is converted into 2-digit ASCII code data, and used for data transfer.

Ex.　Arrangement of data when received
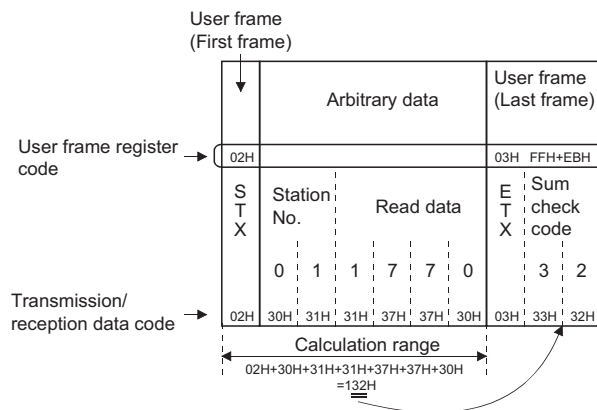
9.1.2 Default registration frame (read only)

This frame is registered to the Q series C24 in advance and can be used in the same way as the other user frames.

(1) Overview

The default registration frame is registered in the OS ROM of the Q series C24. The following table lists one-byte data (codes: 01H to FEH) to a maximum of five-byte data, which is registered in the frames and can be used for read-only (frame numbers: 1H to 3E7H).
Each of these frames is treated as an user frame.

(2) Default registration frame write data and data contents that are transmitted and received

The following lists the codes of the register data and the data contents that are transmitted and received.

Default registration frame No. (Hexadecimal (decimal))	Register data code (1st byte to nth byte)	Registered bytes count	Frame byte count	Data contents transmitted and received
				data contents
1H (1)	01H			(Data codes shown at the left)
2H (2)	02H	1	1	STX
⋮	⋮			⋮
FEH (254)	FEH			(Data codes shown at the left)
FFH (255)	—		—	(For variable data designation)
100H (256)	00H	1	1	NUL
101H (257)	FFH	1		(Data codes shown at the left)
102H (258)	0DH, 0AH			CR, LF
103H (259)	10H, 02H	2	2	DLE, STX
104H (260)	10H, 03H			DLE, ETX
105H (261)	00H, FEH	2	2	(Data codes shown at the left)
106H (262)	00H, 00H, FEH	3	3	(Data codes shown at the left)
107H (263)	03H, FFH, F1H	3	2	ETX, Sum check code[1]
108H (264)	03H, FFH, F1H, 0DH, 0AH	5	4	ETX, sum check code, CR, LF[1]
109H (265)				
⋮	(None)	—	—	—
10DH (269)				
10EH (270)	FFH, EEH			
110H (272)	FFH, F0H			
111H (273)	FFH, F1H			
113H (275)	FFH, F3H			
114H (276)	FFH, F4H	2	1	Sum check code[1]
116H (278)	FFH, F6H			
117H (279)	FFH, F7H			
119H (281)	FFH, F9H			
11FH (287)	FFH, FFH			Register code FFH data (1 byte)
120H (288)				
⋮	(None)	—	—	—
3E7H (999)				

[1] The combination of FFH, ⌐⌐⌐H in the register code is used to handle variable data (sum check code, Q series C24 station No., etc.) as part of the user frame. The data contents that are transmitted and received and the byte count depend on the code combined with register code FFH. See Page 221, Section 9.1.1 (1) for the register code combinations that can be handled as variable data and the data contents that are transmitted and received.

9.2 Transmission/Reception Processing Using User Frame Register Data

The following explains how the Q series C24 transmits and receives using user frame register data.
The Q series C24 checks the transmission/reception of following data, using registered data.

(1) Transmission

(a) If user frame transmission is designated, the user frame is converted, or not converted, from ASCII to BIN data and transmitted, depending on the data communications protocol, ASCII-BIN conversion designation, and user frame No. designation, based on the following data as the send data of the given part.

• Register data code 01H to FEH 1-byte data register part

Q series C24 transmission is based on the register code (01H to FEH) data.

Ex. Register the data codes 03H, 0DH, 0AH as user frame No. 3E8H: When user frame No. 3E8H is designated during data transmission, if ASCII-BIN conversion is disabled, the Q series C24 transmits the data codes 03H, 0DH, 0AH (ETX, CR, LF) as the send data of the given user frame part. If ASCII-BIN conversion is enabled, the Q series C24 converts each of the data above to 2-character ASCII code data and transmits.
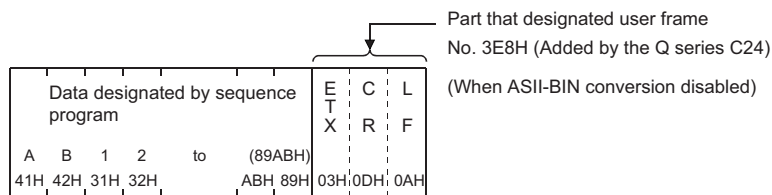
• Register data code FFH + 00H to FFH 2-byte data register part

The Q series C24 transmission is based on the variable data corresponding to the combination of the register codes FFH and 00H to FFH.

For example, if sum check code is registered, the Q series C24 will calculate and transmit the sum check code. If the Q series C24 station No. is registered, the station No. set in the Q series C24 is transmitted.

Ex. Register the data codes 03H, FFH, F0H, 0DH, 0AH as user frame No. 3E9H: If ASCII-BIN conversion is disabled, the Q series C24 transmits the calculated sum check code as the send data of that user frame part. If ASCII-BIN conversion is enabled, the Q series C24 converts the calculated sum check code to 2 characters/byte ASCII code data and transmits.
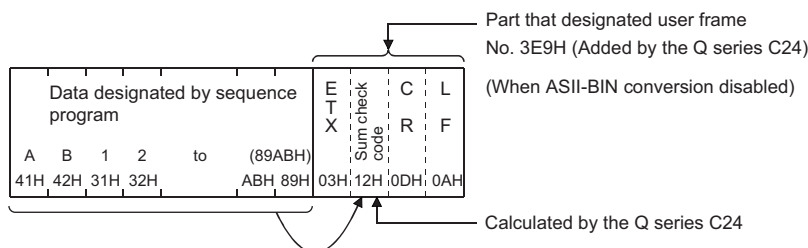
With a multidrop link, the user frame includes data that identifies which station transmitted the message to the external device to facilitate generation of arbitrary send data.

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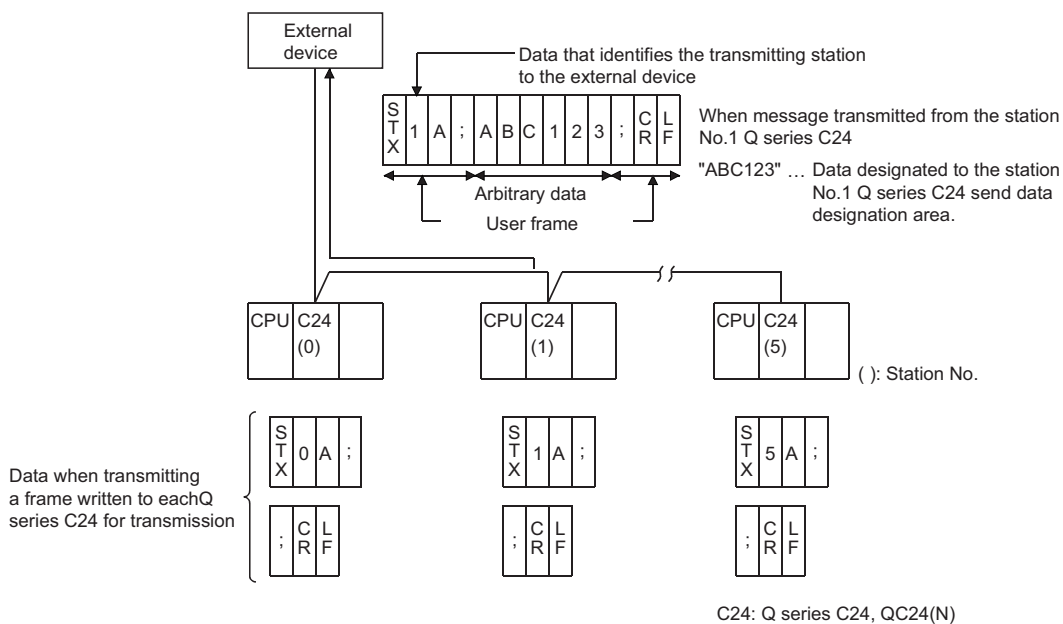
(2) Reception

(a) When setting for reception by user frame is performed, and the first frame is set, the Q series C24 receives the message when it receives data with the same contents as the designated first frame.

If the last frame is set, when the Q series C24 receives data with the same contents as the designated last frame, it sends a reception data read request to the programmable controller CPU.

(b) The following describes the Q series C24 receive processing using register data.

• Register data code 01H to FEH 1-byte data register part

The Q series C24 receives and checks if the received data is data of the same code (01H to FEH) as the registered code.

Ex. Register the data codes 03H, 0DH, and 0AH as user frame No. 3E8H: When user frame No. 3E8H is set as data receive, the Q series C24 receives and checks data codes 03H, 0DH, 0AH (ETX, CR, LF) as the receive data of that user frame part.
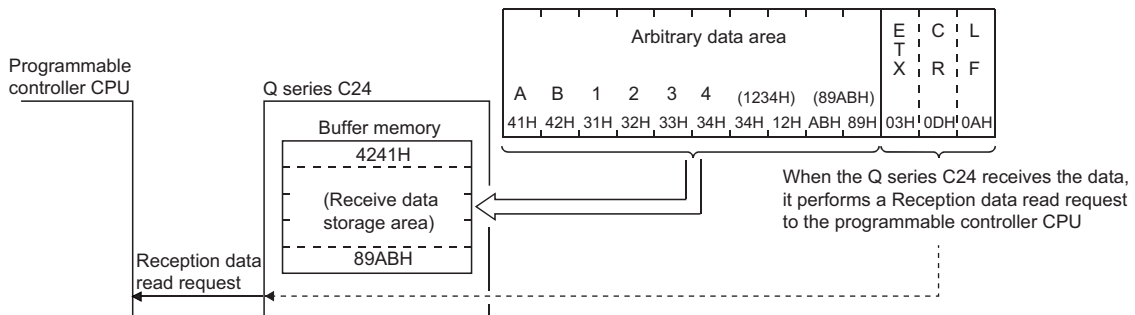
• Register data code FFH + 00H to FFH 2-byte data register part

The Q series C24 receives and checks if the received data is variable data corresponding to the combination of the register codes FFH and 00H to FFH.

For example, if a sum check code is registered, the Q series C24 calculates the sum check code from the receive data and checks if it is the same as the received sum check code. If the two codes are not the same, the Q series C24 performs error processing.

If the Q series C24 station No. is registered, the Q series C24 checks if the received station No. is the same as the station No. set in the Q series C24. If the station Nos. are not the same, the Q series C24 processes the data as if normal data was received instead of an user frame.

Ex. Register the data codes 03H, FFH, F0H, 0DH, 0AH as user frame No. 3E9H: When user frame No. 3E9H is set as a data receive frame, the Q series C24 calculates, receives, and checks the sum check code as the receive data of that user frame part.

(c) The Q series C24 removes the user frame data from the received message.

(The programmable controller CPU cannot read this data.)

With a multidrop link, if the receive user frame inherent to each Q series C24 is connected to the link in advance, the Q series C24 of a given station will store only the arbitrary data area of the message transmitted by the external device to the receive data storage area.

C24: Q series C24, QC24(N)

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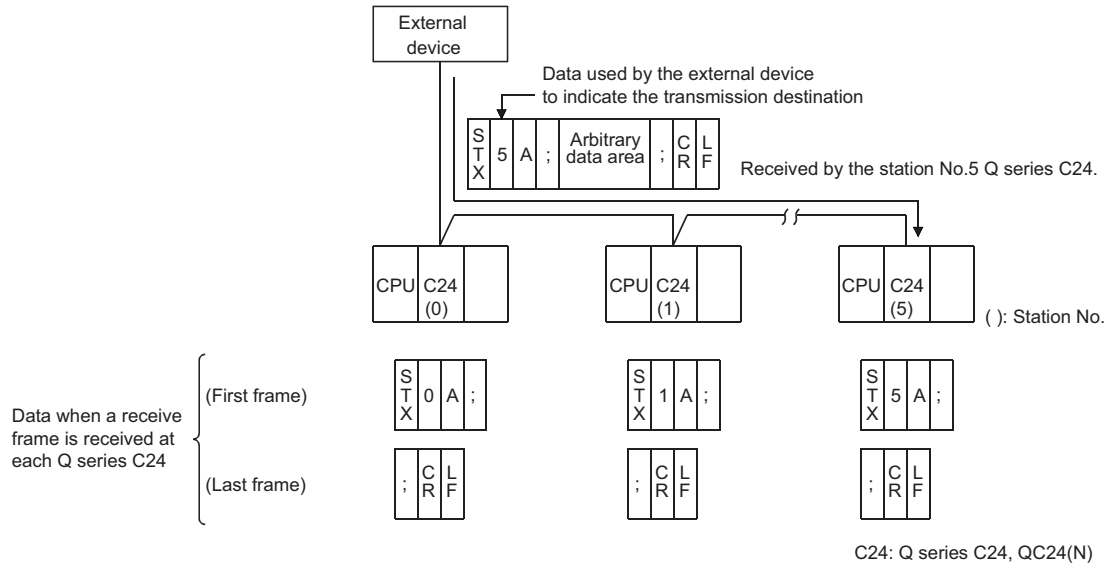
9.3 Precautions when Registering, Reading, Deleting and Using User Frames

The following shows the precautions which should be observed when registering user frames and using registered user frames to transmit data to and receive data correctly from the external device.

(1) Precautions when registering, reading or deleting user frames

(a) User frames can be registered using one of the following methods. However, an user frame to be registered to the flash ROM could be registered by the utility package (GX Configurator-SC) dedicated to the Q series C24 as much as possible.

- Registering via the utility package (GX Configurator-SC) for the Q series C24.
- Registering with the dedicated instruction "PUTE" from the programmable controller CPU.
- Registering from an external device with command "1610" through communication using the MC protocol.

(b) The following settings are required when registering or deleting user frames.

- Switch setting using GX Developer: Set the setting modification to Enable in the transmission setting.
- Settings via GX Configurator-SC: Set the flash ROM write allow/prohibit setting to Allow on the monitor/test screen.
  - To set from the programmable controller CPU, write "1" in the following buffer memory at the startup of the Q series C24 (when the ready signal rises). Flash ROM write allow/prohibit designation area (address: 2000H)

(c) To register, read or delete user frames from the programmable controller CPU, perform the operation while there is no data communication in progress with the external device.

(d) An user frame having only a sum check code as changeable data cannot be registered.

To register a sum check code, add arbitrary data.

(e) Register a receive user frame in the Q series C24 flash ROM.

(f) The changeable data (05H to F9H) can be specified at only one place in the last frame.

(2) Precautions when using user frames

(a) To send/receive data using the user frames, it is necessary to set the user frame number to be used in the buffer memory prior to data transmission/reception (receive user frames must be set at the startup of the Q series C24).

The user frame number to be used can be set from the programmable controller CPU. However, please try to register frames using the utility package (GX Configurator-SC) of the Q series C24.

(b) Set the receive user frame number by the programmable controller CPU to show the procedure to receive data.

Receive user frame data by performing the following operations sequentially.

- If an user frame used in data reception was registered from programmable controller CPU, restart programmable controller CPU.
- When starting the Q series C24, set the receive user frame No. to the buffer memory and write [1] to buffer memory user frame use enable/disable designation area (addresses: ADH/14DH).[1]
- After the value of the buffer memory user frame use enable/disable designation area changes to [2], start receiving data.[1]
- Check if the data from the external device was received normally.

  [1] For details, refer to Page 252, CHAPTER 11.

(c) If the Q series C24 receives additional code data while receiving data with the non procedure protocol, it does not assume that the last byte of data is the following control data.

- Data received as user frame first frame, last frame (☞ Page 220, Section 9.1, ☞ Page 231, Section 9.2)
- Receive complete code data

Therefore, do not set a user frame containing data receive additional code data as a non procedure protocol receive user frame.

(d) The arbitrary data area of a message received from an external device cannot include data with the same contents (same code) as the last frame.

Ex.

User frame (first frame)	Arbitrary dat area	User frame (last frame)
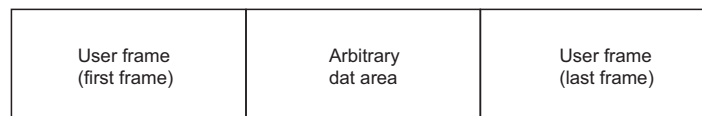
(e) In the following cases, set the data bit length of the transmission specification to 8 bits.

(It is set in the "transmission setting" of switch setting by GX Developer on the Q series C24 side.)

- When transmitting and receiving the sum check code of the variable data as binary data (Write code: FFH, EEH/FFH, F0H/FFH, F4H/FFH, F6H)
- When transmitting and receiving a user frame containing data codes 80H to FFH

9.4   Register/Read/Delete User Frames

The following explains registering, reading, and deleting user frames in the Q series C24 flash ROM or buffer memory.

Point

When registering, reading and deleting the user frames in the flash ROM, try to register them using the utility package (GX Configurator-SC) of the Q series C24.
This section explains how to register, read, or delete user frames from the programmable controller CPU.

(1) Type of user frames

Type		User frame No.	Registration destination	Remarks
Data communication function	Default registration frames	1H to 3E7H (1 to 999)	ROM for the Q series C24 OS	Read enabled
	User frame	3E8H to 4AFH[*2] (100 to 1199)[*3]	Q series C24 flash ROM	Register/read/delete enabled
		8001H to 801FH (-32767 to -32737)[*1]	Q series C24 buffer memory (Addresses: 1B00H to 1FF6H)	
User frame for the programmable controller CPU monitoring function		B001 to B00AH, B061H, B080H to B082H	ROM for the Q series C24 OS	Register/read/delete disabled

> *1   Data contained in user frames used for registering and reading is arranged in the same way as data in user frames used for registering in or reading to the flash ROM.
> Use the arrangement described in this section as a reference, and register and read user frames. User frames can also be registered in the buffer memory, but the user frame for the fixed format section should be registered in the flash ROM whenever possible.
> *2   A user frame cannot be overwritten for registration. To reregister a user frame having the same number, first delete the current user frame and then reregister.
> *3   Check the registration status of the user frame number from GX Configurator-SC.

(2) Devices that can register/read/delete user frames

Type	User frame No.	Device that can register/read/delete								
		Programmable controller CPU			External device			GX Configurator-SC		
		Register	Read	Delete	Register	Read	Delete	Register	Read	Delete
Default registration frames	1H to 3E7H	×			×	○	×	×		
User frame	3E8H to 4AFH	○			○			○		
	8001H to 801FH	○ (FROM/TO)						×		
User frame for the programmable controller CPU monitoring function	B001 to B00AH, B061H, B080H to B082H	×								

Point

Conduct registering, reading, and deletion of the user frame from the sequence program when data communication is not being conducted with external device.

(3) Buffer memory to use

Address (Hexadecimal (decimal))	Name			Stored value	Processing		
					Register	Read	Delete
2H (2)	Flash ROM access		Register/read/delete direction	0: No request 1: Register request 2: Read request 3: Delete request	○	○	○
3H (3)			Frame No. direction	0: No frame No. 1000 to 1199 (3E8H to 4AFH) : Register/read/delete frame No.			
4H (4)			Register/read/delete result storage	0: Normal completion One or higher: Abnormal completion (error code)			
5H (5)			Write data byte count designation (☞ Page 238, Section 9.4 (3) (a))	0: Delete 1 to 80 (1H to C8H) : Register data byte count	○	○	×
6H (6) ⋮ 2DH (45)			User frame (☞ Page 239, Section 9.4 (3) (b))	Data code of frame to be registered/deleted			
204H (516)			Number of registered user frame storage	0: Not registered to Flash ROM 1 to 200 (1H to C8H) : Number registered to Flash ROM	△	△	△
205H (517) ⋮ 21DH (541)			User frame registration status storage (☞ Page 239, Section 9.4 (3) (c)) (For registration No. check)	0: Given range not registered One or higher: Registration status			
21EH (542)	Number of registered default registration frames storage (OS ROM)			n: Registration count (☞ Page 230, Section 9.1.2)			
1B00H (6912)	Registration No.8001H	Register data byte count designation		(Register data byte count designation: ☞ Page 238, Section 9.4 (3) (a)) 1 to 80 (1H to C8H) : Register data byte count (User frame storage. ☞ Page 239, Section 9.4 (3) (b)) Register frame data code	○	△	×
1B01H (6913) ⋮ 1B28H (6952)		User frame storage *40 words					
1B29H (6953)	Registration No.8002H	Register data byte count designation					
1B2AH (6954) ⋮ 1B51H (6993)		User frame storage *40 words					
1B52H (6994) ⋮ 1FCDH (8141)	to						
1FCEH (8142)	Registration No.80F1H	Register data byte count designation					
1FCFH (8143) ⋮ 1FF6H (8182)		User frame storage *40 words		* Register area for 31 frames			

Read/write from programmable controller CPU

○: Always performed, △: Performed as required, ×: Unnecessary

(a) Registration data byte count designation area (Addresses: 5H, 1B00H, 1B29H,..., 1FCEH)

- Indicates the total number of bytes of register data of the user frame to be registered/read.
- Flash ROM access: During the register operation, the user registers the total number of bytes of register data. During the read operation, the total number of bytes of registered data is stored.
- Buffer memory access: During the register operation, the user registers the total number of bytes of register data.

(b) User frame storage area (Addresses: 6H to 2DH, 1B01H to 1B28H, 1B2AH to 1B51H,...1FCFH to 1FF6H)

- During the register operation, the user sequentially stores the register data of the user frame to be registered in (L) (H) order, beginning from the head area of the given area range.
- During the read operation, the register data of the registered user frame is stored with the same contents as when registering.

Ex. Contents stored to user frame storage area when a user frame to transmit and receive ETX, sum check code, CR, and LF (register codes: 03H, FFH, F1H, 0DH, 0AH) is registered to the Flash ROM.
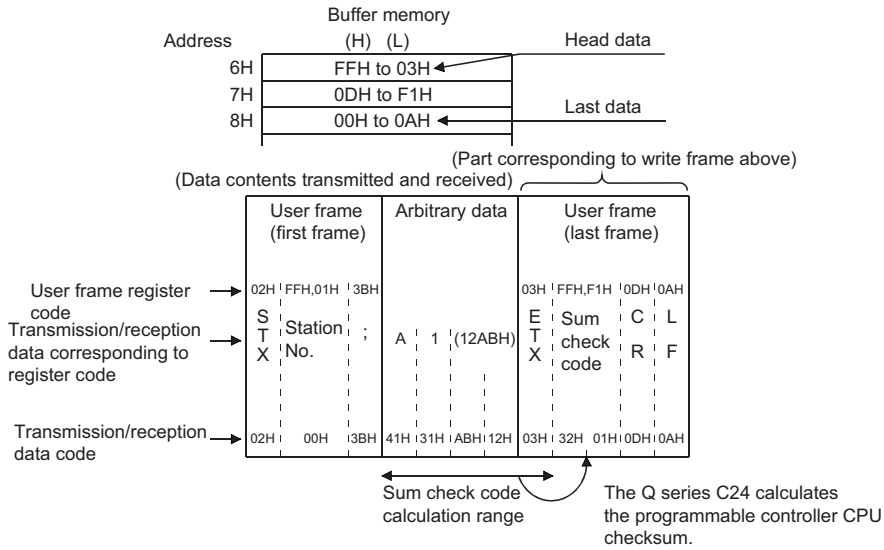
(c) User frame registration status storage area (Addresses: 205H to 21DH)

- The registration status of user frames to the Flash ROM is stored as the values shown below.
- The contents of each area that indicates the registration status are shown below. The contents of the area are indicated in one user frame No./1 bit form.

9.4 Register/Read/Delete User Frames
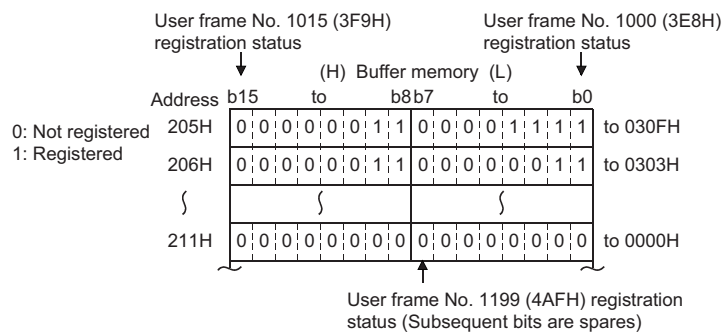
9.4.1 Registering user frames

The following shows an example of a sequence program when registering user frames in the Q series C24 flash ROM.
For details on the PUTE instruction, see Page 398, Section 17.7.
(When the Q series C24 I/O signals are X/Y80 to X/Y9F)

Data set for the program example are as follows:

Setting item	Setting data	
User frame No.	3E8H	
Registration data (10 bytes)	Binary	46H,39H,30H,30H,30H,30H,46H,46H,30H,30H
	ASCII	F90000FF00

```
X50
─┤├──────────────────────────────────────────────[PLS    M50  ]   Registration request

M50
─┤├──────────────────────────────────────────────[MOV  K1    D0  ]   Sets the registration request

        ├─────────────────────────────────────────[MOV  H3E8  D2  ]   Sets the frame number to be
        │                                                              registered

        ├─────────────────────────────────────────[MOV  K10   D3  ]   Sets the number of registration
        │                                                              data bytes

        ├─────────────────────────────────────────[MOV  H3946 D4  ]   Sets the registration data
        │                                                              for the frame to be registered
        │                                                              in D4 to D8
        ├─────────────────────────────────────────[MOV  H3030 D5  ]

        ├─────────────────────────────────────────[MOV  H3030 D6  ]

        ├─────────────────────────────────────────[MOV  H4646 D7  ]

        ├─────────────────────────────────────────[MOV  H3030 D8  ]

        ├──────────────────────────[TO    H8   H2000  K1    K1  ]   Sets the flash ROM write allow

        └──────────────────────────[G. PUTE  U8   D0    D4    M0  ]   Executes user frame registration

M0   M1
─┤├──┤/├──────────────────────────────────────────[SET   M100 ]   Normal completion

     M1
    ─┤├──────────────────────────────────────────[SET   M101 ]   Abnormal completion
```
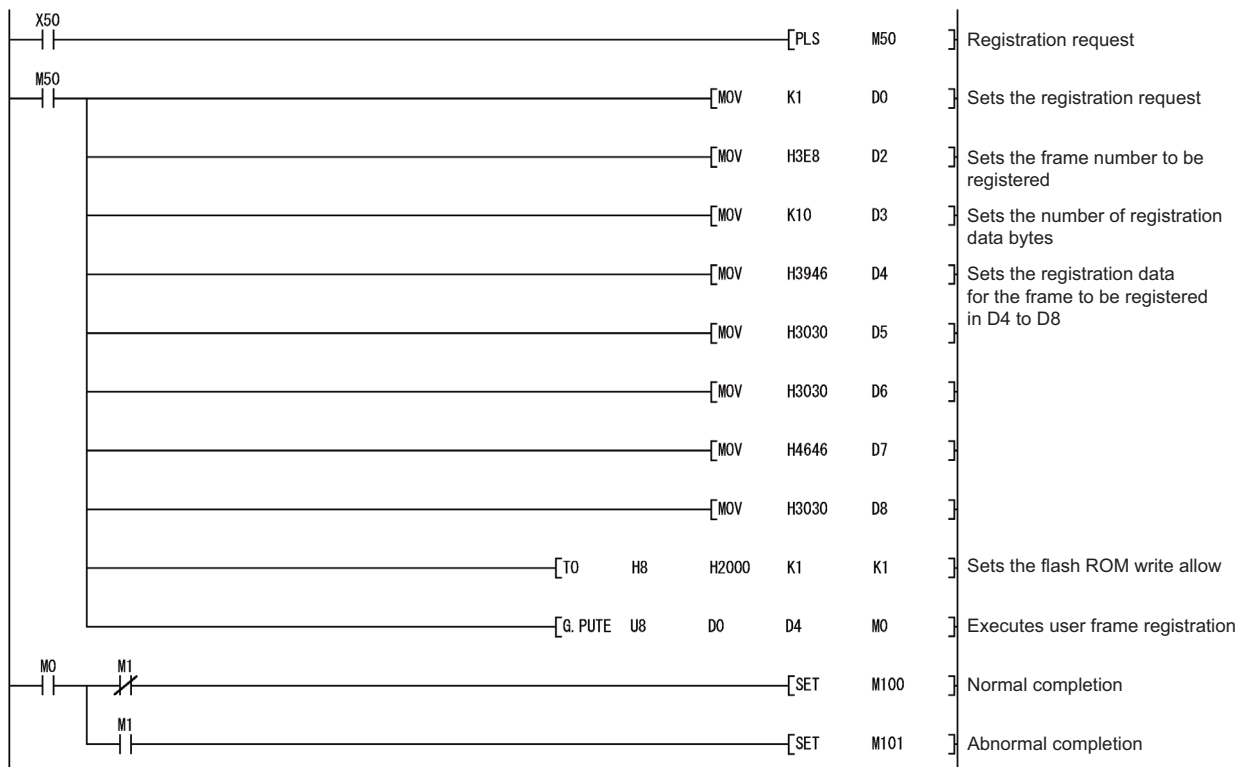
Point

● When registering a user frame in the flash ROM, to designate an user frame number that has already been registered, delete the previously registered number and then reregister.

● The user should manage the number of total bytes for registered data.

● To check unregistered user frames, read the buffer memory (addresses: 205H to 21DH) indicated in Page 238, Section 9.4 (3).

● The SPBUSY instruction can be used to read the communication status by the dedicated instruction.

9.4.2 Reading user frames

The following shows an example of a sequence program when reading user frames registered in the Q series C24 flash ROM.

For details on the GETE instruction, see Page 389, Section 17.5.

(When the Q series C24 I/O signals are X/Y80 to X/Y9F)
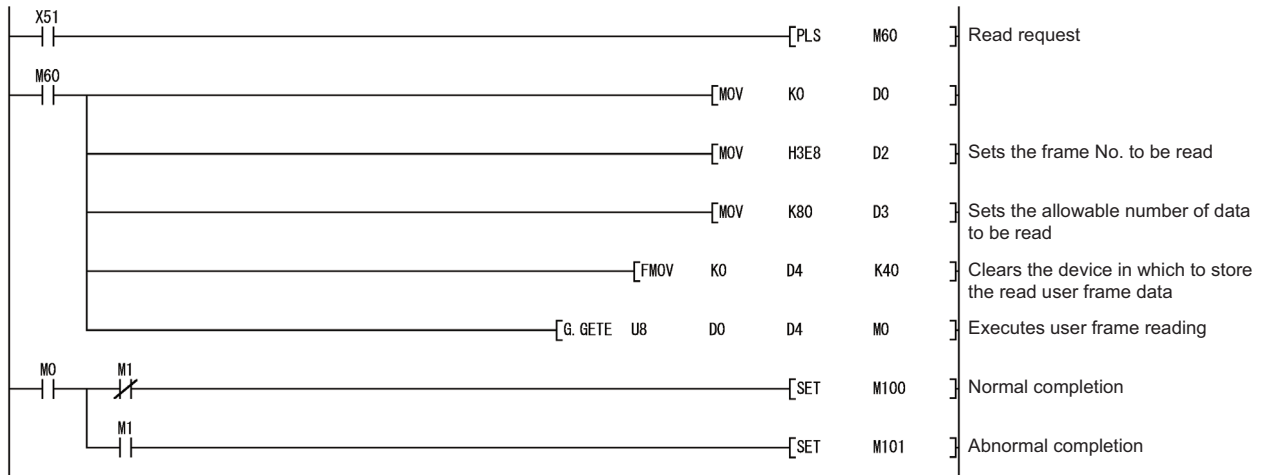
```
X51
 | |————————————————————————————————————[PLS    M60    ]  Read request

M60
 | |————————————————————————————————[MOV    K0     D0    ]

                                      [MOV    H3E8   D2    ]  Sets the frame No. to be read

                                      [MOV    K80    D3    ]  Sets the allowable number of data
                                                               to be read

                                 [FMOV   K0     D4    K40 ]  Clears the device in which to store
                                                               the read user frame data

                              [G. GETE   U8     D0    D4    M0 ]  Executes user frame reading

 M0    M1
 | |———|/|————————————————————————————————[SET    M100   ]  Normal completion

        M1
       | |—————————————————————————————————[SET    M101   ]  Abnormal completion
```

Point

● When an unregistered user frame number is designated, the operation will complete abnormally.

● When the total bytes of data registered in the frame to be read is unknown, read 40 words (80 bytes) by the dedicated instruction.

● The SPBUSY instruction can be used to read the communication status by the dedicated instruction.

9.4.3 Deleting user frames

The following shows an example of a sequence program when deleting user frames registered in the Q series C24 flash ROM.

For details on the PUTE instruction, see Page 398, Section 17.7.

(When the Q series C24 I/O signals are X/Y80 to X/Y9F)

```
X52
─┤├──────────────────────────────────────────────[PLS    M70    ]  Deletes request

M70
─┤├──────┬───────────────────────────────[MOV    K3     D0     ]  Sets the delete request
         │
         ├───────────────────────────────[MOV    H3E8   D2     ]  Sets the No. of the user frame to
         │                                                         be deleted
         │
         ├───────────────────────────────[MOV    K80    D3     ]  Sets a dummy number for
         │                                                         the allowable number of deletions
         │
         ├──────────────────────[TO    H8    H2000   K1    K1  ]  Set the flash ROM write allow.
         │
         └──────────────[G. PUTE   U8    D0    D4    M0        ]  Executes user frame deletion

M0    M1
─┤├───┤╱├───────────────────────────────────────[SET    M100   ]  Normal completion

      M1
     ─┤├────────────────────────────────────────[SET    M101   ]  Abnormal completion
```
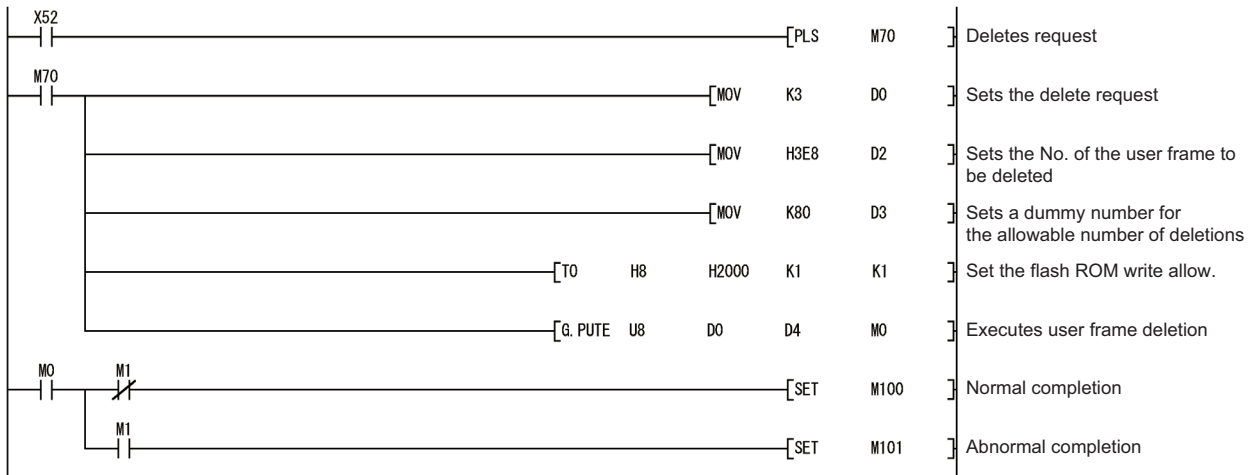
Point

● When an unregistered user frame number is designated, the operation will complete abnormally.

● The SPBUSY instruction can be used to read the communication status by the dedicated instruction.

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CHAPTER 10 ON-DEMAND DATA COMMUNICATIONS USING USER FRAMES

During communications between external device and programmable controller CPU using the MC protocol, on-demand data can be transmitted from the programmable controller CPU to the external device by on-demand function using user frames.

This chapter explains the transmission of the data specified by the programmable controller CPU using a message format other than the message formats (A compatible 1C frame formats 1 to 4, QnA compatible 4C frame format 5) described in the MELSEC Communication Protocol Reference Manual.

10.1 User Frame Data Communications Function

The user frame data communications transmits and receives the first and last parts of a message in the format selected by the user during data communications between programmable controller CPU and external device via the Q series C24.

By using the function described in this chapter, on-demand data shown below can be transmitted from the Q series C24 to an external device.

(Transmitting in QnA compatible 3C frame format 1)
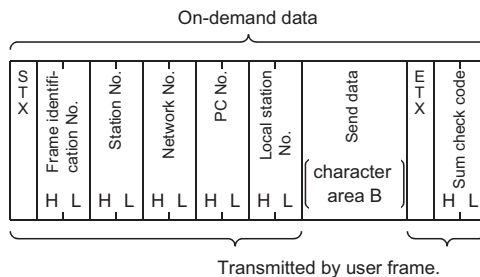
As shown in the left, the user can sort the data except for the "Send data" portion.

User frame data communications can be carried out by registering (registered by the data code) the message format to be transmitted by the external device and the message format to be received by the external device according to the specifications of the external device to the Q series C24 as user frames.

For the illustration above, the Q series C24 transmits the on-demand data as described below.

- User frame sum check code: Calculates the sum check code according to the contents registered in advance by the user and transmits the result as ASCII code or binary code data.
- Other than user frame sum check code: Transmits data of the code registered in advance by the user. (No conversion)
- Send data (character area B): This is the data that the sequence program requested for a transmission with on-demand instruction. The same contents and list as when transmitted without using a user frame described in the MELSEC Communication Protocol Reference Manual are transmitted by communication protocol by GX Developer switch setting and word/byte designation.

10.2 User Frame Types and Registration

Data communications using user frames can be performed by registering the user frames to the Q series C24 from an external device and the programmable controller CPU.

Page 220, CHAPTER 9 explains the types of user frames and the data that can be used.

To register a user frame from the programmable controller CPU, refer to Page 220, CHAPTER 9.

To register a user frame from an external device, first refer to Page 220, CHAPTER 9 and check the precautions, etc., then register the user frame with the function described in the MELSEC Communication Protocol Reference Manual.

10.3 User Frame On-Demand Data Transmission and Buffer Memory Used

This section describes user frame on-demand data transmission processing and the on-demand data list by user frame setting to the Q series C24 buffer memory.

(1) Transmission of on-demand data using user frames

The following describes the transmission of on-demand data using user frames.
- Programmable controller CPU processing
  - Before issuing a transmission request to the Q series C24, set the No. of the user frame registered in the Q series C24 to the buffer memory shown in the table below.
  - Except for the above, the programmable controller CPU execution procedure and control procedure are the same as transmitting on-demand data without user frames described in the MELSEC Communication Protocol Reference Manual.
- External device processing
  - When the external device receives the user frame transmitted by the Q series C24 as the first frame, receive it as on-demand data.

(2) Buffer memory used and on-demand data list

- Buffer memory used

During on-demand data transmission by user frame, the user frame to be transmitted is designated in the buffer memories shown below.

Address		Name			Description
CH1	CH2				
A9H(169)	149H(329)	On-demand user frame designation	First frame No. designation	(1st)	Designates the No. of the user frame that is transmitted as the first frame.
AAH(170)	14AH(330)			(2nd)	0H: Do not transmit Others: Transmit[*1] (Other than 0 is always designated for the 1st frame. When designating the 1st frame, the 2nd frame can also be designated.)
ABH(171)	14BH(331)		Last frame No. designation	(1st)	Designates the No. of the user frame to be transmitted as the last frame.
ACH(172)	14CH(332)			(2nd)	0H: Do not transmit Others: Transmit[*1] (When designating the 1st frame, the 2nd frame can also be designated.)

*1 Designates the registration No. (shown below) of the user frame to be transmitted from among the user frames registered in the Q series C24.
1H to 3E7H (1 to 999): Default registration frame
3E8H to 4AFH (1000 to 1199): User frame (registered in flash ROM)
8001H to 801FH (-32767 to -32737): User frame (registered in buffer memory)

- On-demand data list

The following shows the user frame designation on-demand data list.
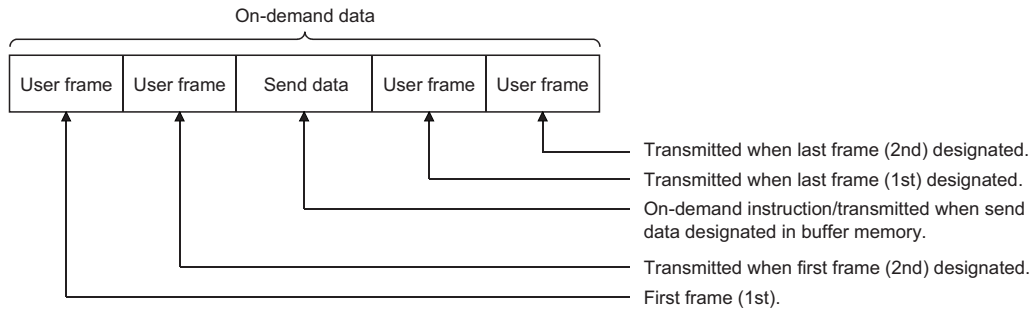
Point

- Only the on-demand data list combinations shown below can be used.

○: Designation data

Combination	Data name				
	First frame (1st)	First frame (2nd)	Send data	Last frame (1st)	Last frame (2nd)
1)	○	○	○	○	○
2)	○	○	○	○	—
3)	○	○	○	—	—
4)	○	○	—	—	—
5)	○	—	○	○	○
6)	○	—	○	○	—
7)	○	—	○	—	—
8)	○	—	—	—	—

- The send data for on-demand data transmission by user frame is listed below. (See Page 220, CHAPTER 9 for a detailed description of user frame.)

Contents of send data		ASCII mode	Binary mode
User frame First frame (1st) Last frame (Last frame)	Codes registered from 00H to FEH	Transmit the data of the code registered in the Q series C24. (No conversion)	
	Combination of codes registered in FFH and 00H to FFH	Transmit the data according to the user-designated contents, code, and byte count.	
User frame First frame (2nd) Last frame (Other than last frame)	Codes registered from 00H to FEH	Converts the data code registered in the Q series C24 to ASCII data and transmits.	Transmits data code registered in the Q series C24. For 10H data, transmits 10H + 10H.
	Combination of codes registered in FFH and 00H to FFH	Converts data of the contents, code, and byte count designated by the user to ASCII data and transmits.	Transmits the data of the contents, code, and byte count designated by the user. For 10H data, transmits 10H + 10H.
Send data[1]	—	Converts the designated send data to ASCII data and transmits.	Transmits the designated data unchanged. (No conversion) For 10H data, transmits 10H + 10H.

*1   Refer to the MELSEC Communication Protocol Reference Manual for details.

10.4 On-Demand Function Control Procedure During User Frame Use

The following uses examples to explain the control procedure when using the on-demand function to frame to transmit on-demand data to an external device by user frame.

10.4.1 Data communication using the ASCII code

The following shows the control procedure when performing switch settings via GX Developer and registration via GX Configurator-SC.

(1) Switch settings by GX Developer

- Set the "Communication protocol setting" to any one of the "MC protocol (formats 1 to 4) ".
- Set the "Station number" to "0".

(2) Registration via GX Configurator-SC

Register as follows when transmitting a user frame, user selected transmission data[1] or a combination of user frames.

(a) "User frame registration" screen

User frame No.	User frame (Registration code)	Contents of user frame registration
02H (2)	02H	STX to host station No. data code matched to QnA compatible 3C frame format 1
3EBH(1003)	F9H, 00H, 00H, FFH, FFH, 00H	
401H(1025)	03H, FFH, F1H	QnA compatible 3C frame format 1 corresponding ETX, sum check code data code

(b) "Transmission control and others system setting" screen, "MC protocol system setting" screen

- Set the "Word/byte units designation" to word units.
- Set the "On-demand user frame designation" items to the following:
  - First frame No. 1st: 02H
  - First frame No. 2nd: 3EBH
  - Last frame No. 1st: 401H
  - Last frame No. 2nd: 0H (No specification)

*1   Use the ONDEMAND instruction to designate the transmission data to two words (1234H, 5678H).
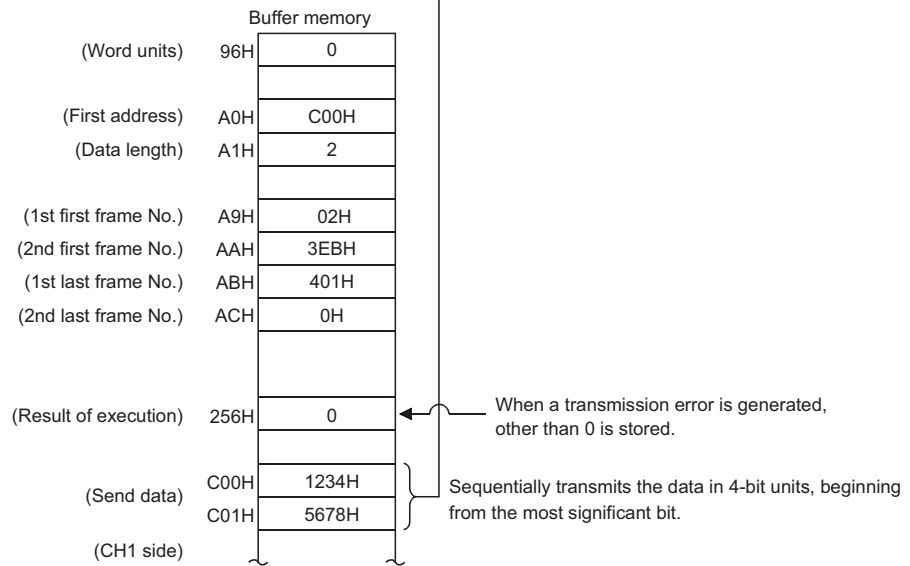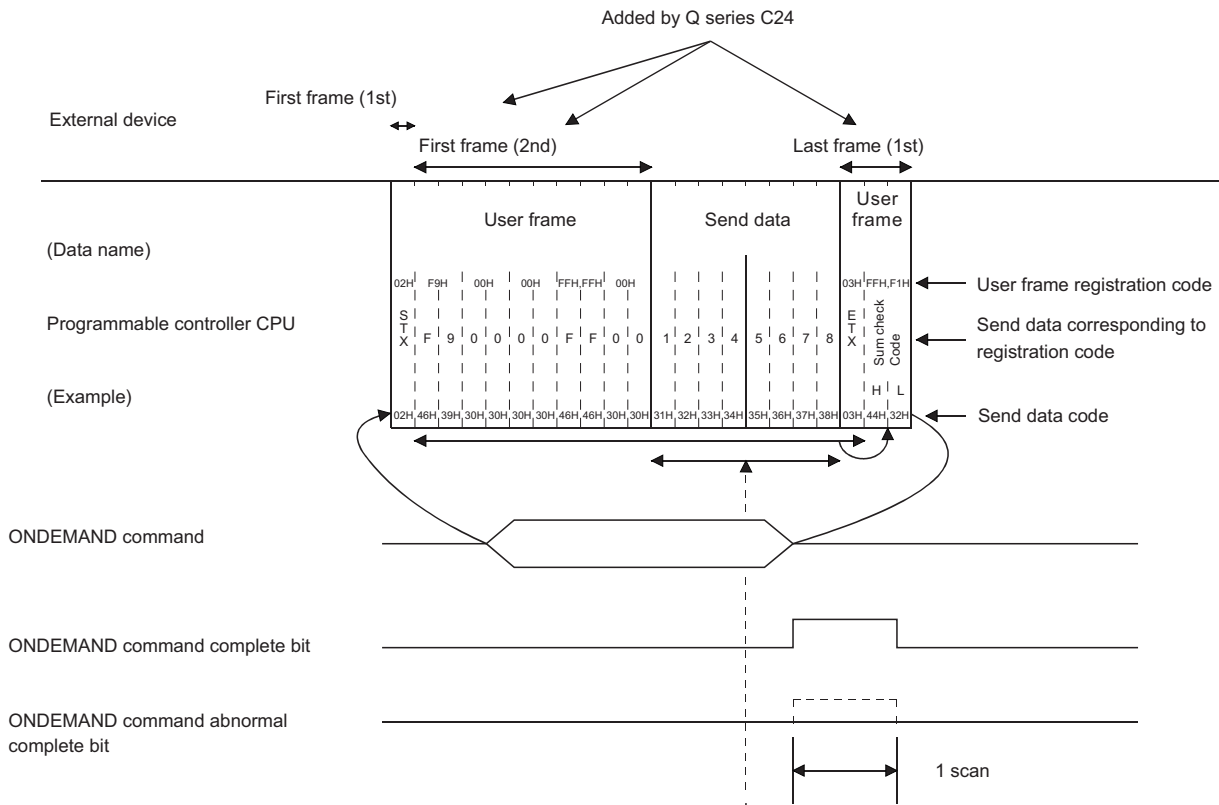
[Control procedure]

10.4.2 Data communications using the binary code

The following shows the control procedure when performing switch settings via GX Developer and registration via GX Configurator-SC.

(1) Switch settings by GX Developer

- Set the "Communication protocol setting" to "MC protocol (format 5)".
- Set the "Station number" to "0".

(2) Registration via GX Configurator-SC

Register as follows when transmitting a user frame, user selected transmission data[1] or a combination of user frames.

(a) "User frame registration" screen

User frame No.	User frame (Registration code)	User frame registration contents
3ECH(1004)	02H, FFH, 01H, 3BH	STX + Q series C24 station No. + ;
402H(1026)	03H, FFH, F0H, 0DH, 0AH	ETX + sum check code + CR + LF Sum check code is designated by a 1 byte binary code.

(b) "Transmission control and others system setting" screen, "MC protocol system setting" screen

- Set the "Word/byte units designation" to word units.
- Set the "On-demand user frame designation" items to the following:
  - First frame No. 1st: 3ECH
  - First frame No. 2nd: 0H (No designation)
  - Last frame No. 1st: 402H
  - Last frame No. 2nd: 0H (No specification)

*1   Use the ONDEMAND instruction to designate the transmission data to two words (1234H, 5678H).

[Control procedure]

10.5 Example of an On-Demand Data Transmission Program Using User Frames

The following shows an example of a sequence program when sending on-demand data including user frames.
Perform the following settings via GX Developer and registration using GX Configurator-SC in advance.
(The Q series C24 I/O signals are X/Y00 to X/Y1F and are sent from the CH1 side interface.)

(1) Switch settings by GX Developer

Set the following setting values on the "Intelligent functional module switch setting" screen.

Setting item		Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device.	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0001H	MC protocol format 1
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting	0000H	
Switch 4	CH2 Communication protocol setting	0001H	
Switch 5	Station No. setting	0000H	Q series C24 station No.

(2) Registration via GX Configurator-SC

- Registering the user frame to be transmitted: To register the user frame data to be transmitted on the "User frame registration" screen, refer to Page 220, CHAPTER 9.
- Registering the user frame No. to be transmitted and the unit of the data length: Using the screens listed below, register the user frame No. and the unit of the length of data to be transmitted, which have been registered on the "User frame registration" screen.
  - "Transmission control and others system setting" screen
  - "MC protocol system setting" screen

Registration screen	Setting item		Setting value	Remarks
"Transmission control and others system setting" screen	Word/byte units designation		0000H	Word unit
"MC protocol system setting" screen	On-demand buffer memory head address designation		0400H	—
	On-demand data length designation		0000H	—
	On-demand user frame designation	First frame No. designation 1st	0002H	—
		First frame No. designation 2nd	03EBH	
		Last frame No. designation 1st	0401H	
		Last frame No. designation 2nd	0000H	(No designation)
	Message wait time designation		0000H	—

(3) Program example

The following program example shows the transmission of on-demand data using the on-demand function.

Designate two words of transmission data with the ONDEMAND instruction.

The data for the user frame section of on-demand data to be sent is the registered data for the user frame No. that was registered with GX Configurator-SC.

X53			[PLS	M50	] On-demand transmission instruction
M50			[MOV K1	D0	] Sets the transmission channel to the CH1 side
			[MOV K0	D1	]
			[MOV K2	D2	] Sets the transmission data count to two words
			[MOV H1234	D10	] Sets the transmitting data in D10 to D11
			[MOV H5678	D11	]
			[RST	M100	] Resets the normal completion flag
			[RST	M101	] Resets the abnormal completion flag
			[SET	M51	] Sets the transmission preparation completion flag
M51	[GP. ONDEMAND U0 D0	D10	M0		] Executes on-demand transmission
M0 M1			[SET	M100	] Normal completion
M1			[SET	M101	] Abnormal completion
			[RST	M51	] Resets the transmission preparation completion flag

Point

● The SPBUSY instruction can be used to read the communication status by the dedicated instruction.

● For details on the dedicated instructions, refer to the User's Manual (Basic).

● Designate the storage capacity for transmission data (stored in D10 to D11 in the above program example) and data length (stored in D2 in the above program example) so that they do not exceed the range of buffer memory assigned by the user for the on-demand function.

CHAPTER 11 DATA COMMUNICATIONS USING USER FRAMES

Registering the fixed format portion of the message transmitted/received by the opposite device and the Q series C24 as a user frame beforehand allows data transmission/reception using a user frame.

The use of the user frame to perform data transmission/reception facilitates the creation of transmission data on the programmable controller CPU side and a simplified sequence program for checking the reception data.

This Chapter explains the data transmission/reception method and procedure when performing data communication with the Q series C24 non procedure protocol using a user frame.
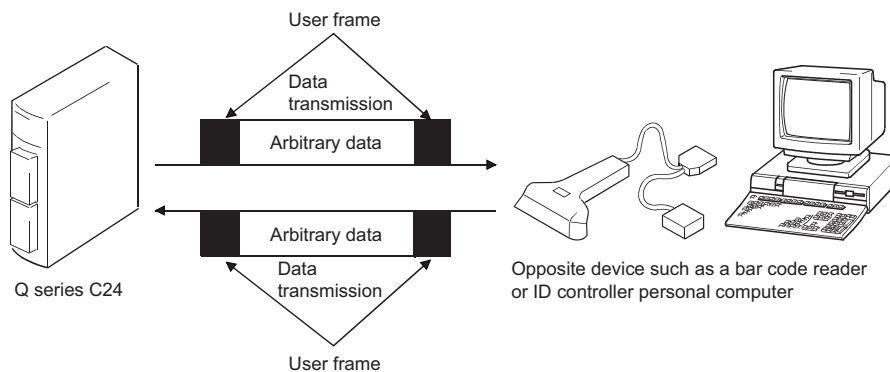
Point

For more details on the "Transparent code" and "ASCII-BIN conversion" used in the explanations of this chapter, see the chapters listed below.

When using transparent codes or performing data communication using ASCII-BIN conversion, please read the following chapters, as well.

- When using transparent codes: ☞ Page 296, CHAPTER 12
- When performing data communication using ASCII-BIN conversion: ☞ Page 319, CHAPTER 13

11.1 Overview of Data Communication Procedure

The following is an overview of the procedure when performing data communication between the opposite device and programmable controller CPU using a user frame.

```
                          ┌──────────────────┐
                          │      Start       │
                          └────────┬─────────┘
                                   │
                ┌──────────────────▼──────────────────┐
                │  Switch setting by GX Developer.     │
                │  Initial setting by GX Configurator-SC│
                └──────────────────┬──────────────────┘

(When only default registration frame used)
                                   (When registering user frames)
                ┌──────────────────▼──────────────────┐
                │ • Register to the Q series C24 Flash ROM.  │ ……*1
                │ • Register to the Q series C24 buffer memory.│
                └──────────────────┬──────────────────┘

                                   (When receiving data)
                ┌──────────────────▼──────────────────┐
                │ Set user frame No., etc. to receive user frame │
                │ designation area                     │
                │ (addresses ADH to B5H, 14DH to 155H, 2020H │
                │ to 2027H, 2120H to 2127H) of the Q series │ ……*2
                │ C24 buffer memory                    │
                │ * Must be set by GX Configurator-SC  │
                │   after debugging is completed.      │
                └──────────────────┬──────────────────┘

                ┌──────────────────▼──────────────────┐
                │     Start data communications        │
                └──────────────────┬──────────────────┘

                   (Transmission)        (Reception)

  ┌───────────────────────────┐      ┌─────────────────────────┐
  │ Designate user frame No. to│      │    Read receive data    │ ……*3
  │ transmission user frame    │      └─────────────────────────┘
  │ designation                │
  │ area (address B7H to 11DH, │
  │ 157H to 1BDH)              │
  │ of the Q series C24 buffer │
  │ memory.                    │
  └───────────────────────────┘
  ┌───────────────────────────┐
  │ Designate transmission data│ …… *4
  │ (arbitrary data area in    │
  │ transmit message)          │
  │ to transmit area of the Q  │
  │ series C24                 │
  │ buffer memory.             │
  └───────────────────────────┘
  ┌───────────────────────────┐
  │     Data transmission      │
  └───────────────────────────┘
```

*1   📖 User's Manual (Basic), ☞ Page 220, CHAPTER 9
*2   ☞ Page 267, Section 11.2.4
*3   ☞ Page 254, Section 11.2.1, ☞ Page 262, Section 11.2.2
*4   ☞ Page 286, Section 11.4

11.2　Data Reception

In data reception using the user frame, the reception method on the Q series C24 side includes format 0 and format 1. This section explains data reception for each format.

11.2.1　About reception data

In reception using the user frame, data arranged as indicated below can be received.

		User frame (first frame)		Arbitrary data		User frame (last frame)	
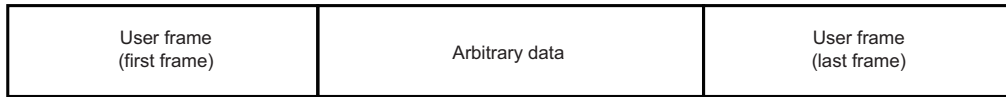
	Reception method	Combination	User frame (first frame)	Arbitrary data	User frame (last frame)	Explanation section	Remarks
With the first frame [*1]	Format-0	(1-A)	○	○	○	*4	For data reception, mixed settings are possible.
		(1-B)	○	-	○		
		(1-C)	○	○	-		
	Format-1	(1-D)	○	○	-	*5	
		(1-E)	○	-	-		
Without the first frame [*1]	Format-0	(2-A)	-	○	○	*6	———
		(2-B)	-	-	○		

○ : Specified data exists.

(When ASCII-BIN conversion is set to "Disable")

Codes that can be received	Codes stored to receive area [*3]
00H to FFH	(Not stored)
00H to FFH	00H to FFH

(When ASCII-BIN conversion is set to "Enable")

Codes that can be received	Codes stored to receive area [*3]
00H to FFH	(Not stored)
30H to 39H, 41H to 46H	0H to 9H,AH to FH

*2

*1 User frames for reception
- The user frame for data reception can set up to a maximum of four combinations of the first frame and the last frame, regardless of whether there is a specification.
- For a combination that specifies the first frame (with the first frame), it is necessary to specify the first frame even in other combinations.
- For a combination that does not specify the first frame (without the first frame), the first frame cannot be specified even in other combinations.
- A combination with the first frame and a combination without the first frame cannot be combined.

*2 If data of other than 30H to 39H and 41H to 46H are received as the data code of the arbitrary data area (including the transparent code data), the Q series C24 ASCII-BIN conversion will generate an error.

*3 Receive data arbitrary data area
When the arbitrary data area is stored to the receive area, and the storage byte count is an odd number of bytes, the receive data count shown below is stored to the receive data count storage area. (When ASCII-BIN conversion is enabled, receive data count is the storage byte count when the arbitrary data area is converted to binary code and stored to the receive area.)
- Word units: Receive data count = Number of bytes stored to receive area ÷ 2···Fractions are truncated
- Byte units: Receive data count = Number of bytes stored to receive area (00H is stored to the upper byte of the last data storage location of the receive area.)

When ASCII-BIN conversion enabled, make the arbitrary data area of the receive data an even number of bytes excluding the additional code.

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11.2 Data Reception

(1) Reception with the first frame (combination 1-A to C) (reception using Format-0)

(a) Reception of combination (1-A)

- In this method, any data section of the reception message that can be handled by the programmable controller CPU side is enclosed by the first frame and the last frame and transmitted from the external device.
- Any reception data prior to the first frame will be ignored.
- The Q series C24 will begin reception processing when data of the same arrangement as the first frame is received. When data of the same arrangement as the last frame is received, arbitrary data is stored in the reception area of the buffer memory and a read request is performed to the programmable controller CPU.
- The received data count initially set in the Q series C24 should be a data count that exceeds the size of the arbitrary data to be received.
- Reception processing via the receive complete code initially set in the Q series C24 will not be performed. The reception data for the receive complete code will be treated as arbitrary data.

Ex. When data transmitted from a bar code reader is received

STX will be registered in the first frame and ETX registered in the last frame according to the message format of the bar code reader.
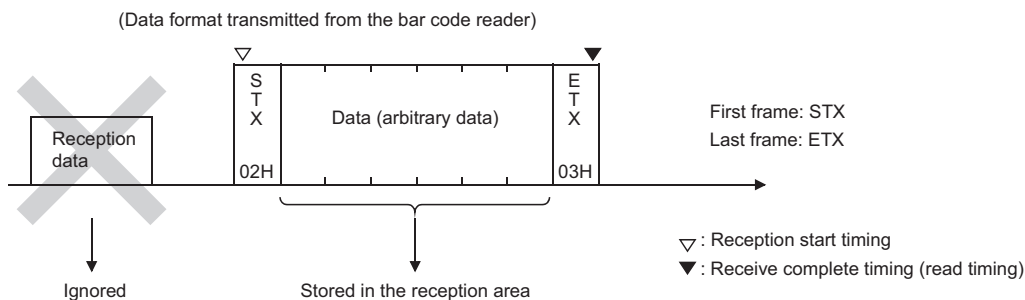
(b) Reception of combination (1-B)

- In this method, messages to be received by the programmable controller CPU side are all transmitted from the external device as fixed format data.
- Any reception data prior to the first frame will be ignored.
- The Q series C24 will begin reception processing when data of the same arrangement as the first frame is received. When data of the same arrangement as the last frame is received, a read request is performed to the programmable controller CPU.
- Since there is no arbitrary data, the reception data count will be "0" when a read request is performed to the programmable controller CPU.
- The received data count initially set in the Q series C24 uses the default value.

256
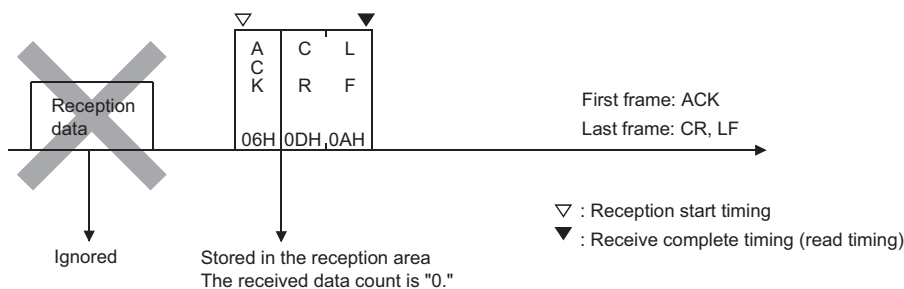
(c) Reception of combination (1-C)

- In this method, start of data transmission from the external device to the programmable controller CPU side is notified by the first frame, after which arbitrary data of a fixed length is repeatedly transmitted from the external device.
- Any reception data prior to the first frame will be ignored. After the first frame is received, all later reception data is treated as arbitrary data.
- The Q series C24 will begin reception processing when data of the same arrangement as the first frame is received. A read request will be repeatedly performed to the programmable controller CPU when arbitrary data equaling the received data count initially set in the Q series C24 is received.
- The received data count initially set in the Q series C24 should be a data count for arbitrary data (fixed length) transmitted from the external device.
- Reception processing via the receive complete code initially set in the Q series C24 will not be performed. The reception data for the receive complete code will be treated as arbitrary data.
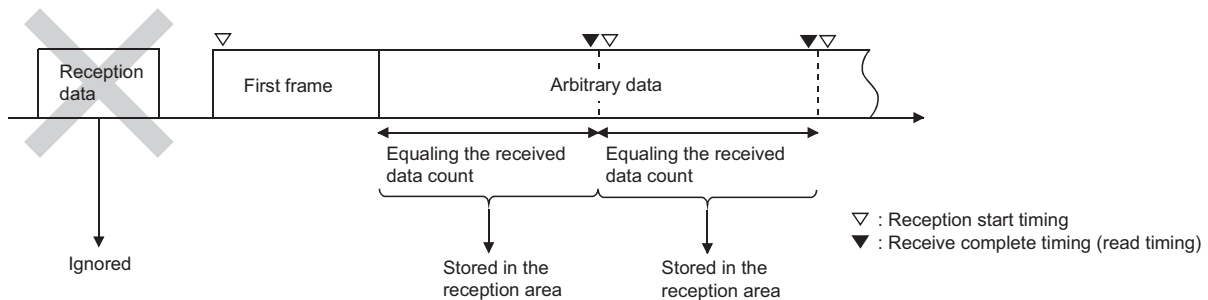
(2) Reception with the first frame (combination 1-D, 1-E) (reception using Format-1)

- In this method, arbitrary data of exclusive format-1 received data count initially set in the Q series C24 is transmitted from the external device together with the first frame.

The data length for the arbitrary data in the reception message that can be handled by the programmable controller CPU side[1] can be specified for each data reception frame combination (up to four combinations).

- Any reception data prior to the first frame will be ignored.
- The Q series C24 will begin reception processing when data of the same arrangement as the first frame is received. When arbitrary data equaling the exclusive format-1 received data count is received, the arbitrary data is stored in the reception area of the buffer memory and a read request is performed to the programmable controller CPU.
- Exclusive format-1 received data count initially set in the Q series C24 should be a data count for arbitrary data to be received. The received data count initially set in the Q series C24 is not used.
- Reception processing via the receive complete code initially set in the Q series C24 will not be performed. The reception data for the receive complete code will be treated as arbitrary data.

Ex. By specifying a user frame, in which only ACK (06H) is registered, as the first frame and also exclusive format-1 received data count for arbitrary data as 0 bytes, a read request will be performed to the programmable controller CPU upon the reception of a 1-byte ACK.

Ex. By specifying a user frame, in which only NAK (15H) is registered, as the first frame and also specifying exclusive format-1 received data count for arbitrary data as 2 bytes, a read request will be performed to the programmable controller CPU upon the reception of NAK + 2-byte data.

▽ : Reception start timing
▼ : Receive complete timing (read timing)
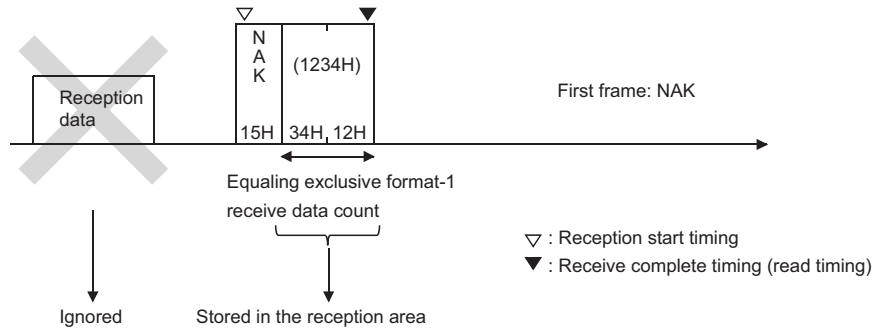
First frame: NAK

*1   The data length for arbitrary data can be specified as a word/byte count of 0 or greater (the unit depends on word/byte units designation) for each combination of the first frame and the last frame specifying format-1.
The received data count for data reception using format-1 is referred to as exclusive format-1 received data count.

(3) Reception without the first frame (combination 2-A, 2-B) (reception using Format-0)

(a) Reception of combination (2-A)

- In this method, a user frame is used as the last frame in place of the non procedure protocol data receive complete code and is transmitted from the external device together with arbitrary data.
- Any reception data prior to the last frame are all treated as arbitrary data.
- The Q series C24 will begin reception processing when arbitrary data is received. When data of the same arrangement as the last frame is received, arbitrary data is stored in the reception area of the buffer memory and a read request is performed to the programmable controller CPU.
- The received data count initially set in the Q series C24 should be a data count that exceeds the size of the arbitrary data to be received.
- The Q series C24 performs the following processing with respect to the reception data that is the same as the receive complete code initially set in the Q series C24.
  - When the reception data is included in the arbitrary data: Reception is processed via the receive complete code.
  - When included in the last frame: Reception is not processed via the receive complete code.

Ex. By registering ETX + CR + LF as the last frame, a read request is performed to the programmable controller CPU when the end of the reception data receives a message of ETX + CR+ LF.

Last frame: ETX, CR, LF

Stored in the reception area

▽ : Reception start timing
▼ : Receive complete timing (read timing)
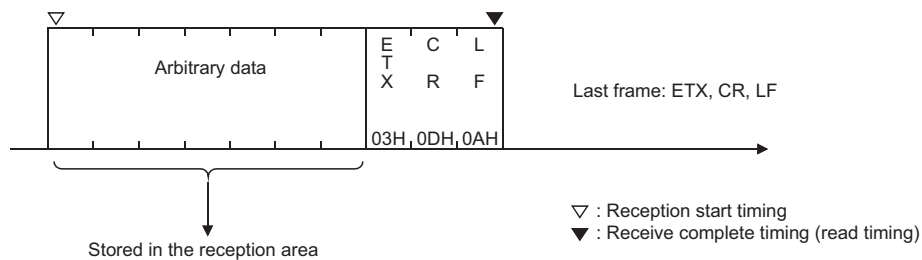
(b) Reception of combination (2-B)

- In this method, a user frame is used as the last frame in place of the non procedure protocol data receive complete code, and fixed format data is transmitted from the external device.
- Any reception data prior to the last frame are all treated as arbitrary data.
- When data of the same arrangement as the last frame is received, the Q series C24 performs a read request to the programmable controller CPU.
- Upon the reception of data from this combination that contains no arbitrary data, the reception data count will be "0" when a read request is performed to the programmable controller CPU.
- The received data count initially set in the Q series C24 uses the default value.
- The Q series C24 performs the following processing with respect to the reception data that is the same as the receive complete code initially set in the Q series C24.
  - When included in the last frame: Reception is not processed via the receive complete code.

Ex. By registering ACK + CR + LF as the last frame, a read request is performed to the programmable controller CPU when the end of the reception data receives a message of ACK + CR + LF.

Last frame: ACK, CR, LF

▽ : Reception start timing
▼ : Receive complete timing (read timing)

Stored in the reception area
The received data count is "0."
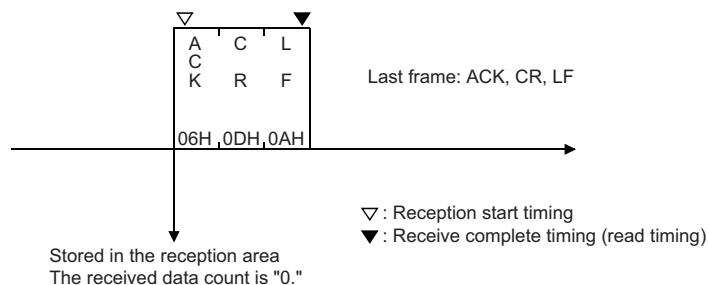
Point

Handling of the Q series C24 receive data

- When an user frame (first frame, last frame) of a code registered in the Q series C24 is received, receive processing by user frame is performed.

- Of the first frame No. and last frame No. (maximum 4 sets) initialized by the user at the buffer memory receive user frame designation area, the set No. (□ th) of the user frame received from the external device is stored to the receive user frame storage area.

- If receive transparent code is designated, the data of the additional code included in the arbitrary data area is removed immediately after reception (before conversion when the receive data is converted from ASCII code to binary code).

11

Remark •

The following shows the difference in how reception data for each reception method (Format-0 and Format-1) is treated when data is received using the combination of (first frame + arbitrary data).

● When data is received using Format-0 (combination (1-C))
　　• The Q series C24 regards all arbitrary data after the first frame as valid data and stores it sequentially in the reception area.
　　• A read request is performed to the programmable controller CPU each time arbitrary data equaling the received data count is received, and this process is repeated.
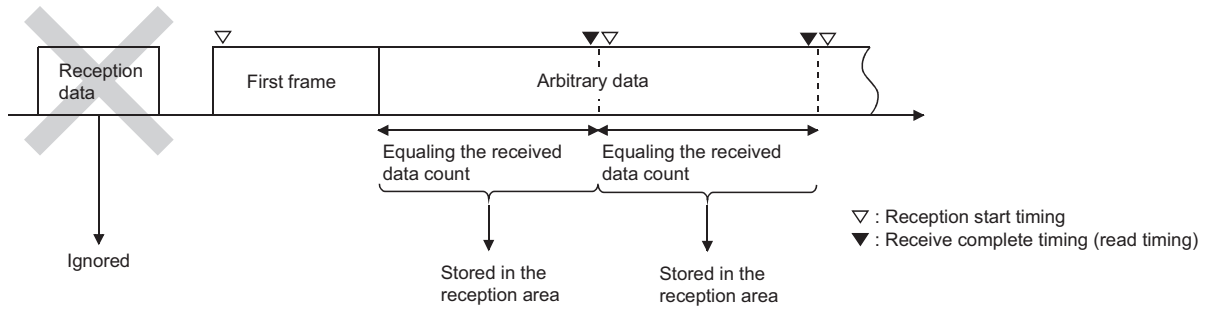
● When data is received using Format-1 (combination (1-D, 1-E))
　　• After the first frame is received, the Q series C24 regards all arbitrary data equaling exclusive format-1 received data count specified for the received first frame combination as valid data and stores it in the reception area. It then performs a read request to the programmable controller CPU.
　　• After data equaling exclusive format-1 received data count is received, any data until the next first frame will be ignored. (Data will not be stored in the reception area.)

• •
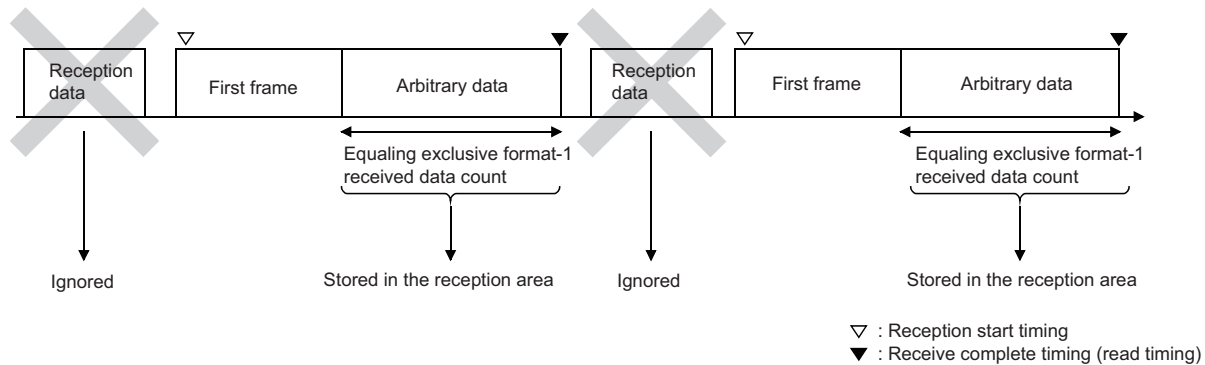
11.2 Data Reception

11.2.2 Timing for start/completion of data reception

This section explains the reading of reception data based on the user frame and other factors (such as the receive complete code and received data count) during data reception using a user frame.

(1) Timing for start/completion of data reception

The following describes the timing for start/completion of the data reception processing with the Q series C24.

- Data reception using a user frame
- Data reception using the receive complete code and received data count initially set in the Q series C24
- Data reception using exclusive format-1 received data count

Item	User frame setting for reception	When using format-0 (See Page 262, Section 11.2.2 (2) for each timing.)	When using Format-1 (See Page 262, Section 11.2.2 (2) for each timing.)
Reception start	With the first frame	When the first frame is received.	
	Without the first frame	When the first data of arbitrary data is received.	—
Receive complete	—	When the factor of receive complete (timing of reception data reading to the programmable controller CPU) is one of the following:	
		(Depends on prior settings. See Page 262, Section 11.2.2 (2))	
		• When the last frame is received. • When data of the receive complete code is received. (In the case of a combination without the first frame) • When data equaling the received data count is received. • When a receive error (time out for the no-reception monitoring time (timer 0)) occurs.	• When exclusive format-1 received data count is specified as 0 and the first frame is received. • When exclusive format-1 received data count is specified as 1 or more and data equaling this count is received. • When a receive error (time out for the no-reception monitoring time (timer 0)) occurs.
		* All arbitrary data received up to the point when one of the above occurs or a receive error is generated is stored in the reception area.	

(2) Timing chart for reception processing using the Q series C24

The following is a timing chart for the reception processing when data reception is performed using the user frame, which includes the reception processing using the received data count. The numbers in the table indicate the timing of a reception data read request to the programmable controller CPU.

[Combination with the first frame]

—		Timing pattern number				
		Reception data				
Combination	Amount of reception data of arbitrary data	Reception data prior to the reception of the first frame	When receiving the first frame	When receiving arbitrary data in the reception message	When receiving the last frame	When receiving the complete code ([*1])
1-A	Reception data count < Received data count	Delete	Reception start	—	1-A 1)	Data of the complete code is treated as part of arbitrary data.
	Reception data count ≥ Received data count			1-A 2)		
1-B	Reception data count = 0			—	1-B	—
1-C	Reception data count ≤ Received data count			1-C 1)	—	Data of the complete code is treated as part of arbitrary data.
	Reception data count > Received data count			1-C 2)		
1-D	Reception data count (exclusive format-1 received data count > 0)			1-D		
1-E	Reception data count (exclusive format-1 received data count = 0)		Reception start	1-E	—	—	—

[Combination without the first frame]

—		Timing pattern number				
		Reception data				
Combination	Amount of reception data of arbitrary data	Reception data prior to the reception of the first frame	When receiving the first frame	When receiving arbitrary data in the reception message	When receiving the last frame	When receiving the complete code ([*1])
2-A ([*2])	Reception data count < Received data count	—	—	Reception start	2-A 1)	2-A 3)
	Reception data count ≥ Received data count			Reception start	2-A 2)	2-A 4)
2-B ([*2])	Reception data count = 0			—	Reception start 2-B	—

*1   The reception processing via the receive complete code is not performed when the same data as the receive complete code has been registered in the last frame.

*2   The data reception interval is not monitored with the no-reception monitoring time (timer 0) when only the last frame is set.

Point

When a receive error is detected, the Q series C24 stores arbitrary data of the reception data received immediately before the error in the reception area of the buffer memory, then turns the reception error detection signal (X4) ON.

[Combination with the first frame] Timing patterns for reception start and receive complete (read)

(For data reception with format-0)

Pattern No. 1-A 1)

External device side	First frame	Arbitrary data	Last frame

Programmable controller CPU side

Pattern No. 1-A 2)

External device side	First frame	Arbitrary data	Last frame

Programmable controller CPU side

Equaling the received data count — Equaling the received data count

Pattern No. 1-B

External device side	First frame	Last frame

Programmable controller CPU side

Pattern No. 1-C 1)

External device side	First frame	Arbitrary data

Programmable controller CPU side

Equaling the received data count

Pattern No. 1-C 2)

External device side	First frame	Arbitrary data

Programmable controller CPU side

Equaling the received data count — Equaling the received data count

(For data reception with format-1)

Pattern No. 1-D

External device side	First frame	Arbitrary data	Reception data	First frame	Arbitrary data

Programmable controller CPU side

Equaling exclusive format-1 received data count

Ignored

Equaling exclusive format-1 received data count

Pattern No. 1-E

External device side	First frame	Reception data	First frame

Programmable controller CPU side

Ignored

When exclusive format-1 received data count is 0

▽ : Reception start timing
▼ : Receive complete timing (read timing)

Point

When data is received using Format-1, the Q series C24 checks again whether the first frame has been received after receiving data equaling the exclusive format-1 received data count. Reception data during that time is ignored.

[Combination without the first frame] Timing patterns for reception start and receive complete (read)

▽ : Reception start timing
▼ : Receive complete timing (read timing)
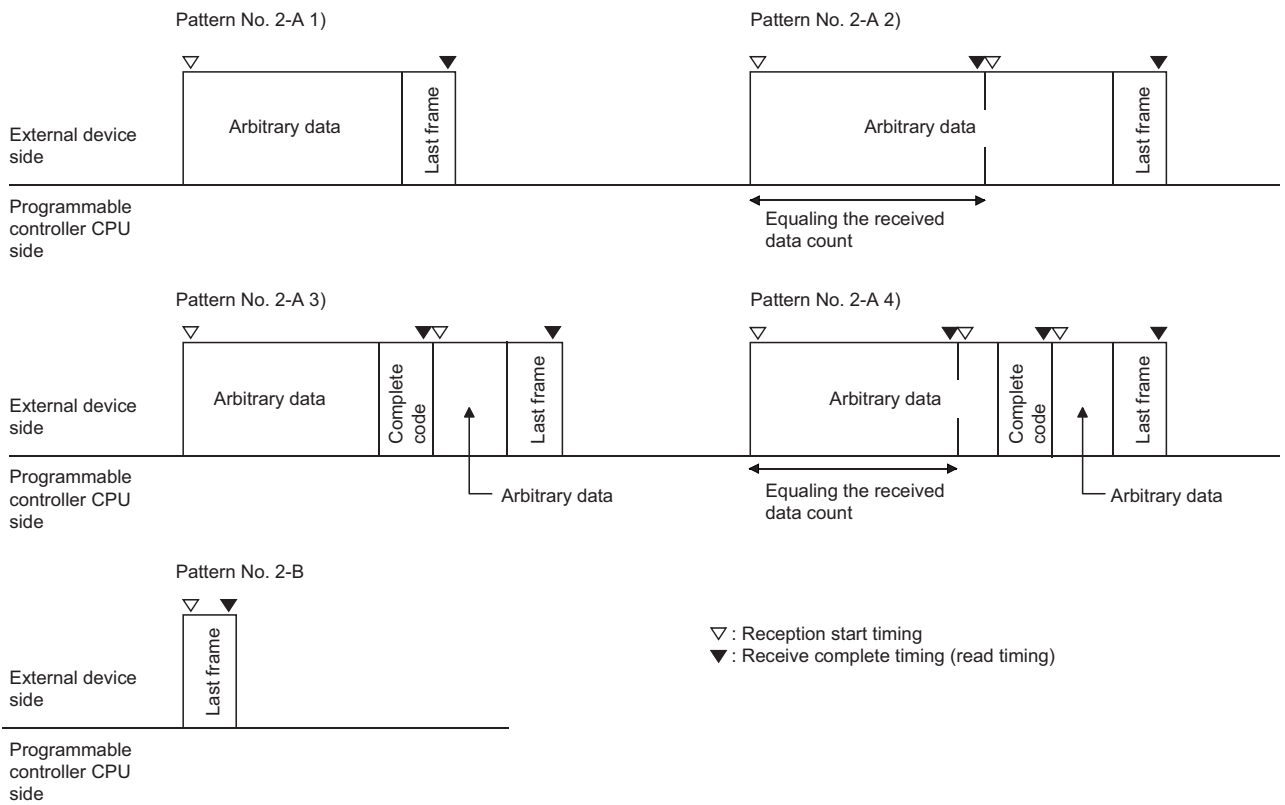
11.2.3   Receive procedure

The following shows the receive procedure when a message, including data with the same arrangement as the specified user frame, is received and the arbitrary data is read to the programmable controller CPU.
(When the CH1 side interface of the Q series C24 receives data)
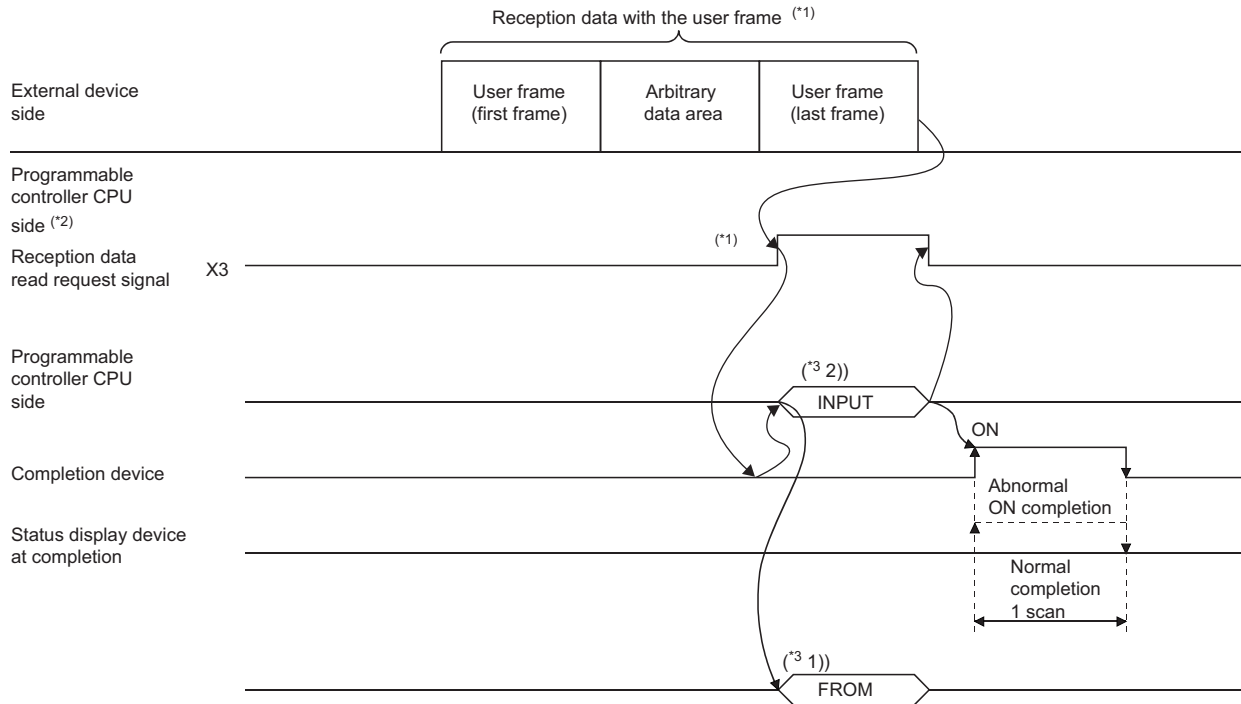
*1   See Page 254, Section 11.2.1 and Page 267, Section 11.2.4 regarding the reading of reception data using a user frame and the timing of reception data reading to the programmable controller CPU.

*2   Sets the receive user frame registration No., etc. in the "non procedure system setting" screen for GX Configurator-SC. During debugging, the initial setting value for data reception shall be set prior to data receiving, but after debugging is completed, it shall be set when the Q series C24 starts up. (☞ Page 267, Section 11.2.4)

*3   Reading (1) below) for checking which user frame was received by the Q series C24 from the programmable controller CPU and reading of the receive data (2) below).
1) Reads which of the user frames set in the receiver user frame designation area was received from the receive user frame storage area (address: 25BH).
2) Reads the arbitrary data area of the receive message from the receive area (default addresses: 600H to 7FFH).

11.2.4　User frame setting for reception

(1) About user frame setting for reception

This setting is to receive data from the opposite device using non procedure protocol through the use of a user frame. Everything is set on the GX Configurator-SC "Non procedure system setting" screen.
The setting items are listed below.

[Setting screen] Non procedure system setting screen

Received data count designation	01FF
Receive complete code designation *Hffff:Not designated receive complete code H0d0a:CR+LF H0000-H00ff:Receive complete code*	FFFF
Receive user frame designation 　User frame use enable/disable designation	Use
Input following eight items within the following range 0:Not designated H0001-H03e7:Default frame H03e8-H04af:Flash ROM user frame H8001-H801f:Buffer memory user frame	
Receive user frame designation 　First frame No. designation 1st	03E8
First frame No. designation 2nd	03E9
First frame No. designation 3rd	0006
First frame No. designation 4th	0015
Last frame No. designation 1st	041B
Last frame No. designation 2nd	0000
Last frame No. designation 3rd	0000
Last frame No. designation 4th	0000
Following user frame receive format designation is valid above function version B	
User frame receive format designation 1st	Format-0
User frame receive format designation 2nd	Format-0
User frame receive format designation 3rd	Format-1
User frame receive format designation 4th	Format-1
User frame receive format designation is valid only in case of [Format-1] 　Exclusive format-1 received data count 1st	0000
Exclusive format-1 received data count 2nd	0000
Exclusive format-1 received data count 3rd	0000
Exclusive format-1 received data count 4th	0002

GX Configurator-SC setting items (Non procedure system setting screen)	Description of setting values	
	Format-0	**Format-1**
Received data count designation	Designates the data count that exceeds the size of the arbitrary data to be received or the data count of the received data size.	The specified value is invalid. (Exclusive format-1 received data count becomes valid.)
Receive complete code designation	(Reception of combination with the first frame) The specified value is invalid. (Reception of combination without the first frame) Designates the code for the last data in the reception message for performing a read request to the programmable controller CPU.	
User frame use enable/disable designation	Designates "Enable".	
First frame No. designation 1st to 4th	Designates the user frame No. (0 or 1 or higher).	Designates the user frame No. (1 or higher).
Last frame No. designation 1st to 4th	Designates the user frame No. (0 or 1 or higher).	Designates 0H for everything.
User frame receive format designation 1st to 4th	Designates "Format-0".	Designates "Format-1".
Exclusive format-1 received data count 1st to 4th	The specified value is invalid.	Designates the data count for the arbitrary data to be received.

(2) Initial settings via GX Configurator-SC ("Non procedure system setting" screen)

This section explains the buffer memory when setting various setting data for data reception using a user frame in a sequence program. (Numbers in the parentheses indicate the buffer memory address.)

(a) User frame use enable/disable designation (addresses: ADH/14DH)

Designate "Enable" when using user frames to receive data.
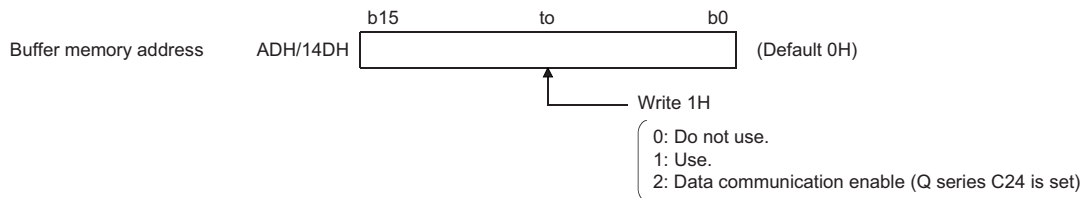
- "1" is written in the user frame use enable/disable designation area.
- After the preparation for the data reception using the user frames is completed, "2" is written in the user frame use enable/disable designation area. (Set by the Q series C24)
- After the value in the user frame use enable/disable designation area is changed from "1" to "2", start receiving data used by the user frame. Until "2" is written in the user frame use enable/disable designation area, data transmission is also not available.

(b) First frame No. designation area and last frame No. designation area (addresses: AEH to B5H/14EH to 155H)

From among the user frames registered in the Q series C24, designate the frame numbers of the user frames you wish to use in the combination and order of priority as described in (1).
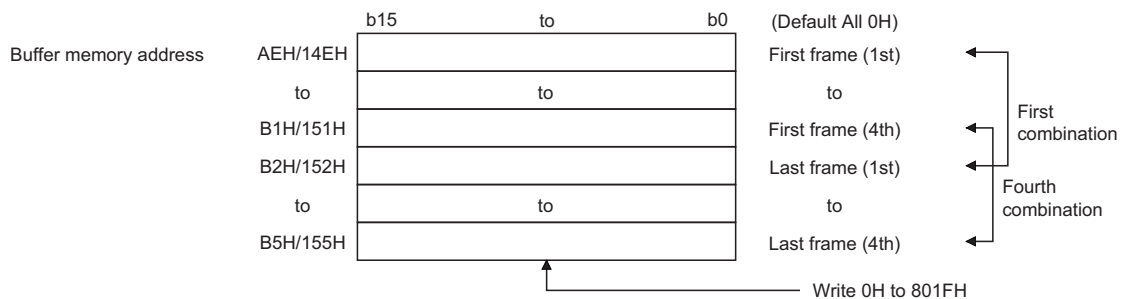
- 0H (0): No designation
- 1H to 3E7H (1 to 999): Designate the default registration frame (for OS ROM registration).
- 3E8H to 4AFH (1000 to 1199): Designate the user frame (for flash ROM registration).
- 8001H to 801FH (-32767 to -32737): Designate the user frame (for buffer memory registration).

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[How to specify the first frame No. and the last frame No.]

Set the frame numbers using the following setting method.

- For the receive user frames, the first frame and last frame are set as a pair, regardless of whether the external device transmits these frames.

(If the external device does not transmit either one of the frames, the unsent frame No. is set to "0" (no setting)).

- A maximum of four combinations of first and last frames can be set for the non procedure protocol. (☞ Page 254, Section 11.2.1)[*1]

(When specifying the first frame)[*2]

- Each frame No. for combinations that specify the first frame and the last frame
- Each frame No. for combinations that specify the first frame but not the last frame

*1   Of the maximum four combinations to be set, if there is a combination that specifies the first frame, specify the first frame for all other combinations. In addition, set in the following order starting from the first buffer memory (AEH to B5H/14EH to 155H).

*2   Of the maximum four combinations to be set, if there is a combination that specifies the last frame only without specifying the first frame, the first frame cannot be specified in any of the combinations. Set the number of the last frame to be used in order starting from the first area of the buffer memory (AEH to B5H/14EH to 155H).

- When setting more than one combination, the first frame having the registered data in the same arrangement or the same frame number cannot be designated.

However, the last frame can be designated.

- Use the user frame numbers of the following user frames to set the receive user frames. (☞ Page 220, Section 9.1)
  - Default registration frame numbers: 1H to 3E7H
  - User frame numbers registered in the Q series C24 flash ROM: 3E8H to 4AFH
  - User frame numbers registered in the Q series C24 buffer memory: 8001H to 801FH

- Do not specify (set) the frame No. of a user frame that includes the receive transparent code designation additional code data shown in Chapter 12 as a user frame for data reception using non procedure protocol.

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11.2 Data Reception

(c) User frame receive format designation (address: 2020H to 2023H/2120H to 2123H)

In data reception using a user frame, specify the reception method for each combination of receive user frames. This setting is valid in a setting shown in Page 268, Section 11.2.4 (2) (b) when it is set using a combination that specifies a user frame.
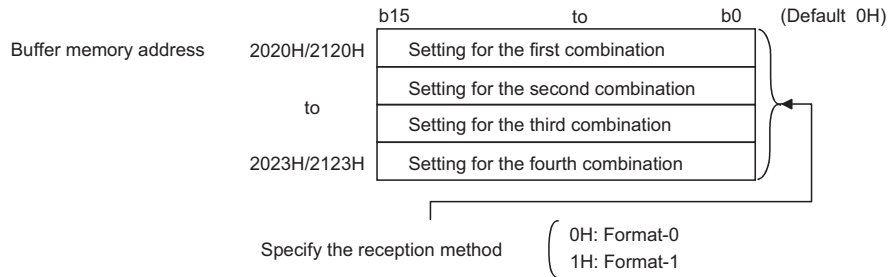
Point

For combinations other than those with the first frame only, data reception is performed using Format-0 even if Format-1 is specified through the above reception method setting.

(d) Exclusive format-1 received data count designation (address: 2024H to 2027H/2124H to 2127H)

- For a combination specifying Format-1 in the user frame receive format designation, specify the arbitrary data word/byte count (size for performing a reception data read request to the programmable controller CPU) when the applicable first frame is received. Specify this for each combination specifying Format-1.
- Specify a size within the size of the storage area for the reception data in the buffer memory.
- The unit for the setting value depends on the setting value given in the word/byte units designation.
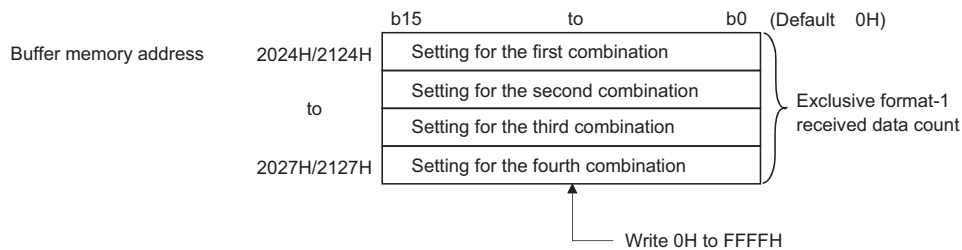
(3) Examples of registering a receive user frame

The following are examples of pre-registering a receive user frame on the CH1 side with the GX Configurator-SC.

(a) When the first frame is specified

In the example, the following three combinations are registered for the receive user frame.

[Setting conditions]

User frame		User frame receive format designation	Exclusive format-1 received data count	Remarks
1st combination	(First frame + last frame)	Format-0	—	The received data count becomes valid.
2nd combination	(First frame only)	Format-1	0H	Exclusive format-1 received data count becomes valid.
3rd combination	(First frame only)	Format-1	2H	

[Setting value]

Setting item		Setting value	Remarks
Received data count designation		1FFH	For Format-0
Receive complete code designation		FFFFH	Set to "No receive complete code".
Receive user frame designation User frame use enable/disable designation		Enable	Always specify "Enable".
Receive user frame designation First frame No. designation	1st	3E8H	0H: No designation 1H or higher: There is a designation. In this setting, only three combinations become valid.
	2nd	3E9H	
	3rd	3EAH	
	4th	0H	
Receive user frame designation Last frame No. designation	1st	41DH	
	2nd	0H	
	3rd	0H	
	4th	0H	
User frame receive format designation	1st	Format-0	The received data count becomes valid.
	2nd	Format-1	Exclusive format-1 received data count becomes valid.
	3rd	Format-1	
	4th	Format-0	—
Exclusive format-1 received data count designation	1st	0H	For Format-1
	2nd	0H	
	3rd	2H	
	4th	0H	

(b) When the first frame is not specified

In the example, the following three combinations are registered for the receive user frame.

[Setting conditions]

User frame		User frame receive format designation	Exclusive format-1 received data count	Remarks
1st combination	(Last frame only)	Format-0	—	The received data count becomes valid.
2nd combination	(Last frame only)			
3rd combination	(Last frame only)			

[Setting value]

Setting item		Setting value	Remarks
Received data count designation		1FFH	For Format-0
Receive complete code designation		00□□H	Designate any received complete code.
Receive user frame designation User frame use enable/disable designation		Enable	Always specify "Enable".
Receive user frame designation First frame No. designation	1st	0H	0H: No designation
	2nd	0H	
	3rd	0H	
	4th	0H	
Receive user frame designation Last frame No. designation	1st	41DH	0H: No designation 1H or higher: There is a designation. In this setting, only three combinations become valid.
	2nd	41EH	
	3rd	41FH	
	4th	0H	
User frame receive format designation	1st	Format-0	Everything is set to Format-0 since the first frame is not designated.
	2nd	Format-0	
	3rd	Format-0	
	4th	Format-0	
Exclusive format-1 received data count designation	1st	0H	Setting value for Format-1. This setting is not required since everything is set to Format-0.
	2nd	0H	
	3rd	0H	
	4th	0H	

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11.3 Receive Program

This section shows examples of the sequence program to read the reception data stored in the Q series C24 buffer memory to the programmable controller CPU, when data including the user frame is received.

11.3.1 Sequence program example

In the program examples provided in this section, data reception by the user frame is indicated based on the following:
- I/O signals of Q series C24: Install Q series C24 in the position where the I/O signal with QCPU is X/Y00 to X/Y1F.
- Interface for Q series C24 used for data communications with external device: Use an RS-232 interface on the CH1 side of Q series C24.
- Intelligent function module switch settings

Switch No.	Bit		Description		Setting value
	Position	Specified value			
Switch 1	b0	OFF	Transmission setting	Operation setting	Independent	0702H (Matched with the external device)
	b1	ON		Data bit	8 bits	
	b2	OFF		Parity bit	None	
	b3	OFF		Even/odd parity	Odd	
	b4	OFF		Stop bit	1 bit	
	b5	OFF		Sum check code	None	
	b6	OFF		Write during RUN	Prohibited	
	b7	OFF		Setting modifications	Prohibited	
	b8 to b15	—	Communication rate setting		19200bps	
Switch 2	—		Communication protocol setting		Nonprocedural protocol	0006H
Switch 5	—		Station number setting		No. 0 station	0000H

- Buffer memory settings for the examples (For other than below, default values are used.)
  - Example in Page 275, Section 11.3.1 (1) shows the GX Configurator-SC setting. For settings, refer to Page 267, Section 11.2.4.
  - Example in Page 276, Section 11.3.1 (2) shows the setting by a sequence program.

Address Dec. (Hex.) CH1	Name	Setting value
173 (ADH)	User frame use enable/disable designation	1H: Enable
174 (AEH)	First frame No. designation, 1st[1]	Example (1): 3E8H Example (2): 8001H
175 (AFH)	First frame No. designation, 2nd[1]	Example (1): 3E9H Example (2): 8002H
176 (B0H)	First frame No. designation, 3rd[1]	6H
177 (B1H)	First frame No. designation, 4th[1]	15H
178 (B2H)	Last frame No. designation, 1st[1]	Example (1): 41BH Example (2): 8005H
179 (B3H)	Last frame No. designation, 2nd	0H: None
180 (B4H)	Last frame No. designation, 3rd	0H: None
181 (B5H)	Last frame No. designation, 4th	0H: None
8224 (2020H)	User frame receive format designation, 1st	0H: Format 0
8225 (2021H)	User frame receive format designation, 2nd	1H: Format 1
8226 (2022H)	User frame receive format designation, 3rd	1H: Format 1

Address Dec. (Hex.)	Name	Setting value
CH1		
8227 (2023H)	User frame receive format designation, 4th	1H: Format 1
8229 (2025H)	Exclusive format-1 received data count, 2nd	12 words
8230 (2026H)	Exclusive format-1 received data count, 3rd	0 word
8231 (2027H)	Exclusive format-1 received data count, 4th	2 words

*1   Indicates the settings of the user frame No. to which the first and last frame Nos. are specified in the programs.

User frame No.	Registration code	Registered data
3E8H/8001H	02H, 51H, 20H, 0AH, 3BH	STX, Q, (SP), Station No. of external device, ;
3E9H/8002H	02H, 41H, 3BH	STX, A, ;
6H	06H	ACK
15H	15H	NAK
41BH/8005H	03H, FFH, F0H	ETX, Sum check code

(1) Example of a sequence program when setting is done using the GX Configurator-SC

For details on the INPUT instruction, refer to the User's Manual (Basic).

X3 M3				Reads combination No.
X4		MOVP U0\G603 D0		Reads combinations of user frames received.
		MOVP K1 D1		Sets the reception channel to CH1.
		MOVP K20 D4		Sets the allowable number of reception data to 20.
			Reads reception data	
		G.INPUT U0 D1 D10 M3		Executes reception.
M3 M4		SET M100		Sets the normal completion flag.
M4		SET M101		Sets the abnormal completion flag.

Q series C24
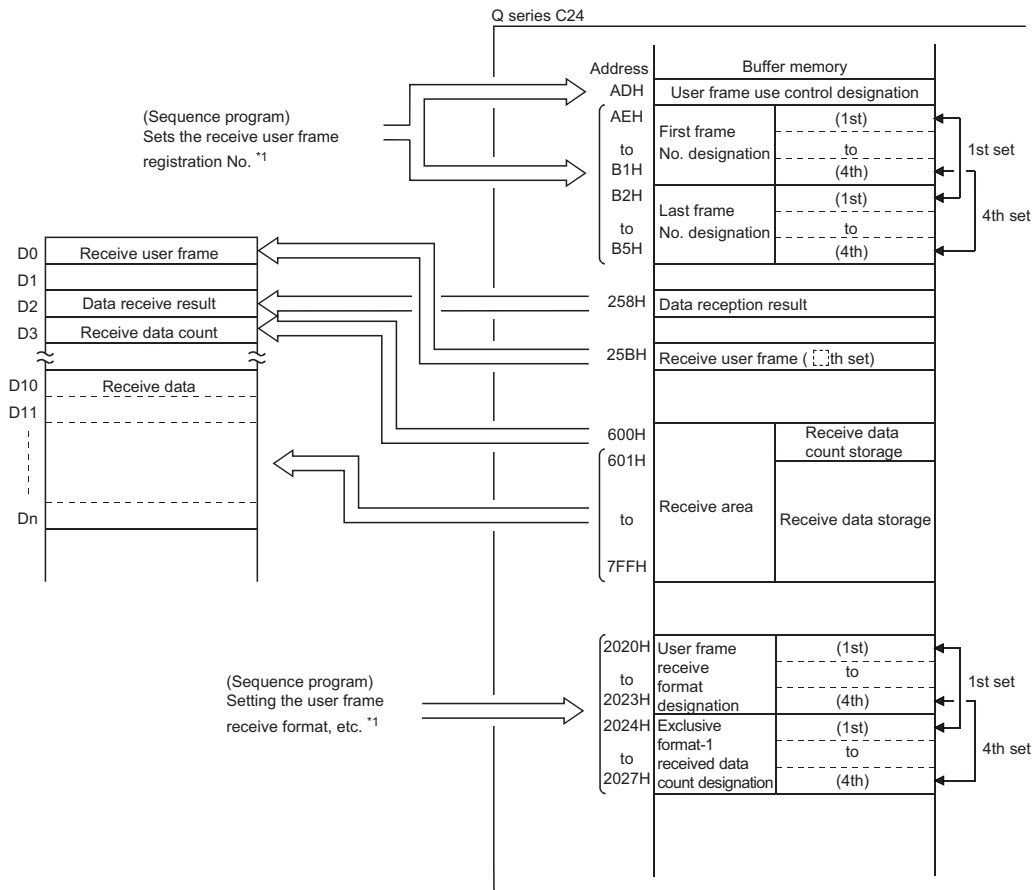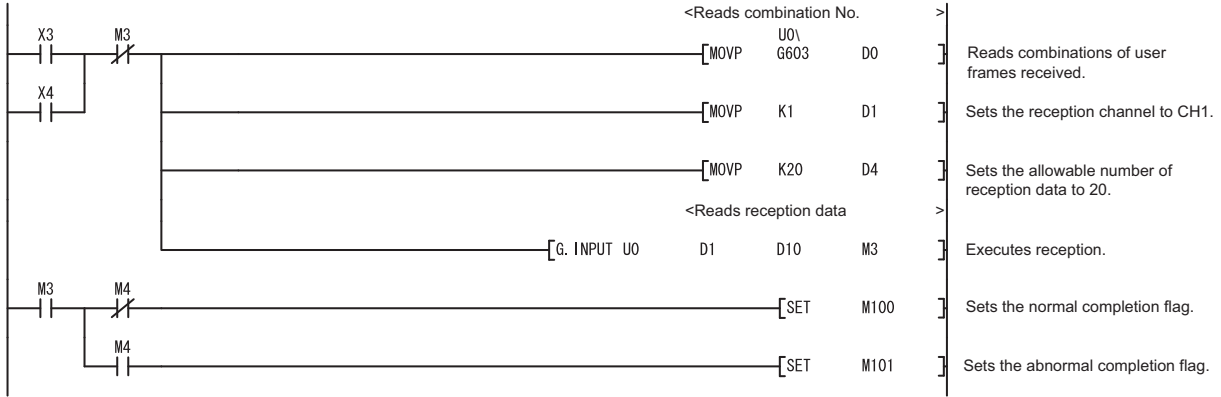
*1 ☞ Page 267, Section 11.2.4

(2) Example of a sequence program when setting is not done using the GX Configurator-SC

For details on the INPUT instruction, refer to the User's Manual (Basic).

*1   ☞ Page 220, CHAPTER 9

```
                                                  <First frame No. (for reception) designation, 1st to 4th>
  M0                                                                              U0\
  ─┤├──────────────────────────────────────────────────────[MOV    H8001    G174 ]─┐
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H8002    G175 ]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H6       G176 ]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H15      G177 ]─┤
                                                  <Last frame No. (for reception) designation, 1st to 4th>
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H8005    G178 ]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H0       G179 ]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H0       G180 ]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    H0       G181 ]─┤
                                                  <Reception format designation 2 to 3, format-1 specified>
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K1       G8225]─┤
                                                                                 U0\   User frame setting for reception *2
  ─────────────────────────────────────────────────────────[MOV    K1       G8226]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K1       G8227]─┤
                                                  <Format-1 received data count designation 2 to 3>
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K12      G8229]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K0       G8230]─┤
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K2       G8231]─┤
                                                  <Set to enable user frame>
                                                                                 U0\
  ─────────────────────────────────────────────────────────[MOV    K1       G173 ]─┤
                                                                                      │
  ─────────────────────────────────────────────────────────[SET    M1           ]─┘

<<Wait until data communications are enabled>>
  M1        U0\
  ─┤├───[=  G173     K2      ]──────────────────────────────[RST    M1           ]─┐
                                                  <Reception is ready>             │
                                                                                   │
                                                  ────────────────[SET    M2      ]─┘

<<Start communications after M2 turns ON>>
                                                  <Reads combination No.>
  X3                                                         U0\
  ─┤├──────────────────────────────────────────────────[MOVP  G603     D0   ]──   Reads combination of received
                                                                                    user frames
  X4
  ─┤├──────────────────────────────────────────────────[MOVP  K1       D1   ]──   Sets to CH1 for reception channel

  ─────────────────────────────────────────────────────[MOVP  K20      D4   ]──   Sets to 20 for No. of allowable
                                                                                    reception data
                                                  <Reads reception data>
  ──────────────────────────────────[G.INPUT  U0    D1    D10    M3   ]──         Executes reception

  M3   M4
  ─┤├──┤/├───────────────────────────────────────────────────[SET    M100     ]── Sets normal completion flag

       M4
  ─────┤├────────────────────────────────────────────────────[SET    M101     ]── Sets abnormal completion flag
```

*2   ☞ Page 267, Section 11.2.4

11.3.2 Application example for data reception using a combination that specifies the first frame

In the description of this program example, conditions for data reception using a user frame are as follows.

(1) The Q series C24 I/O signals

The Q series C24 is installed at QCPU I/O signal addresses X/Y80 to X/Y9F.

(2) Q series C24 interface used in data communications with the external device

The Q series C24 CH1 side RS-232 interface is used.

(3) Data to be registered on the GX Configurator-SC "Transmission control and other system settings" screen and "Non procedure system settings" screen used for data communication using a user frame.

Change default values for the items listed in the table below.
Use default values for other items.

Item	Set contents	Buffer memory address to store registration value	Remarks
Word/byte units designation	Word/byte	96H	Set to either one according to the example.
Receive transparent code designation	Yes/No	120H	When Yes, Additional code: 10H (DLE), Transparent code: 02H (STX)
ASCII-BIN conversion designation	Do not convert	121H	Select "Do not convert" in the example.
Received data count	6 to 511	A4H	Set according to the example.
Receive complete code	None	A5H	—
User frame use enable/disable designation	Use	ADH	
First frame No. designation Last frame No. designation *1	Yes	AEH to B5H	☞ Page 279, Section 11.3.2 (3) (a) to ☞ Page 283, Section 11.3.2 (3) (e)
User frame receive format designation	Format-0/ Format-1	2020H to 2023H	
Exclusive format-1 received data count designation	0H to FFFFH	2024H to 2027H	

*1 This program example gives the registered contents of the user frame No. specified as the first frame No. and the last frame No.

[When receiving with a combination that specifies the first frame]

Item		User frame No.	Registration code	Registered data contents
First frame No.	1st	3E8H	02H, 51H, 20H, 0AH, 3BH	STX, Q, (SP), External device station No.,;
	2nd	3E9H	02H, 41H, 3BH	STX, A, ;
	3rd	6H	06H	ACK
	4th	15H	15H	NAK
Last frame No.	1st	41BH	03H, FFH, F0H	ETX, Sum check code
	2nd	0H (none)	—	
	3rd	0H (none)	—	
	4th	0H (none)	—	

(a) When receiving with a combination of the first frame, arbitrary data and last frame (reception using Format-0)

(b) When receiving with a combination of the first frame and arbitrary data (reception using Format-0)

Additional code (Removed by Q series C24.)

Transparent code

When STX handled as transparent code.

```
D  S
L  T
E  X

10H 02H
```

Head data

External device

```
S       S       C L
T A ; 0 1 2 3 T A B C   R F
X       X       (1234H)
02H 41H 3BH 30H 31H 32H 33H 02H 41H 42H 43H 34H 12H 0DH 0AH
```

Programmable controller CPU

First frame (corresponds to register No. 3E9H)

Arbitrary data are (Received data count)

Reception data read request X83 1)

Programmable controller CPU INPUT

ON

Completion device M0

ON Abnormal completion

Status display device at completion M1 Normal completion

1 scan

Receive data count
Word units
Receive byte count excluding frame and additional code (12)/2=6
Byte units
Receive byte count excluding frame and additional code (12)

The figure shown below is for word units.

Address	Value	Description
A4H	6H	Received data count
ADH	2H	User frame use control designation
AEH	3E8H	First frame No. designation (1st)
AFH	3E9H	(2nd)
B0H	6H	(3rd)
B1H	15H	(4th)
B2H	41BH	Last frame No. designation (1st)
B3H	(None) 0H	(2nd)
B4H	(None) 0H	(3rd)
B5H	(None) 0H	(4th)
120H	(YES) (NO) 1002H/ 0H	Receive transparent code designation
121H	(Disable) 0H	ASCII-BIN conversion designation
25BH	2H	Receive user frame 2) to D0 (th)

(Each 2nd designated frame)

User frame receive format designation

Address	Value	Description
2020H	0H	User frame receive format designation (1st = Format-0)
2021H	0H	(2nd = Format-0)
2022H	1H	(3rd = Format-1)
2023H	1H	(4th = Format-1)
2024H	0H	Exclusive format-1 received data count designation (1st)
2025H	0H	(2nd)
2026H	0H	(3rd)
2027H	2H	(4th)

Buffer memory

Address	Value	Description
600H	00H , 06H	Receive data count 3) to D3
601H	(1) (0) 31H , 30H	Receive data (arbitrary data area)
602H	(3) (2) 33H , 32H	4) to D10 or after
603H	(A) (STX) 41H , 02H	
604H	(C) (B) 43H , 42H	
605H	(1234H) 12H , 34H	
606H	(LF) (CR) 0AH , 0DH	

Buffer memory

Reception data read request

```
X83  M0
─┤├──┤/├──────────────────────────[FROMP  H8   H25B  D0   K1 ]   Reads combinations of user frames received.
X84
─┤├─────────────────────────────────────────────[MOVP  K1   D1 ]   Sets to CH1 the reception channel.

                                                 [MOVP  K6   D4 ]   Sets the allowable number of reception data to 6.

                                          [G.INPUT  U8   D1   D10   M0 ]   Executes reception.

M0   M1
─┤├──┤/├──────────────────────────────────────────[SET   M100 ]   Sets the normal completion flag.
     M1
─────┤├──────────────────────────────────────────[SET   M101 ]   Sets the abnormal completion flag.
```

(c) When receiving with user frame only (reception using Format-0)

Head data

(For reception using first frame and last frame combination)

External device

S T X	Q	⌴	External device station No.	;	E T X	Sum check code
02H	61H	20H	0AH	3BH	03H	03H

Programmable controller CPU

First frame (Correspond to register No. 3E8H and 41BH) ─── Last frame

Reception data read request — X83 — 1)

Programmable controller CPU — INPUT

Completion device — M0

ON

Status display device at completion — M1

ON ---- Abnormal completion
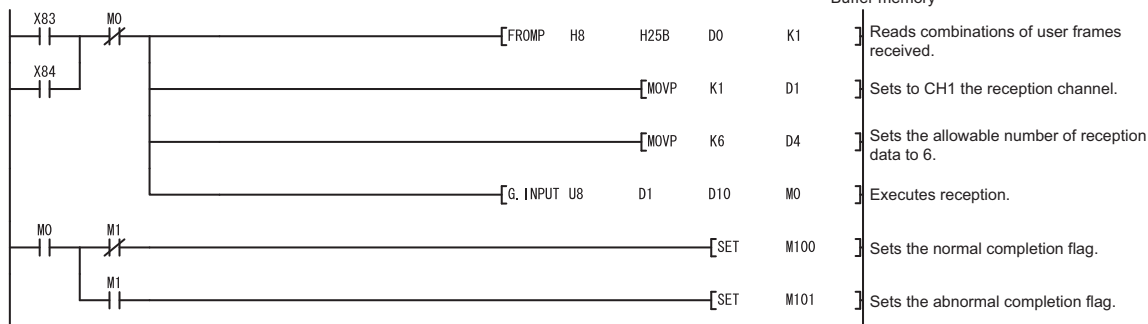
Normal completion

1 scan

Since there is no arbitrary data area, the receive data count is [0].

The illustration below is for reception using first frame and last frame combination.

ADH	2H		User frame use control designation
AEH	3E8H		First frame No. designation (1st)
AFH	3E9H		(2nd)
B0H	6H		(3rd)
B1H	15H		(4th)
B2H	41BH		Last frame No. designation (1st)
B3H	(None) 0H		(2nd)
B4H	(None) 0H		(3rd)
B5H	(None) 0H		(4th)
120H	(YES) (NO) 1002H/ 0H		Receive transparent code designation
121H	(Disable) 0H		ASCII-BIN conversion designation
25BH	1H		Receive user frame 2) (☐th) → to D0
600H	00H , 00H		Receive data count 3) → to D3
2020H	0H		User frame receive format designation (1st = Format-0)
2021H	0H		(2nd = Format-0)
2022H	1H		(3rd = Format-1)
2023H	1H		(4th = Format-1)
2024H	0H		Exclusive format-1 received data count (1st)
2025H	0H		(2nd)
2026H	0H		(3rd)
2027H	2H		(4th)

(Each 1st designated frame)

Buffer memory

Reception data read request

Ladder		Description
X83 — M0 ─── [FROMP H8 H25B D0 K1]		Reads combinations of user frames received.
X84 ─── [MOVP K1 D1]		Sets to CH1 the reception channel.
─── [MOVP K6 D4]		Sets the allowable number of reception data to 6.
─── [G.INPUT U8 D1 D10 M0]		Executes reception.
M0 — M1 ─── [SET M100]		Sets the normal completion flag.
M1 ─── [SET M101]		Sets the abnormal completion flag.

(d) When receiving with first frame only (reception using Format-1)

Head data

External device

A
C
K

06H

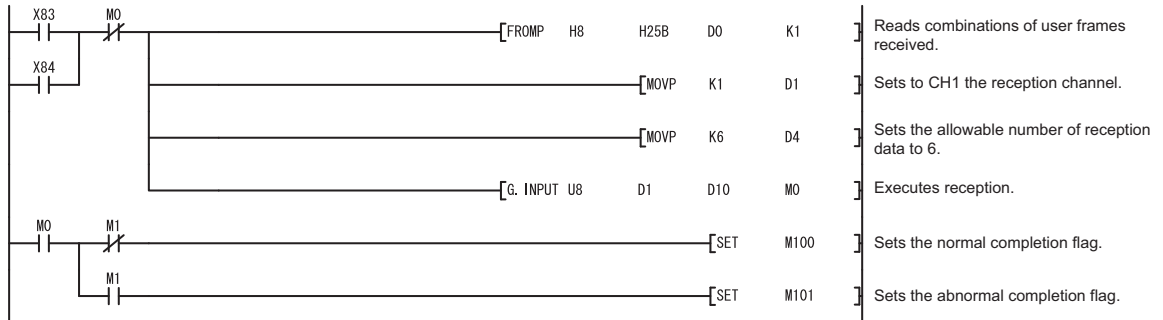Programmable controller CPU

First frame (Correspond to register No. 6H)
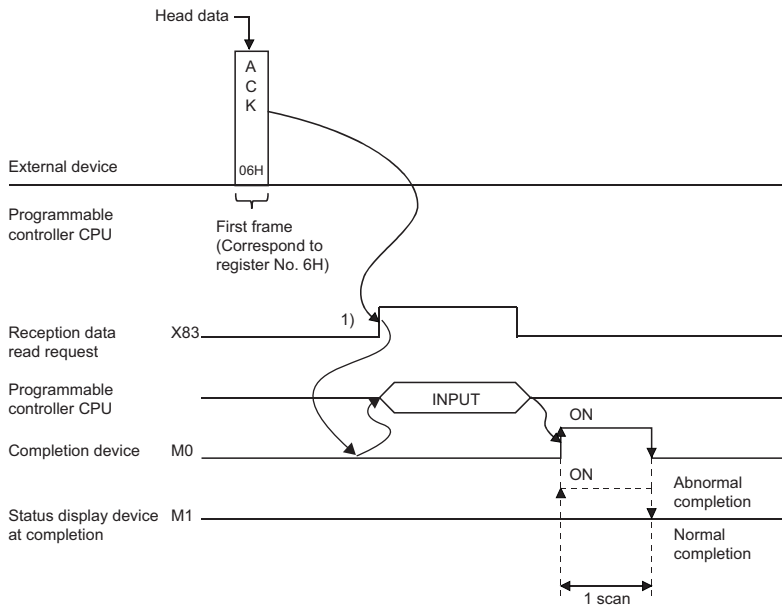
Since it is designated to system 1 received data count "0", the receive data count is [0].
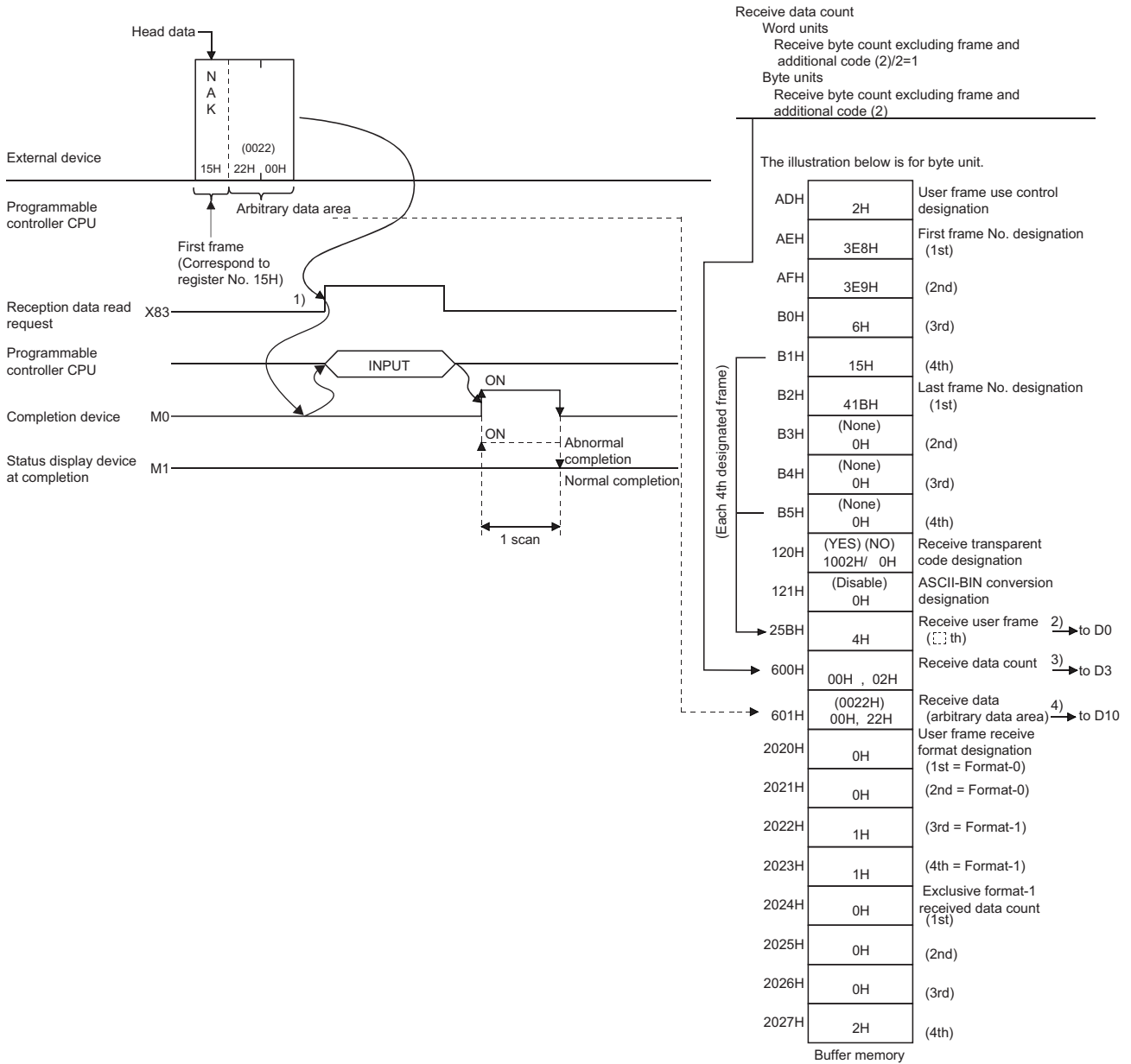
The illustration below is for byte unit.

Reception data read request — X83

1)

Programmable controller CPU

INPUT

ON

Completion device — M0

ON

Abnormal completion

Status display device at completion — M1

Normal completion

1 scan

(Each 3rd designated frame)

Address	Value	Description
ADH	2H	User frame use control designation
AEH	3E8H	First frame No. designation (1st)
AFH	3E9H	(2nd)
B0H	6H	(3rd)
B1H	15H	(4th)
B2H	41BH	Last frame No. designation (1st)
B3H	(None) 0H	(2nd)
B4H	(None) 0H	(3rd)
B5H	(None) 0H	(4th)
120H	(YES) (NO) 1002H/ 0H	Receive transparent code designation
121H	(Disable) 0H	ASCII-BIN conversion designation
25BH	3H	Receive user frame 2) (☐th) → to D0
600H	00H , 00H	Receive data count 3) → to D3
2020H	0H	User frame receive format designation (1st = Format-0)
2021H	0H	(2nd = Format-0)
2022H	1H	(3rd = Format-1)
2023H	1H	(4th = Format-1)
2024H	0H	Exclusive format-1 received data count (1st)
2025H	0H	(2nd)
2026H	0H	(3rd)
2027H	2H	(4th)

Buffer memory

Reception data read request

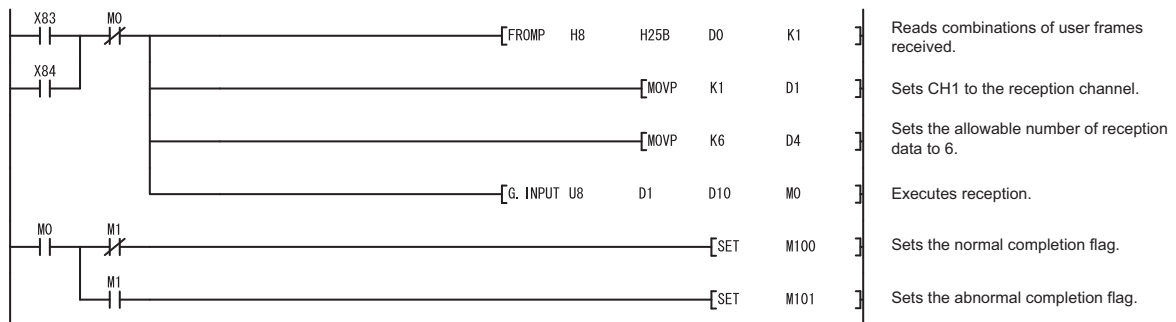| Ladder	Command					Description
X83 M0	FROMP	H8	H25B	D0	K1	Reads combinations of user frames received.
X84	MOVP		K1	D1		Sets to CH1 the reception channel.
	MOVP		K6	D4		Sets the allowable number of reception data to 6.
	G.INPUT U8		D1	D10	M0	Executes reception.
M0 M1	SET			M100		Sets the normal completion flag.
M1	SET			M101		Sets the abnormal completion flag.

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(e) When receiving with a combination of the first frame and arbitrary data (Exclusive format-1 dedicated received data count) (reception using Format-1)

Receive data count
Word units
Receive byte count excluding frame and additional code (2)/2=1
Byte units
Receive byte count excluding frame and additional code (2)

The illustration below is for byte unit.

Address	Value	Description
ADH	2H	User frame use control designation
AEH	3E8H	First frame No. designation (1st)
AFH	3E9H	(2nd)
B0H	6H	(3rd)
B1H	15H	(4th)
B2H	41BH	Last frame No. designation (1st)
B3H	(None) 0H	(2nd)
B4H	(None) 0H	(3rd)
B5H	(None) 0H	(4th)
120H	(YES) (NO) 1002H/ 0H	Receive transparent code designation
121H	(Disable) 0H	ASCII-BIN conversion designation
25BH	4H	Receive user frame 2) to D0 (□ th)
600H	00H , 02H	Receive data count 3) to D3
601H	(0022H) 00H, 22H	Receive data (arbitrary data area) 4) to D10
2020H	0H	User frame receive format designation (1st = Format-0)
2021H	0H	(2nd = Format-0)
2022H	1H	(3rd = Format-1)
2023H	1H	(4th = Format-1)
2024H	0H	Exclusive format-1 received data count (1st)
2025H	0H	(2nd)
2026H	0H	(3rd)
2027H	2H	(4th)

Buffer memory

Reception data read request

Ladder	Instruction	Description
X83 M0 / X84	FROMP H8 H25B D0 K1	Reads combinations of user frames received.
	MOVP K1 D1	Sets CH1 to the reception channel.
	MOVP K6 D4	Sets the allowable number of reception data to 6.
	G.INPUT U8 D1 D10 M0	Executes reception.
M0 M1 /	SET M100	Sets the normal completion flag.
M1	SET M101	Sets the abnormal completion flag.

11.3.3 Application example for data reception using a combination that does not specify the first frame

In the description of this program example, conditions for data reception using a user frame are as follows.

(1) The Q series C24 I/O signals

The Q series C24 is installed at QCPU I/O signal addresses X/Y80 to X/Y9F.

(2) Q series C24 interface used in data communications with the external device

The Q series C24 CH1 side RS-232 interface is used.

(3) Data to be registered on the GX Configurator-SC "Transmission control and other system settings" screen and "Non procedure system settings" screen used for data communication using a user frame.

Change default values for the items listed in the table below.

Use default values for other items.

Item	Set contents	Buffer memory address to store registration value	Remarks
Word/byte units designation	Word/byte	96H	The unit is set to "Word" in the example.
Receive transparent code designation	Yes	120H	Additional code: 10H (DLE), Transparent code: 02H (STX)
ASCII-BIN conversion designation	Do not convert	121H	Select "Do not convert" in the example.
Received data count	6 to 511	A4H	Set according to the example.
Receive complete code	None	A5H	—
User frame use enable/disable designation	Use	ADH	☞ Page 285, Section 11.3.3 (3) (a)
First frame No. designation[1]	None	AEH to B1H	
Last frame No. designation[1]	Yes	B2H to B5H	
User frame receive format designation	Format-0	2020H to 2023H	☞ Page 285, Section 11.3.3 (3) (a) Specify Format-0 for a combination that does not specify the first frame.
Exclusive format-1 received data count designation	0H	2024H to 2027H	

[1] This program example gives the registered contents of the user frame No. specified as the first frame No. and the last frame No.

[When receiving with a combination that does not specify the first frame]

Item		User frame No.	Registered code	Registered data contents
First frame No.	1st	0H (none)	—	
	2nd	0H (none)	—	
	3rd	0H (none)	—	
	4th	0H (none)	—	
Last frame No.	1st	419H	3BH, 04H	;, E0T
	2nd	0H (none)	—	
	3rd	0H (none)	—	
	4th	0H (none)	—	

(a) When receiving using arbitrary data and last frame combination. (reception using Format-0)

Additional code (Removed by the Q series C24.)

Transparent code

When STX is handled as transparent code.

| D L E | S T X |
| 10H | 02H |

Head data

Receive data count
Word units
Receive byte count excluding frame and additional code (12)/2=6
Byte units
Receive byte count excluding frame and additional code (12)

The illustration below is for word units.

External device

| 0 | 1 | 2 | 3 | STX | A | B | C | C R | L F | ; | E O T |

(1234H)

30H 31H 32H 33H 02H 41H 42H 43H 34H 12H 0DH 0AH 3BH 04H

Programmable controller CPU

Arbitrary data area | Last frame (Corresponds to register No.419H)

		User frame use control designation
ADH	2H	
AEH	(None) 0H	First frame No. designation (1st)
AFH	(None) 0H	(2nd)
B0H	(None) 0H	(3rd)
B1H	(None) 0H	(4th)
B2H	419H	Last frame No. designation (1st)
B3H	(None) 0H	(2nd)
B4H	(None) 0H	(3rd)
B5H	(None) 0H	(4th)
120H	(YES) 1002H	Receive transparent code designation
121H	(Disable) 0H	ASCII-BIN conversion designation
25BH	1H	Receive user frame (th)
600H	00H , 06H	Receive data count
601H	(1) (0) 31H , 30H	Receive data (arbitrary data area)
602H	(3) (2) 33H , 32H	
603H	(A) (STX) 41H , 02H	
604H	(C) (B) 43H , 42H	
605H	(1234H) 12H , 34H	
606H	(LF) (CR) 0AH , 0DH	

(Each 1st designated frame)

2) To D0
3) To D3
4) To D10 or after

Reception data read request X3
Programmable controller CPU INPUT ON
Completion device M0 ON Abnormal completion
Status display device at completion M1 Normal completion
1 scan

Buffer memory

2020H	0H	User frame receive format designation (1st = Format-0)
2021H	0H	(2nd = Format-0)
2022H	0H	(3rd = Format-1)
2023H	0H	(4th = Format-1)
2024H	0H	Exclusive Format-1 received data count (1st)
2025H	0H	(2nd)
2026H	0H	(3rd)
2027H	0H	(4th)

Buffer memory

Reception data read request

X83 MO	FROMP H8 H25B D0 K1	Reads combinations of user frames received.
X84	MOVP K1 D1	Sets CH1 to the reception channel.
	MOVP K6 D4	Sets the allowable number of reception data to 6.
	G.INPUT U8 D1 D10 M0	Executes reception.
M0 M1	SET M100	Sets the normal completion flag.
M1	SET M101	Sets the abnormal completion flag.

11.4 Data Transmission

This section explains the arrangement of the transmission data and transmission procedure when transmitting data using a user frame.

11.4.1 Send data

The following describes the data list, codes, and handling of the Q series C24 send data during user frame data transmission.

(1) Send data list

Only the data list combinations shown below are allowed during user frame data transmission.

	User frame (first n frames)	Arbitrary data area	User frame (last m frames)	

Combination \ Data name	User frame (first n frames)	Arbitrary data area	User frame (last m frames)	Note
1)	○	○	○	Total 99 frames
2)	○	○		
3)		○	○	
4)	○			Total 100 frames

○: Designated data exists

(When ASCII-BIN conversion disabled)

Codes that can be designated	Codes when transmitting	Note
	00H to FFH	Added by the Q series C24.
	00H to FFH	Transmission area data.

(When ASCII-BIN conversion enabled)

Codes that can be designated	Codes when transmitting	Note
0H to 9H, AH to FH	30H to 39H, 41H to 46H	Added by the Q series C24. The codes shown at the left are 4-bit codes.
0H to 9H, AH to FH	30H to 39H, 41H to 46H	Transmission area data. The codes shown at the left are 4-bit codes.

*1 Four bits of 0H to FH data are converted to 30H to 39H and 41H to 46H ASCII data and transmitted as the data codes of the data to be transmitted (including the transparent code data).

*2 Send data arbitrary data area
- When the send data count designated by the programmable controller CPU during transmission in byte units is an odd number of bytes, the data of the lower byte of the last send data storage location of the send data storage area are transmitted.
- When ASCII-BIN conversion is enabled, the data to be transmitted is transmitted as 2 characters/byte.

Point

Handling of the Q series C24 send data

● The data of the user frame and the data of the transmission area designated from the programmable controller CPU are transmitted in the contents and order set in the buffer memory send user frame designation area.

● For the user frame section and arbitrary data section, the data can be sent as ASCII code using the ASCII-BIN conversion. For more details on the ASCII-BIN conversion, see Page 319, CHAPTER 13.

● If send transparent code is designated, the additional code data is added in front of the transparent code/additional code in the data of the designated area during transmission and transmitted.

11.4.2 Transmission procedure

The following describes the transmission procedure when a message containing user frames is transmitted to the external device.

Procedure
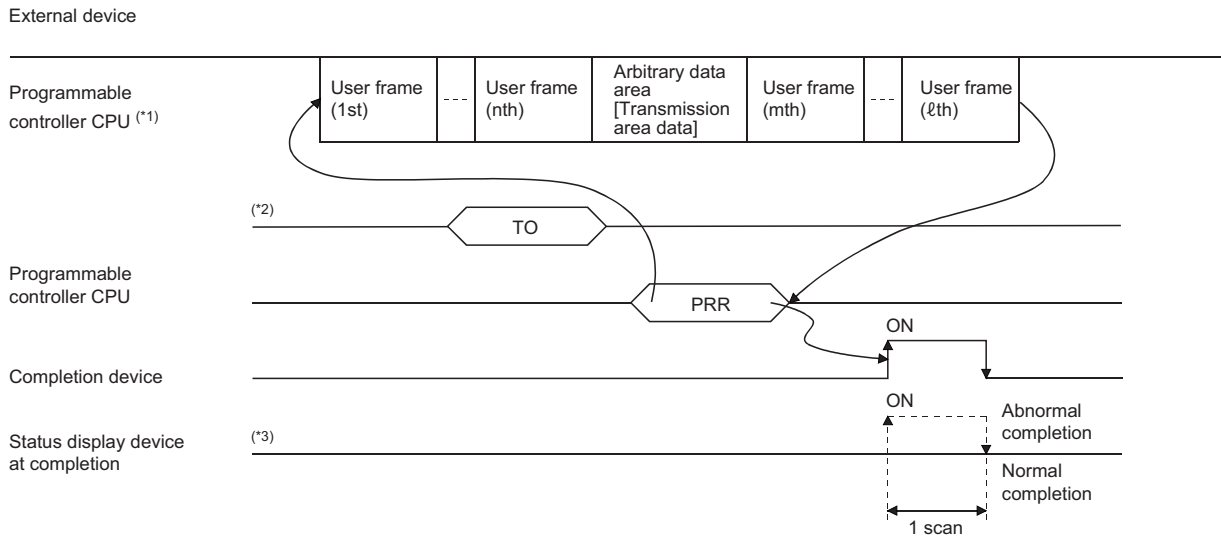
*1 Designates the data of the user frame number to send.

*2 Programmable controller CPU processing

Before issuing a send request to the Q series C24, designate (write) the following data.
- Transmission user frame designation area: User frame No., transmission method and transmission order registered in the Q series C24
- Transmission area (Buffer memory): User data corresponding to transmit message arbitrary data area

*3 When a transmission data count error or data transmission error is generated, the Q series C24 stores the error code to the data transmission result storage area and turns on the transmission abnormal end signal (Xn1).

11.4.3 Settings for transmission user frames

These settings are required for sending data to an external device via user frames and the non procedure protocol.
These settings are made from the GX Configurator-SC or the programmable controller CPU.

(1) Settings via GX Configurator-SC

Perform settings on the following screen to send data using user frames.
- "Non procedure system setting" screen
- "Transmission user frame No. designation system setting" screen

For setting contents on each screen, see Page 289, Section 11.4.3 (2).

(2) Settings via the programmable controller CPU

(a) How to designate and write transmission data when transmitting via user frames

For arbitrary data section when sending a combination of user frames and arbitrary data section, the transmission data count and transmission data are written in the transmission area (the same as when sending them in an arbitrary format.)

User frames are registered using the GX Configurator-SC. Or, the user frame registration number to be sent is written from the programmable controller CPU to the transmission user frame designation area of the buffer memory as shown in the diagram below.

After executing registration/write, the Q series C24 transmits the designated data in the designated order upon execution of the PRR instruction.

Sending data in the following sequence

Sending sequence	Transmission data type	User frame No.	Contents of sent/registered data
1	User frame	2H (2)	02H (STX)
2	User frame	3E82H (1000)	00H, 3BH (station No., ":")
3	Arbitrary data	8000H (-32768)	41H, 42H, 43H, 44H ("ABCD")
4	User frame	400H (1024)	03H, FFH, F6H, 0DH, 0AH (ETX, Sum check, CR, LF)

Address	Buffer memory	
B6H	0 or the following frame designation No	…… User frame being transmitted designation No. area
B7H	0	…… CR/LF output designation area
B8H	1	…… Output head pointer designation area
B9H	4	…… Output head pointer designation area
BAH	2H (1st)	
BBH	3E8H (2nd)	
BCH	8000H (3rd) *1	
BDH	400H (4th)	…… Transmission count designation area
BEH	0H (5th)	
BFH	0H (6th)	

(Transmission user frame designation area)

To the external device ←

(Transmission area)

400H	2 or 4	…… Transmission data count (word unit/byte unit)
401H	42H(B) , 41H(A)	…… Transmission data
402H	44H(D) , 43H(C)	

(When the ASCII-BIN conversion is not performed)

User frame		Arbitrary data	User frame
1st	(2nd)		(4th)
S T X	Station No. (;)	A B C D	E T X, Sum check, C R, L F
02H	01H , 3BH	41H , 42H , 43H , 44H	03H , 4BH , 0DH , 0AH
2H	3E8H	8000H	400H

Corresponding frame No.

* Figure at left is for byte units.
   For word units, the optional data section is sent in the sequence "ABCD."

*1 When sending data that is written in the transmission area, use 8000H as a temporary user frame number. (☞ Page 291, Section 11.4.3 (2) (b))

(b) Transmission user frame designation

The following explains application of the buffer memory to be used when sending data using user frames, along with the designated and stored values.

• User frame being transmitted storage area (addresses: B6H/156H)

What number of the transmission frame number designation area is being sent is stored in the data transmission via user frames.

```
                          b15              to              b0
Buffer memory address   B6H |         0H to 64H          | (CH1 side)
                       156H |         0H to 64H          | (CH2 side)
                                            ↑
        0H(        0): Not sent
      1H to 64H(  1 to 100): User frame being transmitted designation No. (nth number)
```
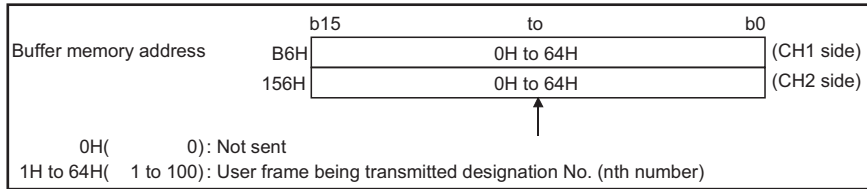
• CR/LF output designation area (addresses: B7H/157H)

When sending a user frame or arbitrary data that does not contain a CR/LF, designate whether a CR+LF will be sent each time a user frame or arbitrary data is sent.

```
                          b15              to              b0
Buffer memory address   B7H |          0 to 1           | (CH1 side)
                       157H |          0 to 1           | (CH2 side)
                                            ↑
                                       0: Do not send
                                       1: Send
```
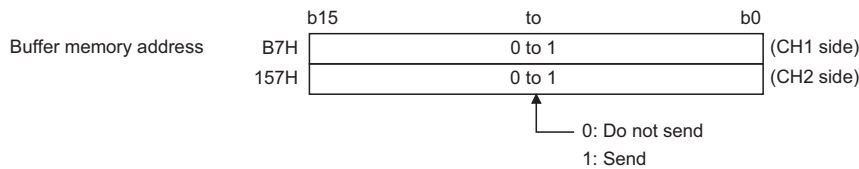
• Output head pointer designation area (addresses: B8H /158H)

Write the head position (□th number) in the transmission frame No. designation area for writing the registration number of the user frame to be sent.

```
                          b15              to              b0
Buffer memory address   B8H |         0 to 100          | (CH1 side)
                       158H |         0 to 100          | (CH2 side)
                                            ↑
                                       0: No designation
                                       1: Send from the first
                                       to       to
                                     100: Send from the 100th
```
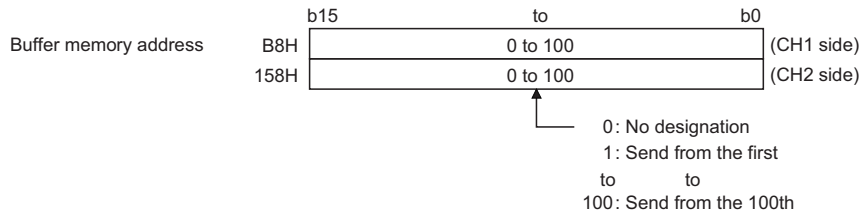
> **Remark** •
>
> Transmission using a user frame cannot be performed when the value of the output head pointer designation area is "0".
>
> •

• Output count designation area (addresses: B9H/159H)

Write the output count of the user frames to be sent from the position designate in the output head pointer designation area.

```
                          b15              to              b0
Buffer memory address  B9H  |          0 to 100          | (CH1 side)
                       159H  |          0 to 100          | (CH2 side)
                                              ↑
                                              └── 0: No designation
                                                  1: Transmit 1 frame
                                                  to        to
                                                  100: Transmit 100 frames
```
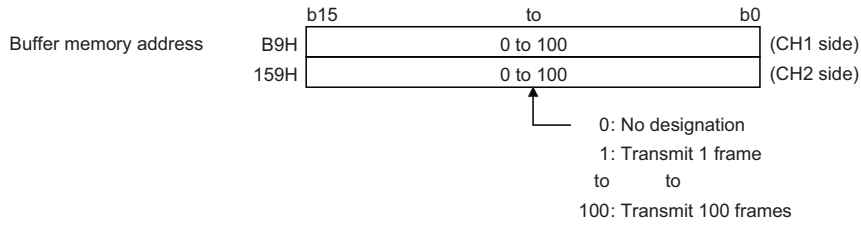
Remark •

The operation is completed normally without data transmission if the value for the output count designation area is "0."

• •

• Transmission frame No. designation area (addresses: BAH to 11DH/15AH to 1BDH)

  • Write the user frame No. to be sent in the order in which they are output from the position designated in the output head pointer designation area.

  • When sending data that is written in the transmission area, use 8000H as a temporary user frame number.

  • By designating user frame number 8000H, the Q series C24 transmits the data of the transmission data designation area for the data count designated in the transmission data count designation area.

```
Buffer memory address  BAH  |      0H  to  801FH(1st)      |⎫
                       to   |             to              | ⎬ (CH1 side)
                      11DH  |     0H  to  801FH(100th)     |⎭

                      15AH  |      0H to  801FH(1st)       |⎫
                       to   |             to              | ⎬ (CH2 side)
                      1BDH  |     0H to  801FH(100th)      |⎭
                                          ↑
```
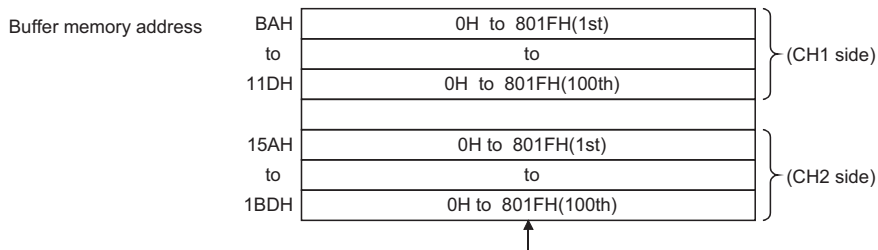
Specifies the following user frame No. for the data to be sent.
Note that the No. on the right side of the user frame No. below is the No. used for transmission without ASCII-BIN conversion for only the data of any frame section when transmission data is converted into ASCII-binary data and transmitted. See Chapters 12 and 13 for details.

                        0H: No transmission designation. (No additional transmission is allowed.)
        1H to 3E7H/4001H to 43E7H: Transmits the default frame having the designated number.
  3E8H to 4AFH/43E8H to 44AFH: Transmits the user frame having the designated number. (For flash ROM registration)
                   8000H/C000H: Transmits data in the transmission area of the buffer memory.
8001H to 801FH/C001H to C01FH: Transmits the user frame having the designated number. (For buffer memory registration)

Point

The following transmission can be performed by adding 4000H to the registered user frame No. and specifying this number.
  • When ASCII-BIN conversion is designated, a specified frame can be sent without the conversion. (☞ Page 321, Section 13.3)
  • A specified frame can be transmitted without adding the additional code for the send transparent code designation. (☞ Page 299, Section 12.3)

11.5 Transmission Program

The following are examples of a sequence program when the user frame (four) and transmission area data are transmitted.

In the description of the sample programs, data transmission using user frames is described for the following conditions case:

- The Q series C24 I/O signals: The Q series C24 installed at QCPU I/O signal addresses X/Y80 to X/Y9F.
- The Q series C24 interface used in data communications with the external device: The Q series C24 CH1 RS-232 interface
- Switch setting using GX Developer: Set the following setting values on the "intelligent functional module switch setting" screen.

	Setting item	Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device.	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0006H	Nonprocedural protocol
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting		
Switch 4	CH2 Communication protocol setting	0000H	
Switch 5	Station No. setting	0001H	Q series C24 station No. (used in the user frame)

- Data to be registered on the GX Configurator-SC's "Transmission control and others system setting" screen and the "Non procedure system settings" screen for data communication via user frames
  - Change the default values for the items listed in the table below.
  - Use default settings for other items.
  - In example of Page 295, Section 11.5 (2), the transmission frame No. is not registered using the GX Configurator-SC. (It is registered using a sequence program.)

Item	Set contents	Buffer memory address to store registration value	Remarks
Word/byte units designation	Byte	96H	—
Send transparent code designation	No	11FH	Additional code: 10H (DLE), Transparent code: 02H (STX)
ASCII-BIN conversion designation	Disable	121H	—
Transmission frame No. designation 1st	3F2H	BAH	
Transmission frame No. designation 2nd	3F3H	BBH	
Transmission frame No. designation 3rd	8001H	BCH	☞ Page 294, Section 11.5 (1)
Transmission frame No. designation 4th	8000H	BDH	
Transmission frame No. designation 5th	41BH	BEH	

(1) Sequence program example when setting is done with GX Configurator-SC

For further details on the PRR instruction, see Page 369, CHAPTER 17.

External device side

Programmable controller CPU side

S T X	Q	External device Station No.	Q series C24 Station No.	;	T	O	T	A	L	;	(Total number)	Transmission area data (arbitrary data section)	E T X	Sum check code
											(012DH)	(1234H)	(56ABH)		
02H	51H	0AH	01H	3BH	54H	4FH	54H	41H	4CH	3BH	2DH	01H	34H	12H	ABH	56H	03H	37H

* Four bytes of data in the transmission area are sent as is.
(4 byte units in the left diagram.)

Registration No. of the corresponding user frame

- 3F2H (First specification)
- 3F3H (Second specification)
- 8001H (Third specification)
- 8000H (Fourth specification)
- 41BH (Fifth specification)

Transmission instruction

Programmable controller CPU — PRR

Completion device — ON

Status display device at completion — ON — Abnormal completion / Normal completion — One scan

Address	Value	Description
B6H	(Not transmitted) (Sending) 0H/Other than 0H	User frame No. being transmitted
B7H	(Do not transmit) 0H	CR/LF output designation
B8H	(1st) 1H	Output head pointer designation
B9H	5H	Output count designation
BAH	3F2H	Transmission frame No. designation (1st)
BBH	3F3H	(2nd)
BCH	8001H	(3rd)
BDH	8000H	(4th)
BEH	41BH	(5th)
BFH	0H	(6th)
C0H	3F4H	(7th)
C1H	8002H	(8th)
C2H	3F5H	(9th)
C3H	8003H	(10th)
C4H	3F6H	(11th)
C5H	8004H	(12th)
C6H	41BH	(13th)
C7H	0H	(14th)

Buffer memory

Address	Value	Description
11FH	(Yes) (No) 1002H/ 0DH	Send transparent code designation
121H	(No conversion) 0H	ASCII-BIN conversion designation
*1 400H	00H , 04H	Transmission area (transmission data count designation)
401H	(1234H) 12H , 34H	(transmission data)
402H	(56ABH) 56H , ABH	

Buffer memory

*1 0002H for word unit

Transmission instruction

```
      X50
    ──┤├──────────────────────────────────[PLS   M50  ]

      M50   X9E   X9F
    ──┤├───┤├───┤/├────────────────────────[MOV   K4    D0   ]

                                    [MOV   H1234  D1   ]   Sets arbitrary transmission data in D1 to D2.

                                    [MOV   H56AB  D2   ]

                          [TO   H8   H400  D0   K3 ]   Sets arbitrary transmission data in the transmission area.

                                    [MOV   K1    D11  ]   Sets CH1 to the transmission channel.

                                    [MOV   H1    D14  ]   Sets the output head pointer

                                    [MOV   H5    D15  ]   Sets the output head count

                          [G. PRR   U8   D11  M0   ]   Executes transmission

      M0   M1
    ──┤├──┤/├──────────────────────────────[SET   M100 ]   Sets normal completion flag.

          M1
    ──────┤├──────────────────────────────[SET   M101 ]   Sets abnormal completion flag.
```

(2) Sequence program example when setting is not done with GX Configurator-SC

The following is the method of data transmission without performing the transmission frame No. designation using the GX Configurator-SC.

For further details on the PRR instruction, see Page 369, CHAPTER 17.

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Ladder	Comment
X50 —[PLS M50]	
M50 X9E X9F —[MOV K4 D0]	
—[MOV H1234 D1]	Sets arbitrary transmission data.
—[MOV H56AB D2]	
—[TO H8 H400 D0 K3]	Sets the number of transmitted data.
—[MOV H3F2 D5]	Sets the transmission user frames in D5 to D9.
—[MOV H3F3 D6]	
—[MOV H8001 D7]	
—[MOV H8000 D8]	
—[MOV H41B D9]	
—[MOV H0 D10]	
—[TO H8 H0BA D5 K6]	Sets output frame No. in the buffer memory.
M50 —[MOV K1 D11]	Sets CH1 to the transmission channel.
—[MOV K0 D12]	Clears the device in which transmission results are stored.
—[MOV H0 D13]	Sets to no CR/LF output.
—[MOV H1 D14]	Sets the output head pointer.
—[MOV H5 D15]	Sets the output counter.
—[G. PRR U8 D11 M0]	Executes user frame transmission.
M0 M1 —[SET M100]	Sets normal completion flag.
M1 —[SET M101]	Sets abnormal completion flag.

	Normal end			Abnormal end	
D0	Send data count	(0004H)	D0	Send data count	(0004H)
D1	Send data	(3412H)	D1	Send data	(3412H)
D2		(AB56H)	D2		(AB56H)
D5	Transmission frame No.	(03F2H)	D5	Transmission frame No.	(03F2H)
D6		(03F3H)	D6		(03F3H)
D7		(8001H)	D7		(8001H)
D8		(8000H)	D8		(8000H)
D9		(041BH)	D9		(041BH)
D10		(0000H)	D10		(0000H)
D11	Interface No.	(0001H)	D11	Interface No.	(0001H)
D12	Transmission result	(0000H)	D12	Transmission result (other than 0000H)	
D13	CR/LF output	(0000H)	D13	CR/LF output	(0000H)
D14	Output head pointer	(0001H)	D14	Output head pointer	(0001H)
D15	Output counter	(0005H)	D15	Output counter	(0005H)

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CHAPTER 12 TRANSPARENT CODES AND ADDITIONAL CODES

Transparent codes and additional codes are used during data communication with an external device to send/receive one-byte data for transmission control on the external device side as user data.

Transparent codes and additional codes are handled in data communication using the non procedure or bidirectional protocol.

- Transparent code: One-byte data for transmission control.
- Additional code: During transmission, one-byte data added preceding the transparent code and additional code data. During reception, one-byte data deleted (the immediately succeeding one-byte data is processed for reception).

12.1 Handling the Transparent Code and Additional Code Data

The following explains how the Q series C24 handles transparent codes and additional codes during data communication using the non procedure or bidirectional protocol.

The range of additional code data that is added or deleted is explained in Page 299, Section 12.3 and Page 309, Section 12.5.

(1) During data transmission

Additional code data is added immediately before the transparent code and additional code data set for transmission.

Ex

Buffer memory → | Transparent code | → | Transparent code | Additional code | → Send

(2) During data reception

When additional code data set for reception is detected, the additional code data is removed and the immediately succeeding one-byte data is processed for reception.

Ex

Buffer memory ← | Arbitrary code | ← | Additional code | Arbitrary code | ← Receive

(3) During data communication using the ASCII-BIN conversion

The handling of transparent codes and additional codes is done for data after ASCII-BIN conversion during transmission and data immediately before the conversion during reception.

Ex When communicating using an arbitrary format of the non procedure protocol

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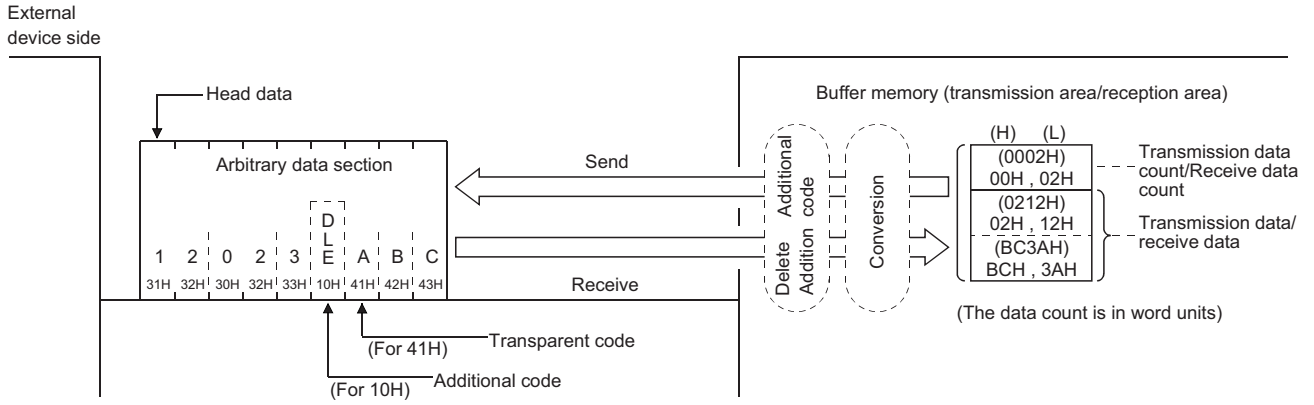
12.2 Registering Transparent Codes and Additional Codes

To control transparent codes and additional codes for data to be sent/received with the non procedure or bidirectional protocol, it is necessary to perform settings in the Q series C24 prior to data communication.
The following explains the registration of transparent and additional codes.

(1) For each interface, 10 combinations and one combination of transparent codes and additional codes can be set for transmission and reception, respectively.

(2) Transparent and additional codes are registered on the GX Configurator-SC's "Transmission control and others system setting" screen.

Point

If additional data code is received during data reception, the Q series C24 will not treat the immediately succeeding one-byte data as the following control data:

● Data received as the first frame and last frame of the user frames
  Therefore, do not set the following:
(The code of the data described above cannot be designated as additional codes for data reception.)
  • A receive user frame that contains additional code data for data reception
  • The same reception complete code as the additional code data for data reception

12.3 Handling Transparent Codes and Additional Codes during Non Procedure Protocol Data Communication

The following explains the handling of transparent codes and additional codes during non procedure protocol data communication.

(1) The data designated by the additional code will be added to or deleted from the data to be transmitted or received.

(2) The following shows the range of communication data for which processing of transparent codes and additional codes is performed.
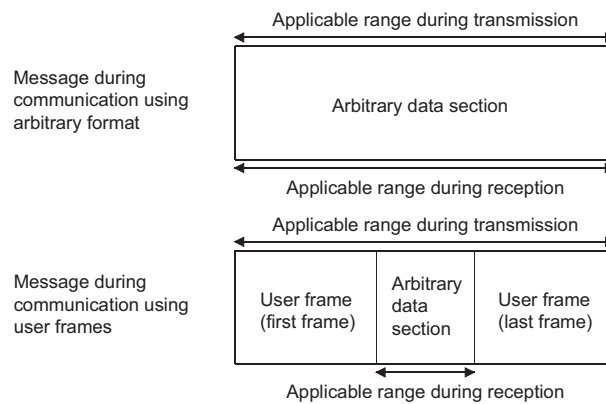
The Q series C24 performs the following processing during data transmission and reception:

(a) When an additional code set for reception is detected during data reception, the additional code data is removed and the immediately succeeding one-byte data is processed for reception as part of the receive data.

(b) When transparent code/additional code data set for transmission is detected during data transmission, the additional code designation data is added immediately before, and is then transmitted.

During data transmission using user frames, even if a transparent code or additional code has been specified in the send transparent code designation area, it is possible to transmit data without adding the additional code data to the user frame portion or arbitrary data.

When sending data without adding the additional code data specified by the send transparent code designation, specify the user frame No. using the following method.

- Specify the number obtained by adding 4000H to the registered user frame No.
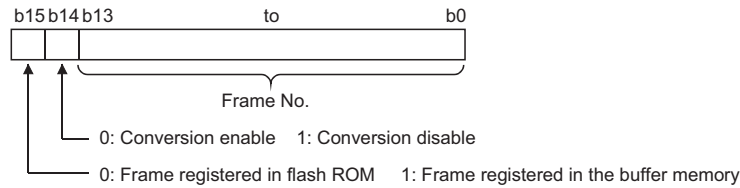
When sending the data for the section designated by 4001H to 44AFH and C000H to C01FH, data will be sent without conversion even if "Enable" has been specified in the ASCII-BIN conversion designation area. (☞ Page 321, Section 13.3)

No. of the use frame to be sent	Designation No. when sending data without adding the additional code specified by the send transparent code designation.
1H to 3E7H (1 to 999)	4001H to 43E7H (16385 to 17383)
3E8H to 4AFH (1000 to 1199)	43E8H to 44AFH (17384 to 17583)
8000H to 801FH (-32768 to -32737)	C000H to C01FH (-16384 to -16353)

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(3) The following describes the processing steps taken by the Q series C24 when performing communication with the transparent code designation and the ASCII-BIN conversion enabled.

(a) Communication using arbitrary format

- Receiving
  - If a receive transparent code is designated, the additional code designation data is deleted (removed).
  - The arbitrary data section is stored in the reception area of the buffer memory. If the ASCII-BIN conversion is designated, the data section is stored in the buffer memory after it has been converted to binary code data.
  - During reception of an arbitrary data section, if the reception-complete code data or the entire count of receive data has been stored, a reception-data read is requested of the programmable controller CPU.
- Sending
  - The transmission data designated from the programmable controller CPU (arbitrary data section of the transmission message) is sent. If the ASCII-BIN conversion is designated, the transmission data section is sent after it has been converted to binary code data.
  - If a send transparent code is designated, additional code data is added preceding the transparent code/additional code data, and is then transmitted.

Ex. When ASCII-BIN conversion is not performed

External device

(Communicating in an arbitrary format)

Q series C24

Head data

Arbitrary data section

```
        D
        L
        E
12H   10H   02H   3AH   BCH
```

Send

Receive

Delete Addition

Additional code

Buffer memory (transmission area/reception area)

```
(H)      (L)
      (0002H)
00H , 02H
      (0212H)
02H , 12H
      (BC3AH)
BCH , 3AH
```

Transmission data count/Receive data count

Transmission data/ receive data

(The data count is in word units)

Transparent code (For 02H)

Additional code (For 10H)

Ex. When ASCII-BIN conversion is performed

External device

(Communicating in an arbitrary format)

Q series C24

Head data

Arbitrary data section

```
              D
              L
              E
1   2   0   2   3   10H   A   B   C
31H 32H 30H 32H 33H  10H 41H 42H 43H
```

Send

Receive

Delete Addition

Additional code

Conversion

Buffer memory (transmission area/reception area)

```
(H)      (L)
      (0002H)
00H , 02H
      (0212H)
02H , 12H
      (BC3AH)
BCH , 3AH
```

Transmission data count/Receive data count

Transmission data/ receive data

(The data count is in word units)

Transparent code (For 41H)

Additional code (For 10H)

(b) Communication using user frames

- Receiving
  - Reception check of user frames (first frame, last frame) is performed.
  - If a receive transparent code is designated, the additional code designation data is deleted (removed) from the arbitrary data section.
  - If a sum check code is designated in a user frame (last frame), the sum check code is calculated.
  - The arbitrary data section is stored in the reception area of the buffer memory. If the ASCII-BIN conversion is designated, the data section is stored in the buffer memory after it is converted to binary code data.
  - During reception of an arbitrary data section, if the reception complete code or the entire count of received data has been stored, or when a user frame (last frame) has been received, a receive data read is requested of the programmable controller CPU.
- Sending
  - The transmission data designated by a user frame or the programmable controller CPU (arbitrary data section of the transmission message) is sent in the order designated by the user.
  - If the ASCII-BIN conversion is designated, the applicable range of data is sent after data is converted to ASCII code data. Also, if a send transparent code is designated, the applicable range of data is sent after adding additional code data before the transparent code/additional code data.
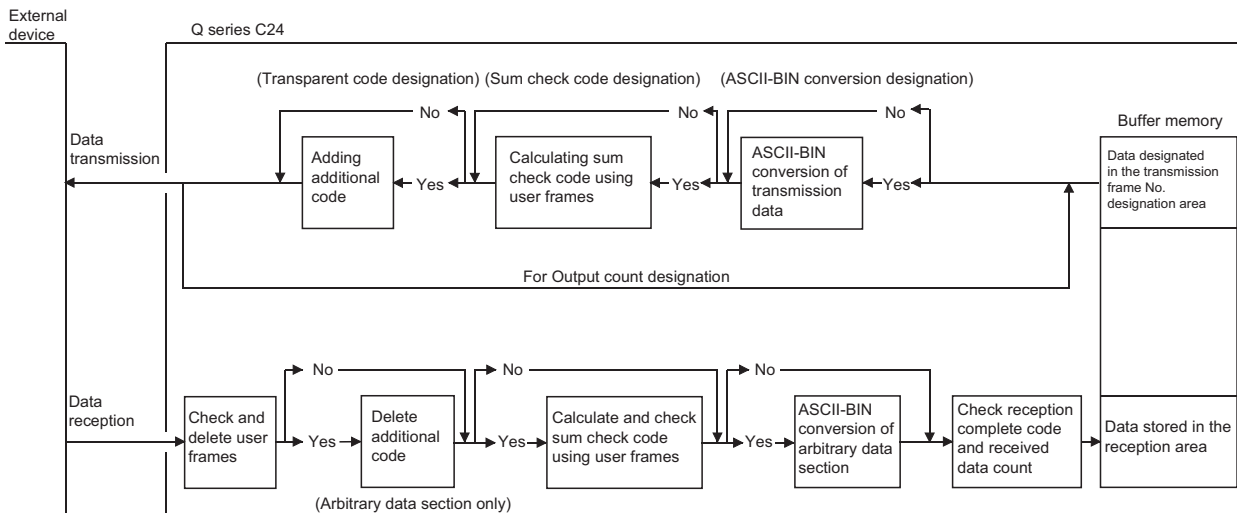
Point

Explained above is how the Q series C24 processes communication data when enabling and disabling the communication via the user-frame function, ASCII-BIN conversion function, and/or transparent code-designation communication function. When communicating data to an external device, use this information as a reference in the selection of a communication method.
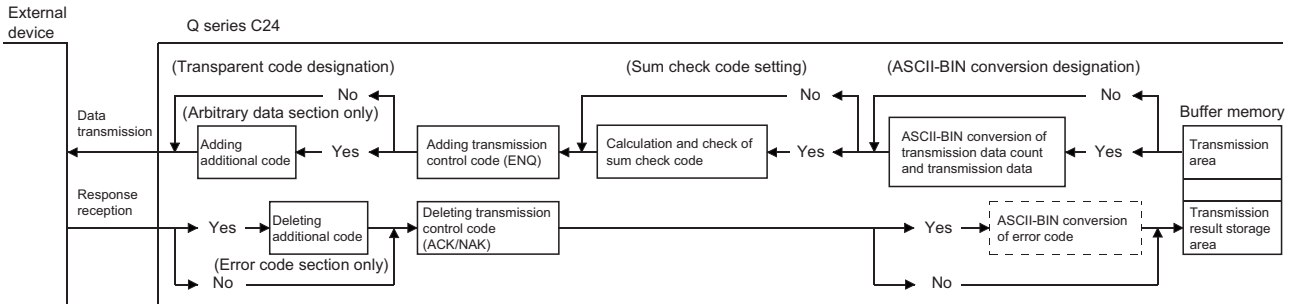
12.4 Example of Data Communication Using the Non Procedure Protocol

This section shows examples of data communication using the non procedure protocol when the following settings and registrations are made.

(1) Settings via GX Developer

Perform the following settings on the "Intelligent function module switch setting" screen.

Setting item		Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device.	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0006H	Nonprocedural protocol
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting		
Switch 4	CH2 communication protocol setting	0000H	
Switch 5	Station No. setting	0000H	Q series C24 station number

(2) Settings via GX Configurator-SC

Register the following on the "Transmission control and others system setting" screen and the "Non procedure system settings" screen.

For items other than those listed below, the default values are used.

Registration screen	Setting item	Setting value	Remarks
Transmission control and other system settings	Send transparent code designation 1st combination	1002H	Transparent code: 02H (STX) Additional code: 10H (DLE)
	Send transparent code designation 2nd combination	1003H	Transparent code: 03H (ETX) Additional code: 10H (DLE)
	Receive transparent code designation 1st combination	1002H	Transparent code: 02H (STX) Additional code: 10H (DLE)
Non procedure system settings	Received data count designation	0006H	—

12.4.1 Example of data reception

The following shows an example of storing receive data in the data register.

(1) Receiving based on the receive complete code

Additional code: 10H (DLE), transparent code: 02H (STX), complete code: 0D0AH (CR + LF)

Point

When the receive transparent code designation is set to Enable and the ASCII-BIN conversion is set to Disable, the codes for receivable data and those for receive data that is stored in the buffer memory's reception area are as follows:

Item		Receivable codes	Codes stored in the reception area
Receive transparent code designation section	Additional code	01H to FFH	(Delete)
	Transparent code	00H to FFH	00H to FFH
Arbitrary data section (including complete code)		00H to FFH	00H to FFH

(2) Receiving based on the completed data count

Additional code: 10H (DLE), transparent code: 02H (STX),

Completed data count: Six words or 12 bytes

Point

When the receive transparent code designation is set to Enable and the ASCII-BIN conversion is set to Disable, the codes for receivable data and those for receive data that is stored in the buffer memory's reception area are as follows:

Item		Receivable codes	Codes stored in the reception area
Receive transparent code designation section	Additional code	01H to FFH	(Delete)
	Transparent code	00H to FFH	00H to FFH
Arbitrary data section (including complete code)		00H to FFH	00H to FFH

12.4.2 Example of data transmission

The following shows an example of data transmission.

- Additional code: 10H (DLE), transparent code: 02H (STX)
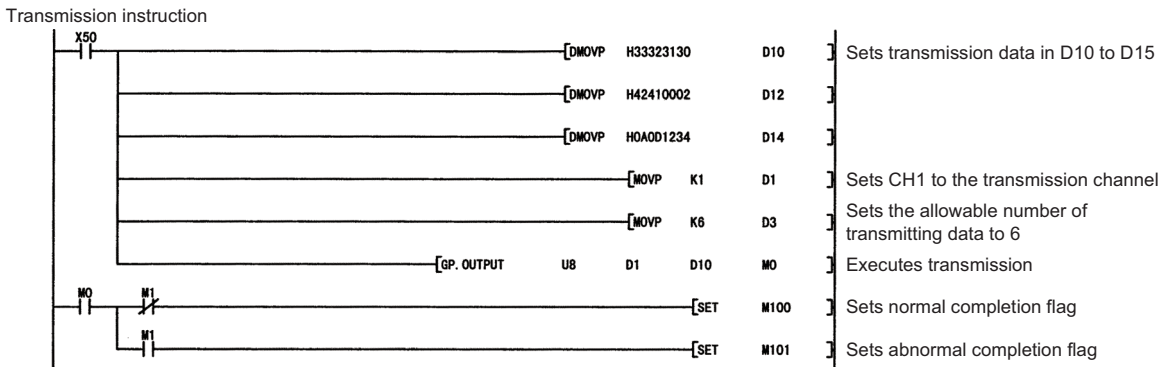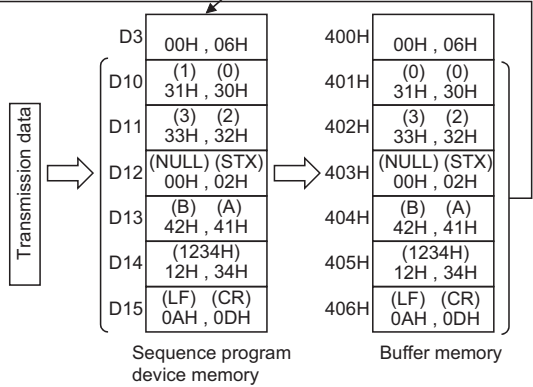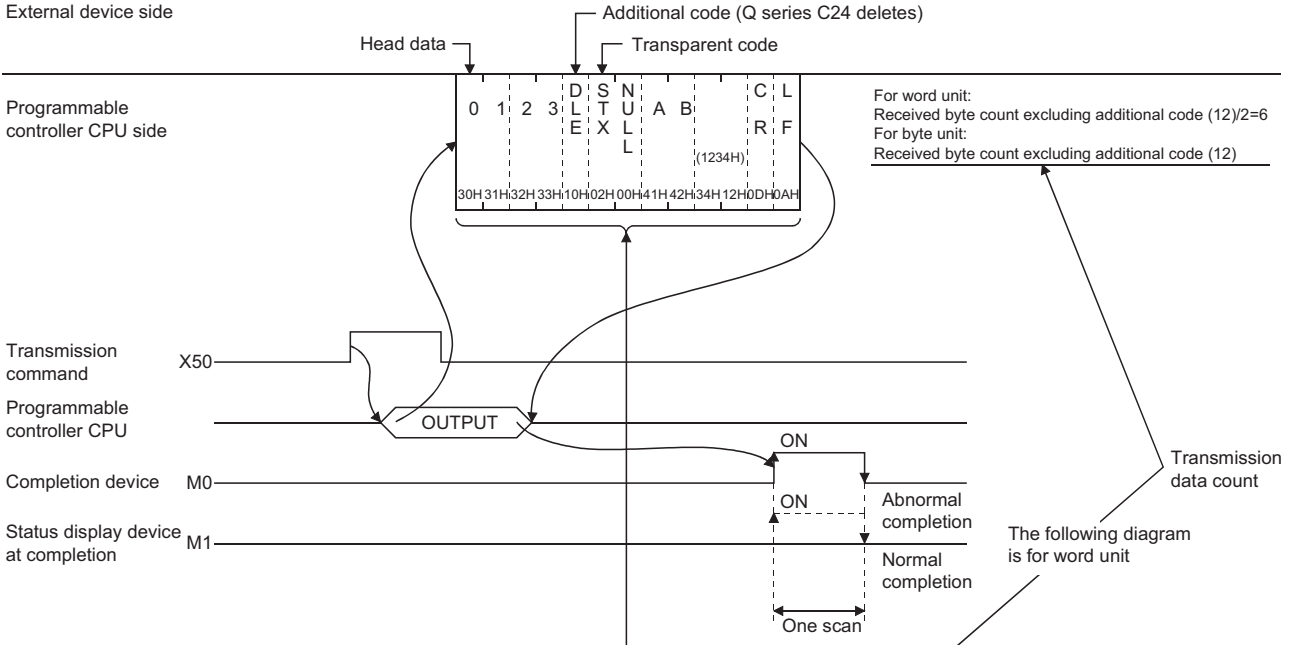
- Additional code: 10H (DLE), transparent code: 02H (STX) (1st group), Additional code: 10H (DLE), transparent code: 03H (ETX) (2nd group)
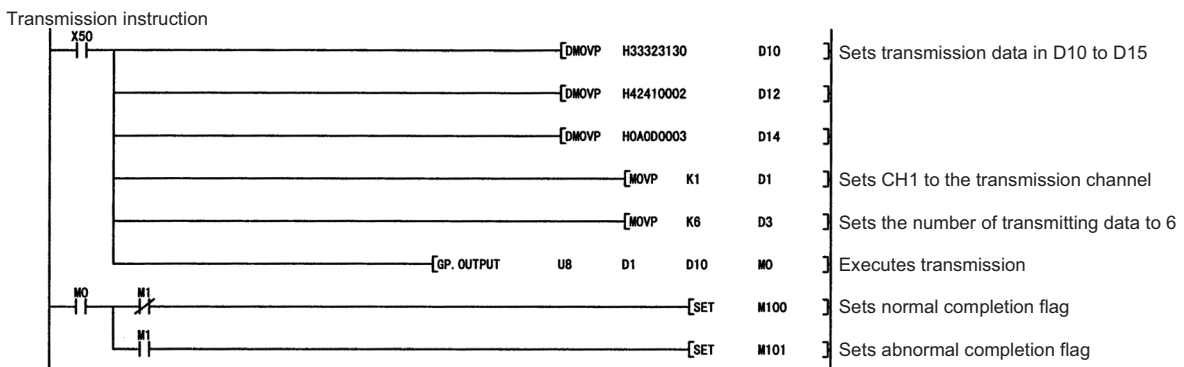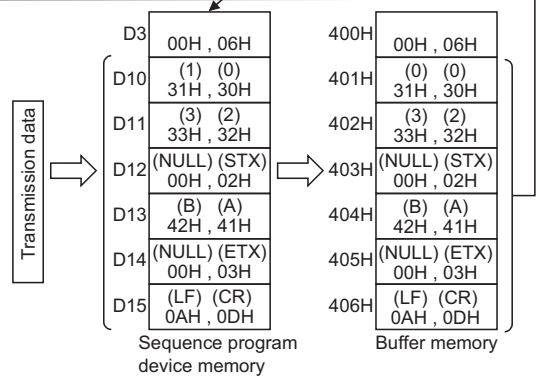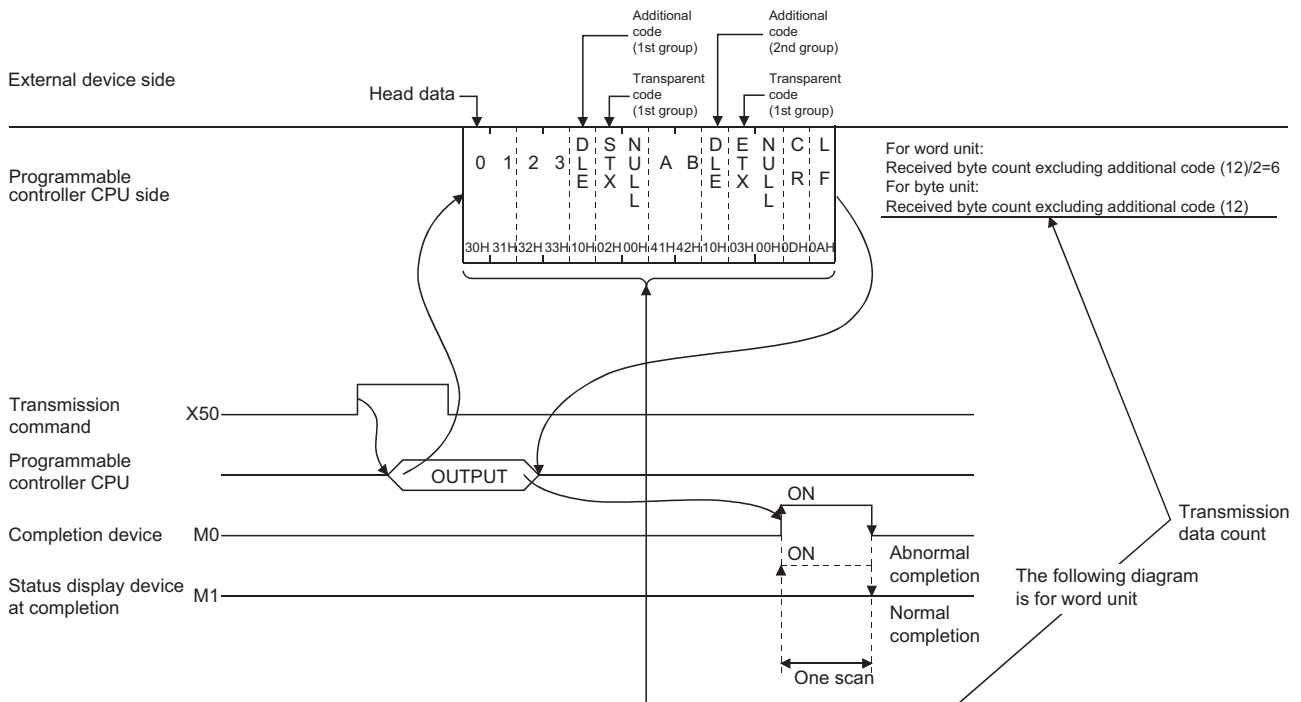
12.5 Handling Transparent Codes and Additional Codes During Bidirectional Protocol Data Communication

The following explains the handling of transparent codes and additional codes during data communication using the bidirectional protocol.

(1) The additional code designation data will be added to or deleted from the data that is sent or received.

(2) Communication data for which transmission/reception processing of transparent codes and additional codes is performed includes the message data length, data section and error code.

Such processing is not performed for the head code (ENQ, ACK, NAK) and sum check code of a message.
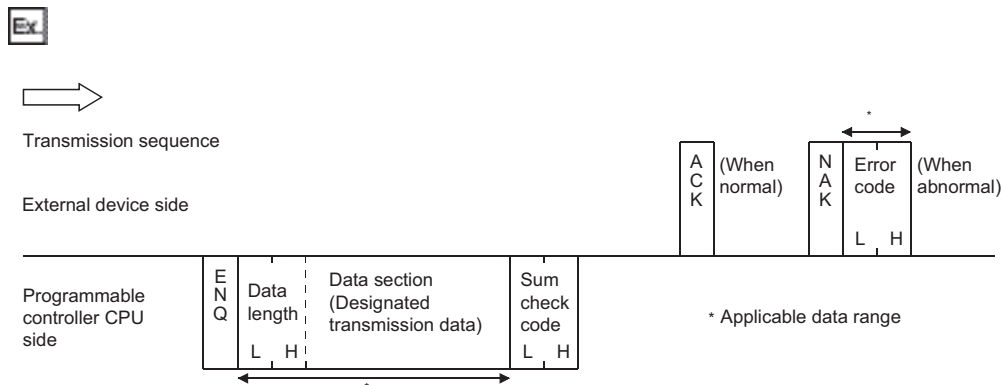
The Q series C24 performs the following processing during data transmission/reception.

(a) When an additional code set for reception is detected during data reception, the additional code data is removed and the immediately succeeding one-byte data is processed for reception as part of the receive data.

When transparent code/additional code data set for transmission is detected during transmission of a message in response to data reception, the additional code designation data is added immediately before, and is then transmitted.

(b) When transparent code/additional code data set for transmission is detected during data transmission, the additional code designation data is added immediately before, and is then transmitted.

When an additional code set for reception is detected while a message is being received in response to data transmission, the additional code data is removed and the immediately succeeding one-byte data is processed for reception as part of the receive data.

(c) Data having an additional code that is added or deleted cannot be included in the data length, nor will it be used for the sum check code.

Ex. When ASCII-BIN conversion is not performed
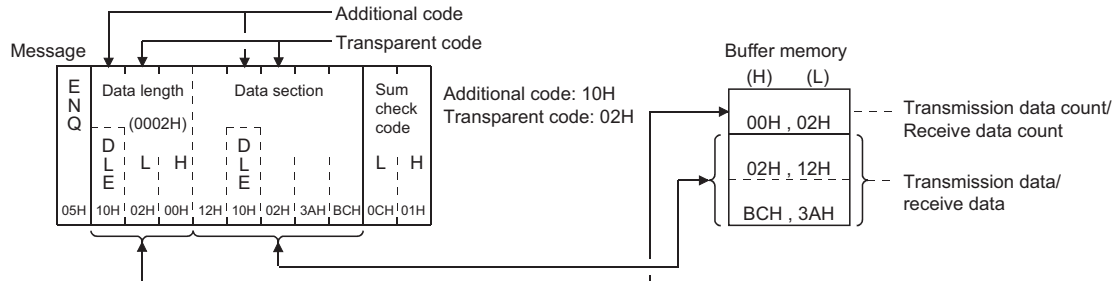
(3) The following are the processing steps taken by the Q series C24 when performing communication with the transparent code designation and ASCII-BIN conversion enabled.

Point

Explained above is how the Q series C24 processes communication data, when enabling and disabling the ASCII-BIN conversion function and/or transparent code designation communication function.
When communicating data to an external device, use this information as a reference in the selection of a communication method.

(a) Receiving

- If a receive transparent code is designated, the additional code designation data is deleted (removed) from the arbitrary data section.
- The arbitrary data section is stored in the reception area of the buffer memory. If the ASCII-BIN conversion is designated, the data section is stored in the buffer memory after it is converted to binary code data.
- When the data section of the designated data length is received, a receive data read is requested of the programmable controller CPU. If the sum check code is set to Enable in the transmission setting via GX Developer switch settings, a reception data read is requested of the programmable controller CPU upon reception of the sum check code.

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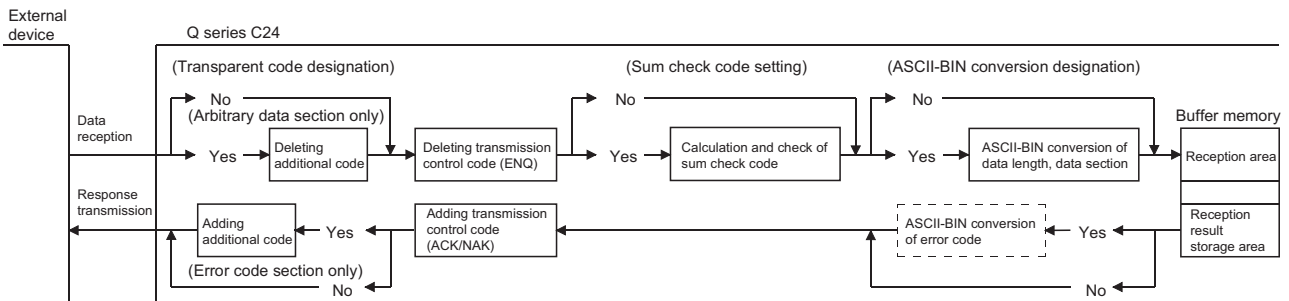
(b) Sending

- The transmission control code data is added to the transmission data designated by the programmable controller CPU (arbitrary data section of the transmission message), and that transmission data is transmitted. If ASCII-BIN conversion is designated, the transmission data is sent after it is converted to ASCII code data.

- If the sum check code is set to Enable in the transmission setting via GX Developer switch settings, the code will be calculated from the transmission message and added to the transmission message.

- If a send transparent code is designated, additional code data is added preceding the transparent code/additional code data for the arbitrary data section, and is then sent.

Ex. The following example shows the data arrangement when data is sent and received. (The communication section of the response message is omitted.)

(When the ASCII-BIN conversion is not performed)

External device

Head data

Arbitrary data section

ENQ	Data length			Data section				Sum check code		

D L E | L | H | D L E | | |

05H | 10H | 02H | 00H | 12H | 10H | 02H | 3AH | BCH | 0CH | 01H

(For 10H) — Additional code

(For 02H) — Transparent code

Send

Receive

Delete Addition code / Additional code

Q series C24

Buffer memory (transmission area/reception area)

(H) (L)
(0002H)
00H , 02H — Transmission data count/Receive data count

(0212H)
02H , 12H
(BC3AH)
BCH , 3AH — Transmission data/ receive data

(The data count is in word units)

(When the ASCII-BIN conversion is performed)

External device

Head data

Arbitrary data section

ENQ	Data length		Data section			Sum check code

L | H | | | D L E | A | B | C | L | H

0 | 2 | 0 | 0 | 1 | 2 | 0 | 2 | 3 | | A | B | C

05H | 30H | 32H | 30H | 30H | 31H | 32H | 30H | 32H | 33H | 10H | 41H | 42H | 43H | 80H | 02H

(For 41H) — Transparent code

(For 10H) — Additional code

Send

Receive

Delete Addition code / Additional code

Conversion

Q series C24

Buffer memory (transmission area/reception area)

(H) (L)
(0002H)
00H , 02H — Transmission data count/Receive data count

(0212H)
02H , 12H
(BC3AH)
BCH , 3AH — Transmission data/ receive data

(The data count is in word units)

12.6 Example of Data Communication Using the Bidirectional Protocol

This section shows examples of the bidirectional protocol data communication when the following settings and registrations are made.

(1) Settings via GX Developer

Perform the following settings on the "Switch setting" screen.

Setting item		Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device.	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0007H	Bidirectional protocol
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting		
Switch 4	CH2 Communication protocol setting	0000H	
Switch 5	Station No. setting	0000H	Q series C24 station number

(2) Settings via GX Configurator-SC

Register the following settings on the "Transmission control and others system setting" screen.

For items other than those listed below, the default values are used.

Registration screen	Setting item	Setting value	Remarks
Transmission control and other system settings	Send transparent code designation 1st combination	1002H	Transparent code: 02H (STX) Additional code: 10H (DLE)
	Send transparent code designation 2nd combination	1003H	Transparent code: 03H (ETX) Additional code: 10H (DLE)
	Receive transparent code designation 1st combination	1002H	Transparent code: 02H (STX) Additional code: 10H (DLE)

12.6.1 Example of data reception

The following shows an example of storing receive data in the data register.

(1) When the receive transparent code designation is set to Enable and the ASCII-BIN conversion is set to Disable

Additional code: 10H (DLE), transparent code: 02H (STX)
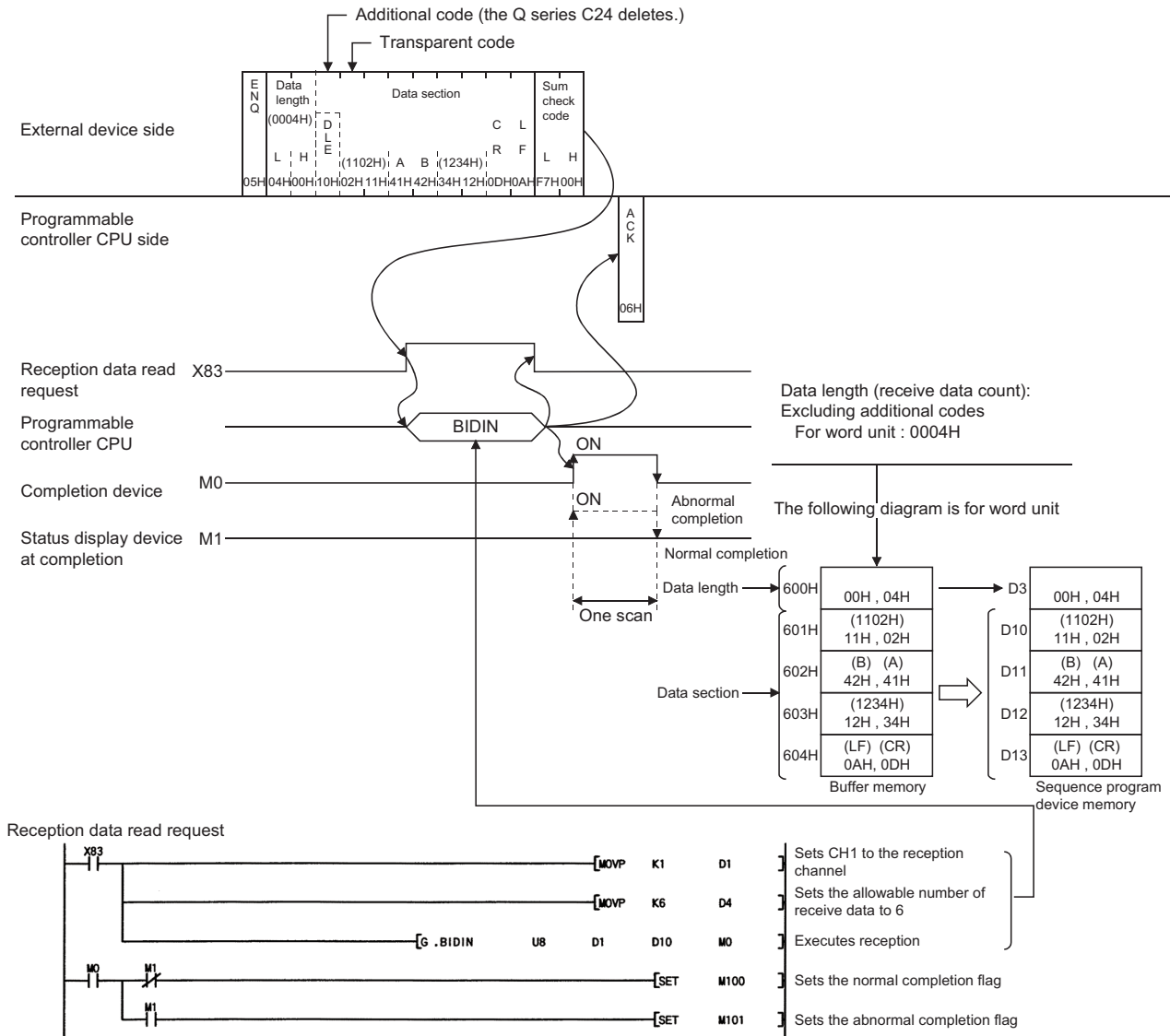
Point

● When the receive transparent code designation is set to Enable and ASCII-BIN conversion is set to Disable, the codes for receivable arbitrary data sections and those for receive data that is stored in the buffer memory's reception area are as follows:

Item		Receivable codes	Codes stored in the reception area
Receive transparent code designation section	Additional code	01H to FFH	(Delete)
	Transparent code	00H to FFH	00H to FFH
Data length, data section			

● When the data length used is in byte units and the data length is an odd byte, 00H will be stored in the upper byte of the last data-storage position in the reception area.

(2) When the receive transparent code designation is set to Enable and the ASCII-BIN conversion is set to Enable

Additional code: 10H (DLE), transparent code: 02H (STX)

* Two bytes of receive data are read to the programmable controller CPU as one-byte data (excluding the additional code).
Data length (No. of receive data):
Excluding additional code
For word unit;
    Byte count after ASCII-BIN conversion (8)/2=4
For byte unit;
    Byte count after ASCII-BIN conversion (4)

The following diagram is for word unit

| | Sets CH1 to the reception channel |
| Sets the allowable number of receive data to 6 |
| Executes reception |
| Sets the normal completion flag |
| Sets the abnormal completion flag |
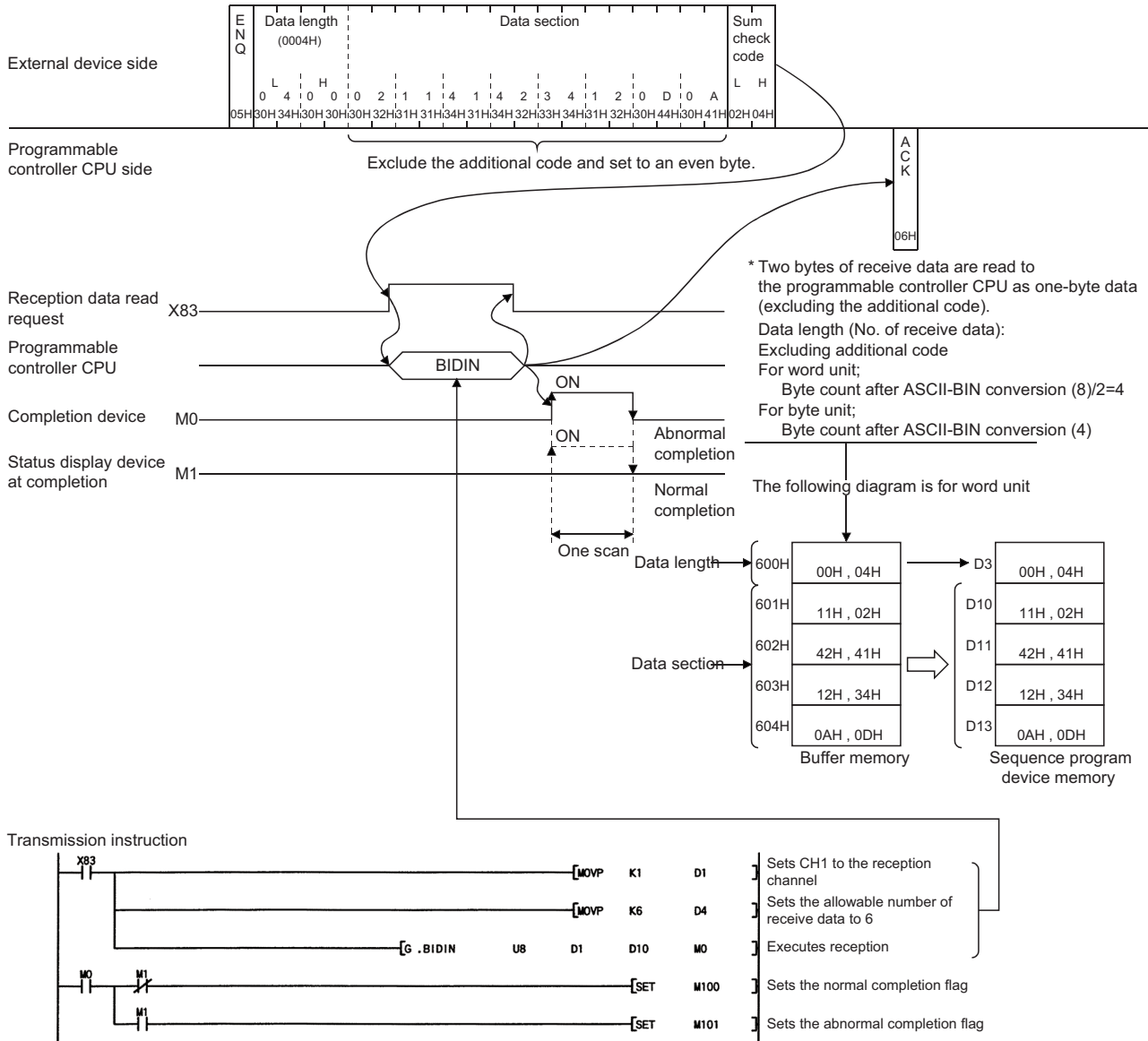
Point

● When the receive transparent code designation is set to Enable and the ASCII-BIN conversion is set to Enable, the codes for receivable arbitrary data section and those for receive data that is stored in the buffer memory's reception area are as follows:

Item		Receivable codes	Codes stored in the reception area
Receive transparent code designation section	Additional code	01H to FFH	(Delete)
	Transparent code	30H to 39H 41H to 46H	0H to 9H AH to FH
Data length, data section			

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12.6.2 Example of data transmission

The following shows an example of data transmission.

(1) When the send transparent code designation is set to Enable and the ASCII-BIN conversion is set to Disable

Additional code: 10H (DLE), transparent code: 02H (STX) (1st group)

Additional code: 10H (DLE), transparent code: 03H (ETX) (2nd group)

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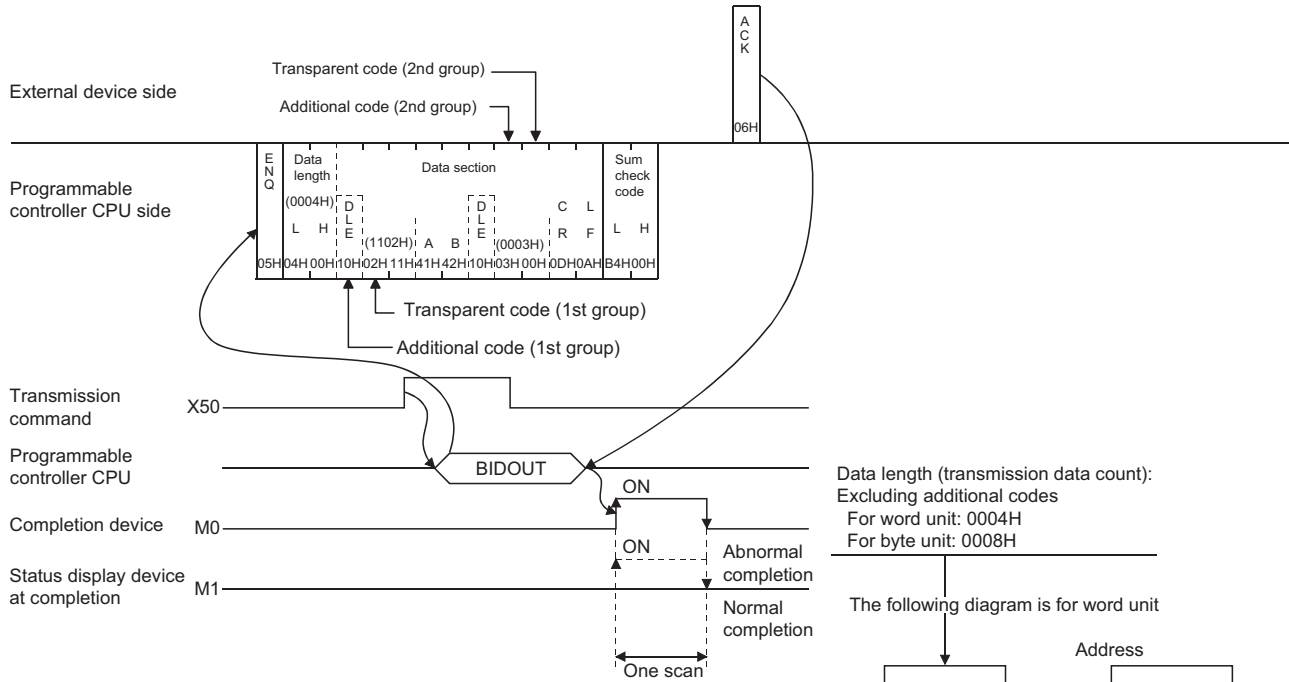
(2) When the send transparent code designation is set to Enabled and the ASCII-BIN conversion is set to Enabled

Additional code: 10H (DLE), transparent code: 02H (STX) (1st group)

Additional code: 10H (DLE), transparent code: 03H (ETX) (2nd group)

Data length (No. of transmission data):
Excluding additional code
For word unit;
  Byte count before ASCII-BIN conversion (8)/2=4
For byte unit;
  Byte count before ASCII-BIN conversion (8)

The following diagram is for word unit

Transmission instruction

Point
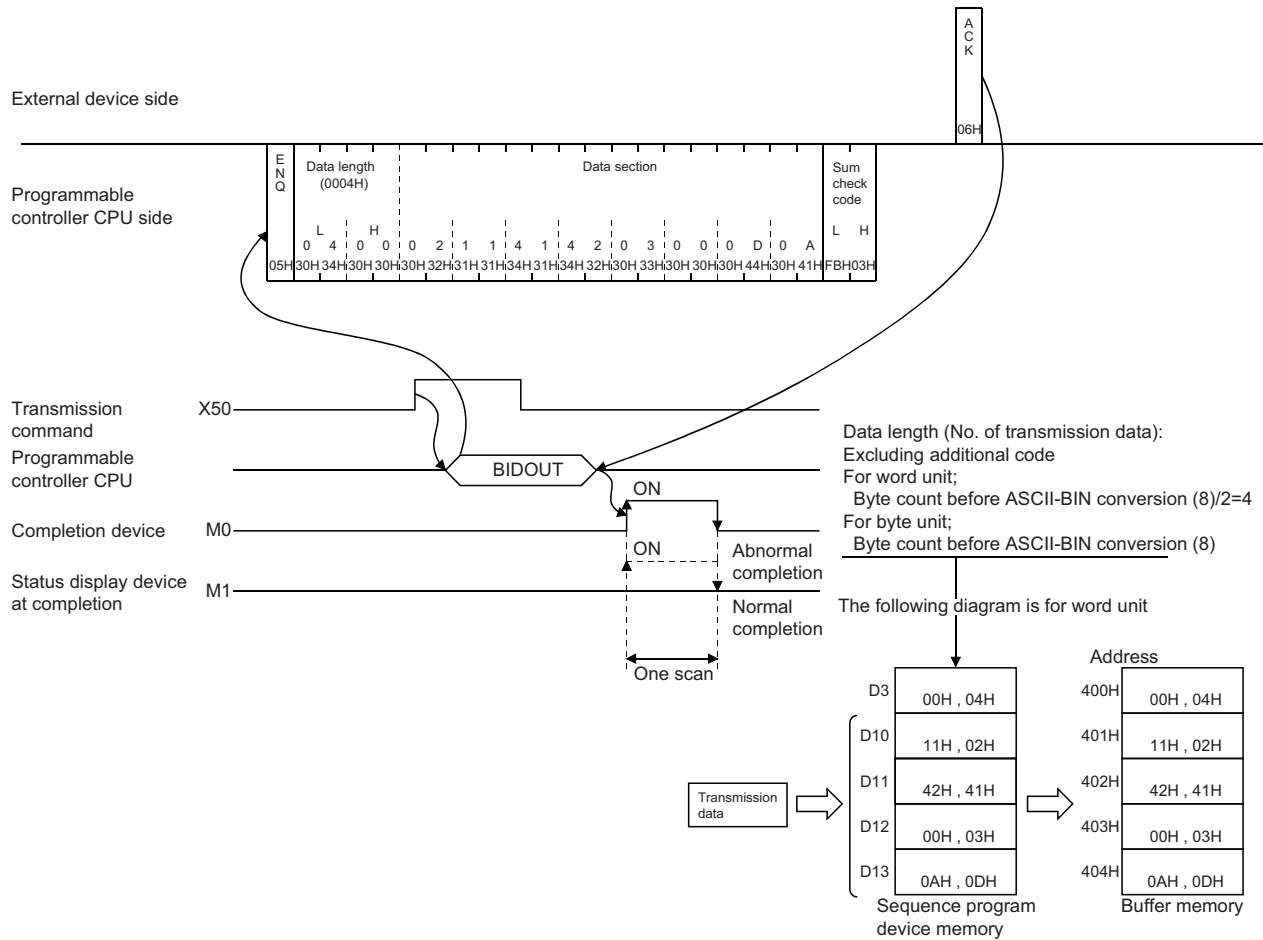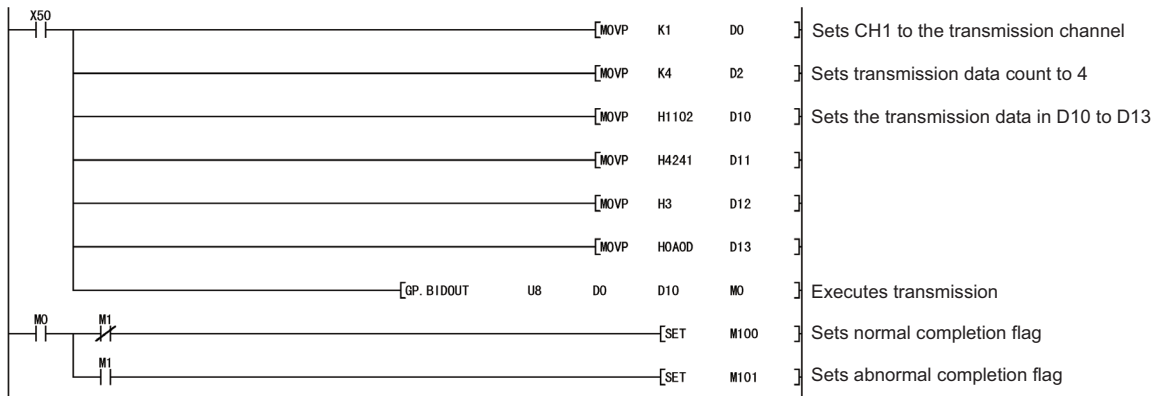
One word of data designated from the programmable controller CPU is converted to four-byte data ("0" to "9", "A" to "F"), and is then transmitted.

CHAPTER 13 COMMUNICATING WITH ASCII CODE (ASCII-BIN CONVERSION)

This chapter explains the binary-to-ASCII conversion (called ASCII-BIN conversion) in order to send/receive data in ASCII format to/from an external device.

13.1 ASCII-BIN Conversion

ASCII-BIN conversion is a data conversion function that converts all data communicated between the Q series C24 and an external device to ASCII code data.
The ASCII-BIN conversion of communication data is performed by the Q series C24 according to the user settings.
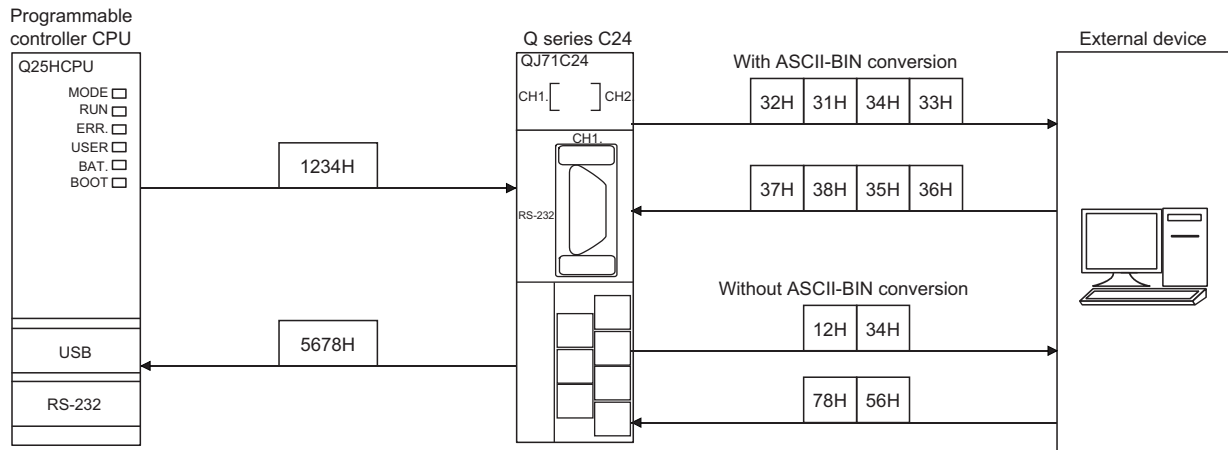
13.2 Settings for ASCII-BIN Conversion

In order to convert data to be sent/received via the non procedure protocol and bidirectional protocol from binary code to ASCII code, it is necessary to make specific settings for the Q series C24 before performing data communication. The following describes the settings for the ASCII-BIN conversion:

(1) The ASCII-BIN conversion settings can be designated for each interface.

(2) The ASCII-BIN conversion settings are registered in the "Transmission control and others system setting" screen of GX Configurator-SC.

13.3 Performing ASCII-BIN Conversion for Data Communicated via Non Procedure Protocol

This section explains the ASCII-BIN conversion of data to be communicated using the non procedure protocol.

(1) The following shows the range of transmission/reception data for which ASCII-BIN conversion can be performed.
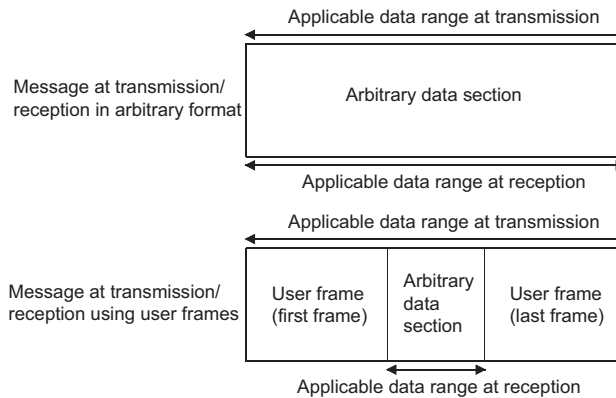
When sending or receiving data, the Q series C24 processes data as follows:

(a) Out of the data in the applicable data range shown above, the Q series C24 sends and receives data whose data code is in the range of 30H to 39H ("0" to "9") and 41H to 46H ("A" to "F").

(b) During data reception, the Q series C24 regards the arbitrary data section as ASCII code data, converting it to binary code data for storage in the buffer memory.

The user frame section is received in the data format corresponding to the registration contents in the Q series C24. During data transmission, the Q series C24 regards data designated by the programmable controller CPU (an arbitrary data section in the transmission message) and user-frame sections as binary code data, converting them into ASCII code data and transmitting them.

- Even if ASCII-BIN conversion is "enabled," it is possible to transmit data without converting the data in any user frame portion or buffer memory transmission area. When sending data without ASCII-BIN conversion, specify the user frame No. using the following method.
- Specify the number obtained by adding 4000H to the registered user frame No.

```
b15 b14 b13          to          b0
┌──┬──┬────────────────────────────┐
│  │  │                            │
└──┴──┴────────────────────────────┘
 ↑  ↑        Number of frames
 │  └── 0: Conversion enabled    1: Conversion disabled
 └───── 0: Frame registered in Flash ROM    1: Frame registered in buffer memory
```

(c) When sending data in the sections designated in 4001H to 44AFH, C000H to C01FH, the additional codes by transmission transparent code designation will not be added. (☞ Page 299, Section 12.3)

User frame No. to be sent	Designated No. when transmitting without ASCII-BIN conversion
1H to 3E7H (1 to 999)	4001H to 43E7H (16385 to 17383)
3E8H to 4AFH (1000 to 1199)	43E8H to 44AFH (17384 to 17583)
8000H to 801FH (-32768 to -32737)	C000H to C01FH (-16384 to -16353)

(2) The processing steps taken by the Q series C24 when communicating with ASCII-BIN conversion and transparent code designation enabled are explained in Page 299, Section 12.3.

- Transmission/reception in arbitrary formats
- Transmission/reception using user frames

13.4 Example of Data Communication Using the Non Procedure Protocol

This section shows examples of data communication using the non procedure protocol when the following settings/registrations are made.

(1) Settings via GX Developer

Perform the following settings on the "Intelligent function module switch setting" screen.

Setting item		Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0006H	Nonprocedural protocol
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting		
Switch 4	CH2 Communication protocol setting	0000H	
Switch 5	Station No. setting	0000H	Station number of the Q series C24

(2) Settings via GX Configurator-SC

Register the following items on the "Transmission control and others system setting," "Non procedure system setting," and "Transmission user frame No. designation system setting" screens.
For items other than those listed below, the default values are used.

Registration screen	Setting item	Setting value
"Non procedure system setting" screen	Received data count designation	0003H
	Receive complete code designation	0009H
	Receive user frame designation User frame use enable/disable designation	Enable
	Receive user frame designation First frame No. designation 1st	03E8H
	Receive user frame designation First frame No. designation 2nd	03E9H
	Receive user frame designation Last frame No. designation 1st	041BH
	Receive user frame designation Last frame No. designation 2nd	041BH
	Transmission user frame designation Output head pointer designation	0001H
	Transmission user frame designation Output count designation	0005H
"Transmission user frame No. designation system setting" screen	Transmission frame No. designation 1st	43F2H
	Transmission frame No. designation 2nd	43F3H
	Transmission frame No. designation 3rd	C001H
	Transmission frame No. designation 4th	8000H
	Transmission frame No. designation 5th	441BH
"Transmission control and others system setting" screen	ASCII-BIN conversion designation	Enable

13.4.1   Example of data reception

The following shows an example of data reception:

(1) Reception using the receive complete code

Complete code: 9H (the code after ASCII-BIN conversion)

Point

● When ASCII-BIN conversion is enabled, the codes of receivable data and the codes of receive data that is stored in the reception area of the buffer memory are as follows:

Item	Receivable codes	Codes stored in the reception area
Arbitrary data section (including complete code section)	30H to 39H, 41H to 46H	0H to 9H, AH to FH

If data codes other than 30H to 39H and 41H to 46H are received for an arbitrary data section, an error occurs after ASCII-BIN conversion processing by the Q series C24.

● To perform ASCII-BIN conversion, the complete code after conversion should be used.

(2) Reception based on the received data count

Reception data read request

MOVP K1 D0		Sets CH1 to the reception channel
MOVP K6 D3		Sets the allowable number of receiving data to 6
G.INPUT U8 D0 D10 M0		Executes reception
SET M100		Sets the normal completion flag
SET M101		Sets the abnormal completion flag
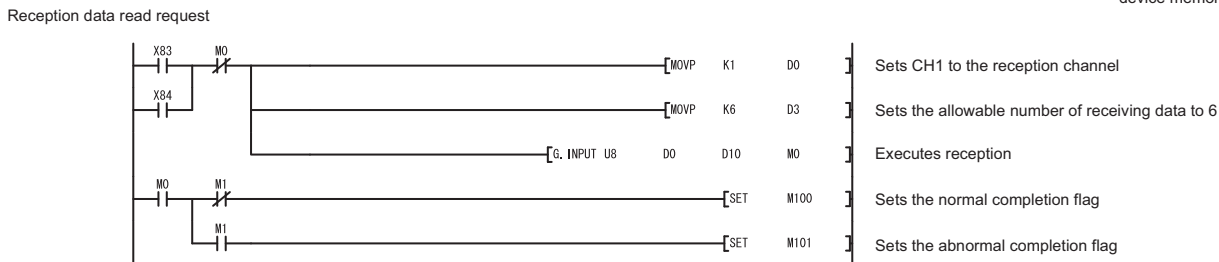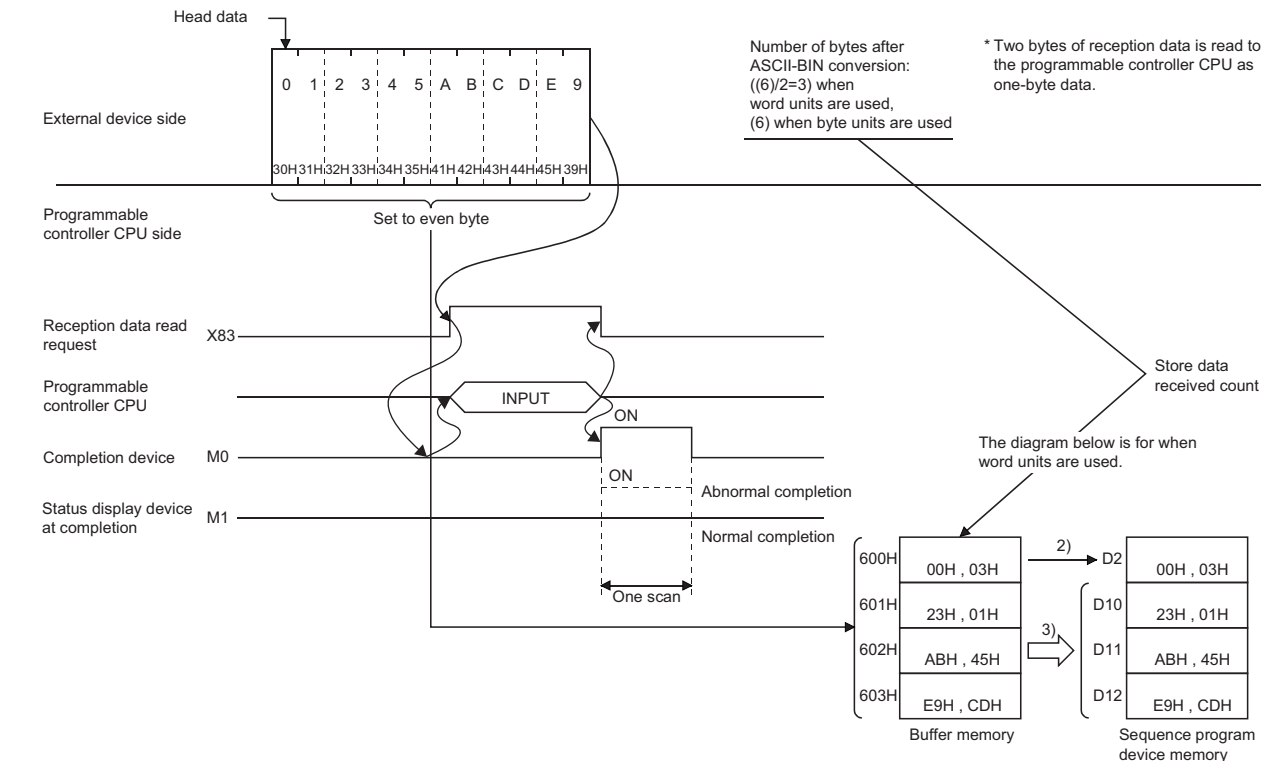
Point

When the receive transparent code designation is set to Disable and ASCII-BIN conversion is enabled, the codes of receivable data and the codes of receive data that is stored in the reception area of the buffer memory are as follows:

Item	Receivable codes	Codes stored in the reception area
Arbitrary data section	30H to 39H, 41H to 46H	0H to 9H, AH to FH

If data codes other than 30H to 39H and 41H to 46H are received for an arbitrary data section, an error occurs after ASCII-BIN conversion by the Q series C24.

(3) Example of reception using user frames

Reads combination of received user frames

Sets CH1 to the reception channel

Sets the allowable number of receive data to 6

Executes reception

Sets the normal completion flag

Sets the abnormal completion flag
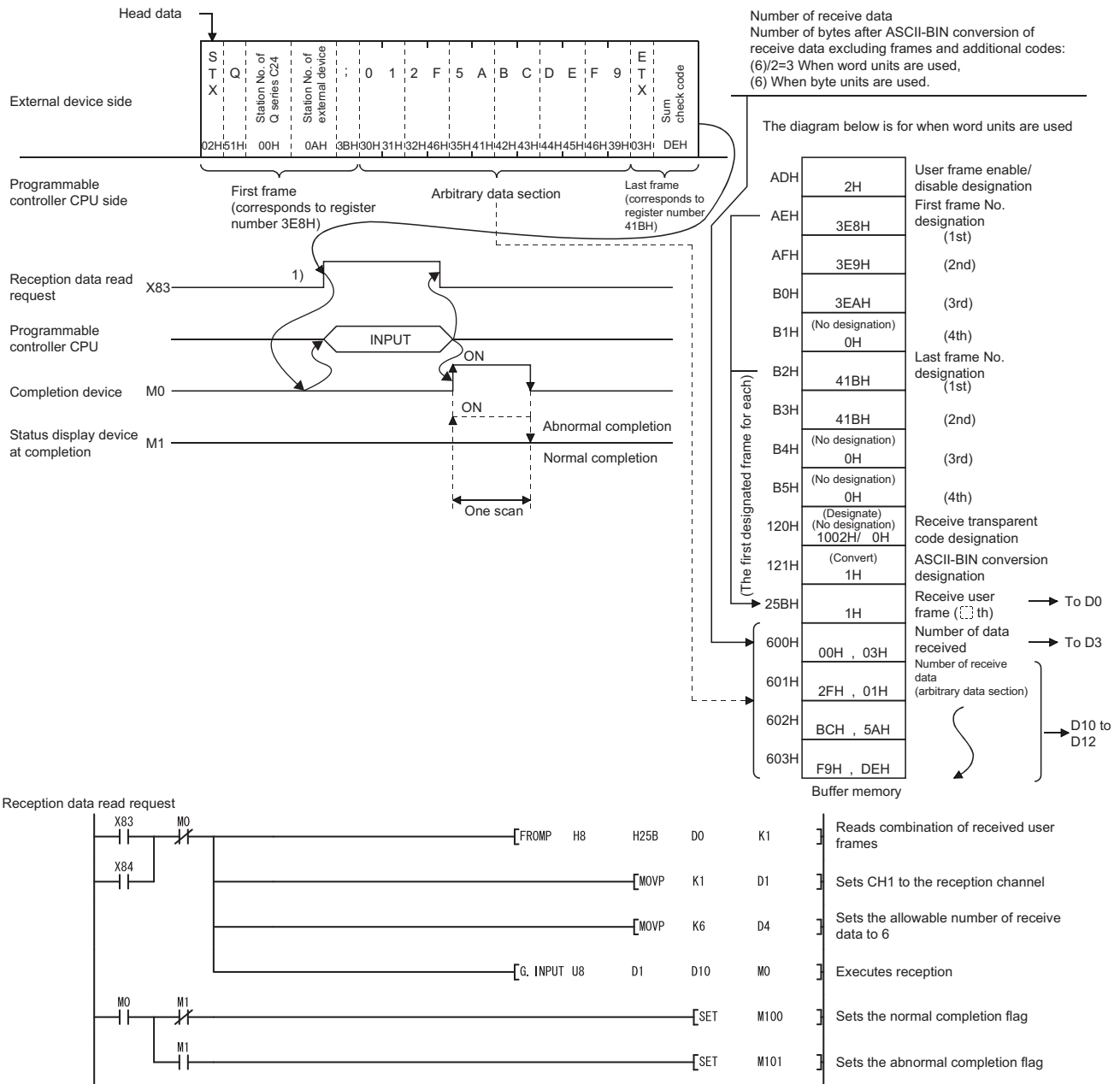
13.4.2 Example of data transmission

The following shows an example of data transmission:

(1) Example of arbitrary data transmission

External device side

Programmable controller CPU side

Data transmission area (arbitrary data section)

3 4 1 2 A B 5 6

33H 34H 31H 32H 41H 42H 35H 36H

* Eight characters of data in the transmission area are sent in two characters per byte through ASCII-BIN conversion.

Transmission instruction Programmable controller CPU   X50

OUTPUT   ON

Completion device   M0   ON

Status display device at completion   M1

Abnormal completion

Normal completion

One scan

121H	(Convert) 1H	ASCII-BIN conversion designation
400H	00H , 02H	Transmission area (Designation of no. of data sent)
401H	(1234H) 12H , 34H	(Transmission data)
402H	(56ABH) 56H , ABH	

Buffer memory   * 0004H in byte units

Transmission instruction

```
   X50
───┤├──────────────────────────────[MOV   H1234   D10   ]   Sets the arbitrary transmission data for D11 to D12
   │
   ├──────────────────────────────[MOV   H56AB   D11   ]
   │
   ├──────────────────────────────[MOVP  K1      D1    ]   Sets CH1 to the transmission channel
   │
   ├──────────────────────────────[MOVP  K2      D4    ]   Sets the number of data sent to 2
   │
   └───────────────────[GP. OUTPUT   U8    D1    D10   M0 ]   Execute the transmission

   M0    M1
───┤├───┤/├───────────────────────────────[SET   M100 ]   Sets normal completion flag
   │
   │     M1
   └────┤├────────────────────────────────[SET   M101 ]   Sets abnormal completion flag
```

(2) Example of transmission by user frame

External device side

Programmable controller CPU side

S T X	Q	Station No. of external device	Station No.	C24	;	T O T A L	;	(Total number)	Data in transmission area (arbitrary data section)	E T X	Sum check code
								(012 DH)	3 4 1 2 A B 5 6		
02H 51H		0AH	00H	3BH	54H4FH 54H41H 4CH3BH		2DH	01H	33H 34H 31H 32H 41H 42H 35H 36H	03H	A7H

* Eight characters of data in the transmission area are sent in two characters per byte through ASCII-BIN conversion.

Register No. of corresponding user frame

Corresponds to 3F2H (for first designated frame)
Corresponds to 3F3H (for second designated frame)
Corresponds to 8001H (for third designated frame)
8000H (for fourth designated frame)
Corresponds to 41BH (for fifth designated frame)

Transmission instruction — X50

Programmable controller CPU — PRR — ON

Completion device — M0 — ON

Status display device at completion — M1 — Abnormal completion / Normal completion — One scan

Address	Value	Description
B6H	(Not sent)(Sending) 0H/Other than 0H	User frame No. being transmitted
B7H	(Do not send) 0H	CR/LF output designation
B8H	(1st) 1H	Output head pointer designation
B9H	5H	Output count designation
BAH	3F2H	Transmission frame no. designation (1st)
BBH	3F3H	(2nd)
BCH	C001H	(3rd)
BDH	8000H	(4th)
BEH	441BH	(5th)
BFH	0H	(6th)
121H	(Convert) 1H	ASCII-BIN conversion designation
400H	00H , 02H	Transmission area (Designation of no. of data sent)
401H	(1234H) 12H , 34H	(Transmission data)
402H	(56ABH) 56H , ABH	

Buffer memory * 0004H in byte units

Transmission instruction

```
X50
─┤├──────────────────────────────────[MOVP  K1    D1 ]   Sets CH1 to the transmission channel
  │─────────────────────────────────[MOVP  H2    D10 ]   Sets the number of data sent to 2
  │─────────────────────────────────[MOVP  H1234 D11 ]   Sets the arbitrary transmission data for D11 to D12
  │─────────────────────────────────[MOVP  H56AB D12 ]   Sets the arbitrary transmission data for transmission buffer
  │───────────────────────[TOP    H8   H400  D10  K3 ]   Sets the arbitrary transmission data for transmission buffer
  │─────────────────────────[GP. PRR  U8   D1   M0 ]     Executes user frame transmission
 M0  M1
─┤├──┤/├──────────────────────────────[SET   M100 ]     Sets normal completion flag
 M1
─┤├──────────────────────────────────[SET   M101 ]     Sets abnormal completion flag
```

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13.5 Performing ASCII-BIN Conversion for Data Communicated via the Bidirectional Protocol

This section explains the ASCII-BIN conversion of data to be communicated using the bidirectional protocol.

(1) The following shows the range of transmission/reception data for which ASCII-BIN conversion can be performed.
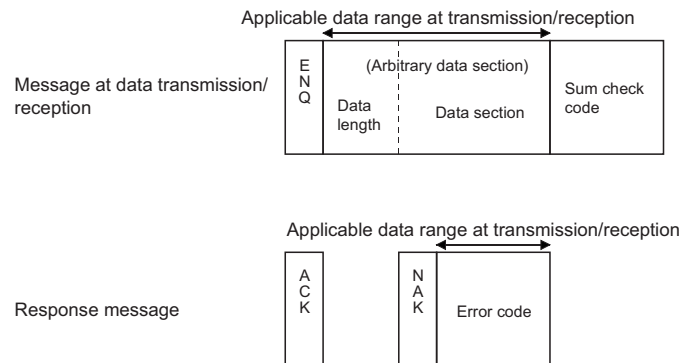
When sending or receiving data, the Q series C24 processes data as follows:

(a) Range of ASCII-BIN conversion

The Q series C24 performs the ASCII-BIN conversion for any data section (data length and data section) and error code in a message.

(b) Conversion of data length

- At transmission: The Q series C24 converts a transmission data count to 4-digit ASCII code data (hexadecimal), then sends it beginning with the lowest byte (L).
- At reception: The Q series C24 converts a received data length (4-digit ASCII code data (hexadecimal)) to 2-byte binary code data and stores it in the reception data count storage area.

(c) Conversion of data section

- At transmission: The Q series C24 converts transmission data for one address to 4-digit ASCII code data (hexadecimal), then sends it beginning with the lowest byte (L).
- At reception: The Q series C24 converts each two characters of a received data section (2-digit ASCII code data (hexadecimal)) to 1-byte binary code data and stores it in the reception data storage area.

(d) Conversion of error code

- At transmission: The Q series C24 converts an error code for a detected error to 4-digit ASCII code data (hexadecimal), then sends it beginning with the lowest byte (L). (For 3412H, it is converted to "3412" and sent beginning with "12".)
- At reception: The Q series C24 converts the first 2 digits of a received error code (4-digit ASCII code data (hexadecimal)) to 2-byte binary code data as the lower byte, and stores it in the transmission result storage area. (For "1234" is received, it is converted to 3412H and stored.)

(e) Treatment of sum check code

The data length and the data section after ASCII-BIN conversion are added together and the lowest two bytes of the resulting binary code data are treated as a sum check code.

- At transmission: The Q series C24 calculates a sum check code using the data length and data section after ASCII-BIN conversion, then adds it to the transmission message.
- At reception: The Q series C24 calculates a sum check code using the received data length and data section prior to ASCII-BIN conversion, then checks the received head of the sum-check code using the code as a lower byte.

*1 Calculation of sum check code
30H+32H+30H+30H+31H+32H+33H+34H+35H+41H+42H+43H=0287H
(H)(L)
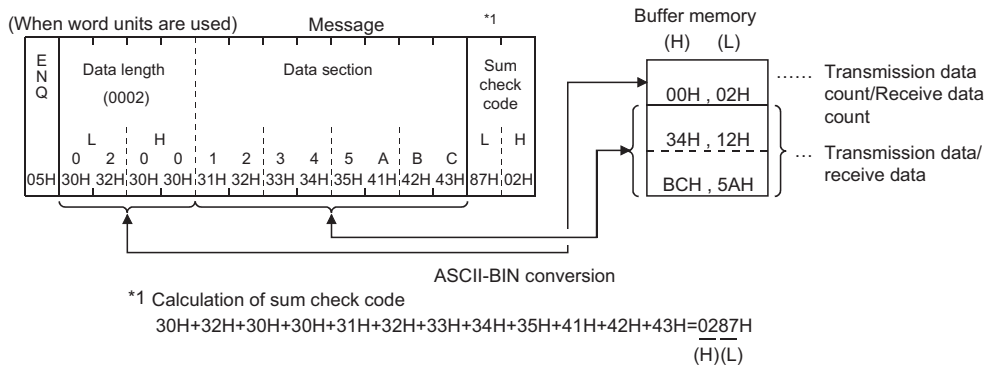
(2) Page 309, Section 12.5 explains how Q series C24 processes data communicated when ASCII-BIN conversion and transparent code designation are both enabled.

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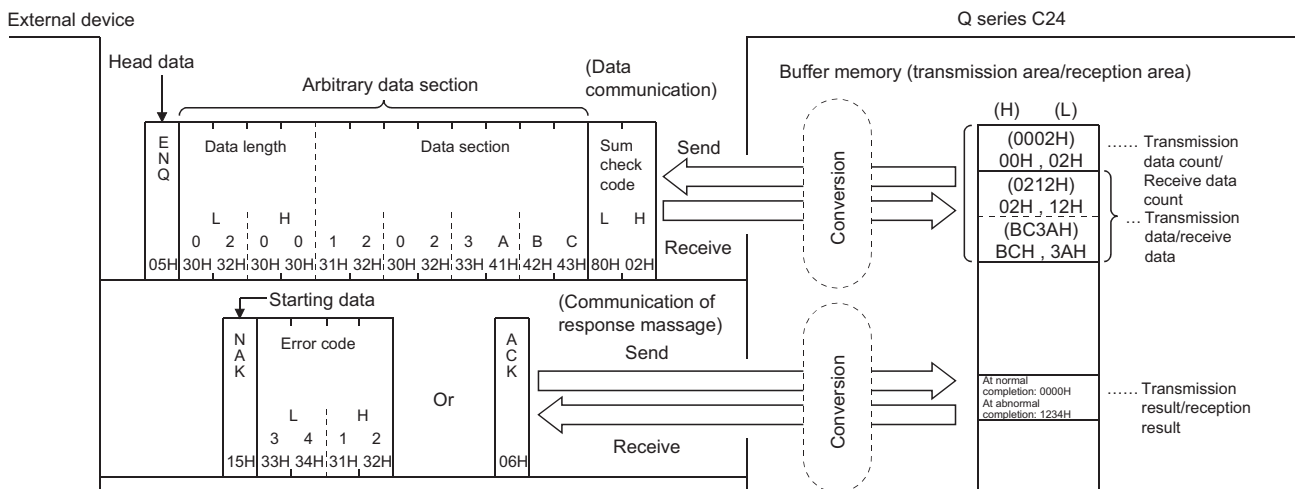
13.6 Example of Data Communication Using the Bidirectional Protocol

This section shows examples of data communication using the bidirectional protocol when the following settings and registrations are made.

(1) Settings via GX Developer

Perform the following settings on the "Intelligent function module switch setting" screen.

Setting item		Setting value	Remarks
Switch 1	CH1 Transmission setting	Set according to the external device.	—
	CH1 Communication rate setting		
Switch 2	CH1 Communication protocol setting	0007H	Bidirectional protocol
Switch 3	CH2 Transmission setting	0000H	Not used
	CH2 Communication rate setting		
Switch 4	CH2 Communication protocol setting	0000H	
Switch 5	Station No. setting	0000H	Station number of the Q series C24

(2) Settings via GX Configurator-SC

Register the following items on the "Transmission control and others system setting" screen.

For items other than those listed below, the default values are used.

Setting item	Setting value
Send transparent code designation	1004H
Receive transparent code designation	1004H
ASCII-BIN conversion designation	Convert

13.6.1　Example of data reception

The following shows an example of data reception when ASCII-BIN conversion is enabled.

When the receive transparent code designation is set to Enable and ASCII-BIN conversion is set to Enable, Additional code: 10H (DLE), transparent code: 04H (E0T)

Reception data read request

	MOVP	K1	D1		Sets CH1 to the reception channel
	MOVP	K6	D4		Sets the allowable number of receive data to 6
	G .BIDIN	U8	D1	D10 M0	Executes reception
	SET	M100			Sets the normal completion flag
	SET	M101			Sets the abnormal completion flag
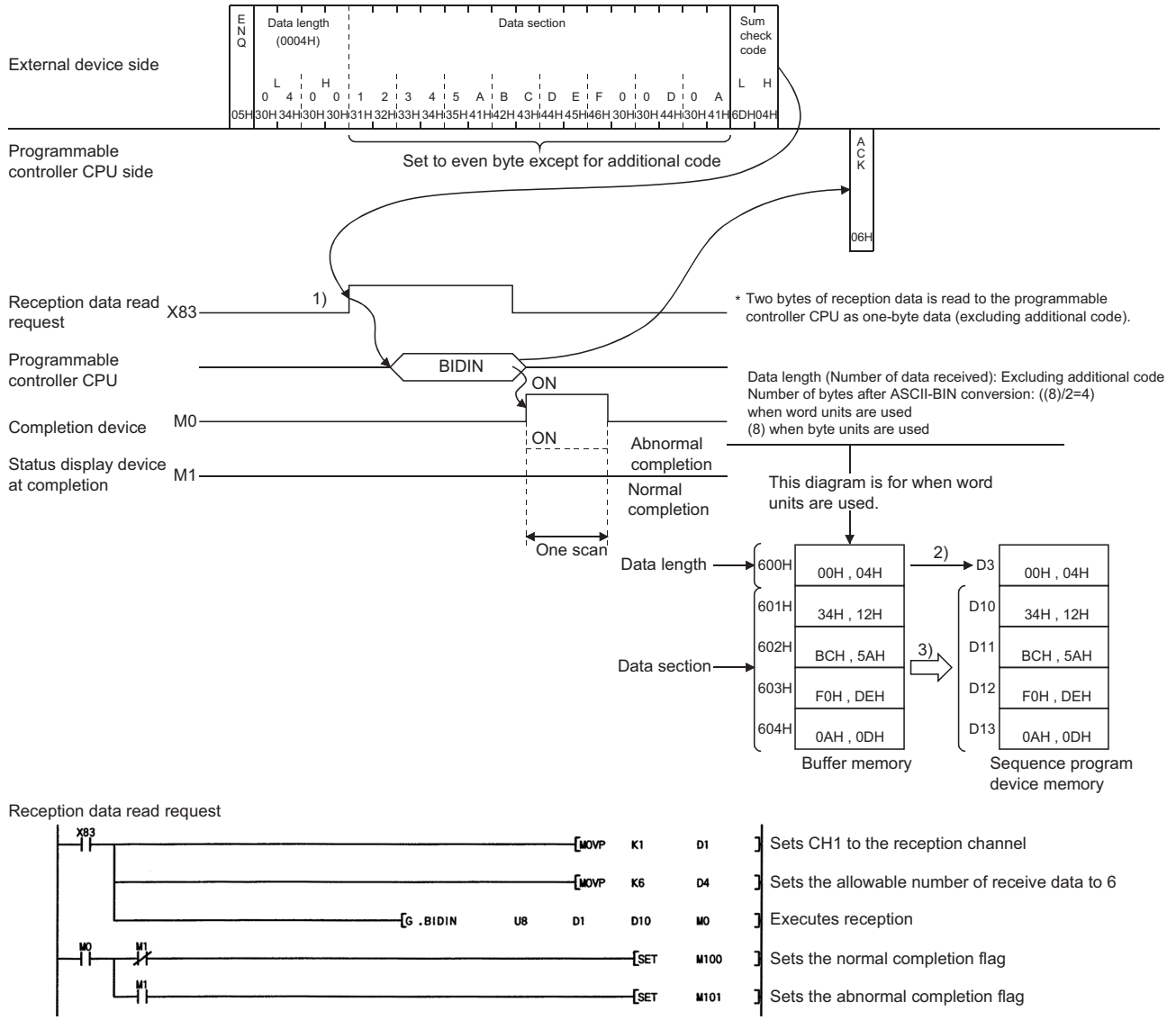
Point

When the receive transparent code designation is set to Enable and ASCII-BIN conversion is set to Enable, the codes of receivable arbitrary data sections and the codes of receive data that is stored in the reception area of the buffer memory are as follows:

Item		Receivable codes	Codes stored in the reception area
Sections for which the reception transparent code designation is enabled	Additional code	01H to FFH	(Delete)
	Transparent code	30H to 39H 41H to 46H	0H to 9H AH to FH
Data length, data section			

13.6.2 Example of data transmission

The following shows an example of data transmission when ASCII-BIN conversion is enabled.

When the send transparent code designation is set to Enable and ASCII-BIN conversion is set to Enable, Additional code: 10H (DLE), transparent code: 04H (E0T)
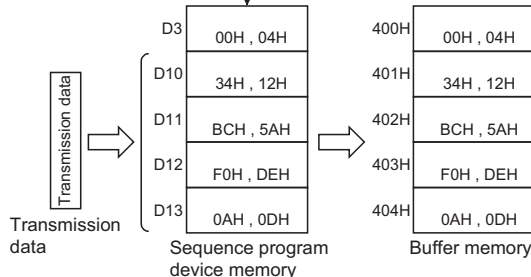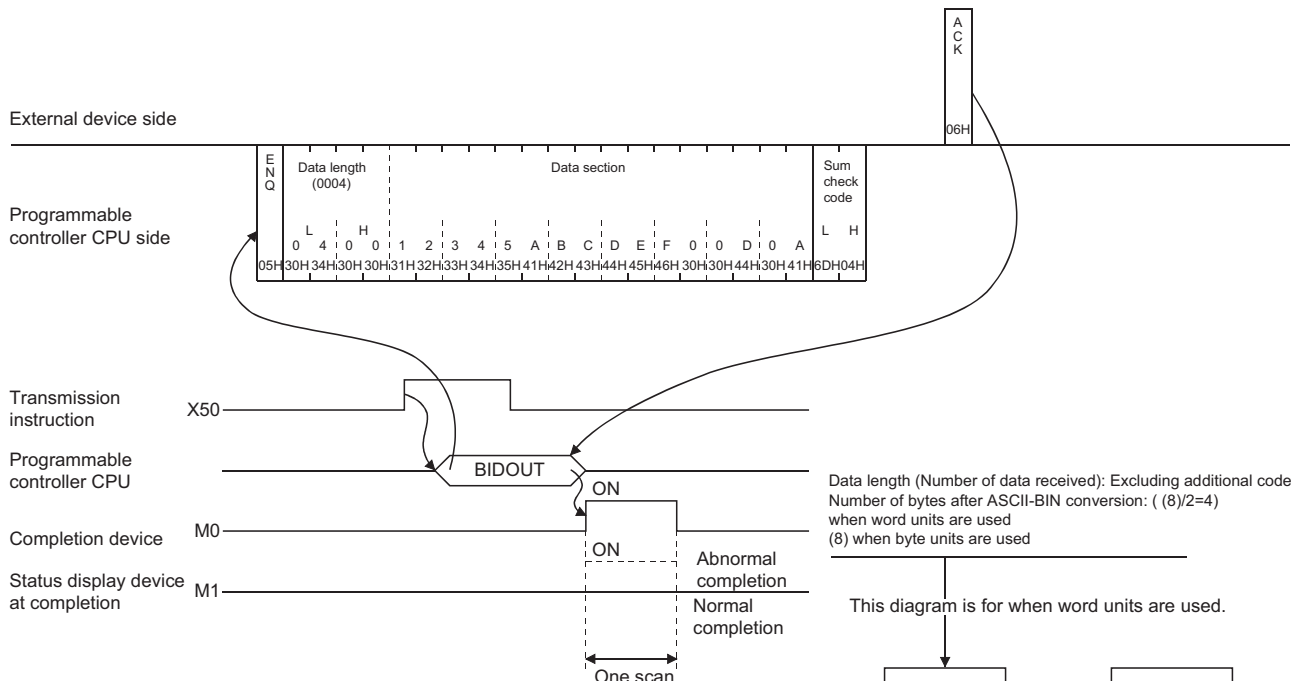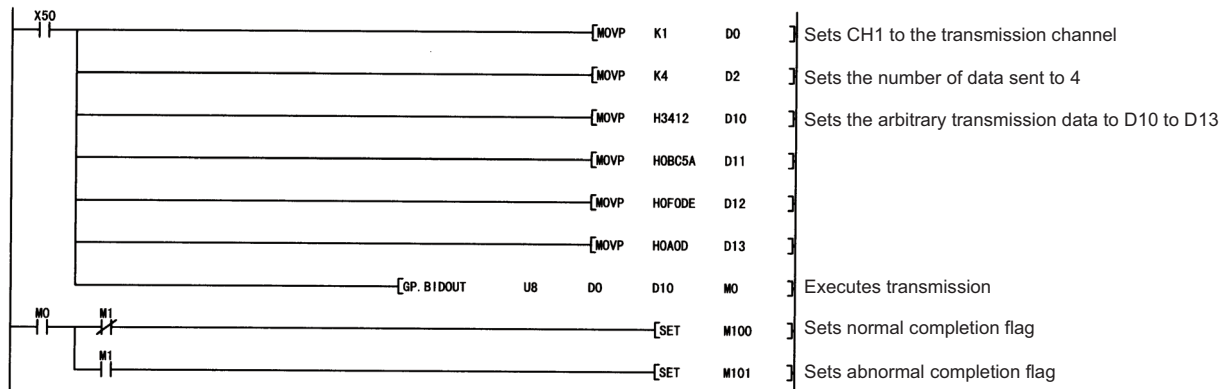
Point

Data for one address (one word) in the buffer memory's transmission area is converted into four-byte ASCII code data ("0" to "9" and "A" to "F"), and is then transmitted.

CHAPTER 14 DATA COMMUNICATIONS USING EXTERNAL DEVICE AND PROGRAMMABLE CONTROLLER CPU M : N CONFIGURATION

> *Point*
>
> Always read this chapter when communicating data by using a multidrop link to connect the external devices and programmable controller CPU in an m: n system configuration. You do not have to read this chapter when using a system configuration other than
> m: n to communicate data.

This section describes the case when data is communicated between external devices and the programmable controller CPU by connecting multiple external devices (m stations) and multiple Q series C24 (n stations) over a multidrop link. (The total number of m and n is up to 32 stations.)

With this m : n multidrop link, only MC protocol data communications by command transmission from the external devices can be performed.

14.1 Data Communications Precautions

(1) When communicating data by using an m: n system configuration, multiple external devices cannot communicate data with the programmable controller CPU at the same time.

Interlock the external devices so that the external device can communicate with the programmable controller CPU in a 1:1 configuration.

See Page 336, Section 14.2 to Page 339, Section 14.3 for the items to be agreed upon and the interlock method to interlock the external devices.

(2) Communicate data between external devices and the programmable controller CPU by the following methods only.

- Full-duplex data communications (m : n data communications is impossible with half-duplex data communications)
- Data communications by command transmission from external device using an MC protocol excluding the format 3 and format 5 control procedure (Data communications using the format 3 and format 5 control program and data transmission from sequence program using the on-demand function cannot be performed.)

(3) The data transmitted by one external device is received by all the other external devices, including the external device that transmitted the data. The send data from a programmable controller CPU is also received by all the external devices.

Therefore, it may be necessary for devices that received data not addressed to them (judged by station No. in the message) to ignore the receive data.

At the programmable controller CPU, Q series C24 also ignores the receive data other than that addressed to it.

(4) Connect to multiple external devices and connect the terminating resistor as described in User's Manual (Basic).

(5) When communicating data by using an m: n system configuration, designate the following station number at the [Station No.] and [Local station No.] items in the command message to be transmitted from an external device.

(a) When accessing the programmable controller CPU

Item	Communications using QnA compatible 2C/3C/4C frame	Communications using A compatible 1C frame
Station No.	Station No. of Q series C24 to be passed through (📖 MELSEC Communication Protocol Reference Manual)	
Local station No.	Station No. of access source external device[1]	Designation unnecessary (No [Local station No.] item)

(b) When accessing another external device (interlock communications)

Item	Communications using QnA compatible 2C/3C/4C frame	Communications using A compatible 1C frame
Station No.	Station No. of access destination external device[1]	
Local station No.	Station No. of access source external device[1]	Designation unnecessary (No [Local station No.] item)

[1]　A station No. within the [0] to [31] (00H to 1FH) range not set to the Q series C24 on the programmable controller CPU side is used as the external device No. in the [Station No.] and [Local station No.] items in the message.
Select and designate the No. of each external device.
The designation method is described in (📖 MELSEC Communication Protocol Reference Manual).
Station No.: Designates the No. of the transmit destination external device.
Local station No.: Designates the No. of the transmit source external device. (Does not have to be designated when A compatible 1C frame is used.)

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14.1 Data Communications Precautions

14.2 External Devices Interlock Conditions

When using a multidrop line to communicate data between external devices and the programmable controller CPU in an m: n configuration, interlocks must be provided between the external devices so that multiple external devices cannot communicate data with the programmable controller CPU at the same time.

This section describes the conditions for providing the interlocks between the external devices so that any one of the external devices can communicate data with the programmable controller CPU.

(Conditions for priority use (obtaining line ownership) of the line from the start to the end of data communications with the programmable controller CPU.)

14.2.1 Maximum communications time per external device station

This condition determines the maximum time each external device can communicate with the programmable controller CPU after obtaining line ownership. (Time ⊢—⊣ in the illustration below.)

This prevents loss of data communications between other external devices and the programmable controller CPU by shutdown of the external device that obtained line ownership.
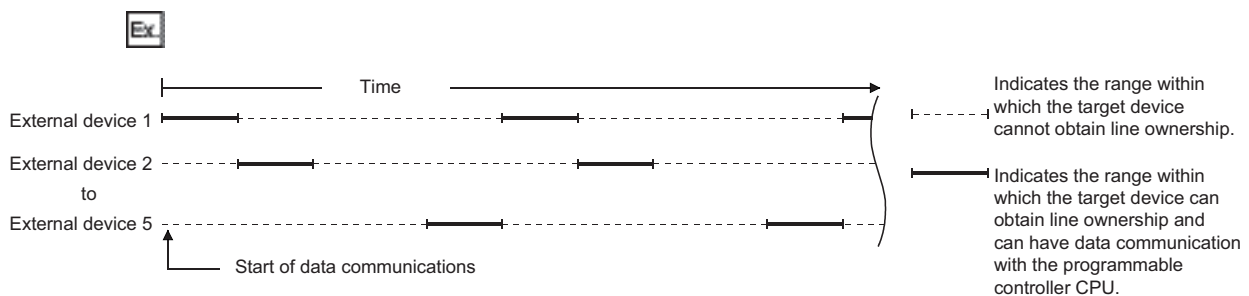
Point

● Make the maximum data communications time per external device station the maximum time of the external device that requires the most time to communicate data with the programmable controller CPU.

● After system starting, complete data communications from the external device that obtained line ownership and the programmable controller CPU within the maximum communications time.
(If data communications cannot be completed within this time, initialize the Q series C24 transmission sequence by transmitting the EOT/CL code to the objective programmable controller CPU within the maximum communications time.
(📖 MELSEC Communication Protocol Reference Manual)

● While an external device and the programmable controller CPU are communicating data, have the other external devices check for timeout so that they do not transmit data during this time.

14.2.2 Message structure when communicating data between external devices

The message structure when communicating data between external devices is determined by any of the following. This condition is determined to provide interlocks between the external devices so that each of them can exchange data with the programmable controller CPU in a 1:1 configuration.

(1) When making the message structure the same as that of each control procedure format frame

(a) Use a number within the [0] to [31] (00H to 1FH) range not set to the Q series C24 on the programmable controller CPU side as the external device No. in the [Station No.] and [Local station No.] items in the message.

(b) Select and designate the external device numbers.

The designation method is described in the MELSEC Communication Protocol Reference Manual.

- Station No.: Designates the No. of the transmit destination external device.
- Local station No.: Designates the No. of the transmit source external device. (Does not have to be designated when A compatible 1C frame is used.)

Ex. When m : n configuration is 5:27

The values in ( ) are the external device and the Q series C24 station numbers (decimal: hexadecimal)
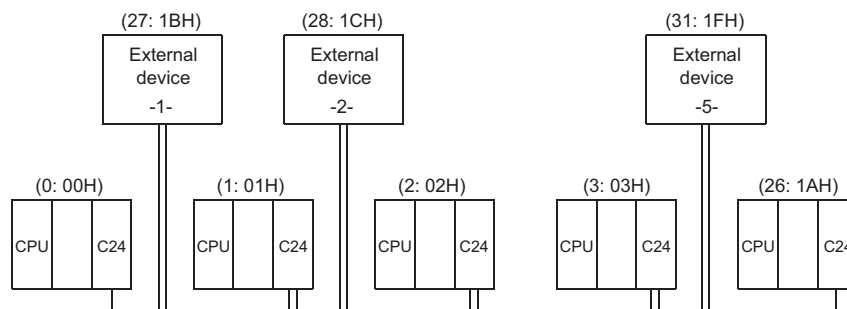
C24: Q series C24, QC24(N), UC24

(2) When message structure different from that of control procedure format frames can be used

(a) Change the head data of each message to other arbitrary data.
   - When selecting ASCII code format 1, format 2, or format 4, change ENQ (05H).

(b) Arbitrarily list the data following the head data of each message according to the user specifications.

External device 1 (station No. 1BH)

	Transmission destination station No.	Transmission source station No.	Command	Message wait	Sum check code
(;)	(1C)	(1B)	(ZZ)	(2)	(CD)
3BH	31H 43H	31H 42H	5AH 5AH	32H	43H 44H

External device 2 (station No. 1CH)

	Transmission destination station No.	Transmission source station No.
(:)	(1C)	(1B)
3AH		

Head data
Arbitrary contents

Point
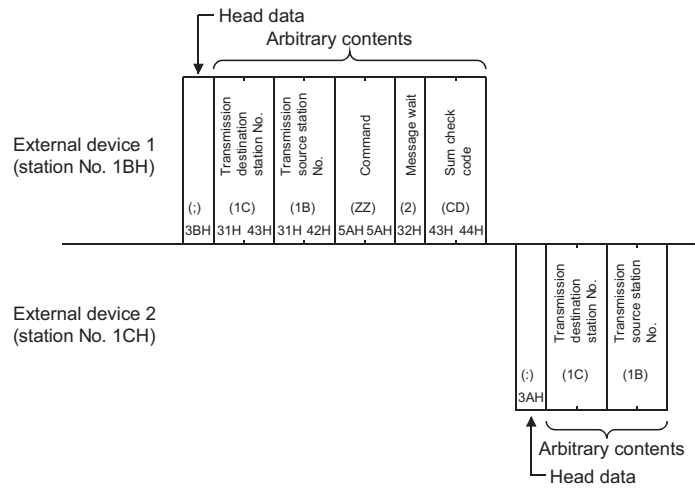
Correspond the message structure for general reporting to all the other external devices except programmable controller CPU stations using unused station numbers or a message structure different from the Q series C24 control procedure format.

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CHAPTER 14 DATA COMMUNICATIONS USING EXTERNAL DEVICE AND PROGRAMMABLE CONTROLLER CPU M : N
CONFIGURATION

14.3 Examples of Procedure for Data Communications with the Programmable Controller CPU

The following uses examples to describe the procedure when communicating data with a programmable controller CPU by interlocking the external devices.

14.3.1 Sequential data communications between external devices and the programmable controller CPU

The external devices sequentially obtain the line usage right and communicate data with the programmable controller CPU based on their station No.
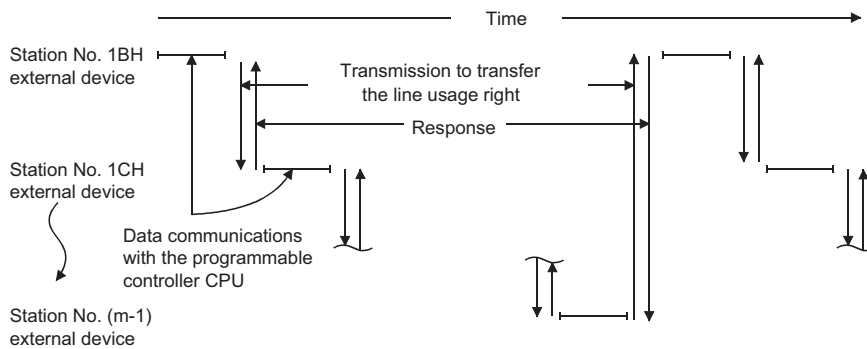
The following uses an example to describe the procedure when external devices communicate data with the programmable controller CPU.

◎: External device that obtained the line usage right

C24: Q series C24, QC24 (N), UC24

14.3 Examples of Procedure for Data Communications with the Programmable Controller CPU
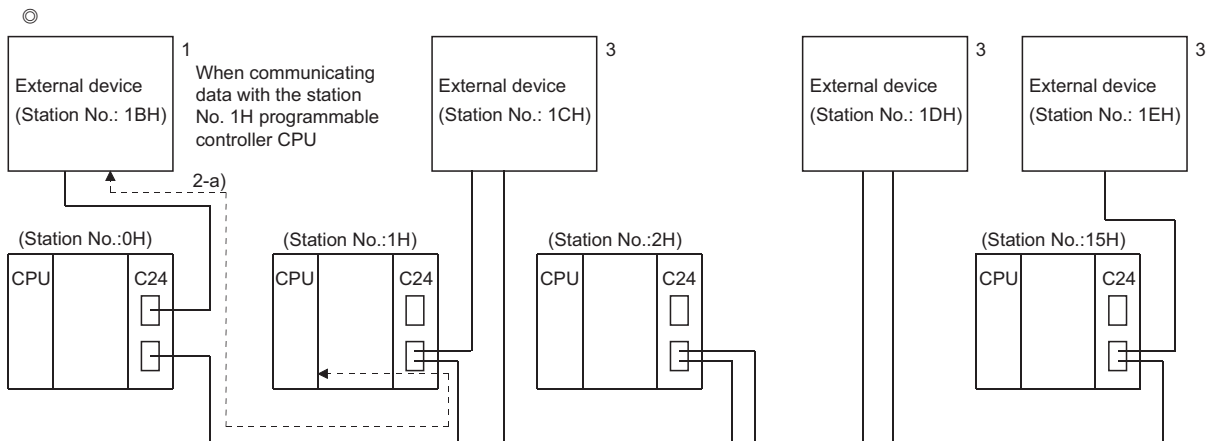
_1._ **When the system starts, the external device with the lowest station No. (1BH) is given the line usage right.**

_2._ **The external device that obtained the line usage right,**

a) When communicating data with the programmable controller CPU, begins processing from step 4 after communicating data with the programmable controller CPU within the maximum data communications time from among all the external devices.

b) When not communicating data with the programmable controller CPU, immediately begins processing from step 4

_3._ **The external devices that have not obtained the line usage right check the line usage time of the external device that obtained the line usage right and ignore the receive data not addressed to their own station.**

When the line usage time exceeds the maximum data communications time, each external device performs the processing of step 7.

◎: External device that obtained the line usage right
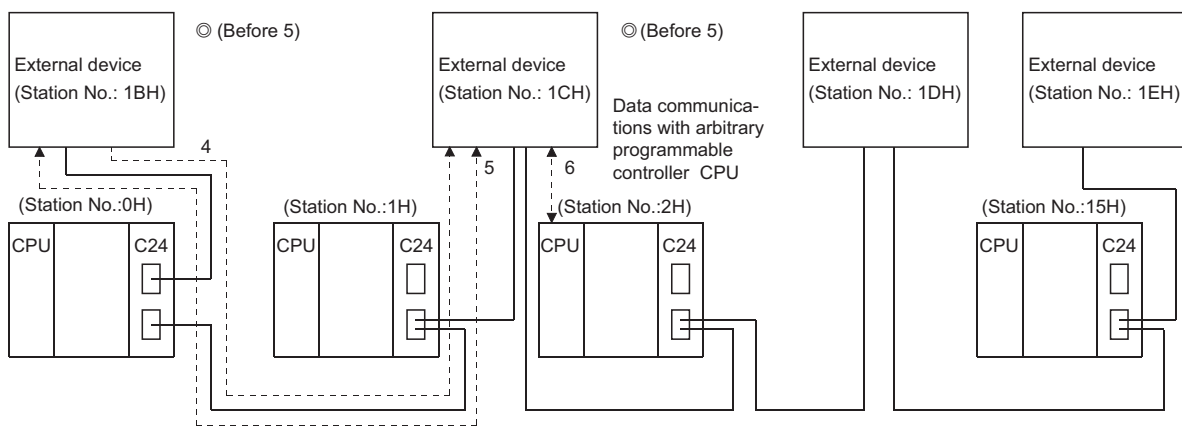
C24: Q series C24, QC24 (N), UC24

_4._ **External devices that communicated data with the programmable controller CPU, or external devices that do not have to communicate data with the programmable controller CPU, transmit the data for transferring the line usage right to the external device of the next station No. A message structure example is shown in Step 5.**

When a response message (step 5) is not received from the next external device to which the line usage right was passed, data transmission for transferring the line usage right to the external device of the next station No. is repeated until the line usage right is accepted.

5. **The external device that accepts the line usage right transmits a response message to the external device that passed it the line usage right.**

Ex.
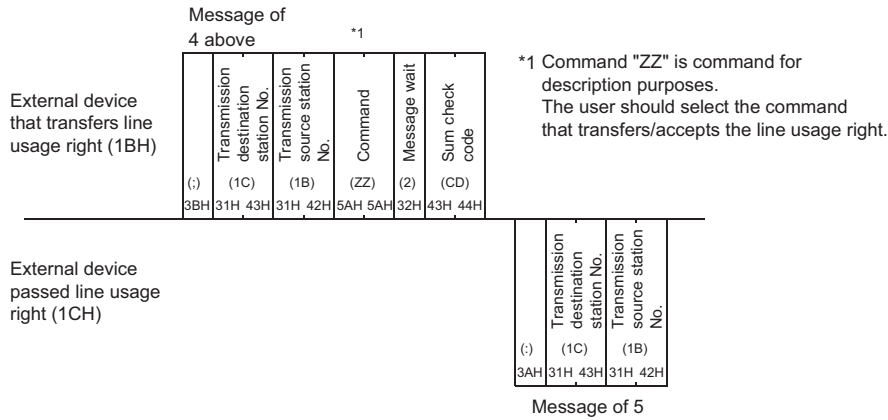
6. **The external device that accepted the line usage right by transmitting a response message performs processing beginning from step 2.**

7. **When line usage time of the external device that currently has the line usage right exceeds the maximum data communications time.**
a) The external device of the next station No. transmits all external devices general report data and obtains the line usage right and performs step 2.
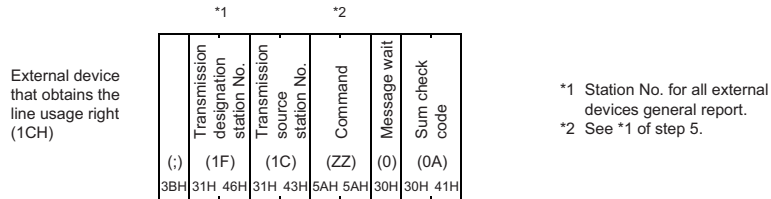
b) The other external devices check if all external devices general report data was received. If the data was received, the external device performs step 3.
If the data was not received, the next external device transmits all external devices general report data and obtains the line usage right and performs step 2. The other external devices perform step 7-b).

14.3.2 Data communications between programmable controller CPU and external devices by designating a master station and slave stations

One of the external devices is made the master station and the other external devices communicate data with the programmable controller CPU after obtaining permission from the master station.
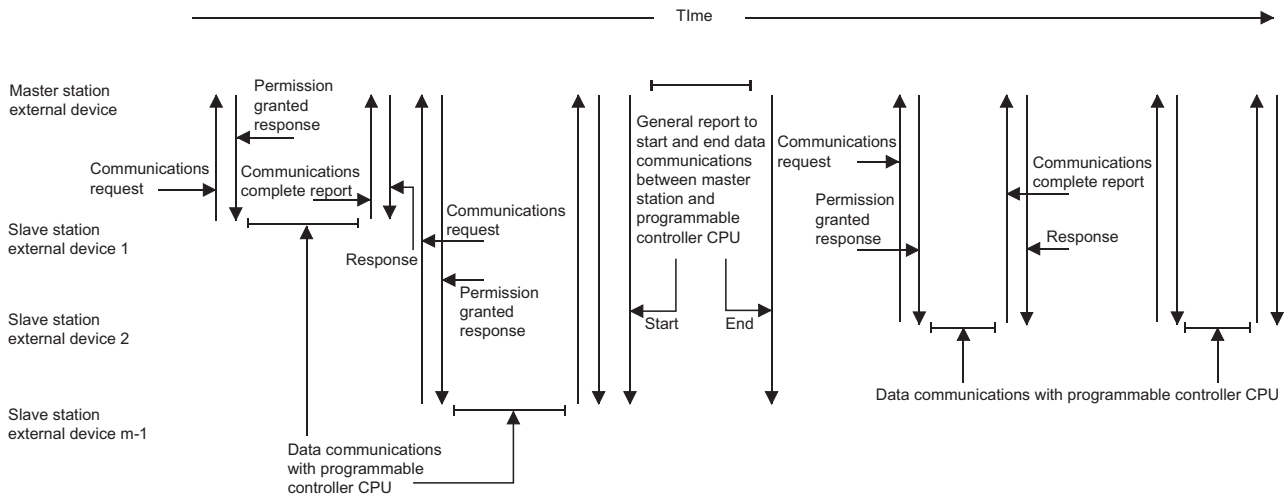
The following uses an example to describe the procedure when external devices communicate data with the programmable controller CPU.

In this example, after the start of data communications between external devices and the programmable controller CPU, the external devices perform a maximum data communications time time-out check. Slave station external devices that are not communicating data with the programmable controller CPU check if the external device that completed data communications with the programmable controller CPU transmitted a communications complete report.

In the following descriptions, the external device with the lowest station No. (1BH) is assumed to be the master station and the other external devices are assumed to be slave stations.

◎: External device that obtained the line usage right

C24: Q series C24, QC24 (N), UC24
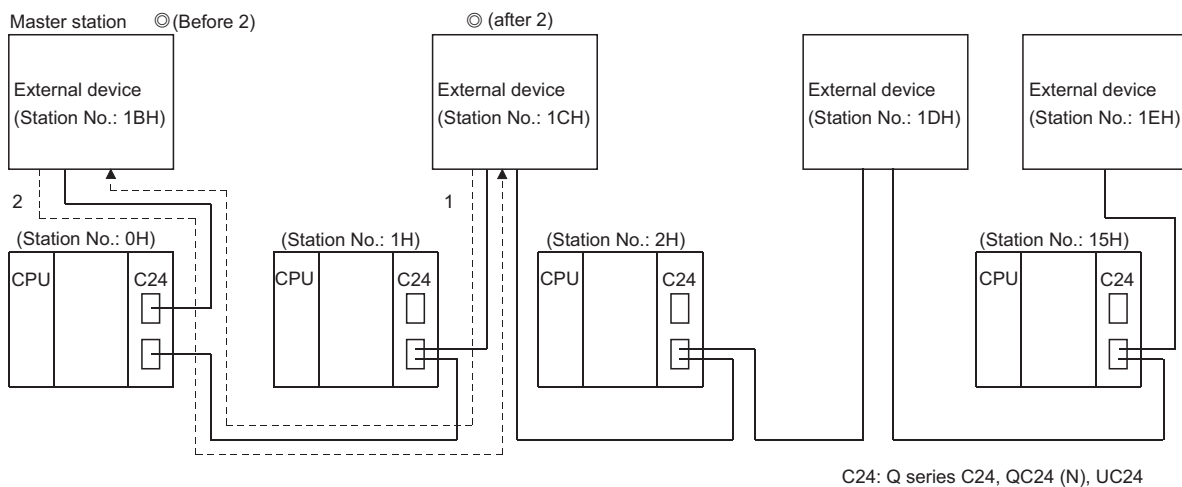
1. **A slave station that wants to communicate data with the programmable controller CPU sends a communications request to the master station to obtain the line usage right. A message structure example is shown in step 2.**

2. **The master station transmits a permission granted response to the slave station that issued the communications request.**

◎: External device that obtained the line usage right

C24: Q series C24, QC24 (N), UC24
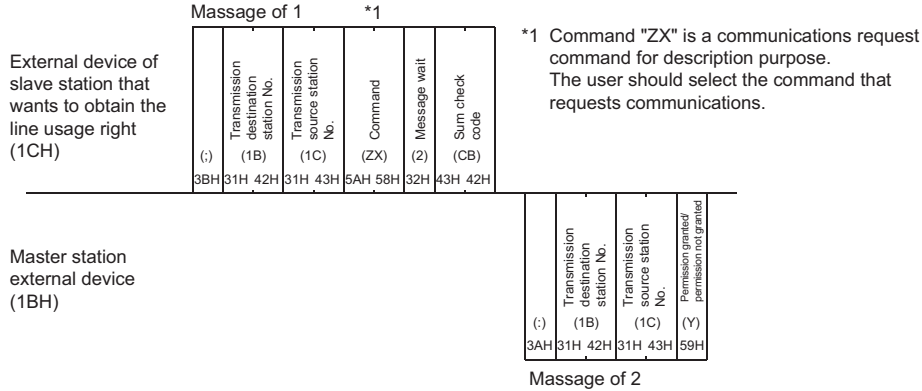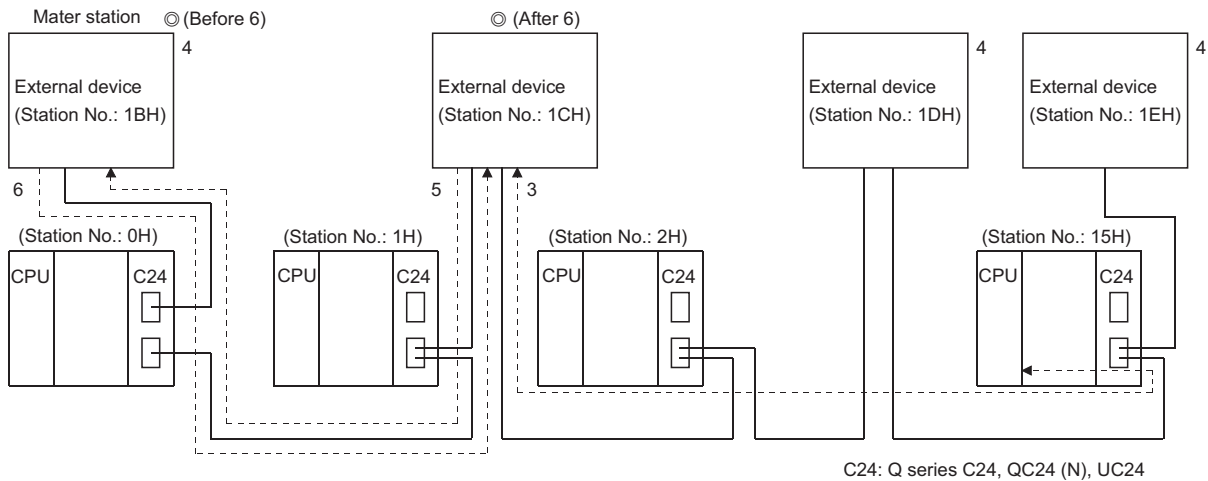
3. **After communicating data with the programmable controller CPU within the maximum data communications time from among the external devices, the slave station that received the "permission granted" response goes to step 5.**

4. **The master station that transmitted the "permission granted" response and the slave stations that did not obtain line usage right check the line usage time of the slave station that obtained the line usage right and ignore receive data other than that addressed to their local station.**
When the line usage time exceeds the maximum data communications time, each external device performs the processing of step 7.

5. **After data communications are complete, the slave station that exchanged data with the programmable controller CPU transmits a communications complete report to the master station. A message structure example is shown in step 6.**
Slave stations that do not communicate data with the programmable controller CPU check if a communications complete report was transmitted and do not communicate data with the master station during that time.

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14.3 Examples of Procedure for Data Communications with the Programmable Controller CPU

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6. **The master station that received the communications complete report transmits a response to the slave station that transmitted the communications complete report.**

Message of 5   *1

External device of slave station to perform the communications complete report (1CH)	(;)	Transmission destination station No. (1B)	Transmission source station No. (1C)	Command (ZY)	Message wait (2)	Sum check code (CC)
	3BH	31H 42H	31H 43H	5AH 59H	32H	43H 43H

*1 Command "ZY" is a communications complete report command for description purpose. The user should select the communications complete report command.

Master station external device (1BH)	(:)	Transmission destination station No. (1B)	Transmission source station No. (1C)
	3AH	31H 42H	31H 43H

Message of 6

7. **After completion of step 6 above, or when the line usage time of the slave station that obtained the line usage right exceeds the maximum data communications time:**

a) The master station waits for a communications request from a slave station.

When the master station receives a communication request, it performs processing from step 2.

b) The slave stations do not communicate data with the master station until data communications with the programmable controller CPU are necessary.

When data communications with the programmable controller CPU becomes necessary, that slave station performs processing from step 1.

8. **When the master station itself wants to exchange data with the programmable controller CPU and a slave stations does not have the line usage right, it transmits all external devices except programmable controller CPU a general report data and obtains the line usage right before communicating data with the programmable controller CPU.**

After data communications with the programmable controller CPU are complete, the master station transmits all external devices general report data to inform the slave stations that data communications with the programmable controller CPU are complete.

During this time, the slave stations do not communicate data with the master station until master station data communications are complete.

    *1   *2

External device of master station that obtained the line usage right (1BH)	(;)	Transmission destination station No. (1F)	Transmission source station No. (1B)	Command (ZX)	Message wait (0)	Sum check code (07)
	3BH	31H 46H	31H 42H	5AH 58H	30H	30H 37H

*1 Station No. for all external devices general report.
*2 Commands "ZX" and "ZY" are commands for description purposes. The user should select the command when the master station communicates data with slave stations.

    *1   *2

External device of master station that transmits communications complete report (1BH)	(;)	Transmission destination station No. (1F)	Transmission source station No. (1B)	Command (ZY)	Message wait (0)	Sum check code (08)
	3BH	31H 46H	31H 42H	5AH 59H	30H	30H 38H

CHAPTER 15 SWITCHING THE MODE AFTER STARTING

This function forcefully switches the current communication protocol and transmission specifications of the designated interface from an external device and the programmable controller CPU after the Q series C24 starts.

When the Q series C24 starts, it begins operation with the setting values of the GX Developer switch setting.

Point

The mode switching function is used to change the communication protocol of the specified interface and transmission specifications and continue data communications without restarting the QCPU. (When using the dedicated instruction (UINI instruction) for mode switching, refer to Page 402, Section 17.8.)

(1) Mode switching from external device

(a) If the communication protocol of the interface connecting the external device is MC protocol, mode switching can be performed.

(b) The communication protocol can be changed from the MC protocol as shown below.

15
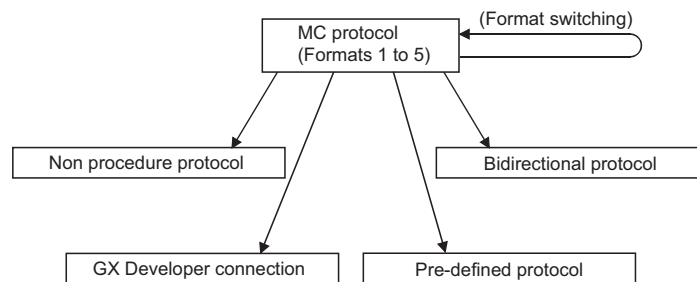
(c) The transmission specifications set by the GX Developer switch setting can be changed.

(2) Mode switching from programmable controller CPU

    (a) Regardless of the current communication protocol of the connected interface, the external device can perform mode switching from the sequence program.

    (b) The communication protocol can be changed from the sequence program as shown below.
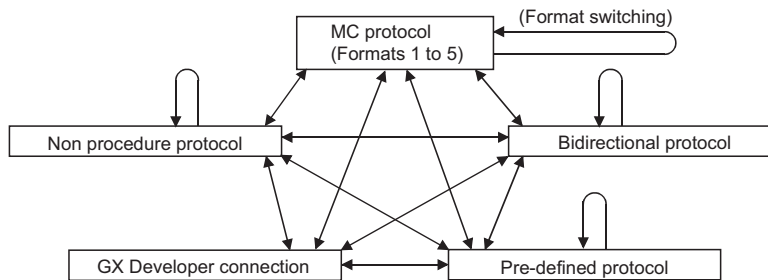
    (c) The transmission specifications set by the GX Developer switch setting can be changed.

Point

When using the mode switching function, set the setting change of the communication setting to "enable" in the GX Developer switch setting.
(☐ User's manual (Basic))

15.1 Mode Switching Operation and Contents that can be Changed

This section describes the set contents that can be changed with mode switching and the operation of Q series C24 after mode switching.

15.1.1 Settings that can be changed with mode switching

The following describes the settings that can be changed with mode switching.

(1) Switching the communication protocol

(a) The communication protocol setting of each interface can be switched.

(b) The communication protocol after the mode switching is specified by the switching mode No. designation area of the buffer memory (address: 90H, 130H).

(2) Changing the transmission specifications

(a) The transmission setting of each interface can be switched.

(b) The transmission setting after the mode switching is specified by the transmission specification after switching designation area of the buffer memory (address: 91H, 131H).

Point

Mode switching allows the user to change the settings corresponding to communication protocol and transmission switch settings of the GX developer.

15.1.2 Operation for mode switching

The following describes the Q series C24 operation for mode switching.

(1) Processing currently in execution

(a) If there is a mode switching request, mode switching immediately starts.

(b) If one of the following processing was being performed when a mode switching request was issued, that processing is terminated.

- Data communications using an MC protocol
  - Command message receive processing and response message or on-demand data transmission processing are all terminated.
  - The transmission complete end signal for an on-demand data transmission request is not turned on.
- Data communications using non procedure, bidirectional, or pre-defined protocol
  - Data and response message transmit and receive processing are all terminated.
  - All the input signals from the programmable controller CPU related to transmit and receive processing are turned off.
  - If the receive data from the external device was being stored to the Q series C24, the receive data up to that point is ignored and the data is processed with the current receive data count as [0].

(2) Modification of buffer memory stored value

(a) Special applications area (addresses: 252H to 253H, 262H to 263H)

The communication protocol status and transmission specifications after mode switching is complete are stored.
The values stored to areas other than the above are not changed. The contents before switching are preserved.

(b) User free area (addresses: 400H to 1AFFH, 2600H to 3FFFH)

The stored values are not changed. The contents before mode switching are preserved.

15.2 Mode Switching Precautions

(1) Set-up between the external device and the programmable controller CPU

Make the following setting for the external device and the programmable controller CPU so that mode switching is not performed during data communications.

(a) Which side is to switch the mode, the programmable controller CPU or external device

(b) Timing for each mode switching pattern

(c) Interlocking of all connected devices in the case of mode switching

- Method and message structure when all the connected stations are informed of the mode switching execution
- Method and message structure when all the connected stations are informed of the mode switching completion
- Device No. and meaning of the value when a programmable controller CPU word device is used

(2) Mode switching from external device

(a) Once the mode has been changed to a mode other than MC protocol (Formats 1 to 5), it cannot be changed from the external device.

In this case, change the mode on the programmable controller CPU.

(b) Only the Q series C24 (including multidrop link stations) connected to an external device is available for mode switching from the external device

(📖 MELSEC Communication Protocol Reference Manual)

It is not available for other Q series C24 stations connected over a network system.

Point

It is recommended to switch the mode on the programmable controller CPU side.

(3) Data communications after mode switching

The Q series C24 requires approximately 400 ms as processing time of mode switching only.

While the mode switching is being executed, the setting values cannot be stored into the buffer memory special applications area and data cannot be transmitted between the Q series C24 and the external device.
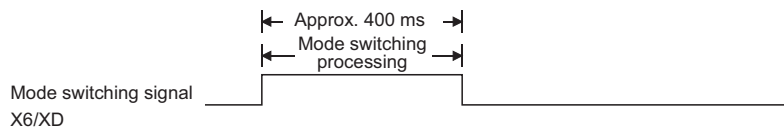
(4) Linked operation mode switching

Do not switch the mode when two interfaces of the Q series C24 are in linked operation. Also, do not switch the mode for linked operation.

15.3   I/O Signals for Handshake with Programmable Controller CPU and Buffer Memory

This section describes the I/O signals for handshake and the buffer memories used when mode switching is performed.

(1) I/O signals for handshake with programmable controller CPU

Item	I/O signal		Signal name	Device turned ON/OFF		Timing
	CH1	CH2		CPU	C24	
Mode switching	X6	XD	Mode switching in progress		○	
	Y2	Y9	Mode switching request	○		

Remark •

The following signals can also be used as I/O signals, in addition to the above.
Refer to User's Manual (Basic) for the programmable controller CPU I/O signals.
- Q series C24 ready signal (X1E): Turned ON when the Q series C24 can be accessed from the programmable controller CPU
- Watchdog timer error signal (X1F): Turned ON when the Q series C24 does not operate normally
- CH1 ERR. signal (XE): Turned ON when the CH1 ERR. has occurred
- CH2 ERR. signal (XF): Turned ON when the CH2 ERR. has occurred

• •

(2) Buffer memory

Address (Decimal (hexadecimal))		Name		Setting value/Stored value
CH1	CH2			
144 (90H)	304 (130H)	For specifying mode switching	Switching mode No. designation (☞ Page 351, Section 15.3 (2) (a))	0001H: MC protocol (Format 1) ⋮ 0007H: Bidirectional protocol 0009H: Pre-defined protocol 00FFH: GX Developer connection
145 (91H)	305 (131H)		Transmission specification setting after switching (☞ Page 351, Section 15.3 (2) (b))	0000H: Matched to the settings at the GX Developer 8000H to 8FFFH: Matched to the settings of this area
515 (203H)		For confirming mode switching and switch setting	Switch setting error, mode switching error condition	0: Normal Other than 0: Switch setting error, mode switching error (▢ User's manual (Basic))

(a) Switching mode No. designation area (addresses: 90H, 130H)

Write the desired mode No. (0001H to 0007H, 00FFH).

```
                              b15              to              b0
Buffer memory address 90H/130H  [                              ]  (Default 0000H)
                                                ↑
                                                └──────── 0001H: MC protocol (Format 1)
                                                          0002H: MC protocol (Format 2)
                                                          0003H: MC protocol (Format 3)
                                                          0004H: MC protocol (Format 4)
                                                          0005H: MC protocol (Format 5)
                                                          0006H: Non procedural protocol
                                                          0007H: Bi-directional protocol
                                                          0009H: Pre-defined protocol
                                                          00FFH: GX Developer connection [1]
```
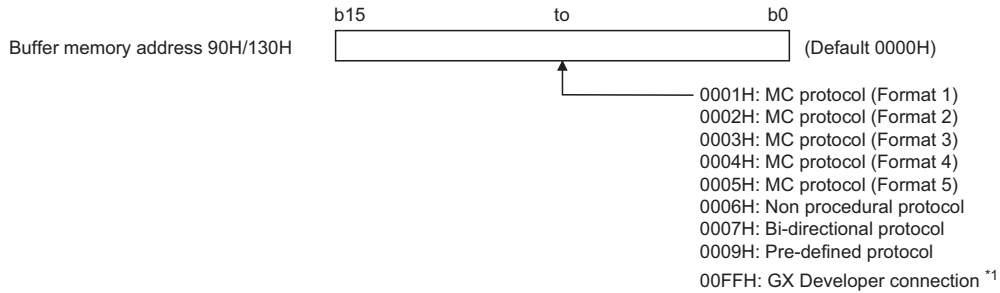
*1   The communication protocol is specified as "00H" when the GX Developer connection mode is set using the GX Developer switch setting.

(b) Switching transmission specifications designation area (address: 91H, 131H)

- Designates the transmission specifications after mode switching.
- When the transmission specifications are returned to the contents set in GX Developer, [0000H] is written to this area.
- When setting arbitrary transmission specifications (other than the contents set in GX Developer), the value corresponding to ON/OFF of the relevant bit in the table listed below is written. Relevant bit 1 (ON)/0 (OFF) is designated the same as transmission setting of GX Developer.

15

[For the Q series C24]

```
b15    to    b8 b7 b6 b5 b4 b3 b2 b1 b0
┌─────────────┬──┬──┬──┬──┬──┬──┬──┬──┐
│ 80H to 8FH  │  │  │  │  │  │  │  │ 0│ CH1 side *1
├─────────────┼──┼──┼──┼──┼──┼──┼──┼──┤
│ 80H to 8FH  │  │  │  │  │  │  │  │  │ CH2 side *1
└─────────────┴──┴──┴──┴──┴──┴──┴──┴──┘
```

Bit	Description	OFF(0)	ON(1)	Remarks
b0	Operation setting	Independent	Link	Be sure to set the CH1 side to OFF(0).
b1	Data bit	7	8	Parity bit is not included.
b2	Parity bit	NO	Yes	Vertical parity
b3	Even/odd parity	Odd	Even	Valid only when parity bit is set to Yes.
b4	Stop bit	1	2	————
b5	Sum check code	NO	Yes	————
b6	Write during RUN	Prohibited	Allowed	————
b7	Setting modifications	Prohibited	Allowed	————

Bit	Description	Set value	Remarks
b8 to b15	Communication speed	80H to 8FH	Refer to *2

*1   All items in the table should be set to OFF for the interface which "GX Developer connection" is set in the switching mode number designation. The Q series C24 operates with the values set in GX Developer.

Transmission setting	GX Developer side setting
Operation setting	Independent
Data bit	8
Parity bit	Yes
Even/odd parity	Odd
Stop bit	1
Sum check code	Yes
Write during RUN	Allowed
Setting modifications	Allowed/Prohibited

*2   The setting value of the communication speed.

Communication speed (Unit: bps)	Bit position b15 to b8	Communication speed (Unit: bps)	Bit position b15 to b8	Remarks
50	50bps	14400	86H	
300	80H	19200	87H	Slow down the communication speed when data cannot be communicated normally due to overrun error, framing error, etc. in communication with external devices.
600	81H	28800	88H	
1200	82H	38400	89H	
2400	83H	57600	8AH	
4800	84H	115200	8BH	
9600	85H	230400	8CH	

- Transmission speed of 230400 bps is available for only CH1 of the QJ71C24N (-R2/R4) and LJ71C24(-R2).
- When connecting external devices to both of two interfaces, the total of the communication speed should be 115200 bps of less (230400 bps or less the QJ71C24N (-R2/R4)). When connecting an external device to either of two interfaces, the maximum of 115200 bps is available for the interface (a maximum of 230400 bps for the QJ71C24N (-R2/R4) or LJ71C24(-R2)). In this case, set 300 bps for the other interface to which no external device is connected.
- Set "80H" to the interface for which "GX Developer connection" is set in the switching mode number designation. The communication speed set on the GX Developer is applied.

Remark •

The programmable controller CPU must also be aware of the following I/O signals for handshake and buffer memories when the mode is switched from an external device.
- • Mode switching in progress signal (X6/XD)
- • Switch setting error, mode switching error storage area (address: 203H)

• •

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15.3 I/O Signals for Handshake with Programmable Controller CPU and Buffer Memory

15.4 Switching the Mode from the Programmable Controller CPU

This section shows how the Q series C24 mode is switched from the programmable controller CPU.

15.4.1 Mode switching procedure

The following explains the procedure for switching the Q series C24 mode from the programmable controller CPU.
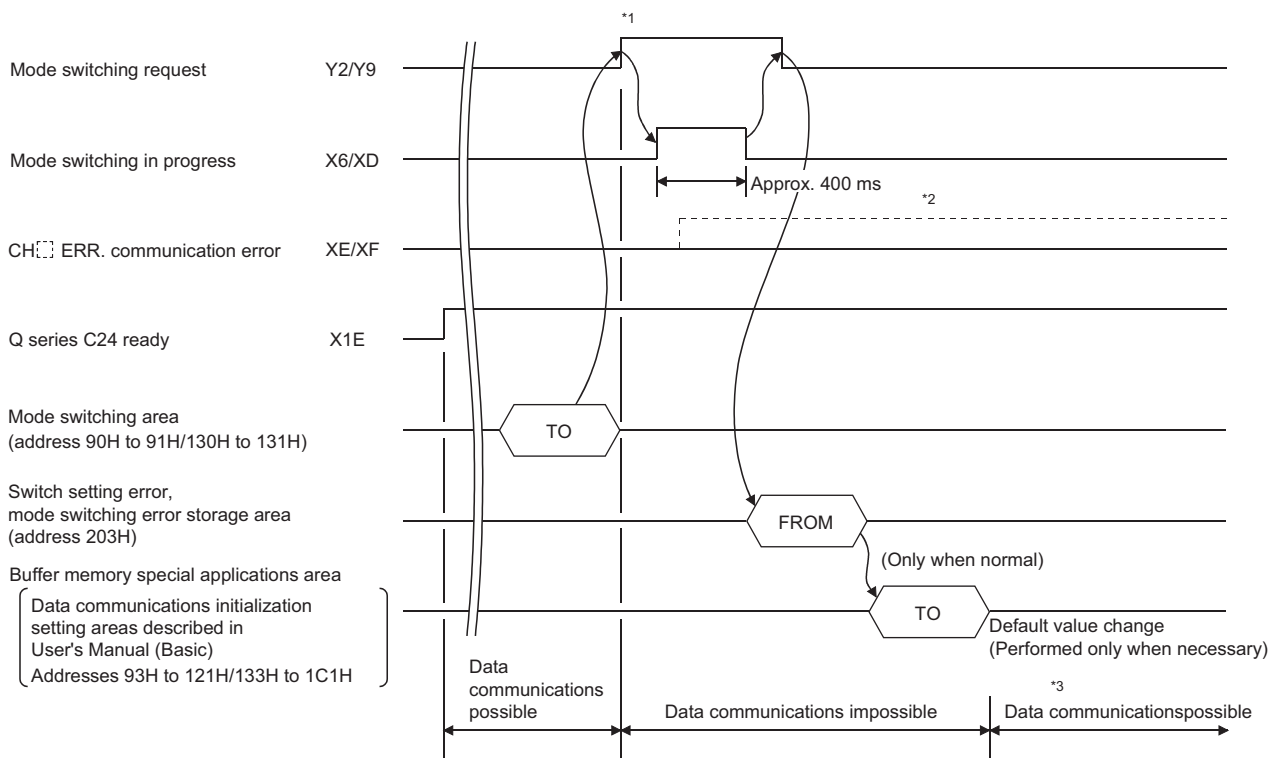
*1 Inform in advance all the connected device that data communications by mode switching cannot be performed.

*2 When XE and XF were turned on, check the error contents as described in the User's Manual (Basic) and take the corresponding action.
- Checking of mode switching designation contents for buffer memory mode switching area and writing of mode switching designation contents within the range that can be designated.
- Re-execution of mode switching

*3 After checking that mode switching was completed normally, inform all the connected devices that data communications are possible and restart data communications.
To check the Q series C24 mode (communication protocol, transmission specifications) after switching, read the buffer memories (addresses: 252H to 253H, 262H to 263H) described in the User's Manual (Basic).

15.4.2 Mode switching sample program

The following shows a sample sequence program that switches the CH1 interface mode.
(The Q series C24 I/O signals X/Y00 to X/Y1F)
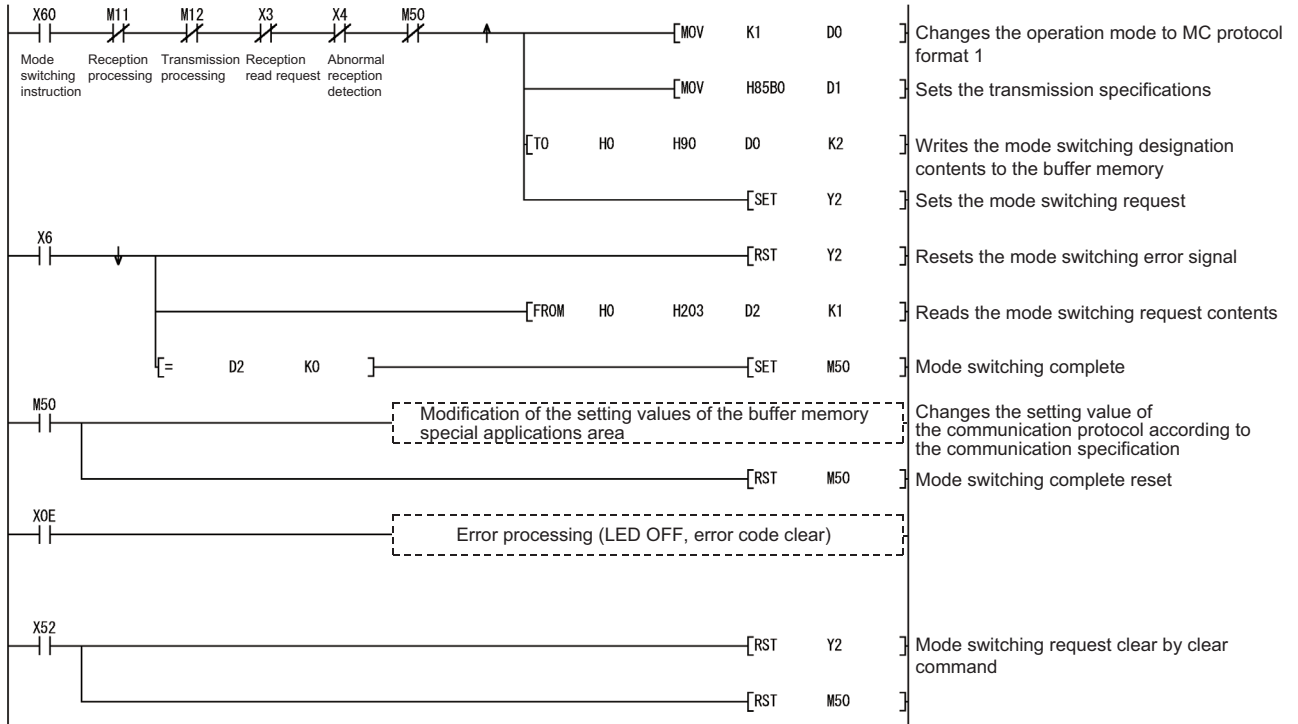
15.5   Switching the Mode from an External Device

This section shows how the Q series C24 mode is switched from an external device.

15.5.1   Mode switching procedure

The following explains the procedure for switching the Q series C24 mode from an external device.
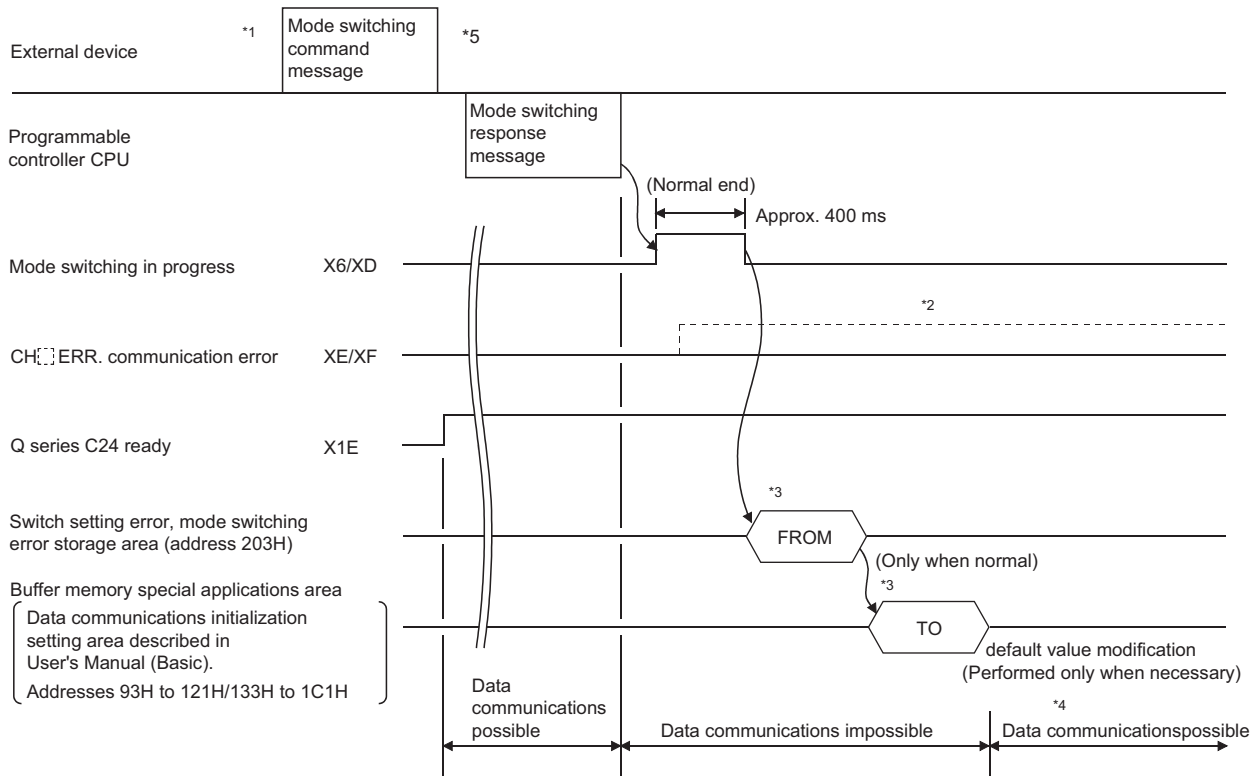
*1   Inform in advance all the connected devices that data communications by mode switching cannot be performed.
*2   When XE and XF were turned on, check the error contents as described in the User's Manual (Basic) and take the corresponding action.
  • Checking of mode switching designation contents for buffer memory mode switching area and writing of mode switching designation contents within the range that can be designated.
  • Re-execution of mode switching
*3   When the mode was switched from an external device, after mode switching is complete, read and write the buffer memory special applications area shown below from the programmable controller CPU.
  • Switch setting error, mode switching error storage area (address: 203H)
  • Data communications initialization setting areas (addresses: 93H to 121H /133H to 1C1H) described in the User's Manual (Basic).
*4   After checking that mode switching was completed normally, inform all the connected devices that data communications are possible and restart data communications.
*5   For the message format, refer to MELSEC Communication Protocol Reference Manual.

Remark ●

To check the Q series C24 mode (communication protocol, transmission specifications) after switching, read the buffer memories (addresses: 252H to 253H, 262H to 263H) described in the User's Manual (Basic).
(To check the external device, read the buffer memory with the MC protocol buffer memory read function.)

● ●

15.5.2 Mode switching sample program

The following shows a programmable controller CPU sample sequence program that switches the CH1 interface mode from an external device.
(The Q series C24 I/O signals X/Y00 to X/Y1F)
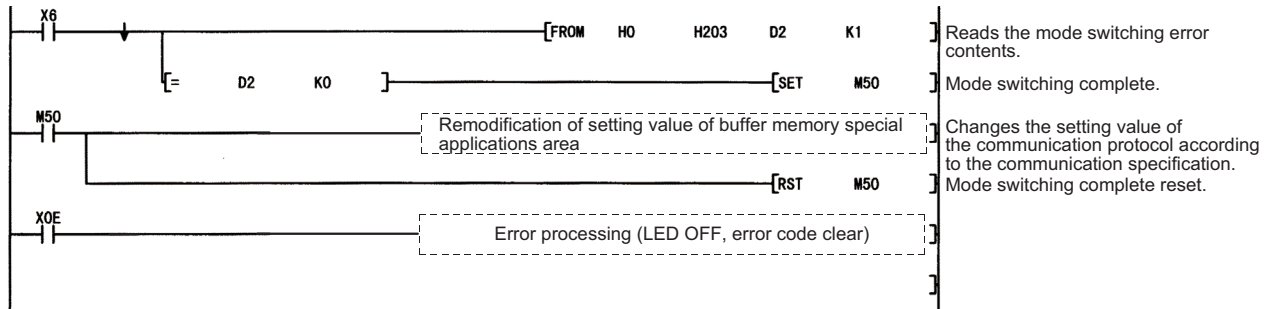
CHAPTER 16 USING COMMUNICATION DATA MONITORING FUNCTION

The following describes the QJ71C24N (-R2/R4) and LJ71C24(-R2) communication data monitoring functions.

16.1 Communication Data Monitoring Function

16.1.1 Overview

Communication data monitoring function is a function to monitor communication data between the QJ71C24N (-R2/R4) or LJ71C24(-R2) and an external device on communication lines.
The system startup time can be reduced by analyzing the communication data on the communication lines when debugging the system.
The following two methods are for the communication data monitoring.

(1) Communication data monitoring by the sequence program (Explained in this section)

Monitoring is performed by the monitor start instruction written in the communication data monitoring specification area of the buffer memory.

(2) Communication data monitoring by GX Configurator-SC

The debugging support function of the GX Configurator-SC protocol FB support in used for monitoring (circuit trace).
See the Operating Manual (Protocol FB support function) for the debugging support function of the GX Configurator-SC protocol FB support.
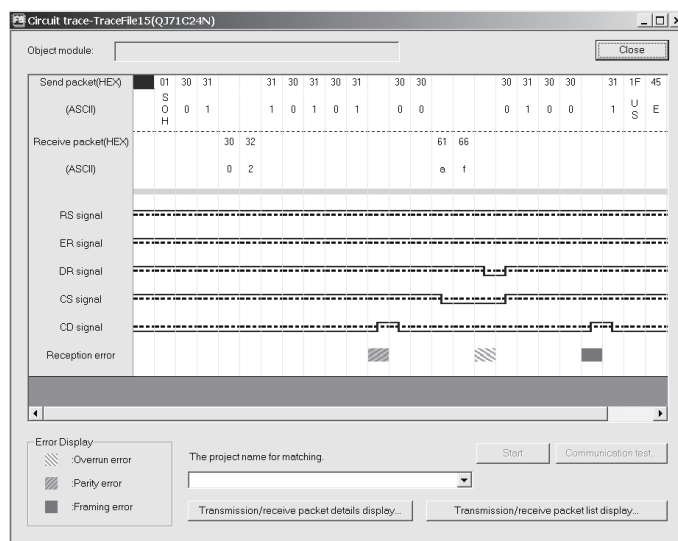
This section describes the communication data monitoring by the sequence program.

16.1.2 Communication data monitoring operation

The following describes the communication data monitoring operation.

> **Point**
>
> - When using the communication data monitoring function, the total transmission speed of the two interfaces should not exceed 115200 bps.
> - The communication data monitoring function is effective when the communication protocol is assigned to 0H to 9H.

(1) Monitor start

(a) Monitor start instruction "0001H" is written in the communication data monitoring specification area (Address: 2018H/2118H). (Set by user)

(b) By the monitor start instruction, the monitor data pointer/monitor data size area are cleared to 0 and "0002H" is written in the communication data monitoring specification area which starts monitoring.[1] (Q series C24 is set.)

(c) When a monitor setting error occurs, "100FH" is written in the communication data monitoring specification area. (Q series C24 is set.)

Check the monitor buffer head address and the monitor buffer size setting range and perform monitoring again.

[1] Monitor data area (Default address: 2602H to 32FFH/3302H to 3FFFH) is not cleared to 0.

(2) During monitoring

(a) After monitoring starts, data of reception, transmission, receiving error, and signal change are stored from the head address of the monitor data area in the order of occurrence.

(b) When the monitoring data exceeds the capacity of the monitor data area, monitoring is continued by writing new data over the oldest data.

However, monitoring may automatically stop according to the settings of the monitor option area (Address: 2019H/2119H). (☞ Page 363, Section 16.2 (2) (a))

```
              (CH1)        Buffer memory
              2600H          0003H          Monitor data pointer storage area
              2601H          0CFEH          Monitor data size storage area
              2602H                    +0
              2603H                    +1
              2604H                    +2
              2605H     Oldest data    +3
              2606H
                                              Monitor data area
               to

              32FFH
        (Default value)
```
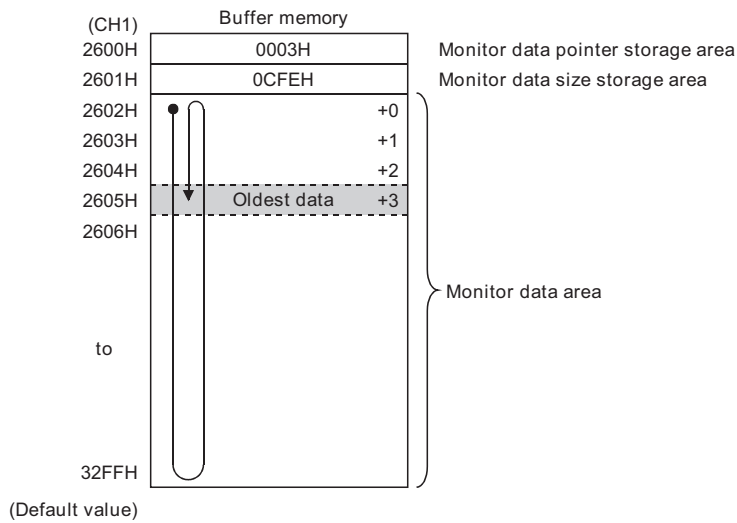
(c) Each data is stored in the monitor data area using the following timing.

Data classification		Data storage timing
Received data		When receiving data
Transmitted data		When transmitting data
Receiving error data		When detecting receiving errors
RS-232 line	RS (RTS), ER (DTR) signals	When changing the RS (RTS), ER (DTR) signals
	CS (CTS), DR (DSR), CD (DCD) signals	When signal changes are detected during the periodic processing (Operation interval: 1 to 19ms) as well as for the above timing (Monitoring is not performed during the periodic processing)

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(3) Monitor stop

Monitoring stops if any of the following conditions is satisfied.

(a) Monitor stop by user instructions

Monitoring stops if "0000H" is written in the communication data monitoring specification area of the buffer memory. (Set by the user)

(b) Monitor stop by the system when the monitor data area is full

- The full stop specification (bit 0) of the monitor option specification area of the buffer memory is set to "ON".
- When the monitor data area is full (monitor buffer size), monitoring is automatically stopped and "1002H" is written in the communication data monitoring specification area. (Set by the Q series C24)

(c) Monitor stop by the system when the timer 0 error occurs

- The timer 0 error stop specification (bit 2) of the monitor option specification area of the buffer memory is set to "ON".
- When the timer 0 error (error code 7F40H) occurs, monitoring is automatically stopped and "1002H" is written in the communication data monitoring specification area. (Set by the Q series C24)[1]

*1   Part of the data immediately after the occurrence of a timer 0 error may be entered in the monitor data area.

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16.1 Communication Data Monitoring Function

16.2 Communication Data Monitoring Function Settings

Settings for the communication data monitoring function can be configured on the "Transmission control and other system setting" screen of GX Configurator-SC or in the sequence program.

(1) GX Configurator-SC setting for the communication data monitoring function

The setting items for the communication data monitoring function are listed below.

See Page 363, Section 16.2 (2) in this section for setting details.

[Transmission control and other system setting screen]
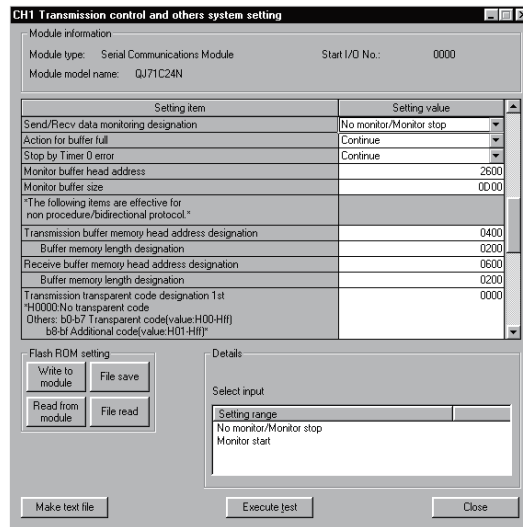
[Setting items]

Setting items	Setting values	Item details
Send/Receive data monitoring designation	No monitoring/Monitor stop, Monitor start	Select "monitor start" for constant monitoring.
Action for buffer full	Continue/Stop	Select "stop" to stop monitoring when the monitor data area is full.
Stop by Timer 0 error	Continue/Stop	Select "stop" to stop monitoring when a timer 0 error occurs.
Monitor buffer head address	0400H to 1AFDH, 2600H to 3FFDH	Enter a value to change the monitor buffer address. (Default address: 2600H/3300H)
Monitor buffer size	0003H to 1A00H	Enter a value the monitor buffer size. (Default: 0D00H)

(2) Buffer memory for communication data monitoring function

(a) Communication data monitoring specification area (Address: 2018H/2118H)

Set start/stop of the communication data monitoring.

See Page 359, Section 16.1.2 for communication data monitoring setting operation.


```
                        b15            to           b0
Buffer memory address  2018H/2118H  [                    ]  (Default: 0000H)
                                            ↑
                                     Set the monitor start/stop.

                                     0000H: No monitor/Monitor stop
                                     0001H: Monitor start
                                     0002H: Monitoring (Set by Q series C24)
                                     1002H: Monitor stop (Set by Q series C24)
                                     100FH: Monitor setting error (Set by Q series C24)
```

(b) Monitor option specification area (Address: 2019H/2119H)

Specify the options of the communication data monitoring function.


```
                        b15        to      b3  b2  b1  b0
Buffer memory address  2019H/2119H  [   0      ][1/0][0][1/0]  (Default: 0000H)
                                                              Action for buffer full
                                                              0H: OFF
                                                              1H: ON

                                                  Stop by timer 0 error
                                                  0H: OFF
                                                  1H: ON
```

- Action for buffer full (bit 0)
  - When action for buffer full is OFF: When the monitoring data exceeds the capacity of the monitor data area, monitoring continues by writing the new data over the oldest data.
  - When action for buffer full is ON: When the monitor data area is full (monitor buffer size), monitoring is automatically stopped and "1002H" is written in the communication data monitoring specification area. (Set by the Q series C24)
- Stop by timer 0 error (bit 2)
  - When the stop by timer 0 error is OFF: Monitoring continues even if the timer 0 error (error code 7F40H) occurs.
  - When the stop by timer 0 error is ON: When the timer 0 error (error code 7F40H) occurs, monitoring is automatically stopped and "1002H" is written in the communication data monitoring specification area. (Set by the Q series C24)

(c) Monitor buffer head address specification area (Address: 201AH/211AH)

Specify the head address of the storage area (monitor data area) for the monitor data within the range of the user's free area of the buffer memory.

Setting range: 0400H to 1AFDH, 2600H to 3FFDH (Default: 2600H/3300H)

(d) Monitor buffer size specification area (Address: 201BH/211BH)

Set the size of the monitor data area.

Setting range: 0003H to 1A00H (Default: 0D00H)

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16.2 Communication Data Monitoring Function Settings

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(e) Monitor data pointer storage area (Address: according to monitor buffer head address setting (Default: 2600H/3300H))

- The oldest data position of the monitor data area is stored using the offset value from the head address of the monitor data area.
  - 0 to (monitor buffer size specification (Default: 0D00H) -3): oldest data position
- When the monitoring data exceeds the monitor buffer size, the new data is written over the oldest data. (Ring buffer type) The oldest data position of the monitor data area can be confirmed from this area.

Ex. "2611H" becomes the oldest data when "000FH" is the monitor data pointer using "2602H" as the head address of the monitor data area.

		Buffer memory batch monitor-2	
Monitor data pointer storage area
Monitor data size storage area
Oldest data in the monitor data area

(f) Monitor data size area (Address: according to the monitor buffer head address setting (Default: 2601H/3301H))

The number of monitor data stored in the monitor data area is stored.
0 to (monitor buffer size specification (Default: 0D00H) -2): Number of monitor data

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(g) The monitor data area (Default addresses: 2602H to 32FFH /3302H to 3FFFH)

The monitor data are stored in one-word units as shown in the configuration below.

See Page 366, Section 16.3 for an example of the communication data monitoring.

b15 b14 b13 b12	b11 b10 b9 b8	b7 ... b0	
0 0 0 0	* CD(DCD) CS(CTS) DR(DSR)	Received data	When receiving data
0 0 0 1	* CD(DCD) CS(CTS) DR(DSR)	Transmitted data	When transmitting data
0 0 1 0	* CD(DCD) CS(CTS) DR(DSR)	0 RS(RTS) ER(DTR)	When the RS(RTS)/ER(DTR) signal is changed
0 0 1 1	* CD(DCD) CS(CTS) DR(DSR)	0 FE OVR PE (*1)	When a reception error occurs
0 1 0 0	* CD(DCD) CS(CTS) DR(DSR)	0	When detecting a CD(DCD) to DR(DSR) signal change
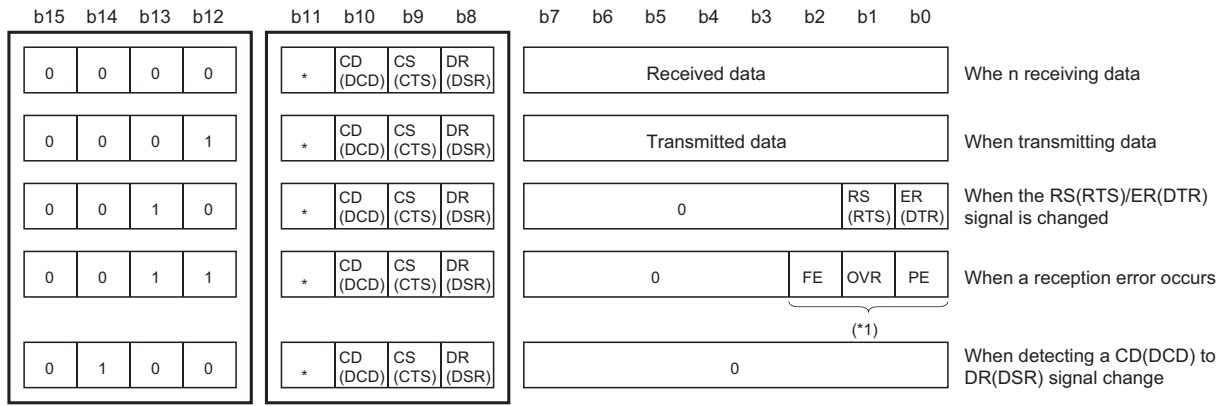
Data classification
(b12 to b15)
 0: When receiving data
 1: When transmitting data
 2: When the RS(RTS)/ER(DTR)
    signal is changed
 3: When a reception error occurs
 4: When detecting a CD(DCD) to
    DR(DSR) signal change

Signal condition (b8 to b11)
* System area

*1 FE: Framing error
   OVR: Overrun error
   PE: Parity error

16.3 Communication Data Monitoring Example

The following is an example of the data monitoring of nonprocedural protocol communication.

(1) System configuration

The system configuration for the sample program is as shown below.
The CH used for operation of this sample program is CH1 only.

CH1: Transmission channel
CH2: Reception channel

GX Developer   QJ71C24N-R2
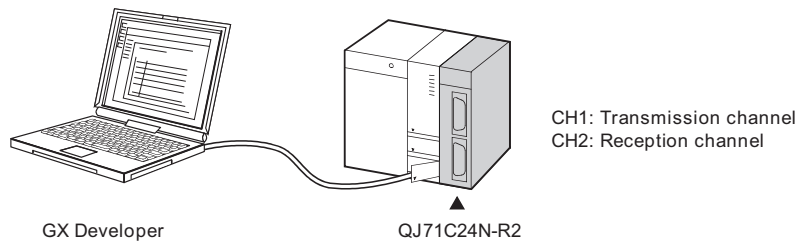
(2) Program condition

This is a program to monitor transmitted data from CH1 of the QJ71C24N-R2 with user instructions.

(a) GX Developer switch setting

Switch number	Setting value
Switch 1	07C2
Switch 2	0006
Switch 3	07C2
Switch 4	0006
Switch 5	0000

(b) Devices used by the user

- Monitor start instruction signal: X20
- Monitor option specification signal: X21
- Monitor stop instruction signal: X22
- During monitor start instructions: M20
- During monitoring: M21
- During monitor stop instructions: M22
- Communication data monitoring specification area storage condition: D300
- Monitor option specification area storage condition: D301

(c) Sample program


```
        SM400                                                    ┌MOV    U0¥      D300  ┐
          ┤├───────────────────────────────────────────────────┤       G8216          │
          │                                                      └                     ┘
          │                                                      ┌MOV    U0¥      D301  ┐
          └──────────────────────────────────────────────────────┤       G8217          │
                                                                 └                     ┘
<Monitor start (X20 is ON)>
         X20    M21                                       ┌FMOVP  H0      U0¥     H0CFE ┐   Monitor data area is cleared to 0
          ┤∤────┤/├──────────────────────────────────────┤               G9730          │
          │                                               └                             ┘
          │                                               ┌MOVP   H1      U0¥           ┐
          └───────────────────────────────────────────────┤               G8216          │
                                                          └                             ┘
          │                                                              ┌SET    M20    ┐   Monitor start being instructed
          └────────────────────────────────────────────────────────────┤              │
                                                                         └              ┘
         M20       U0¥                                                   ┌RST    M20    ┐
          ┤├──┌= G8216     H2 ┐────────────────────────────────────────┤              │
          │   └                ┘                                        └              ┘
          │                    │                                       ┌SET    M21    ┐   Monitoring (0002H)
          │                    └───────────────────────────────────────┤              │
          │                                                            └              ┘
          │       U0¥                                                   ┌RST    M20    ┐   Monitor setting error (100FH)
          └───┌= G8216    H100F ┐──────────────────────────────────────┤              │
              └                  ┘                                     └              ┘
<Monitor option (X21 is ON)>
         X21    M21                                              ┌MOVP   H5      U0¥           ┐
          ┤∤────┤/├──────────────────────────────────────────────┤               G8217          │
                                                                 └                             ┘
         M21       U0¥                                                   ┌RST    M21    ┐   During monitor stop (1002H)
          ┤├──┌= G8216    H1002 ┐──────────────────────────────────────┤              │
              └                  ┘                                     └              ┘
<Monitor stop (X22 is ON)>
         X22    M21                                              ┌MOVP   H0      U0¥           ┐
          ┤∤────┤├──────────────────────────────────────────────┤               G8216          │
          │                                                      └                             ┘
          │                                                              ┌SET    M22    ┐   Monitor stop being instructed
          └────────────────────────────────────────────────────────────┤              │
                                                                         └              ┘
         M22       U0¥                                                   ┌RST    M22    ┐
          ┤├──┌= G8216     H0 ┐────────────────────────────────────────┤              │
          │   └               ┘                                        └              ┘
          │                   │                                       ┌RST    M21    ┐   Monitor stop (0000H)
          │                   └────────────────────────────────────────┤              │
                                                                       └              ┘
```

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(3) Confirming monitor data by GX Developer

The monitor data area for CH1 (Address: 2602H to 32FFH) is monitored on the buffer memory batch monitoring screen of GX Developer.

See Page 365, Section 16.2 (2) (g) for the data configuration of the monitor data area.

Ex. The following data are sent from CH1 using non procedure protocol.
Transmitted data; "ABCDEFGH" + 0D0AH (five-word)

Buffer memory batch monitor-1				

Module start address: 00 (Hex)

Buffer memory address: 2600　○ DEC　⦿ HEX

Monitor format: ⦿ Bit & Word　Display: ⦿ 16bit integer　Value: ○ DEC
　　　　　　　 ○ Bit　　　　　　 ○ 32bit integer　　　　　 ⦿ HEX
　　　　　　　 ○ Word　　　　　 ○ Real number
　　　　　　　　　　　　　　　 ○ ASCII character

Start monitor | Stop monitor | Option setup | Device test | Close

Address	+F E D C	+B A 9 8	+7 6 5 4	+3 2 1 0	
2600	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
2601	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 1	000B
2602	0 0 1 0	0 0 1 1	0 0 0 0	0 0 1 1	2303
2603	0 0 0 1	0 0 1 1	0 1 0 0	0 0 0 1	1341
2604	0 0 0 1	0 0 1 1	0 1 0 0	0 0 1 0	1342
2605	0 0 0 1	0 0 1 1	0 1 0 0	0 0 1 1	1343
2606	0 0 0 1	0 0 1 1	0 1 0 0	0 1 0 0	1344
2607	0 0 0 1	0 0 1 1	0 1 0 0	0 1 0 1	1345
2608	0 0 0 1	0 0 1 1	0 1 0 0	0 1 1 0	1346
2609	0 0 0 1	0 0 1 1	0 1 0 0	0 1 1 1	1347
260A	0 0 0 1	0 0 1 1	0 1 0 0	1 0 0 0	1348
260B	0 0 0 1	0 0 1 1	0 0 0 0	1 1 0 1	130D
260C	0 0 0 1	0 0 1 1	0 0 0 0	1 0 1 0	130A
260D	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
260E	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
260F	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
2610	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
2611	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000
2612	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0000

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
0	0	0	1	0	0	1	1	0	1	0	0	0	0	0	1	When transmitting data

* System area　　*　CD　CS　DR　　　Data transmission
　　　　　　　　　 (DCD)(CTS)(DSR)

CHAPTER 17 DEDICATED INSTRUCTIONS

Dedicated instructions are used to simplify programming when using the intelligent functional module functions.

Among the dedicated instructions for the QJ71C24N(-R2/R4) and QJ71C24(-R2) explained in this manual, this chapter focuses on the instructions that can be used for QCPU.

There are restrictions on the function version and the serial number of the QJ71C24N(-R2/R4) and QJ71C24(-R2) that can use the dedicated instructions.

For details, refer to the Q Corresponding Serial Communication Module User's Manual (Basic).

17.1 Dedicated Instruction List and Available Devices

(1) Dedicated instruction list

The following table lists the dedicated instructions explained in this chapter.

Application	Dedicated instruction	Functional description	Reference section
Data transmission/reception	BUFRCVS[1]	Receives data by an interrupt program during data communication via the non procedure protocol or bidirectional protocol.	Page 371, Section 17.2
	PRR[1]	Employs user frames to perform data communication via the non procedure protocol according to the contents defined in the transmission user frame designation area.	Page 393, Section 17.6
Setting the units of communication data count	CSET	Sets the units (word/byte) of transmission/reception data count.	Page 384, Section 17.4
The programmable controller CPU monitoring function		Registers/cancels programmable controller CPU monitoring in order to use the programmable controller CPU monitoring functions.	Page 375, Section 17.3
Registration/reading of user frames to Flash ROM	PUTE	Registers a user frame.	Page 398, Section 17.7
	GETE	Reads a user frame.	Page 389, Section 17.5
Mode switching	UINI	Changes the mode, transmission specifications and host station No. of the Q series C24.	Page 402, Section 17.8

Point

The user should not change data (control data, request data, etc.) designated by a dedicated instruction until the execution of that instruction is completed.

*1 To change the following values preset in the buffer memory for use of dedicated instructions, use GX Configurator-SC or execute the CSET instruction (Initial setting) before starting data exchange. (☞ Page 384, Section 17.4)
  • Word/byte units designation (address: 96H/136H)
  • Transmission buffer memory head address designation (address: A2H/142H)
  • Transmission buffer memory length designation (address: A3H/143H)
  • Receive buffer memory head address designation (address: A6H/146H)
  • Receive buffer memory length designation (address: A7H/147H)
The dedicated instructions are executed based on the values preset in the buffer memory at module startup or those that have been changed by the CSET instruction (Initial setting).

(2) Available devices

The following devices are available for the dedicated instructions:

Internal devices		File register	Constant[*2]
Bit[*1]	Word		
X, Y, M, L, F, V, B	T, ST, C, D, W	R, ZR	K, H

*1 Word device bit designation can be used as bit data. Word device bit designation is done by designating [Word device.Bit No.]
(Designation of bit numbers is done in hexadecimal.)
For example, bit 10 of D0 is designated as [D0.A].
However, there can be no bit designation for timers (T), retentive timers (ST) and counters (C).

*2 Available devices are given in each of the Constant field.

17.2 Z.BUFRCVS

This instruction is used to receive data by an interrupt program through non procedure or bidirectional protocol communication.

Setting data	Applicable device							
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S)	—	○		—				○	—
(D)	○	○		—					

[Instruction code]   [Executing condition]   [Instruction format]

Z.BUFRCVS

	Z.BUFRCVS	"Un"	(S)	(D)	

*1

*1   If the host station is a Basic model QCPU (function version B or later), Universal model QCPU, or LCPU, " " (double quotation) of the first argument can be omitted.

17.2.1 Setting data

Setting data	Description	Setting range	Set by	Data type
"Un"/Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	0 to FEH	User	String/BIN-16 bit
(S)	Reception channel number 1: Channel 1 (CH1 side) 2: Channel 2 (CH2 side)	1, 2	User	Device name
(D)	Head number of the devices that store receive data * Receive data is read from the reception area of the buffer memory.	—	System	

The file registers of each of the local device and the program cannot be used as the setting data.

17.2.2 Receive data

Device	Item	Setting data	Setting range	Set by
(D)+0	Receive data length	Stores the number of data read from the receive data count storage area. *1(0 or higher).	—	System
(D)+1 ⋮ (D)+n	Receive data	Stores data read from the receive data count storage area in sequence, starting from the lowest-numbered address.	—	System

*1   According to the "Word/byte units designation" by GX Configurator-SC, the number of bytes is stored when byte is designated and the number of words is stored when word is designated.

Remark ●

● For information about errors caused by incorrect data designated by the user, refer to "Errors" described later. When a reception error occurs, the error code can be read from the data reception result storage area (address: 258H/268H) in the buffer memory.

● The "Set by" column indicates the following:
  • User: Data set by the user before executing the dedicated instruction.
  • System: The programmable controller CPU stores execution results of the dedicated instruction.

● ●

17.2.3 Functions

(1) This instruction stores data received from an external device to a designated device.

(2) This instruction can identify the address of the reception area in the buffer memory and read relevant receive data.

(3) When this instruction is executed, reception is completed and the reception data read request signal (X3/XA) or the reception abnormal detection signal (X4/XB) is turned off automatically.

It is not necessary to turn on the reception data read completion signal (Y1/Y8) when receive data is read by this instruction.

(4) The BUFRCVS instruction is used by an interrupt program and its processing is completed in one scan.

[Operation when the BUFRCVS instruction is being executed]
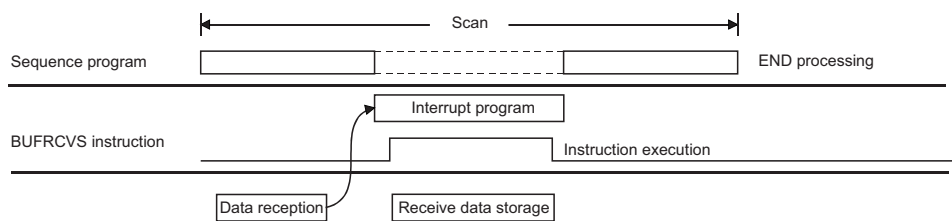
17.2.4 Errors

(1) When the dedicated instruction is completed abnormally, the error flag (SM0) turns on and the error code is stored in SD0.

See the following manuals regarding the error code, and check the errors and take corrective actions.
<Error codes>
4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used
7000H or higher: 📖User's Manual (Basic)

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17.2.5 Precaution when using the BUFRCVS instruction

(1) Use the BUFRCVS instruction when receiving data via an interrupt program.

(2) Simultaneous execution of dedicated instructions

The following table lists the handling for when executing another instruction during execution of the BUFRCVS instruction or executing the BUFRCVS instruction during execution of another instruction in the same channel.

Instruction[1]	Availability of simultaneous execution	Handling of simultaneous execution
OUTPUT	○	—
PRR		
INPUT	×	INPUT instruction and BUFRCVS instruction cannot be used at the same time. (However, simultaneous execution is available when channels to be used are not the same.)
BIDOUT	○	—
BIDIN	×	BIDIN instruction and BUFRCVS instruction cannot be used at the same time. (However, simultaneous execution is available when channels to be used are not the same.)
CSET	○	—
PUTE		
GETE		
BUFRCVS		
SPBUSY		
UINI		

○: Available, ×: Not available

[1] Because the dedicated instructions listed below use a different communication protocol from that for the BUFRCVS instruction, they are not used in the same channel.
- ONDEMAND
- CPRTCL

(3) The device storing data received via the BUFRCVS instruction must have an area that is large enough to store the maximum size of data received from the external device.

If an area large enough to store the maximum size of data received from the external device is not secured, the data following the storage device will be overwritten.

17.2.6 Program example

An interrupt program that reads receive data.

(Setting)

    • Interrupt pointer setting with GX Developer

Item	Description
PLC side:	Interrupt pointer Start No. = 50, Interrupt pointer No. of module = 2 (fixed) • CH1 side interrupt pointer = I50, CH2 side interrupt pointer = I51
Intelli. module side:	Start I/O No. = 0, Start SI No. = 0 (fixed)

    • Interrupt program start enable/disable setting with GX Configurator-SC

      • CH1 side: Issues interrupt (performs communication via the non procedure protocol.)

      • CH2 side: Does not issue interrupt

When the input/output signals of the Q series C24 are X/Y00 to X/Y1F
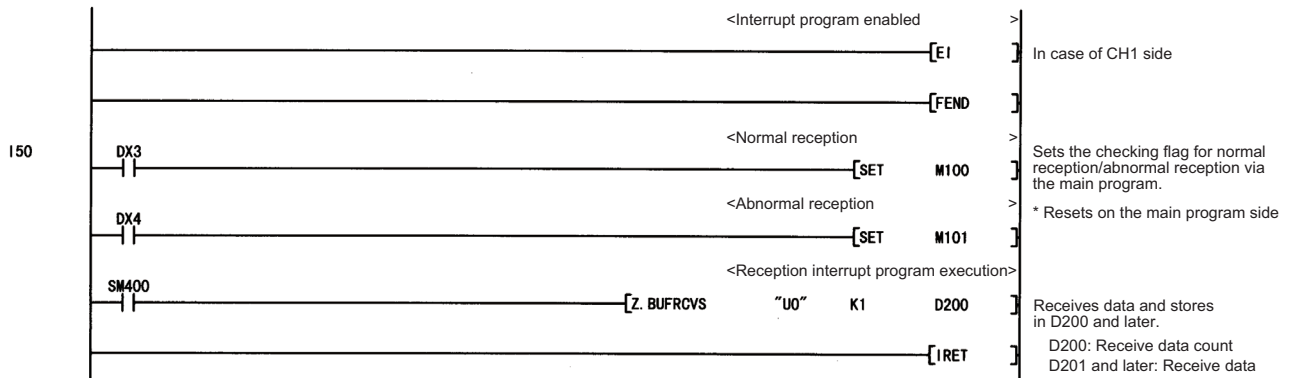
17.3 ZP.CSET (Programmable Controller CPU Monitoring Register/Cancel)

With this instruction, monitoring of the programmable controller CPU can be registered or cancelled.

Setting data	Applicable device								
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	—	○		—				○	—
(S2)	—	○		—					
(D1)	—	○		—					
(D2)	○	○		—					

[Instruction code]   [Executing condition]   [Instruction format]

ZP.CSET

| ZP.CSET | "Un" | (S1) | (S2) | (D1) | (D2) |
| | *1 | | | | |

*1   If the host station is a Basic model QCPU (function version B or later), Universal model QCPU, or LCPU, " " (double quotation) of the first argument can be omitted.

17.3.1 Setting data

Setting data	Description	Set by	Data type
"Un"/Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	String/BIN-16 bit
(S1)	Channel No. for sending the monitoring result 1: Channel 1 (CH1 side) 2: Channel 2 (CH2 side)	User	BIN-16 bit
(S2)	Head number of the devices that store control data	User, System	Device name
(D1)	Dummy	—	Device name
(D2)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D2)+1 also turns ON if the instruction execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

17.3.2   Control data

(1) Registering the programmable controller CPU monitoring

Device	Item		Setting data	Setting range	Set by
(S2)+0	Execution type		Designate 0.	0	User
(S2)+1	Completion status		Stores the result of execution upon completion of an instruction. 0: Normal Other than 0: Error code	—	System
(S2)+2	Request type		Designate the request content. 2: Registers programmable controller CPU monitoring.	2	User
(S2)+3	Cycle time units		Designate the unit of cycle time. 0: 100ms 1: s 2: min	0 to 2	
(S2)+4	Cycle time		Designate the cycle time. 1H to FFFFH: Cycle time	1H to FFFFH	
(S2)+5	Programmable controller CPU monitoring function		Designate the monitoring function. 1: Constant cycle transmission 2: Condition agreement transmission	1, 2	
(S2)+6	Programmable controller CPU monitoring transmission measure		Designate the transmission measure. 0: Data transmission (device data, CPU abnormal information) 1: Notification[1]	0, 1	
(S2)+7	Constant cycle transmission	User frame output head pointer	Designate the head pointer of the table setting the user frame numbers for constant cycle transmission. 0: No designation (at condition agreement transmission and notification[1]) 1 to 100: Head pointer	0, 1 to 100	User
(S2)+8		User frame transmission count	Designate the user frame transmission (output) counts for constant cycle transmission. 0: No designation (at condition agreement transmission and notification[1]) 1 to 100: Transmission count	0, 1 to 100	
(S2)+9		Modem connection data No.	Designate the data No. for connecting the modem function when sending notifications in constant cycle transmission.[2] 0: No designation (at data transmission and condition agreement transmission) BB8H to BD5H: Data No. for connection (flash ROM) 8001H to 801FH: Data No. for connection (buffer memory)	0, BB8H to BD5H, 8001H to 801FH	
(S2)+10	Registered word blocks count		Designate the number of blocks of a word device to be monitored.	0 to 10	
(S2)+11	Registered bit blocks count		Designate the number of blocks of a bit device to be monitored.	0 to 10	
(S2)+12	Programmable controller CPU abnormal monitoring (Programmable controller CPU status monitoring)		Designate whether or not to execute abnormal monitoring for the programmable controller CPU. 0: Do not monitor. 1: Monitor.	0, 1	
(S2)+13	Programmable controller CPU monitoring setting	Device code	Designate the code of a device to be monitored. 0: Do not monitor device. Other than 0: Device code.	☞ Page 38, Section 2.2.2 (4)	

Device	Item			Setting data	Setting range	Set by
(S2)+14	1st (first block)		Monitoring head device	Designate the head number of the monitoring device in this block.	0 or more	User
(S2)+15						
(S2)+16			Registration points	Designate the registration points (read points) for this block. 0: Do not monitor device. 0: Do not monitor device. • For a bit device, designate the points in word units.	0, 1 or more	
(S2)+17		Condition agreement transmission	Monitoring condition	Designate the monitoring condition for this block. 0: No designation (at constant cycle transmission) 1 or more: Monitoring condition	☞ Page 37, Section 2.2.2 (2)	
(S2)+18			Monitoring condition value	Designate the monitoring condition value for this block. 0 or more: Monitoring condition • Designate 0 for constant cycle transmission.		
(S2)+19			User frame output head pointer	Designate the head pointer of the table designating the user frame number for condition agreement transmission for this block. 0: No designation (at constant cycle transmission and notification^{*1}) 1 to 100: Head pointer	0, 1 to 100	
(S2)+20			User frame transmission count	Designate the user frame transmission (output) count in condition agreement transmission for this block. 0: No designation (at constant cycle transmission and notification^{*1}) 1 to 100: Transmission count	0, 1 to 100	
(S2)+21			Modem connection data No.	Designate the data No. for connecting the modem function when sending notifications in condition agreement transmission for this block.^{*3} 0: No designation (at data transmission and constant cycle transmission) BB8H to BD5H: Data No. for connection (flash ROM) 8001H to 801FH: Data No. for connection (buffer memory)	0, BB8H to BD5H, 8001H to 801FH	
(S2)+22 to (S2)+102	Programmable controller CPU monitoring setting 2nd to 10th (2nd to 10th block)			The same arrangement as the first programmable controller CPU monitoring setting item.	—	
(S2)+103	CPU status monitoring setting (Abnormal monitoring) 11th (11th block)	Condition agreement transmission	Fixed value	Designate the fixed value when the CPU status monitoring is performed.	1	
(S2)+104					0	
(S2)+105					0	
(S2)+106					1	
(S2)+107					5	
(S2)+108					1	
(S2)+109			User frame output head pointer	Designate the head pointer of the table designating the user frame number for condition agreement transmission for this block. 0: No designation (at constant cycle transmission and notification^{*1}) 1 to 100: Head pointer	0, 1 to 100	
(S2)+110			User frame transmission count	Designate the user frame transmission (output) count in condition agreement transmission for this block. 0: No designation (at constant cycle transmission and notification^{*1}) 1 to 100: Transmission count	0, 1 to 100	
(S2)+111			Modem connection data No.	Designate the data No. for connecting the modem function when sending notifications in condition agreement transmission for this block.^{*3} 0: No designation (at data transmission and constant cycle transmission) BB8H to BD5H: Data No. for connection (flash ROM) 8001H to 801FH: Data No. for connection (buffer memory)	0, BB8H to BD5H, 8001H to 801FH	

*1   For the LJ71C24(-R2), notification function cannot be used.
*2   For the LJ71C24(-R2), use the modem function to designate the data No. for connecting when executing the constant cycle transmission.
*3   For the LJ71C24(-R2), use this block to designate the data No. for connecting when executing the condition agreement transmission.

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17.3 ZP.CSET (Programmable Controller CPU Monitoring Register/Cancel)

(2) Canceling the programmable controller CPU monitoring

Device	Item	Setting data	Setting range	Set by
(S2)+0	Execution type	Designate 0H.	0	User
(S2)+1	Completion status	Stores the result of execution upon completion of an instruction. 0: Normal Other than 0: Error code	—	System
(S2)+2	Request type	Designate the request content. 3: Cancels the programmable controller CPU monitoring.	3	User
(S2)+3 ⋮ (S2)+111	For system	Use prohibited (including for any other purposes such as for programs)	—	System

Remark ●

● For information about errors caused by incorrect data designated by the user, see the description in "Errors".

● The "Set by" column indicates the following:
  • User: Data set by the user before executing the dedicated instruction.
  • System: The programmable controller CPU stores execution results of the dedicated instruction.

● ●

17.3.3   Functions

(1) To register the programmable controller CPU monitoring, this instruction registers data necessary for the Q series C24 to execute the programmable controller CPU monitoring function.

When the data registration to execute the programmable controller CPU monitoring function is completed normally, the Q series C24 begins monitoring the programmable controller CPU and transmitting monitoring results to an external device.

(2) To cancel the programmable controller CPU monitoring, this instruction ends the Q series C24's monitoring operation of the programmable controller CPU.

When canceling of the programmable controller CPU monitoring is completed normally, the Q series C24 terminates the operation of the programmable controller CPU monitoring function.

(3) A maximum of 10 blocks can be designated for a word device or bit device to monitor the device memory.

To register the device memory to monitor, designate the word device blocks for the registered word blocks, then designate the bit device blocks for the registered bit blocks.

(4) Before sending the programmable controller CPU monitoring results to the external device, the user frame and user frame number should be registered with GX Configurator-SC in advance.

(5) To register the programmable controller CPU monitoring once again, cancel the programmable controller CPU monitoring before registration.

(6) Whether the CSET instruction is being executed or has been completed normally/abnormally can be checked by the completion device (D2) designated as a setting data.

  (a) Completion device ((D2) + 0)

    Turns on at the END processing of the scan where the CSET instruction is completed, and turns off at the next END processing.

  (b) Completion device ((D2) + 1)

    Turns on and off depending on the completion status of the CSET instruction.
    • Normal completion: Stays off and does not change.
    • Abnormal completion: Turns on at the END processing of the scan where the CSET instruction is completed, and turns off at the next END processing.

(7) When the programmable controller CPU monitoring registration is performed, the corresponding interface data communication protocol setting is only designated when non procedure protocol is used for the following data for designation in the control data.

- User frame output head pointer for constant cycle sending/ batch conditions sending.
- User frame transmission count for constant cycle sending/ batch conditions sending.

When the communication protocol setting for the corresponding interface is MC protocol, there is no need to designate the user frame output head pointer and the user frame transmission count.
(It is ignored when being designated.)

(8) Simultaneous execution of dedicated instructions

The following table lists the handling for when executing another instruction during execution of the CSET instruction or executing the CSET instruction during execution of another instruction in the same channel.

Instruction[1]	Availability of simultaneous execution	Handling of simultaneous execution
ONDEMAND OUTPUT PRR	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later. (However, simultaneous execution is available when channels to be used are not the same.)
INPUT	(the right column)	[When instructions are executed in order of INPUT → CSET] • Dedicated instructions simultaneous execution error (7FF0H) occurs in the CSET instruction. (However, simultaneous execution is available when channels to be used are not the same.) [When instructions are executed in order of CSET → INPUT] • Simultaneous execution is available.
CSET	×	• The next instruction will be ignored until the active instruction has been completed. (However, simultaneous execution is available when channels to be used are not the same.)
PUTE GETE BUFRCVS SPBUSY	○	—
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.

○: Available, ×: Not available

*1 Because the dedicated instructions listed below use a different communication protocol from that for the CSET instruction (programmable controller CPU Monitoring Register/Cancel), they are not used in the same channel.
- BIDOUT, BIDIN
- CPRTCL
If the dedicated instructions above are used in the same channel with the CSET instruction, the communication protocol setting error (7FF2H) occurs.

[Operation when a CSET instruction is being executed]
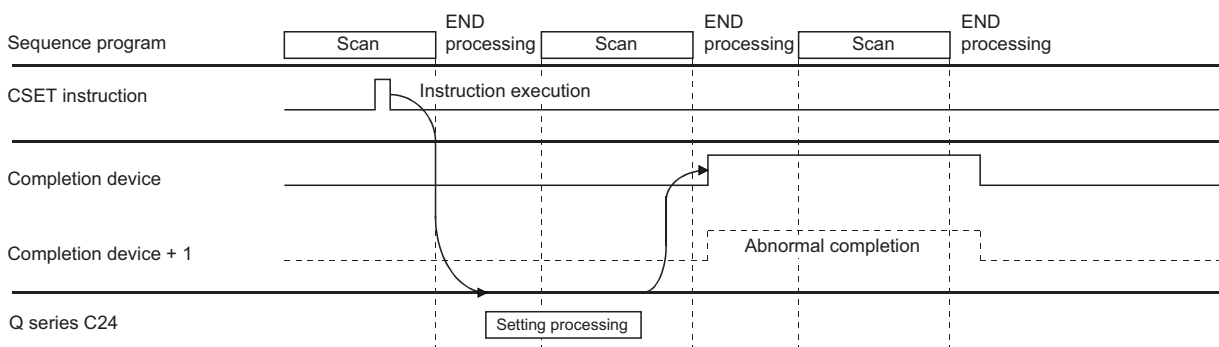
17.3.4 Errors

(1) When the dedicated instruction is completed abnormally, the error flag (SM0) turns on and the error code is stored in SD0.

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

(2) The programmable controller CPU monitoring setting (control data (S2) + 13 to (S2) + 102) is not checked when the CSET instruction is executed, but when the designated cycle time elapses.

In the case the monitoring data registered from the Q series C24 is not sent after the CSET instruction is completed normally and the designated cycle time elapses, check the programmable controller CPU monitoring function execution result (buffer memory 2205H/2305H) to check the errors, and take corrective actions.

17.3.5 Program example

(1) A program that registers the programmable controller CPU monitoring

The following example shows how to register the programmable controller CPU monitoring and send the monitoring results from the interface on the CH1 side.[1]

[1] The following registration is done to send the contents of M0 to M15 and D100 to D109 to the external device on a constant cycle (cycle time is 3 min).

When the input/output signals of the Q series C24 are X/Y00 to X/Y1F

Ladder instruction			Description
X24	[PLS	M30]	Converts registration command to pulses
M30 M35	[MOV K0	D0]	Sets execution type
	[MOV K2	D2]	Sets request type (programmable controller CPU monitoring registration)
	[MOV K2	D3]	Sets cycle time unit to minutes
	[MOV K3	D4]	Sets cycle time to 3 (minutes)
	[MOV K1	D5]	Sets the monitoring function to constant cycle transmission
	[MOV K0	D6]	Sets the means of transmission to data transmission
	[MOV K1	D7]	Sets the output head pointer
	[MOV K2	D8]	Sets the transmission count of the user frame
	[SET	M31]	Sets data set complete flag -1
M31	[MOV K1	D10]	Sets the number of registered word blocks to 1
	[MOV K1	D11]	Sets the number of registered bit blocks to 1
	[MOV H0A8	D13]	Registers the devices for D100 to D109 as the first block
	[MOV K100	D14]	
	[MOV K0	D15]	
	[MOV K10	D16]	
	[MOV H90	D22]	Registers the devices for M0 to M15 as the second block
	[MOV K0	D23]	
	[MOV K0	D24]	
	[MOV K1	D25]	
	[SET	M32]	Sets data setting complete flag -2
	[RST	M31]	
M32	[ZP. CSET "U0" K1 D0 D200	M0]	Executes programmable controller CPU monitoring registration
M0 M1	[SET	M35]	Normal completion
M1	[SET	M36]	Abnormal completion
	[RST	M32]	

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(2) A program that cancels the programmable controller CPU monitoring

This following example shows how to cancel the programmable controller CPU monitoring for the interface on CH1 side.

When the input/output signals of the Q series C24 are X/Y00 to X/Y1F
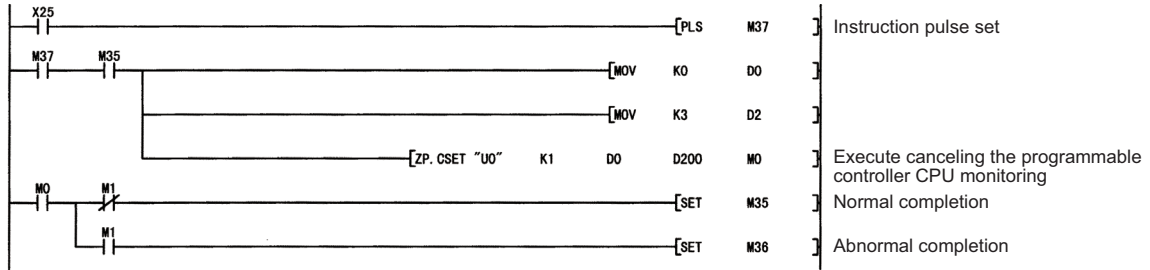
17.4 ZP.CSET (Initial Settings)

With this instruction, the unit of transmission/reception data (word/byte) and data communication areas can be set.

Setting data	Applicable device							
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	—	○		—				○	—
(S2)	—	○		—					
(D1)	—	○		—					
(D2)	○	○		—					

[Instruction code]	[Executing condition]	[Instruction format]
ZP.CSET	↑	ZP.CSET │ "Un" │ (S1) │ (S2) │ (D1) │ (D2) *1

*1   If the host station is a Basic model QCPU (function version B or later), Universal model QCPU, or LCPU, " " (double quotation) of the first argument can be omitted.

17.4.1 Setting data

Setting data	Description	Set by	Data type
"Un"/Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	String/BIN-16 bit
(S1)	Channel No. for sending the monitoring result 1: Channel 1 (CH1 side) 2: Channel 2 (CH2 side)	User	BIN-16 bit
(S2)	Head number of the devices that store control data	User, System	Device name
(D1)	Dummy	—	Device name
(D2)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D2)+1 also turns ON if the instruction execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

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17.4.2 Control data

Device	Item	Setting data	Setting range	Set by
(S2)+0	Execution type	Designate 0.	0	User
(S2)+1	Completion status	Stores the result of execution upon completion of an instruction. 0: Normal Other than 0: Error code	—	System
(S2)+2	Request type	Designate the request content. 1: Setting of word/byte units and buffer memory assignment change	1	User
(S2)+3	Word/byte units designation	Designate the units of transmission/reception data count. 0: Current setting value 1: Word units 2: Byte units	0, 1, 2	
(S2)+4	On-demand function buffer memory head address	Designate the head address of the buffer memory used with the on-demand function. 0H: Use the current setting value 400H to 1AFFH, 2600H to 3FFFH: Head address	0H, 400H to 1AFFH, 2600H to 3FFFH	User
(S2)+5	On-demand function buffer memory size	Designate the size (word number) of the buffer memory used with the on-demand function. 0H: Use the current setting value 1H to 1A00H: Size	0H, 1H to 1A00H	
(S2)+6	Transmission area head address	Designate the head address of the transmission area used with the non procedure /bidirectional protocol. 0H: Use the current setting value 400H to 1AFFH, 2600H to 3FFFH: Head address	0H, 400H to 1AFFH, 2600H to 3FFFH	
(S2)+7	Transmission area size	Designate the size (word number) of the transmission area used with the non procedure /bidirectional protocol. 0H: Use the current setting value 1H to 1A00H: Size • The head transmission area (1 word) is used as a transmission data count designation area.	0H, 1H to 1A00H	User
(S2)+8	Reception area head address	Designate the head address of the reception area used with the non procedure /bidirectional protocol. 0H: Use the current setting value 400H to 1AFFH, 2600H to 3FFFH: Head address	0H, 400H to 1AFFH, 2600H to 3FFFH	
(S2)+9	Reception area size	Designate the size (word number) of the reception area used with the non procedure /bidirectional protocol. 0H: Use the current setting value 1H to 1A00H: Size • The head reception area (1 word) is used as a reception data count storage area.	0H, 1H to 1A00H	
(S2)+10 ⋮ (S2)+111	For system	Use prohibited (including for any other purposes such as for programs)	—	System

Remark •

● For information about errors caused by incorrect designated by the user, refer to "Errors" described later in this section.

● The "Set by" column indicates the following:
   • User: Data set by the user before executing the dedicated instruction.
   • System: The programmable controller CPU stores execution results of the dedicated instruction.

• •

17.4 ZP.CSET (Initial Settings)

17.4.3 Functions

(1) This instruction changes the current values of the settings below to transmit/receive data using the following communication protocols:

- Data count unit (word/byte) of the data to be transmitted/received
- Transmission area in the buffer memory used by the on-demand function of the MC protocol
- Transmission and reception areas in the buffer memory used with the non-procedure protocol
- Transmission and reception areas in the buffer memory used with the bidirectional protocol

(2) To change the above setting values from the programmable controller CPU, execute the CSET instruction.

The CSET instruction must be executed before starting any data communication (execute it before the first scan). Once data communication begins, the CSET instructions cannot be executed (the setting values cannot be changed).

More than one CSET instruction cannot be executed simultaneously to perform the initial settings.

(3) Simultaneous execution of dedicated instructions

The following table shows the handling for when executing another instruction during execution of the CSET instruction or executing the CSET instruction during execution of another instruction in the same channel.

Instruction	Availability of simultaneous execution	Handling of simultaneous execution
ONDEMAND	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later. (However, simultaneous execution is available when channels to be used are not the same.)
OUTPUT		
PRR		
BIDOUT		
BIDIN		
INPUT	(the right column)	[When instructions are executed in order of INPUT → CSET] • Dedicated instructions simultaneous execution error (7FF0H) occurs in the CSET instruction. (However, simultaneous execution is available when channels to be used are not the same.) [When instructions are executed in order of CSET → INPUT] • Simultaneous execution is available.
CSET	×	• The next instruction will be ignored until the active instruction has been completed. (However, simultaneous execution is available when channels to be used are not the same.)
PUTE	○	—
GETE		
BUFRCVS		
SPBUSY		
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.

○: Available, ×: Not available

(4) Whether the CSET instruction is being executed or has been completed normally/abnormally can be checked by the completion device (D2) designated as a setting data.

(a) Completion device ((D2) + 0)

Turns on at the END processing of the scan where the CSET instruction is completed, and turns off at the next END processing.

(b) Completion device ((D2) + 1)

Turns on and off depending on the completion status of the CSET instruction.

- Normal completion: Stays off and does not change.
- Abnormal completion: Turns on at the END processing of the scan where the CSET instruction is completed, and turns off at the next END processing.

[Operation when the CSET instruction is being executed]
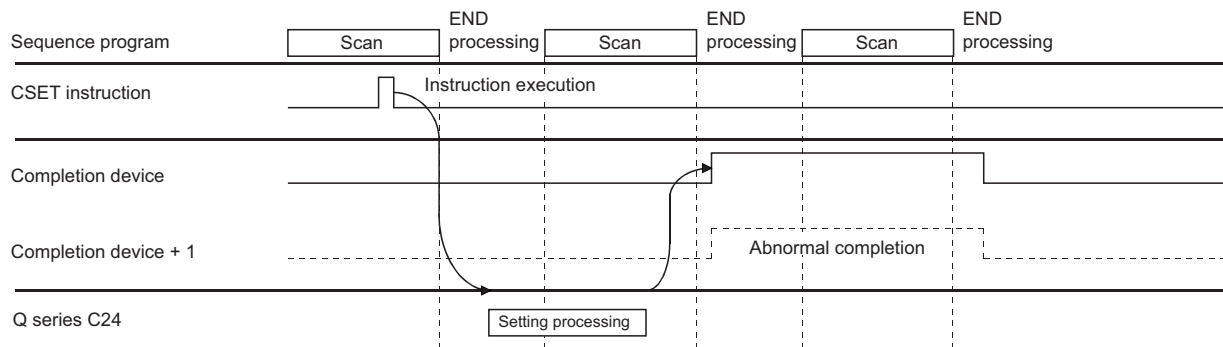
17.4.4　Errors

When the dedicated instruction is completed abnormally, the error flag (SM0) turns on and the error code is stored in SD0.

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

17.4.5　Program example

A program that changes the transmission buffer area for interface on CH1 side

- Set the transmission buffer to C00H to FFFH.
- Set the reception buffer to 600H to 7FFH.

When the input/output signals of the Q series C24 are X/Y00 to X/Y1F
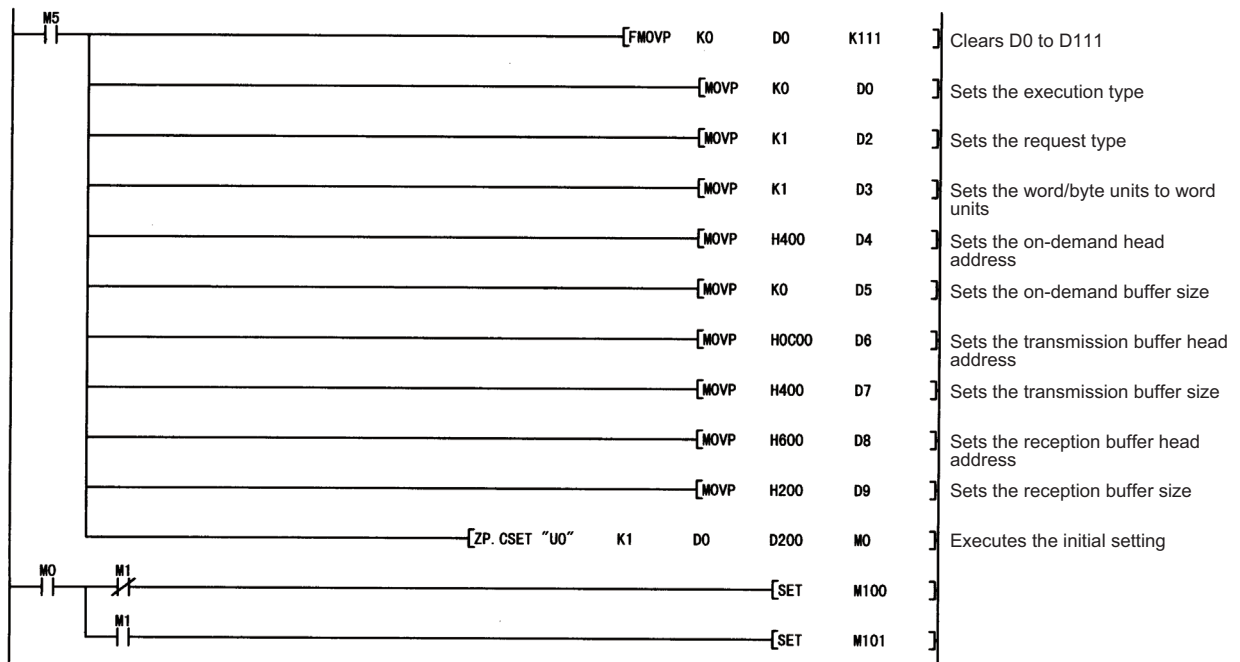
17.5 G(P).GETE

This instruction reads out a user frame.

Setting data	Applicable device							
	Internal device		File register	Link direct device J☐\☐		Intelligent function module device U☐\G☐	Index register Zn	Constant	Others
	Bit	Word		Bit	Word				
(S1)	—	○				—			
(S2)	—	○				—			
(D)	○	○				—			

[Instruction code] [Executing condition]

G.GETE ⊓ ─┤├─ Command ─┤├─ | G.GETE | Un | (S1) | (S2) | (D) |

GP.GETE ↑ ─┤├─ Command ─┤├─ | GP.GETE | Un | (S1) | (S2) | (D) |

17.5.1 Setting data

Setting data	Description	Set by	Data type
Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	BIN-16 bit
(S1)	Head number of the devices that store control data	User, System	Device name
(S2)	Head number of the devices storing the registered data that has been read		Device name
(D)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D)+1 also turns on if the execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

17.5.2 Control data

Device	Item	Setting data	Setting range	Set by
(S1)+0	Dummy	—	0	—
(S1)+1	Read result	The result of reading via the GETE instruction is stored. 0: Normal Other than 0: Error code	—	System
(S1)+2	Directed frame No.	Designate the user frame No.	1000 to 1199	User
(S1)+3	Allowable number of read bytes	Designate the maximum bytes of the user frame's registered data that can be stored in (S2).	1 to 80	User
	Registered bytes count	The number of bytes of the user frame's registered data that has been read is stored. 1 to 80: Number of bytes of registered data	—	System

Remark •

● For information about errors caused by incorrect data designated by the user, see Page 392, Section 17.5.4.

● The "Set by" column indicates the following:
   • User: Data set by the user before executing the dedicated instruction.
   • System: The programmable controller CPU stores execution results of the dedicated instruction.

• •

17.5.3 Functions

(1) This instruction reads data from the user frame in the Q series C24 as designated by Un.
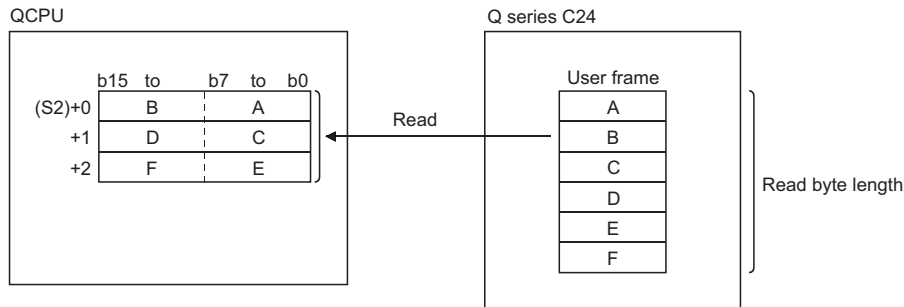
(2) Simultaneous execution of dedicated instructions

The following table lists the handling for when executing another instruction during execution of the GETE instruction or executing the GETE instruction during execution of another instruction in the same channel.

Instruction	Availability of simultaneous execution	Handling of simultaneous execution
ONDEMAND	○	—
OUTPUT		
PRR		
INPUT		
BIDOUT		
BIDIN		
CSET		
PUTE	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.
GETE	×	• The next instruction will be ignored until the active instruction has been completed.
BUFRCVS	○	—
SPBUSY		
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.
CPRTCL	○	—

○: Available, ×: Not available

(3) Whether the GETE instruction was completed normally/abnormally can be checked by the completion device (D) or status display device at completion ((D)+1).

(a) Completion device

Turns on at the END processing of the scan where the GETE instruction is completed, and turns off at the next END processing.

(b) Status display device at completion

Turns on and off depending on the completion status of the GETE instruction.
- Normal completion: Stays off and does not change.
- Abnormal completion: Turns on at the END processing of the scan where the GETE instruction is completed, and turns off at the next END processing.

[Operation when the GETE instruction is being executed]
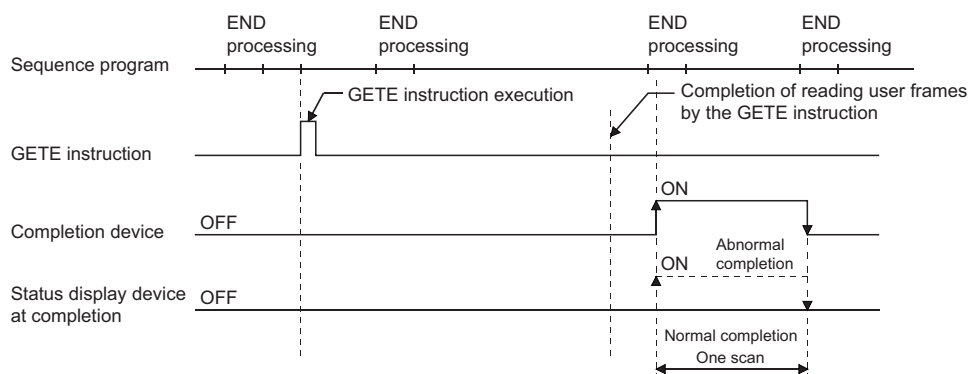
17.5.4 Errors

When the dedicated instruction is completed with an error, the complete status display device at completion ((D)+1), turns on and the error code is stored in the control data read result ((S1)+1).

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

17.5.5 Program example

A program that reads registered data of the user frame having registration number 3E8H to devices D4 and later

When the input/output signals of the Q series C24 are X/Y80 to X/Y9F
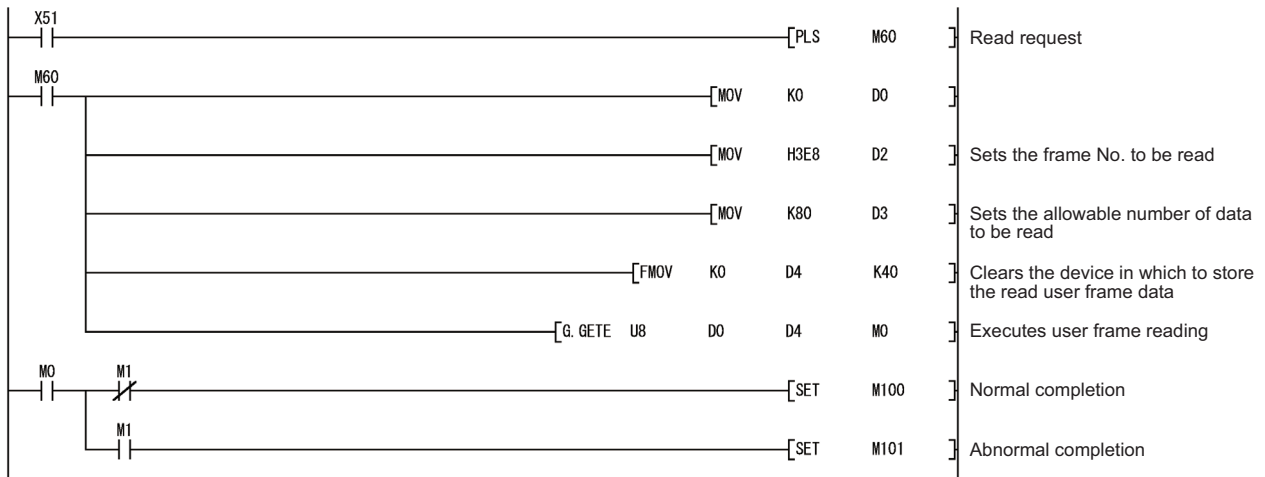
17.6 G(P).PRR

In non procedure protocol communication, this instruction transmits data using a user frame according to the data specified in the transmission user frame designation area.

Setting data	Applicable device								
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant	Others
	Bit	Word		Bit	Word				
(S)	—	○				—			
(D)	○	○				—			

[Instruction code]   [Executing condition]

G.PRR

```
        ┌─┐         Command
────────┘ └─────    ──┤├──      [ G.PRR | Un | (S) | (D) ]
```

GP.PRR

```
        ┌          Command
─────────┤     ─    ──┤├──      [ GP.PRR | Un | (S) | (D) ]
```

17.6.1 Setting data

Setting data	Description	Set by	Data type
Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	BIN-16 bit
(S)	Head number of the devices that store control data	User, System	Device name
(D)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D)+1 also turns on if the execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

17.6.2 Control data

Device	Item	Setting data	Setting range	Set by
(S)+0	Transmission channel	Designate the transmission channel. 1: Channel 1 (CH1 side) 2: Channel 2 (CH2 side)	1, 2	User
(S)+1	Transmission result	The transmission completion result by the PRR instruction is stored. 0: Normal Other than 0: Error code	—	System
(S)+2	CR/LF addition designation	Designate whether or not to add CR/LF to the transmission data. 0: Do not add CR/LF. 1: Add CR/LF.	0, 1	User
(S)+3	Transmission pointer	Transmission user frame designation area designates from which the frame number data may be transmitted.	1 to 100	User
(S)+4	Output count	Designate the number of user frames to be transmitted.	1 to 100	User

Remark •

● For information about errors caused by incorrect data designated by the user, see Page 396, Section 17.6.4.

● The "Set by" column indicates the following:
  • User: Data set by the user before executing the dedicated instruction.
  • System: The programmable controller CPU stores execution results of the dedicated instruction.

• •

17.6.3 Functions

(1) This instruction transmits the user frame data using the non procedure protocol of the Q series C24 as designated by Un, according to the control data stored in the device designated by (S) and succeeding devices, as well as the transmission user frame designation area of the Q series C24.

(2) Simultaneous execution of dedicated instructions

The following table lists the handling for when executing another instruction during execution of the PRR instruction or executing the PRR instruction during execution of another instruction in the same channel.

Instruction[1]	Availability of simultaneous execution	Handling of simultaneous execution
PRR	×	• The next instruction will be ignored until the active instruction has been completed. (However, simultaneous execution is available when channels to be used are not the same.)
INPUT	○	—
OUTPUT	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later. (However, simultaneous execution is available when channels to be used are not the same.)
CSET		
PUTE	○	—
GETE		
BUFRCVS		
SPBUSY		
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.

○: Available, ×: Not available

[1] Because the dedicated instructions listed below use a different communication protocol from that for the PRR instruction, they are not used in the same channel.
- ONDEMAND, BIDOUT, BIDIN
- CPRTCL

If the dedicated instructions above are used in the same channel with the PRR instruction, the communication protocol setting error (7FF2H) occurs.

(3) Whether the PRR instruction was completed normally or abnormally can be checked with the completion device (D) or status display device at completion ((D)+1).
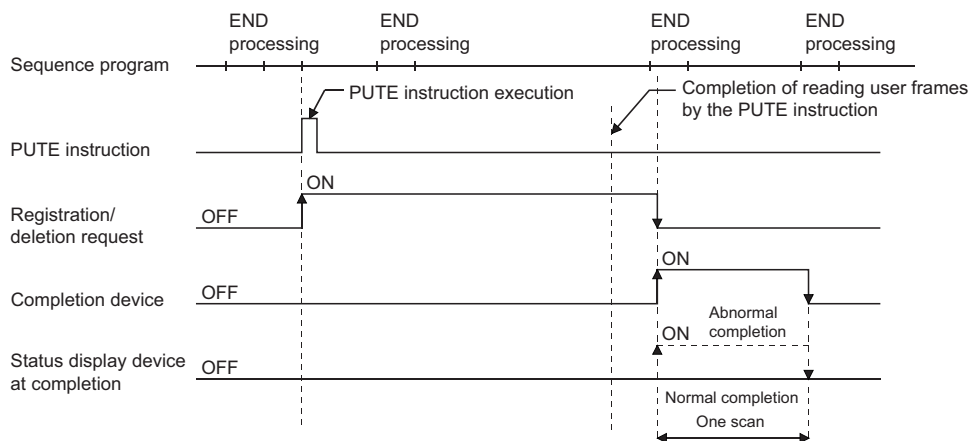
(a) Completion device

Turns on at the END processing of the scan where the PRR instruction is completed, and turns off at the next END processing.

(b) Status display device at completion

Turns on and off depending on the completion status of the PRR instruction.

- Normal completion: Stays off and does not change.
- Abnormal completion: Turns on at the END processing of the scan where the PRR instruction is completed, and turns off at the next END processing.

[Operation when the PRR instruction is being executed]
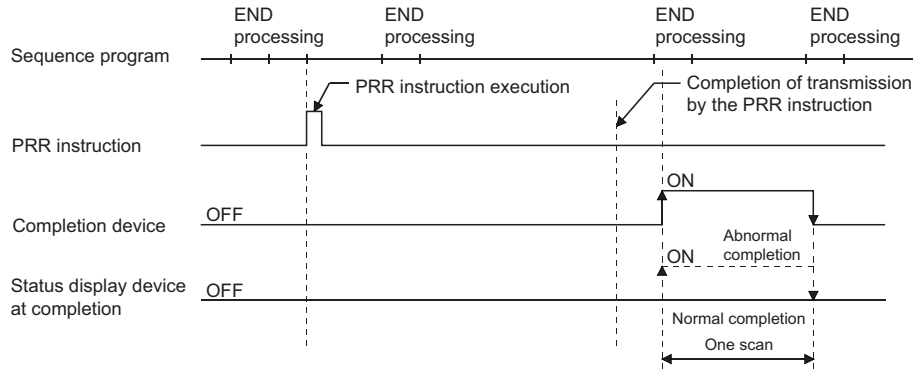
17.6.4　Errors

When the dedicated instruction is completed with an error, the status display device at completion ((D)+1), turns on and the error code is stored in the control data transmission result ((S1)+1).

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

17.6.5　Program example

A program that sends arbitrary data and the first to fifth user frames registered in the transmission frame setting
When the input/output signals of the Q series C24 are X/Y80 to X/Y9F

Transmission instruction
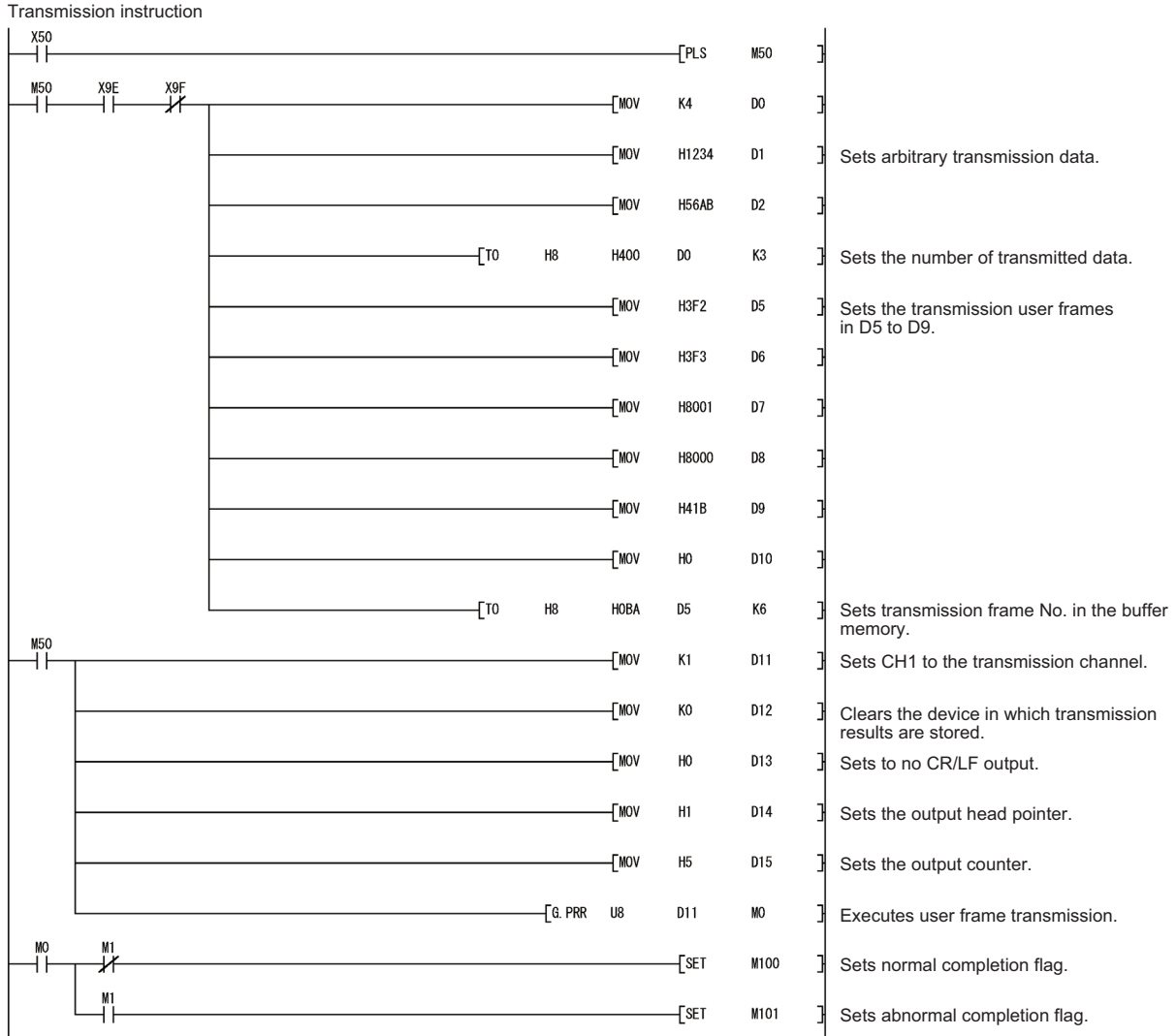
	Normal end			Abnormal end	
D0	Send data count	(0004H)		Send data count	(0004H)
D1	Send data	(3412H)		Send data	(3412H)
D2		(AB56H)			(AB56H)
D5	Transmission frame No.	(03F2H)		Transmission frame No.	(03F2H)
D6		(03F3H)			(03F3H)
D7		(8001H)			(8001H)
D8		(8000H)			(8000H)
D9		(041BH)			(041BH)
D10		(0000H)			(0000H)
D11	Interface No.	(0001H)		Interface No.	(0001H)
D12	Transmission result	(0000H)		Transmission result (other than 0000H)	
D13	CR/LF output	(0000H)		CR/LF output	(0000H)
D14	Output head pointer	(0001H)		Output head pointer	(0001H)
D15	Output counter	(0005H)		Output counter	(0005H)

17.7 G(P).PUTE

This instruction registers a user frame.

Setting data	Applicable device								
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant	Others
	Bit	Word		Bit	Word				
(S1)	—	○				—			
(S2)	—	○				—			
(D)	○	○				—			

[Instruction code]   [Executing condition]

G.PUTE

        Command

| G.PUTE | Un | (S1) | (S2) | (D) |

GP.PUTE

        Command

| GP.PUTE | Un | (S1) | (S2) | (D) |

17.7.1 Setting data

Setting data	Description	Set by	Data type
Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	BIN-16 bit
(S1)	Head number of the devices that store control data	User, System	Device name
(S2)	Head number of the devices that store registered data		
(D)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D)+1 also turns on if the execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

17.7.2 Control data

Device	Item	Setting data	Setting range	Set by
(S1)+0	Register/delete designation	Designate whether to register or delete the user frame having the number designated by (S1) Register: 1 Delete: 3	1, 3	User
(S1)+1	Register/delete result	The registration/deletion result by the PUTE instruction is stored. 0: Normal Other than 0: Error code	—	System
(S1)+2	Frame No.	Designate the user frame No.	1000 to 1199	User
(S1)+3	Registered bytes count	1 to 80: Number of bytes of the user frame to be registered. • Designate 1 to 80 as dummy when deleting.	1 to 80	User

> **Remark** •
>
> ● For information about errors caused by incorrect data designated by the user, see the description in "Errors".
>
> ● The "Set by" column indicates the following:
>   • User: Data set by the user before executing the dedicated instruction.
>   • System: The programmable controller CPU stores execution results of the dedicated instruction.
> •

17.7.3 Functions

(1) This instruction registers or deletes the user frame for the Q series C24 as designated by Un.

(2) When registering a user frame

(a) When registering a user frame, set 1 to the device for (S1)+0.

Data in the device designated by (S2) and after will be registered according to the control data.

(b) The registered data should be stored in the device designated by (S2) and after as described below.

Thus, at least (registered data number)/2 devices will be necessary to store the registered data and they should be assigned beginning with the device designated by (S2).

For example, when registering 6 bytes of data, 3 devices beginning with the device designated by (S2) will be used.
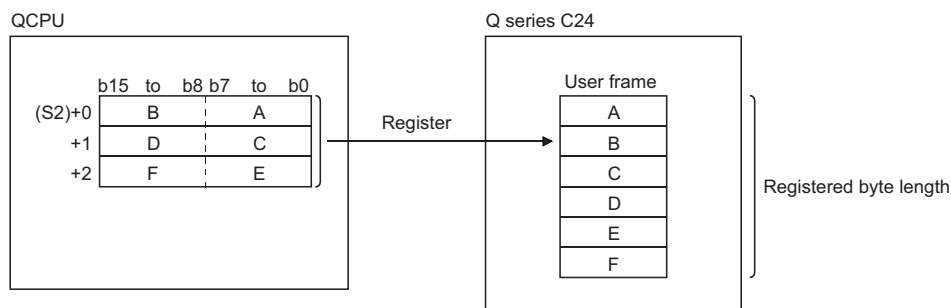
(3) When deleting a user frame

(a) When deleting a user frame, set 3 to the device for (S1)+0.

The user frames of the frame numbers designated by (S1)+2 will be deleted.

(b) The registered byte number designated by (S1)+3 and registered data storage device designated by (S2) are not used by the PUTE instruction, but they are necessary for formatting it.

Designate 1 to 80 for (S1)+3 and a dummy device for (S2).

(4) Simultaneous execution of dedicated instructions

The following table lists the handling for when executing another instruction during execution of the PUTE instruction or executing the PUTE instruction during execution of another instruction in the same channel.

Instruction	Availability of simultaneous execution	Handling of simultaneous execution
ONDEMAND	○	—
OUTPUT		
PRR		
INPUT		
BIDOUT		
BIDIN		
CSET		
PUTE	×	• The next instruction will be ignored until the active instruction has been completed.
GETE	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.
BUFRCVS	○	—
SPBUSY		
UINI	×	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.
CPRTCL	○	—

○: Available, ×: Not available

(5) Whether the PUTE instruction was completed normally or abnormally can be checked with the completion device (D) or status display device at completion (D+1).

(a) Completion device

Turns on at the END processing of the scan where the PUTE instruction is completed, and turns off at the next END processing.

(b) Status display device at completion

Turns on and off depending on the completion status of the PUTE instruction.
- Normal completion: Stays off and does not change.
- Abnormal completion: Turns on at the END processing of the scan where the PUTE instruction is completed, and turns off at the next END processing.

[Operation when the PUTE instruction is being executed]

17.7.4 Errors

When the dedicated instruction is completed with an error, the status display device at completion ((D)+1), turns on and the error code is stored in the control data registration/deletion result ((S1)+1).

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

17.7.5 Program example

The following shows an example of a sequence program when registering user frames.

Data set for the program example are as follows:

Setting item	Setting data	
User frame No.	3E8H	
Registration data (10 bytes)	Binary	46H,39H,30H,30H,30H,30H,46H,46H,30H,30H
	ASCII	F90000FF00

When the input/output signals of the Q series C24 are X/Y80 to X/Y9F
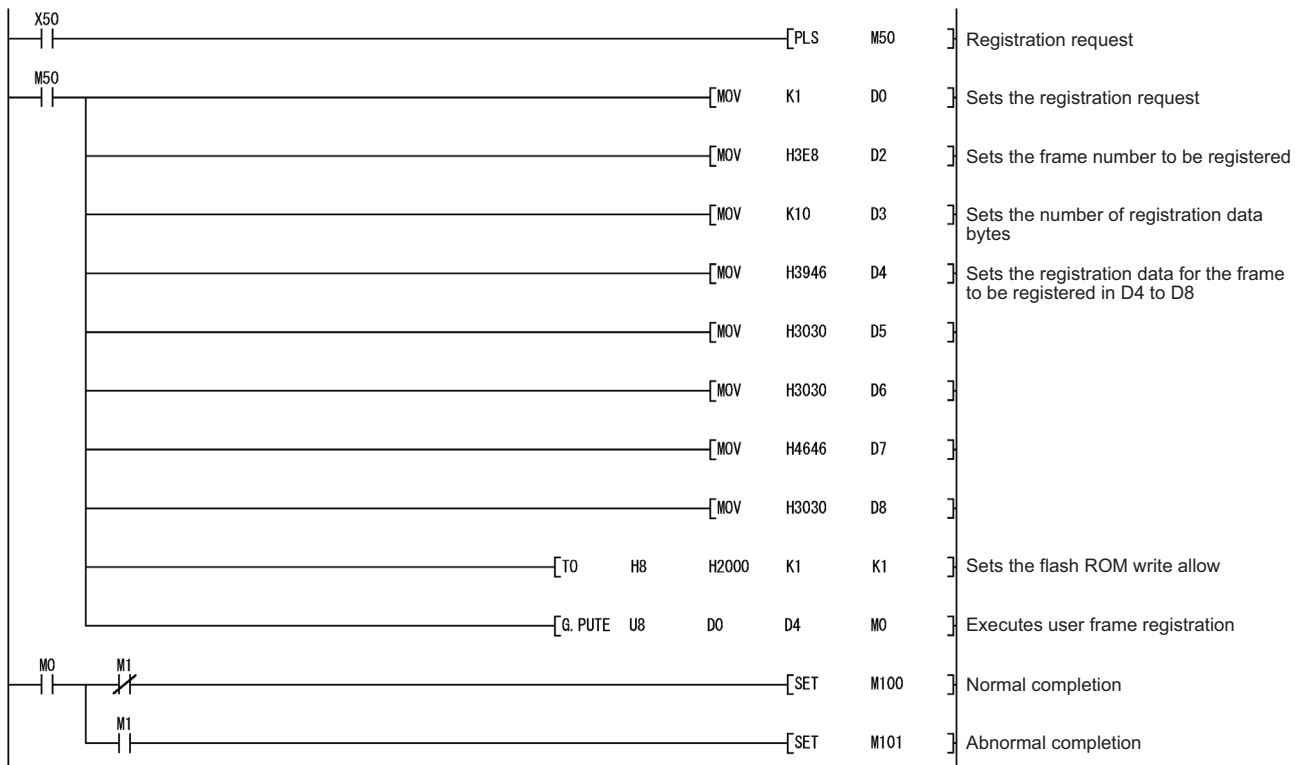
17.8   ZP.UINI

This instruction can change the mode, transmission specifications and station number of the Q series C24.

It is applicable to the QJ71C24N (-R2/R4), and LJ71C24 (-R2).

Setting data	Applicable device							
	Internal device		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant	Others
	Bit	Word		Bit	Word				
(S)	—	○				—			
(D)	○	○				—			

[Instruction code]   [Executing condition]

ZP.UINI

Command

ZP.UINI | "Un" | (S) | (D)

*1

*1   If the host station is a Basic model QCPU (function version B or later), Universal model QCPU, or LCPU, " " (double quotation) of the first argument can be omitted.

17.8.1   Setting data

Setting data	Description	Set by	Data type
"Un"/Un	Start I/O signal of the module (00 to FE: The 2 upper digits of an input/output signal expressed in 3-digit.)	User	String/BIN-16 bit
(S)	Head number of the devices that store control data	User, System	Device name
(D)	Head bit device number of the local station that turns ON for one scan upon instruction completion. (D)+1 also turns on if the execution completes abnormally.	System	Bit

The file registers of each of the local device and the program cannot be used as the setting data.

17.8.2   Control data

Device	Item	Setting data	Setting range	Set by
(S)+0	For system	Always specify this to 0.	0	User
(S)+1	Execution result	The execution result of the UINI instruction is stored. 0: Normal Other than 0: Error code	—	System
(S)+2	Execution type	Specify the execution type. 0: Switch the settings by those indicated in (S)+3 and later. 1: Return the settings to the GX Developer switch settings.	0, 1	User
(S)+3	CH1 transmission specifications setting	Set the CH1 side transmission specifications.	☞ Page 403, Section 17.8.2 (1)	
(S)+4	CH1 communication protocol setting	Set the CH1 side communication protocol.	☞ Page 404, Section 17.8.2 (2)	
(S)+5	CH2 transmission specifications setting	Set the CH2 side transmission specifications.	☞ Page 403, Section 17.8.2 (1)	User
(S)+6	CH2 communication protocol setting	Set the CH2 side communication protocol.	☞ Page 404, Section 17.8.2 (2)	
(S)+7	Station No. setting	Set the host station No.	0 to 31	
(S)+8 to (S)+12	For system	Always specify this to 0.	0	

(1) (S)+3 (CH1 transmission specifications setting) and (S)+5 (CH2 transmission specifications setting)

Bit	Description	OFF(0)	ON(1)	Remarks
b0	Operation setting	Independent	Link	Be sure to set the CH1 side to OFF(0).
b1	Data bit	7	8	Parity bit is not included.
b2	Parity bit	NO	Yes	Vertical parity
b3	Even/odd parity	Odd	Even	Valid only when parity bit is set to Yes.
b4	Stop bit	1	2	
b5	Sum check code	NO	Yes	
b6	Write during RUN	Prohibited	Allowed	
b7	Setting modifications	Prohibited	Allowed	

Bit	Description	Set value	Remarks
b8 to b15	Communication speed	00H to 0FH	Refer to *2

*1 All items in the table should be set to OFF for the interfaces which "GX Developer connection" is set in the communication protocol setting. The Q series C24 operates with the values set in GX Developer.

Transmission setting	GX Developer side setting
Operation setting	Independent
Data bit	8
Parity bit	Yes
Even/odd parity	Odd
Stop bit	1
Sum check code	Yes
Write during RUN	Allowed
Setting modifications	Allowed/Prohibited

*2 The setting value of the communication speed

Communication speed (Unit: bps)	Bit position b15 to b8	Communication speed (Unit: bps)	Bit position b15 to b8	Remarks
50	0FH	14400	06H	
300	00H	19200	07H	
600	01H	28800	08H	Slow down the communication speed when data cannot be communicated normally due to overrun error, framing error, etc. in communication with external devices.
1200	02H	38400	09H	
2400	03H	57600	0AH	
4800	04H	115200	0BH	
9600	05H	230400	0CH	

- Transmission speed of 230400 bps is available for only CH1.
- When connecting external devices to both of two interfaces, the total of the communication speed should be 230400 bps of less. When connecting an external device to either of two interfaces, the maximum of 115200 bps is available for the interface (a maximum of 230400 bps if using CH1 side)). In this case, set 300 bps for the other interface to which no external device is connected.
- Set "00H" to the interface for which "GX Developer connection" is set in the communication protocol setting. Serial communication module will operate at the communication speed set on the GX Developer.

(2) (S)+4 (CH1 communication protocol setting) and (S)+6 (CH2 communication protocol setting)

Setting No.	Description		Remarks
0H	GX Developer connection (For connection to MELSOFT products)		GX Developer communication rate and transmission specifications are automatically set.
1H	MC protocol	Format 1	For communication with ASCII code in the specified form of an A compatible 1C frame or QnA compatible 2C/3C/4C frame
2H		Format 2	
3H		Format 3	
4H		Format 4	
5H		Format 5	For communication with binary code in a QnA compatible 4C frame
6H	Nonprocedural protocol		For communication using non procedure protocol
7H	Bidirectional protocol		For communication using bidirectional protocol
8H	For synchronous setting		Set to the CH1 side when CH1 and CH2 interfaces are used in linked operation (operated with the communication protocol of the CH2 side).
9H	Pre-defined protocol		For communication using pre-defined protocol

Point

For details of the CH□ transmission specifications setting, CH□ communication protocol setting and station No. setting, refer to the User's Manual (Basic).

Remark

● For information about errors caused by incorrect data designated by the user, see Page 406, Section 17.8.4.

● The "Set by" column indicates the following:
  • User: Data set by the user before executing the dedicated instruction.
  • System: The programmable controller CPU stores execution results of the dedicated instruction.

17.8.3 Functions

(1) This instruction changes the transmission specifications, communication protocol and host station No. of each channel of the Q series C24 specified by Un.

(2) Execution of the UINI instruction changes the following buffer memory settings to enable communication with the new settings.

Address Dec. (Hex.)		Application	When module is started up	When UINI instruction is executed	When mode is switched by mode switching request signal (Y2/Y9) (☞ Page 345, CHAPTER 15)
CH1	CH2				
512 (200H)		Station No. (switch setting)	GX Developer set values	GX Developer set values	GX Developer set values
591 (24FH)		Station No. (instruction setting)		Set value changed by UINI instruction	
592 (250H)	608 (260H)	Communication protocol status (switch setting)		GX Developer set values	
593 (251H)	609 (261H)	Transmission setting status (switch setting)			
594 (252H)	610 (262H)	Communication protocol status (current)		Set value changed by UINI instruction	Set values changed by mode switching
595 (253H)	611 (263H)	Transmission status (current)			

> **Point**
>
> The UINI instruction can change the following settings that cannot be changed by mode switching that uses the mode switching request signal (Y2/Y9).
>
> ● Station No. setting change
>
> ● Switching to synchronous operation or switching from synchronous operation to the other mode (independent operation)

(3) Whether the UINI instruction was completed normally or abnormally can be checked with the completion device (D) or status display device at completion ((D)+1).

(a) Completion device

Turns on at the END processing of the scan where the UINI instruction is completed, and turns off at the next END processing.

(b) Status display device at completion

Turns on and off depending on the completion status of the UINI instruction.
- Normal completion: Stays off and does not change.
- Abnormal completion: Turns on at the END processing of the scan where the UINI instruction is completed, and turns off at the next END processing.

[Operation when the UINI instruction is executed]
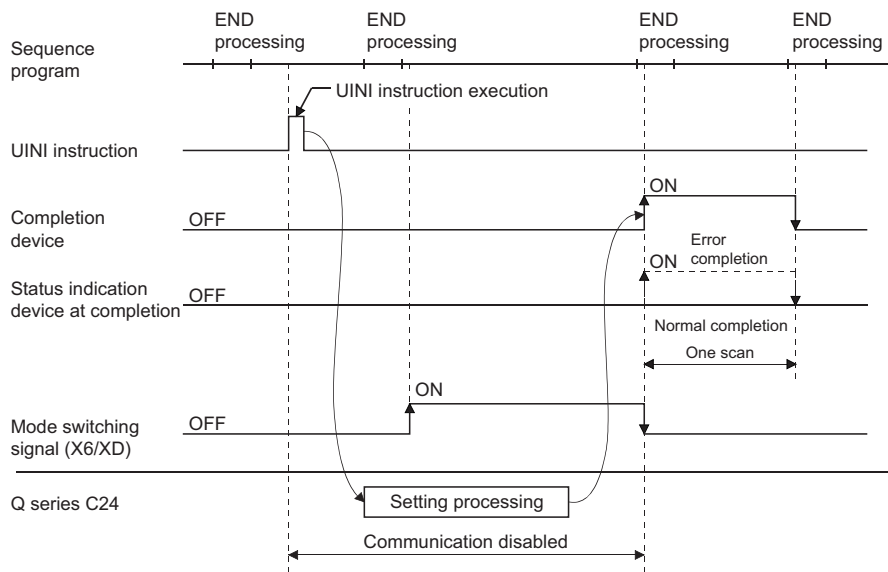
17.8.4 Errors

When the dedicated instruction is completed with an error, the status display device at completion ((D)+1), turns on and the error code is stored in the control data transmission result ((S1)+1).

See the following manuals regarding the error code, and check the errors and take corrective actions.

<Error codes>

4FFFH or less: User's manual (hardware design, maintenance and inspection) for the CPU module used

7000H or higher: 📖User's Manual (Basic)

17.8.5 Program example

The settings of the Q series C24 installed in the position of I/O No. X/Y00 to X/Y1F are changed as indicated below when X20 is turned on.

Device	Bit		Description			Set value
	Position	**Specified value**				
(S)+3	b0	OFF	CH1 transmission specifications setting	Operation setting	Independent	07E6H
	b1	ON		Data bit	8 bits	
	b2	ON		Parity bit	Yes	
	b3	OFF		Even/odd parity	Odd	
	b4	OFF		Stop bit	1 bit	
	b5	ON		Sum check code	Yes	
	b6	ON		Write during RUN	Allowed	
	b7	ON		Setting modifications	Allowed	
	b8 to b15	—		Communication rate setting	19200bps	
(S)+4	—		CH1 communication protocol setting		Synchronous setting	0008H
(S)+5	b0	ON	CH2 transmission specifications setting	Operation setting	Synchronous	07E7H
	b1	ON		Data bit	8 bits	
	b2	ON		Parity bit	Yes	
	b3	OFF		Even/odd parity	Odd	
	b4	OFF		Stop bit	1 bit	
	b5	ON		Sum check code	Yes	
	b6	ON		Write during RUN	Allowed	
	b7	ON		Setting modifications	Allowed	
	b8 to b15	—		Communication rate setting	19200bps	
(S)+6	—		CH2 communication protocol setting		MC protocol format 5	0005H
(S)+7	—		Station No. setting		Station 1	0001H

X20	Y2	Y9	X6	X0D			FMOV	H0	D0	K13		Clears the control data

```
    X20    Y2     Y9     X6    X0D
 ───┤↑├───┤/├────┤/├────┤/├────┤/├─────────────────────[FMOV  H0      D0      K13 ]   Clears the control data
   UINI   CH1 mode CH2 mode CH1 mode CH2 mode
   instruction switching switching switching switching
   command  request  request
                                          ────────────────[MOV   H0      D0      ]   Always sets 0

                                          ────────────────[MOV   H0      D1      ]   Clears the execution result to 0

                                          ────────────────[MOV   H0      D2      ]   Sets the execution type to 0

                                          ────────────────[MOV   H7E6    D3      ]   Sets the CH1 transmission specifications

                                          ────────────────[MOV   H8      D4      ]   Sets the CH1 communication protocol

                                          ────────────────[MOV   H7E7    D5      ]   Sets the CH2 transmission specifications

                                          ────────────────[MOV   H5      D6      ]   Sets the CH2 communication protocol

                                          ────────────────[MOV   H1      D7      ]   Sets the host station No.

                                          ───────────────[ZP.UINI "U0"  D0      M0 ]  Executes the UINI instruction

                                          ────────────────────────────[SET   M100 ]  Turns ON the interlock signal for
                                                                                      communication stop*1
    M0     M1
 ───┤├─────┤/├──────── [ Processing for normal completion ]
          │ M1
          ├─┤├──────── [ Processing for error completion ]
          │
          └──────────────────────────────────[RST   M100 ]  Turns OFF the interlock signal for
                                                             communication stop*1
   M100
 ───┤/├─────────────── [ Data communication processing ]
  Interlock signal for
  communication stop
```

(*1)

> *1   Perform programming so that data communication processing is not executed while the interlock signal for communication stop (M100) is ON.

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17.8.6 Precautions

(1) Execute the UINI instruction after stopping all data communications with the other device.

Otherwise, the following will occur.

(a) When the UINI instruction is executed during receive processing

The receive processing is stopped and the reception data accumulated until then are all discarded.

(b) When the UINI instruction is executed during transmission processing

The transmission processing is stopped upon acceptance of the UINI instruction.

(2) When a modem is connected, execute the UINI instruction after cutting off the line with the other device. (The line is cut off when the UINI instruction is executed.)

(3) If the communication protocol and/or transmission specifications are changed with the UINI instruction, also change those of the other device according to the new settings.

Also, if the station No. setting (host station No.) is changed, correct the station No. in the other device side request message to the new station No.

(4) Simultaneous execution of dedicated instructions

The following table shows the handling for when executing another instruction during execution of the UINI instruction or executing the UINI instruction during execution of another instruction in the same channel.

Instruction	Availability of simultaneous execution	Handling of simultaneous execution
ONDEMAND	✕	• Dedicated instructions simultaneous execution error (7FF0H) occurs in the dedicated instruction attempted later.
OUTPUT		
PRR		
INPUT		
BIDOUT		
BIDIN		
CSET		
PUTE		
GETE		
CPRTCL		
BUFRCVS	○	—
SPBUSY		
UINI	✕	• The next instruction will be ignored until the active instruction has been completed.

○: Available, ✕: Not available

(5) Before executing the UINI instruction, set the transmission setting modification to "Enabled" in the GX Developer switch setting.

When the switch setting has not yet been made, the transmission setting modification is processed as "Enabled".

(6) Do not use the UINI instruction and mode switching request signal (Y2/Y9) together to execute mode switching.

(7) To use the current communication protocol, transmission specifications and host station No. obtain the values from the following status storage areas (current) of the buffer memory and set them to the control data.

Address Dec. (Hex.)		Application
CH1	CH2	
591 (24FH)		Station No. (instruction setting)
594 (252H)	610 (262H)	Communication protocol status (current)
595 (253H)	611 (263H)	Transmission status (current)

APPENDIX

Appendix 1 Specification Comparison between the Q Series C24 and L series C24

The functions of the L series C24 correspond to those of the Q series C24, whose first five digits of the serial number is 11062 and the function version is B or later.

The following table lists the specification comparison between the Q series C24 and L series C24.

Item	Difference	
	Q series C24 (function version B)	L series C24
Notification function	Supported	Not supported

Point

When applying the program used in the system of the Q series to the L series, refer to precautions for applying a program in the following manual.
📖 MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

Memo

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I

REVISIONS

Print date	*Manual number	Revision
Dec., 1999	SH (NA)-080007-A	First edition
Oct., 2000	SH (NA)-080007-B	Add the contents of the function version B. Put Windows base software products together from Mitsubishi Programmable Controller MELSEC series to Mitsubishi integrated FA software MELSOFT series. Standardize the name from software package (GPP function) to product name (GX Developer). [Correction] Entire manual (change MELSECNET/10H to MELSECNET/H), Contents, About the Manuals, About the Generic Terms and Abbreviations, Section 1.1, 1.2 POINT, Section 2.1, 2.2.1, 2.2.3, 2.2.5, 2.2.6, 2.3.1, 2.3.2, Section 3.1.1, 3.2.3, 3.2.4, 3.3.1, 3.3.4, 3.3.5, 3.3.6, 3.4 (entire), Section 4.3, Chapter 9 (entire), Chapter 11 (entire), Section 12.2, 12.3, 12.4 (entire), 12.6 (entire), Section 13.3, 13.4, 13.6 (entire), Section 15.3, Section 16.2 (entire) to 16.7 [Addition] Section 2.4 (9), Section 3.2.3 POINT
Jun., 2001	SH (NA)-080007-C	Standardize the name from utility package (QSCU) to product name (GX Configurator-SC). [Correction] About the Manuals, The Manual's Use and Structure, About the Generic Terms and Abbreviations, Program example (Section 9.4.1, 9.4.2, 9.4.3, Section 11.5 (1) (2), Section 16.5, 16.6, 16.7), Section 1.1 (2) (diagram), 1.2, Chapter 3 (entire), Section 4.1 (2), Section 9.1.1 (4) 5), Section 11.3.2 (3), 11.3.3 (3), Section 13.6.1 (diagram) [Addition] Section 3.3.4, 3.3.6 (4), 3.4.5 (4)
Jan., 2003	SH(NA)-080007-D	[Additional model] QJ71C24N, QJ71C24N-R2, QJ71C24N-R4 [Correction] SAFETY PRECAUTIONS, About the Manuals, The Manual's Use and Structure, About the Generic Terms and Abbreviations, Section 1.2, Section 2.2.4 (2) (c), Section 3.3.1, 3.3.5, 3.3.6, 3.4.2, 3.4.3, 3.4.7, 3.4.8 (3), 3.5, Section 6.1, Section 7.1, 7.2, Section 9.1.1 (4), Section 10.4.1 (2) 1), Section 11.2.4 (2), 11.4.3 (a), 11.5, Section 15.1, 15.2, 15.3, 15.4.2, Section 17.1, 17.3, 17.4 [Addition] Section 4.4.2 (6), Chapter 16 (entire)
Dec., 2003	SH(NA)-080007-E	[Correction] About the Generic Terms and Abbreviations, Section 3.4.6 (4), Section 6.1, 6.3 (1) (b), Section 9.1.1 (4), Section 11.2.4 (2)
Jun., 2004	SH(NA)-080007-F	[Correction] About the Generic Terms and Abbreviations, Section 3.3.4 (4), 3.4.3 (6), 3.4.4 (5), Section 8.2 (2), Section 11.3.1, Section 16.2 (1)
Sep., 2004	SH(NA)-080007-G	[Correction] Section 1.2, Section 6.1, Section 9.1.1 [Addition] Section 17.8
Feb., 2005	SH(NA)-080007-H	[Correction] Section 3.4.2, 3.4.4, Chapter 17 (Simultaneous execution of dedicated instructions)
Mar., 2006	SH(NA)-080007-I	[Correction] SAFETY PRECAUTIONS, Section 6.1, Section 17.1
Jun., 2007	SH(NA)-080007-J	[Change of a term] "PLC" was changed to "programmable controller". [Correction] About The Generic Terms and Abbreviations, Section 2.3.1(4), Section 3.4.5, Section 11.4.3, 11.5, Section 12.3, Section 13.4, Section 15.3, Section 17.2, 17.3, 17.4, 17.5, 17.6, 17.7, 17.8
Aug., 2008	SH(NA)-080007-K	[Correction] SAFETY PRECAUTIONS, About The Generic Terms and Abbreviations, Section 3.1.1, 3.3.3, 3.3.6, 3.3.7, Section 7.1, Section 9.1.2, Section 17.2 to17.4, 17.8
Jun., 2009	SH(NA)-080007-L	[Partial correction] About The Generic Terms and Abbreviations, Sections 1.1, 1.2, 3.3.1, 3.3.5, 9.1.2, 9.4.1,Chapter 15, Sections 15.1.2, 15.3, 17.2, 17.3, 17.4, 17.5, 17.6, 17.7, 17.8

Print date	*Manual number	Revision
Jan., 2010	SH(NA)-080007-M	[Additional model] LJ71C24, LJ71C24-R2 [Partial correction] SAFETY PRECAUTIONS, INTRODUCTION, Related Manuals, The Manual's Use and Structure, About The Generic Terms and Abbreviations, Definitions and Descriptions of Terminology, Section 1.2, 2.3.1, 2.3.2, 3.1.1, 3.1.3, 3.2.4, 3.3.1, 3.3.5, 3.3.6, 3.3.7, 8.3, 9.1.2, 9.4.1, 15.3, 15.4.1, 15.5.1, 16.1.1, 17.2, 17.3, 17.4, 17.7, 17.8 [Partial addition] Product application, APPENDIXES
Aug., 2012	SH(NA)-080007-N	[Partial correction] CONTENTS, Generic Terms and Abbreviations, Section 1.1, 1.2, 3.2.3, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.6, 3.4.2, 3.4.7, 3.4.8, 3.5.2, 4.4.2, 6.3, Chapter 7, Sections 7.1, 7.2, 7.3, 8.2, 8.4, 8.5, 9.4, 11.2.2, 11.2.3, 11.3.1, 11.3.2, 11.3.3, 11.4.3, 12.4.1, 13.4.1, 14.3.1, 15.3, 16.1.2, 16.2, 16.3, 17.6, 17.7, 17.8, WARRANTY [Partial addition] COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES
Dec., 2014	SH(NA)-080007-O	[Partial correction] SAFETY PRECAUTIONS, COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, RELEVANT MANUALS, GENERIC TERMS AND ABBREVIATIONS, Section 2.2.5, 2.3.2, 3.3.7, 3.4.1, 3.4.6, 3.4.7, 3.4.8, 8.4, 9.1, 10.5, 11.1, 11.2.1, 11.3.1, 11.4.3, 12.4.1, Chapter 15, Section 16.1.2, 16.2, 17.6.5, 17.8.2 [Change of manual structure] Subsections are added to Section 17.2 to 17.8.

Japanese manual version SH-080002-T

WARRANTY

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

1. Gratis Warranty Term and Gratis Warranty Range

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

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

[Gratis Warranty Term]

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

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

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

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

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

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

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Specifications subject to change without notice.