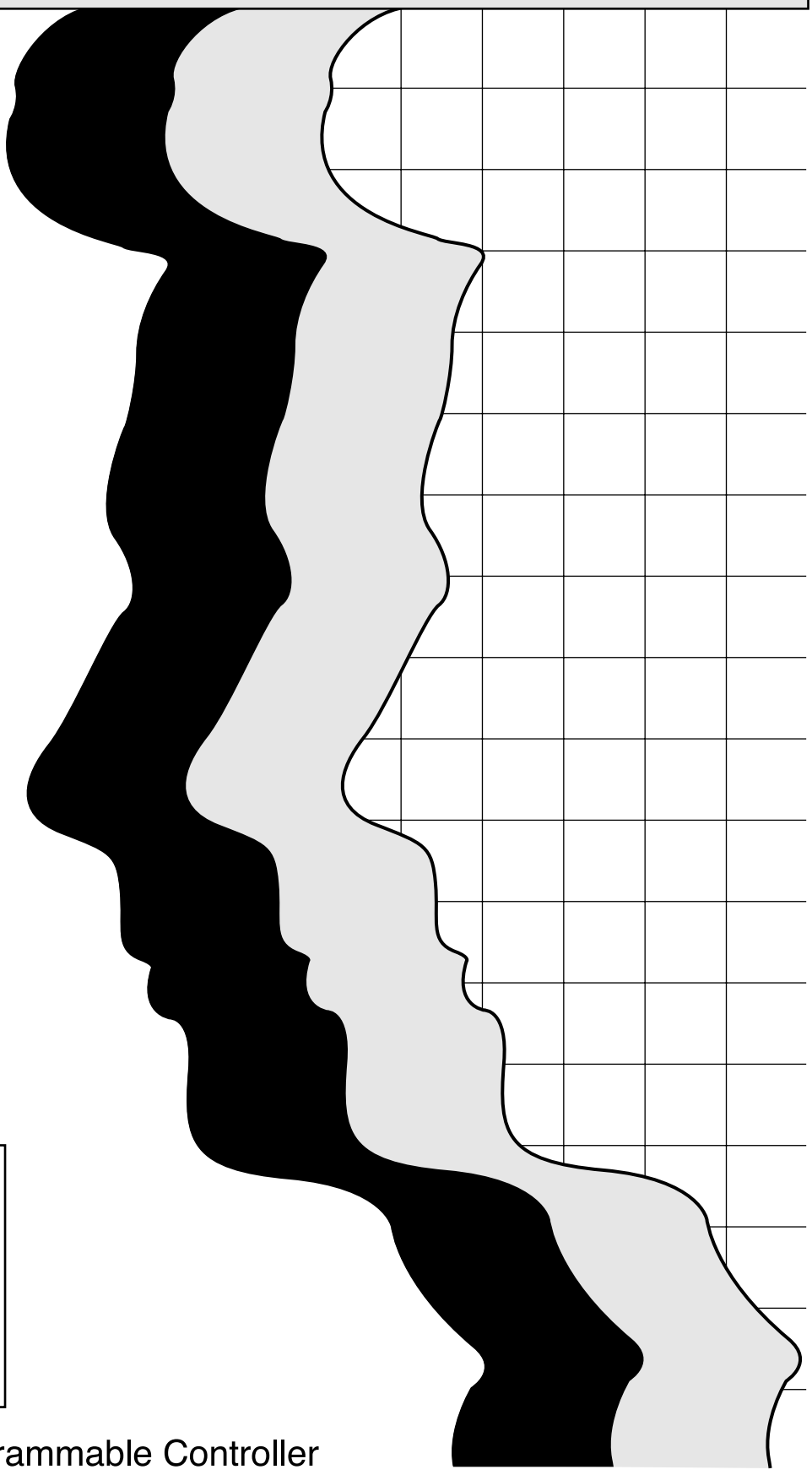
MITSUBISHI

RS-232C Interface Module Type AJ65BT-R2

User's Manual



MELSEC

Mitsubishi Programmable Controller

• SAFETY INSTRUCTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	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 medium or slight personal injury or physical damage.

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

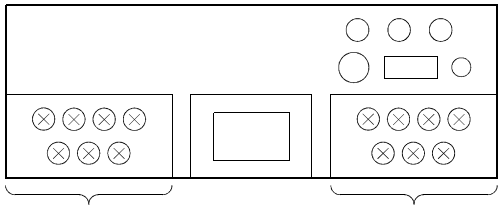
[Design Instructions]

⚠ DANGER

- If a communication error occurs in the data link, the following will occur in the station having the communication error.
  Use the communication status information, and configure an interlock circuit in the sequence program so that the system will operate safely.
  Incorrect outputs and incorrect operations can lead to accidents.
  (1) All points of the general-purpose input from this module will turn OFF.
  (2) All points of the general-purpose output from this module will turn OFF.
- The input/output may turn ON or OFF depending on the module trouble.
  Provide a circuit that externally monitors input/output signals that could lead to serious trouble.

⚠ CAUTION

- Do not bind the control wire or communication cable with the main circuit or power wire, or place the control wire near these.
  Separate by at least 100mm or more.
  Failure to observe this could lead to malfunctions caused by noise.
- Always connect the master module and CC-Link dedicated cable at the data link terminal block.
  If the data link terminal block and general-purpose input/output terminal block are incorrectly inserted, module trouble could occur.



[Mounting Instructions]

⚠ CAUTION

- Use this module within the general specification environment described in the manual.
  Use in an environment outside the general specification range could lead to electric shocks, fires, malfunctioning, product damage or deterioration.
- Always connect the crimp, press-fit or solder the connector wire connections with the maker-designated tools, and securely connect the connector to the module.
  An incomplete connection could lead to short-circuits or malfunctioning.
- Do not directly touch the conductive section of the module.
  Failure to observe this could lead to module malfunctioning or trouble.
- Securely fix the module with the DIN rail or installation screw. Tighten the installation screw within the designated torque range.
  A loose screw could lead to dropping, short-circuiting or malfunctioning.
  If the screw is too tight, dropping or short-circuiting could occur due to screw damage.
- Securely mount the connector of each connection cable to the mounting section.
  An incomplete connection could lead to malfunctioning caused by an incorrect contact.

[Wiring Instructions]

⚠ CAUTION

- Before starting installation or wiring work, be sure to shut off all phases of external power supply used by the system.
  Failure to shut off all phases could lead to electric shocks, product damage or malfunctioning.
- Always install the terminal covers enclosed with the product before turning ON the power or operating the product after installation or wiring work.
  Failure to install the terminal cover could lead to electric shocks.
- Always ground the FG terminal with Class D grounding (Class 3 grounding) dedicated of the programmable controller.
  Failure to do so could lead to malfunctioning.
- Always confirm the product's rated voltage and terminal layout before wiring the module.
  Connecting with a power supply other than the rated power supply, or incorrect wiring could lead to fires or trouble.
- Tighten the terminal screws within the specified torque range.
  A loose terminal screw could lead to short-circuiting or malfunctioning.
  If the terminal screw is too tight, dropping or short-circuiting could occur due to screw damage.
- Make sure that foreign matter, such as cutting chips or wire scraps, do not enter the module.
  Failure to observe this could lead to fires, trouble or malfunctioning.
- The communication cables and power supply cable connected to the module must be placed in a conduit or fixed with a clamp.
  If the cable is not placed in a conduit or fixed with a clamp, the module or cable could be damaged by the cable variation, movement or unintentional pulling leading to malfunctioning caused by an improper cable connection.
- Do not install the control lines together with the communication cables, or bring them close to each other. Failure to do so may cause malfunctions due to noise.
- Do not remove the communication cable or power supply cable connected to the module by pulling on the cable section.
  If the cable has a connector, hold the connector at the section connected to the module, and remove.
  If the cable does not have a connector, loosen the screws at the section connected to the module, and remove.
  Pulling on the cable while connected to the module could lead to module or cable damage, or malfunctioning caused by an improper cable connection.

[Startup/Maintenance Instructions]

⚠ CAUTION
• When power is ON, do not touch the terminals. Doing so can cause an electric shock or malfunction. • Before cleaning or tightening the terminal screws and module mounting screws, be sure to shut off all phases of external power supply used by the system. Failure to shut off all phases could lead to module trouble or malfunctioning. • Do not touch the connector inside the lid at the front of the module. Failure to observe this could lead to module trouble or malfunctioning. • Never disassemble or modify the module. Failure to observe this could lead to trouble, malfunctioning, injuries or fires. • Do not drop or apply any strong impact to the module. Doing so may damage the module. • Before installing or removing the module on the panel, be sure to shut off all phases of external power supply used by the system. Failure to shut off all phases could lead to module trouble or malfunctioning. • Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)

[Disposal Instructions]

⚠ CAUTION
• When disposing of the product, handle it as industrial waste.

REVISIONS

* The instruction manual No. is described on the lower left of the back cover of this instruction manual.

Date of print	* Instruction manual No.	Revision details
Jul., 1997	IB (NA)-66781-A	Initial print
Apr., 1999	IB (NA)-66781-B	Complete review
Sep., 2002	IB (NA)-66781-C	Equivalent to Japanese version D Addition of description for use of the QCPU (Q mode) Addition Compliance with the EMC/Low Voltage Directive, Section 4.5.1, Section 5.2.2 Deletion Section 2.3 Partial Correction SAFETY INSTRUCTIONS, About Manuals, Chapter 1, Section 2.1, Section 2.2, Section 3.1, Section 3.2, Section 3.3, Section 3.4, Section 3.7, Section 4.1, Section 4.2, Section 4.4, Section 4.5.2, Section 4.5.3, Section 4.6, Section 5.2, Section 5.6.2, Section 8.3, Section 9.1, Section 9.2.4, Section 10.1.2, Section 10.2
Nov., 2005	IB (NA)-66781-D	Partial Correction SAFETY INSTRUCTIONS, About Manuals, Generic Terms and Abbreviations, Definitions and Details of Terms, Section 1.1, Section 2.1, 2.2, Section 3.1, 3.2, 3.4, 3.6.1, 3.6.2, 3.7, 3.8, 3.9.1, 3.9.2, Section 4.2, 4.4, 4.5.2, 4.5.3, Section 5.2.1, 5.3, 5.4, 5.5.1, 5.5.2, 5.7.1, 5.7.2, 5.7.3, 5.7.4, Section 6.3.1, 6.3.2, 6.4.1, 6.4.2, Section 7.3.1, 7.4.3, 7.5.2, Section 8.2, 8.3, 8.4, 8.5, 8.9.2, Section 9.1, 9.2.1, 9.2.2, 9.2.3, 9.2.4, 9.3.2, 9.3.3, Section 10.1.2, 10.3 Addition INDEX
Oct., 2006	IB (NA)-66781-E	Partial Correction SAFETY INSTRUCTIONS, Section 3.2, 3.4, 4.4, 7.3
Nov., 2007	IB (NA)-66781-F	Change of a term "PLC" was changed to "programmable controller". Partial Correction Section 4.2, 4.4, Section 5.1, 5.2.1, 5.5.1, 5.6.2, 5.7.3, Section 6.2, 6.3, 6.4.1, 6.4.2, Section 7.4.3, Section 8.10, Section 9.2.1, 9.2.2, 9.2.4, 9.3.1, 9.3.3, Section 10.1.2, 10.3, 10.4

Japanese Manual Version SH-3633-G

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INTRODUCTION

Thank you for purchasing the Mitsubishi general-purpose programmable controller MELSEC-A.
Always read through this manual, and fully comprehend the functions and performance of the A Series programmable controller before starting use to ensure correct usage of this product.
Make sure that this manual is delivered to the final user.

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About Manuals

The following manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

Related Manuals

Manual Name	Manual Number (Model Code)
Control & Communication Link System Master/Local Module Type AJ61BT11/A1SJ61BT11 User's Manual Explains the configuration, performance and specifications, functions, handling, wiring and troubleshooting of the AJ61BT11 and A1SJ61BT11 system. (Sold separately)	IB-66721 (13J872)
Control & Communication Link System Master/Local Module Type AJ61QBT11/A1SJ61QBT11 User's Manual Explains the configuration, performance and specifications, functions, handling, wiring and troubleshooting of the AJ61QBT11 and A1SJ61QBT11 system. (Sold separately)	IB-66722 (13J873)
CC-Link System Master/Local Module User's Manual QJ61BT11N Explains the configuration, performance and specifications, functions, handling, wiring and troubleshooting of the QJ61BT11N system. (Sold separately)	SH-080394E (13JR64)
AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual QJ61BT11 (Dedicated Instructions) Explains the configuration, performance and specifications, functions, handling, wiring and troubleshooting of the QJ61BT11 system. (Sold separately)	IB-66251 (13J742)

Compliance with the EMC/Low Voltage Directive

When incorporating the Mitsubishi programmable controller into other machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3, "EMC Directives and Low Voltage Directives" of the User's Manual (Hardware) included with the CPU module or base unit used.
The CE logo is printed on the rating plate of the programmable controller, indicating compliance with the EMC and low voltage directives.
To conform this product to the EMC Directive and Low Voltage Directive, refer to the Section of "CC-Link Modules" in Chapter 3 "EMC Directive and Low Voltage Directive" in the User's Manual (Hardware) of the CPU module used or the programmable controller CPU supplied with the base unit.

Using This Manual

This section "Using this manual" describes the R2 usage in categories of purpose.
Refer to the following details when using this manual.

(1) To find the characteristics of R2 (Section 1.1)
The features are described in section 1.1.

(2) To find the system configuration (Section 2.1)
The configuration of a system using R2 is explained in section 2.1.

(3) To find the master module that can use R2, and the CPU version that can use the CC-Link dedicated commands (Section 2.2)
The master module that can use R2, and the CPU version that can use the CC-Link dedicated commands are explained in section 2.2.

(4) To find the R2 specifications (Chapter 3)
The R2 specifications are described in Chapter 3.

(5) To find the time for transmitting/receiving data with R2 (Sections 3.8, 3.9)
The R2 transmission delay time and transmission/reception time are explained in sections 3.8 and 3.9.

(6) To find the procedures for operating R2 (Chapter 4)
The procedures for operating the R2, and the methods of checking the module state are explained in Chapter 4.

(7) To find how to access the R2 buffer memory (Sections 5.6, 5.7)
The methods of accessing the buffer memory are described in sections 5.6 and 5.7.

(8) To exchange data with an external device (Chapter 6)
The methods of exchanging data with an external device are explained in Chapter 6.

(9) To add a frame when exchanging data (Chapter 7)
The details of the frame, and the methods of adding a frame are explained in Chapter 7.

(10) To find sample programs (Chapter 9)
Sample programs are described in Chapter 9.

(11) When trouble occurs (Chapter 10)
The error code list and troubleshooting are described in Chapter 10.
"How to Use This Manual" is described by purposes of using CSKP.
Refer to the following and use this manual.

Generic Terms and Abbreviations

Unless specially noted, the following generic terms and abbreviations are used in this manual to explain the AJ65BT-R2 type RS-232-C interface module.

Generic term/abbreviation	Details of generic term/abbreviation
R2	Abbreviation for AJ65BT-R2 type RS-232-C interface module.
CC-Link	Abbreviation for Control & Communication Link system.
Master module	Generic term when using AJ61QBT11, A1SJ61QBT11, AJ61BT11, A1SJ61BT11, QJ61BT11 and QJ61BT11N as the master station.
Remote module	Generic term for AJ65BTB□-□□, AJ65BTC□-□□, AJ65BT-64AD, AJ65BT-64DAV and AJ65BT-64DAI.
External device	Generic term for devices such as ID controller, bar code reader and general-purpose personal computer, connected to R2 for data communication.
GPPW	Generic term for model names: SWnD5C-GPPW, SWnD5C-GPPW-A, SWnD5C-GPPW-V and SWnD5C-GPPW-VA. (“n” included in the model name indicates a number “4” or more.)
AnNCPU	Abbreviation of A0J2HCPU, A1SCPU, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, ASJHCPU, A1NCPU, A2CCPU, A2CCPUC24, A2CCPUC24-PRF, A2CJCPU, A2NCPU, A2NCPU-S1, A2SCPU, A2SHCPU and A2FXCPU
AnACPU	Abbreviation of A2ACPU, A2ACPU-S1, A2ACPUP21/R21, A2ACPUP21/R21-S1, A3ACPUP21/R21, A3NCPU and A3ACPU
AnUCPU	Abbreviation of A2UCPU, A2UCPU-S1, A2USCPU, A2USCPU-S1, A2USHCPU-S1, A3UCPU and A4UCPU
QnACPU	Abbreviation of Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU and Q4ARCPU
ACPU	Abbreviation of AnNCPU, AnACPU and AnUCPU
QCPU (Q mode)	Generic term for Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU and Q25HCPU
QCPU-A (A mode)	Generic term for Q02CPU-A, Q02HCPU-A and Q06HCPU-A

Definitions and Details of Terms

The definitions and details of terms used in this manual are explained below.

(1) [M] ○○H
This indicates the buffer memory address of the master station.

(2) [R2] ○○H
This indicates the buffer memory address of R2.

(3) Master station
The station that controls the remote station, local station and intelligent device station.

(4) Intelligent device station
Slave station on CC-Link system that can carry out transient transmission with R2, etc.

(5) Transient transmission
Function that communicates data with a designated station when access is requested from the programmable controller CPU, etc.

(6) Buffer memory automatic update function
Function that automatically updates the data between the R2 buffer memory and master stations' automatic update buffer.

(7) Automatic update buffer
Buffer memory in master station used for the buffer memory automatic update function in respect to R2.

(8) Registration frame
Row of data targeted for the fixed format section of the statement transmitted and received between the external device and R2.
The registration frames include the default registration frame registered in the R2, and the user registration frame registered by the user using EEPROM.

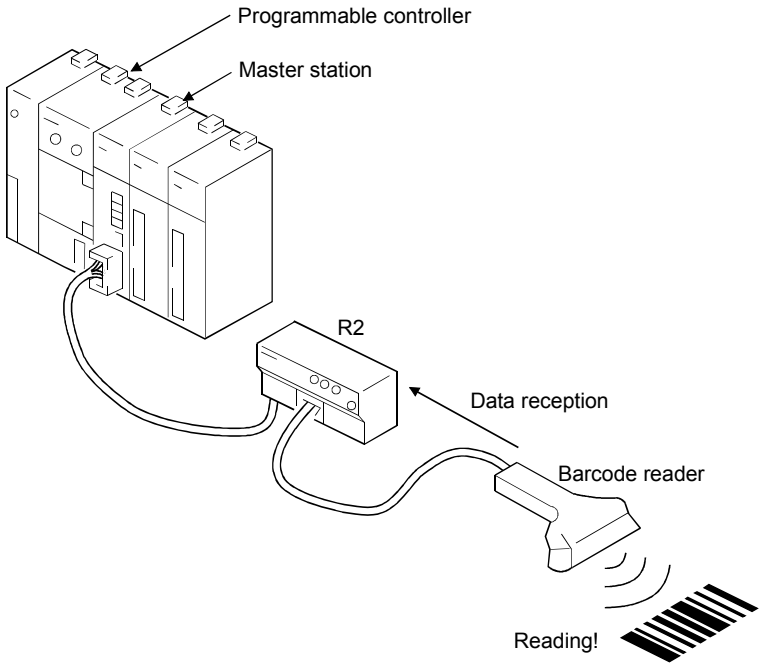
(9) Transmission frame 1 area
Buffer memory address [R2] 118H to 119H.
With frame transmission that uses the transmission frame 1 area, a frame can be added each to the head and end of a random data item when transmitting the data.

(10) Transmission frame 2 area
Buffer memory address [R2] 120H to 185H.
With frame transmission that uses the transmission frame 2 area, up to 100 frames can be added when transmitting the data.

1. OUTLINE

This User's Manual explains the features and specifications of the R2 used as the intelligent device station of the CC-Link, communication with an external device, and the special specifications, etc.
R2 can exchange data with an external device, such as an RS-232-C connection type barcode reader, ID controller or general-purpose personal computer.

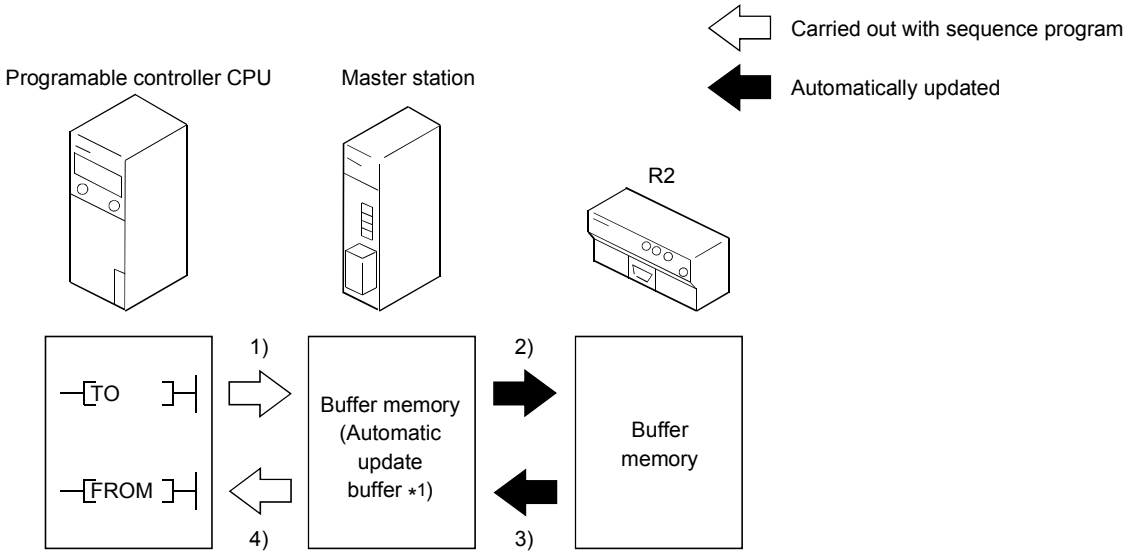
- When a barcode reader is connected



1.1 Features

(1) Easy communication by using the buffer memory automatic update function.

This function automatically updates the buffer memory between the R2 and master station at the timing set in R2.
With this, a program to read and write between the R2 and master station can be eliminated. As the data can be read and written with just the FROM/TO command, the program is simplified.
(This can be used with all CPUs.)



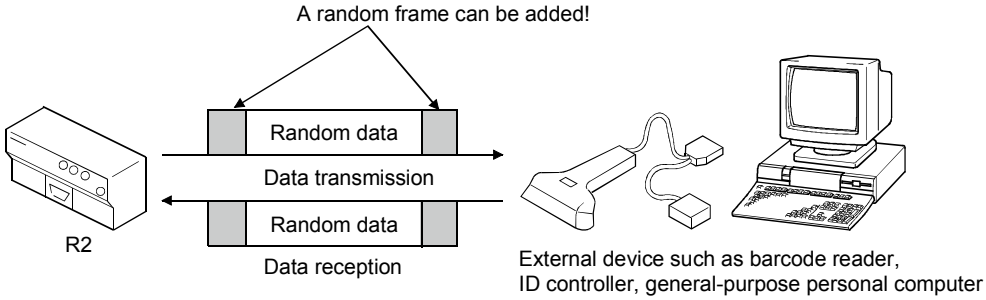
*1 The address differs as shown below for the A Series and Q/QnA Series.
A Series : Bank 2 M 0H to FFFH
Q/QnA Series : M 2000H to 2FFFH

1) The data to be stored in the R2 buffer memory is written into the master station's automatic update buffer.
2) The data is automatically written in at the R2 timing.
3) The data is automatically read at the R2 timing.
4) The corresponding master station's buffer memory is read to the data in the R2 buffer memory to be read out.

(2) Addition of frame during data transmission/reception with external device

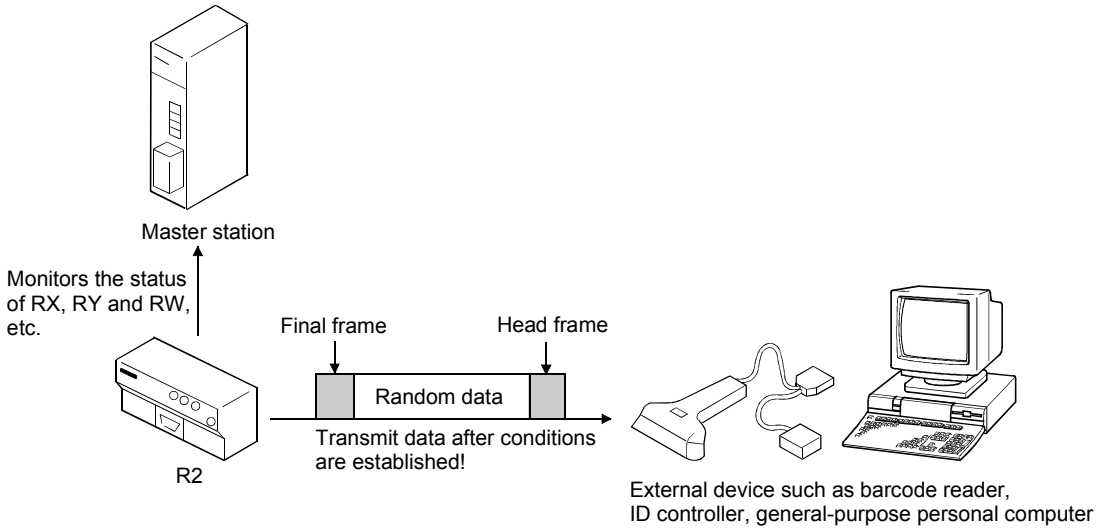
By adding a frame to the head and end, a statement format matching the specifications of the external device, such as the barcode reader or ID controller, can be created and communicated.

The frames include those that are set as the default, and the frames that can be randomly created by the user (user registration frame).



(3) Automatic transmission possible when user-set transmission conditions are established

When the user-designated transmission conditions (changes in RX, RY, RW, etc.), are established, data can be automatically transmitted to the external device.



(4) Two general-purpose input/output points each provided as a standard

Two points each are provided for the general-purpose input and output so the synchronous signal with the barcode reader and ID controller, etc., can be directly input and output without providing a separate remote I/O module.

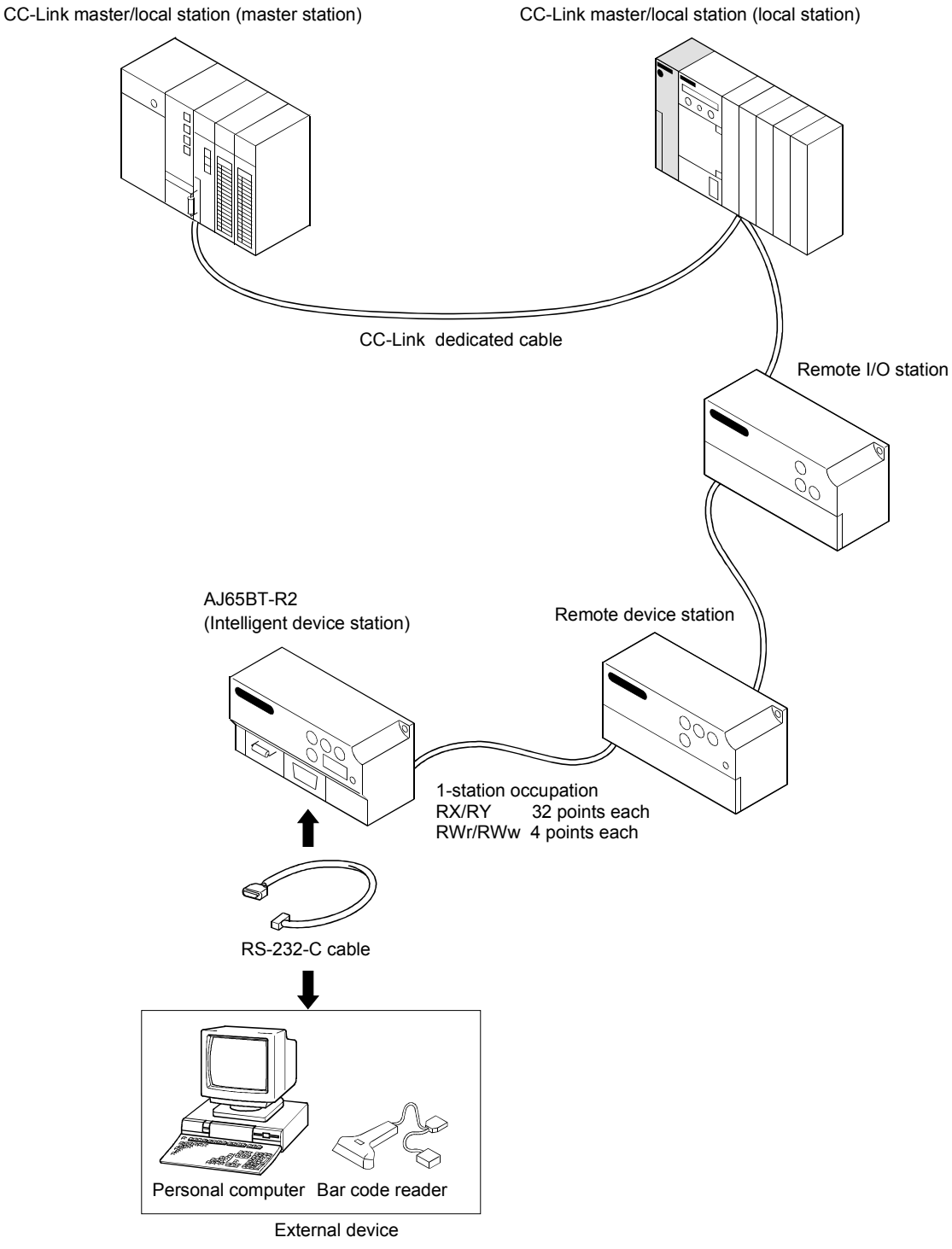
MEMO

2. SYSTEM CONFIGURATION

The system configuration for using R2 is shown explained in this section.

2.1 System configuration

The system configuration for using R2 is shown below.
Up to 26 R2 modules can be connected to one master station.



2.2 Applicable systems

The master module of the CC-Link system that can use R2, and the programmable controller CPU that can use the CC-Link dedicated commands are explained in this section.

(1) Applicable master modules

The following indicates the master modules that can use the R2.

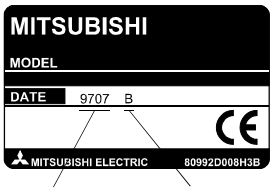
- AJ61BT11
- A1SJ61BT11
- AJ61QBT11
- A1SJ61QBT11
- QJ61BT11N
- QJ61BT11

POINT

When using any of the AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11, use the one that has the following number (9707 B or later) in the DATE field of the rating plate.
The module that does not have "9707 B" in the DATE field cannot use the R2.

<Large type>

<Compact type>



(2) Restrictions on use of CC-Link dedicated commands

Depending on the used programmable controller CPU and master module, the CC-Link dedicated commands may be unusable.
For details of the restrictions, refer to the A Series Master Module User's Manual (Details) and AnSHCPU/AnACPU/AnUCPU Programming Manual (Dedicated Instructions).
For program examples using the dedicated commands, refer to Section 9.2.2, Section 9.2.3, Section 9.3.2 and Section 9.3.3.

3. SPECIFICATIONS

3.1 General specifications

The general specifications of the R2 are shown below.

<table>
<tr><th>Item</th><th colspan="6">Specifications</th></tr>
<tr><td>Working ambient temperature</td><td colspan="6">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="6">-20 to 75°C</td></tr>
<tr><td>Working ambient humidity</td><td colspan="6">10 to 90%RH, with no dew condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="6">10 to 90%RH, with no dew condensation</td></tr>
<tr><td rowspan="5">Vibration resistance</td><td rowspan="5">JIS B 3502, IEC 61131-2 compliant</td><td></td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>No. of sweeps</td></tr>
<tr><td rowspan="2">When there is intermittent vibration</td><td>10 to 57Hz</td><td>–</td><td>0.075mm</td><td rowspan="4">10 times each in X, Y and Z directions (for 80 minutes)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>–</td></tr>
<tr><td rowspan="2">When there is continuous vibration</td><td>10 to 57Hz</td><td>–</td><td>0.035mm</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>–</td></tr>
<tr><td>Impact resistance</td><td colspan="6">JIS B 3502, IEC 61131-2 compliant (147m/s^2, 3 times each in X, Y and Z directions)</td></tr>
<tr><td>Working atmosphere</td><td colspan="6">No corrosive gases</td></tr>
<tr><td>Working altitude *3</td><td colspan="6">2000m or less</td></tr>
<tr><td>Installation place</td><td colspan="6">Inside control panel</td></tr>
<tr><td>Overvoltage category *1</td><td colspan="6">II or less</td></tr>
<tr><td>Degree of contamination *2</td><td colspan="6">2 or less</td></tr>
</table>

*1 Indicates to which power distribution section, from the public power distribution network to the in-plant machine device, the device is assumed to be connected.
Category II applies to a device fed power from a fixed facility.
The withstand surge voltage level for a device with a rating up to 300V is 2500V.

*2 Exponential indicating the degree of conductive matter generated in the environment where device is used.
In the degree of contamination level 2, only non-conductive contaminants are generated. However, temporary conductivity could occur due to rare condensation.

*3 Do not use or store the programmable controller in the environment where the pressure is higher than the atmospheric pressure at sea level. Otherwise, malfunction may result. To use the programmable controller in high-pressure environment, contact your nearest Mitsubishi representative.

3.2 Performance specifications

The R2 performance specifications are shown below.

(1) RS-232-C specifications

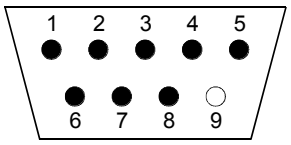
Item		Specifications
Interface specifications		RS-232-C compliant, 1 channel (Refer to section 3.3)
Transmission method		Full duplex communication method
Synchronization method		Start-stop synchronization method
Transmission speed		300, 600, 1200, 2400, 4800, 9600, 19200bps (Select with RS-232-C transmission specification setting switch)
Data format	Star bit	1
	Data bit	7/8
	Parity bit	1 (Yes)/0 (No)
	Stop bit	1/2
Error detection		With parity check (even/odd)/None
Communication control (flow control)		DTR/DSR (ER/DR) control
		DC1/DC3 control
Transmission distance		15m
OS reception area		5120 bytes

(2) Data link specifications

Item	Specifications
General-purpose input/output specifications	Input side : 24VDC (Positive common/negative common shared type) 2 points Output side : Transistor output (sink type) 12/24VDC 2 points Terminal block (Refer to section 3.4)
Transmission path	Bus (RS-485)
EEPROM writing life	100,000 times
CC-Link station type	Intelligent device station
No. of occupied stations	1 station (RX/RY 32 points each, RWw/RWr 4 points each)
Connection cable	CC-Link dedicated cable
Withstand voltage	One minute at 500VAC between DC external terminal batch and grounding
Insulation resistance	10MΩ or more with 500VDC insulation resistance meter between DC external terminal batch and grounding
Noise withstand level	DC type noise voltage 500Vp-p With noise width 1μs, noise frequency 25 to 60Hz noise simulator
Module installation screw	M4 × 0.7mm × 16mm or more screw (Tightening torque range 0.78 to 1.18N·m)
Applicable DIN rail	TH35-7.5Fe, TH35-7.5Al, TH35-15Fe (JIS C 2812 compliant)
External power supply	24VDC
	Current consumption: 0.11A
Tolerable instantaneous power failure time	1ms
Weight	0.40kg

3.3 RS-232-C interface specifications

The specifications of the RS-232-C interface for connection with an external device are shown below.



The following type of connector is mounted on the R2 side, so use a mate connector that matches this type.
9-pin D-SUB (female) screw-fixed type
DDK Ltd.
17L-10090-27-D9AC

Pin No.	Name	Signal abbrev.	Signal direction R2↔external device
1	Reception carrier detection	CD	←
2	Reception data	RD(RXD)	←
3	Transmission data	SD(TXD)	→
4	Data terminal ready	ER(DTR)	→
5	Signal ground	SG	←
6	Data set ready	DR(DSR)	←
7	Transmission request	RS(RTS)	→
8	Transmission enable	CS(CTS)	←
9	Not used	–	–

The details of each signal are explained below.

CD..... The CD signal status can be read with the input signal RXnB.

ER (DTR)..... When using DTR/DSR control, this is turned ON and OFF according to the empty size of the OS reception area for storing the received data.
(The DTR signal turns ON when the RS can receive data.)
When not using DTR/DSR control, the output signal RYnA is followed.

DR (DSR) ..... When using DTR/DSR control, if this is OFF, data will not be transmitted from R2 to the external device.
Set this to be always ON when the external device is in the reception enabled state.
When not using DTR/DSR control, the DSR signal status will be ignored.

RS..... This follows the R2 101H setting and output signal RYn9.

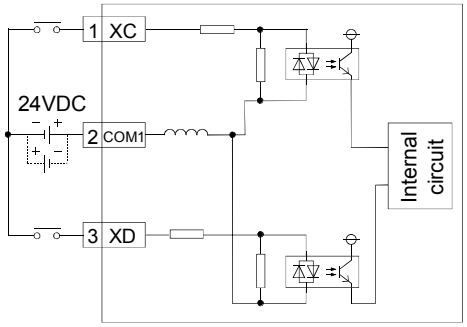
CS..... When the CS signal is OFF, data will not be transmitted from R2 to the external device.
Set this to be always ON when the external device is in the reception enabled state.

A standard connection example of the RS-232-C cable is given in section 4.5.2.

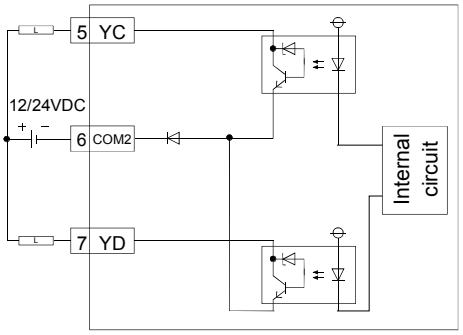
3.4 General-purpose input/output specifications

The general-purpose input/output specifications of the R2 are shown below.

(1) General-purpose input specifications

		DC input (Positive common/negative common shared type)				
		R2	External connection view			
No. of input points		2 points				
Insulation method		Photo coupler insulation				
Rated input voltage		24VDC				
Rated input current		Approx. 7mA				
Working voltage range		19.2 to 28.8VDC (ripple rate within 5%)				
Max. No. of simultaneous input points		100%				
ON voltage/ON current		14V or more/3.5mA or more				
OFF voltage/OFF current		6V or less/1.7mA or less				
Input resistance		Approx. 3.3kΩ				
Response time	OFF→ON	10ms or less				
	ON→OFF	10ms or less				
Common method		2 points/common (COM1) Positive common/negative common shared type				
External connection method		7-point terminal block (M3.5 screw)	Terminal No.	Signal name	Terminal No.	Signal name
Applicable wire size		0.75 to 2mm^2	TB1	XC	TB3	XD
Applicable crimp terminal		RAV1.25-3.5, RAV2-3.5 (JIS C 2805 compliant)	TB2	COM1	TB4	NC

(2) General-purpose output specifications

		Transistor output (sink type)				
		R2	External connection view			
No. of output points		2 points				
Insulation method		Photo coupler insulation				
Rated load voltage		12/24VDC				
Working load voltage range		10.2 to 28.8VDC (ripple rate within 5%)				
Max. load current		0.1A/point 0.2A/common				
Max. rush current		0.4A 10ms or less				
Leakage current at OFF		0.1mA or less				
Max. voltage drop at ON		1.5VDC or less (MAX) 0.1A				
Output type		Sink type				
Response time	OFF→ON	2ms or less				
	ON→OFF	2ms or less (resistance load)				
Output section externally supplied power	Voltage	10.2 to 28.8VDC (ripple rate within 5%)				
	Current	50mA or less (TYP. 24VDC, per common) Not including external load current.				
Surge killer		Zener diode				
Common method		2 points/common (COM2)				
External connection method		7-point terminal block (M3.5 screw)	Terminal No.	Signal name	Terminal No.	Signal name
Applicable wire size		0.75 to 2mm^2	TB5	YC	TB7	YD
Applicable crimp terminal		RAV1.25-3.5, RAV2-3.5 (JIS C 2805 compliant)	TB6	COM2		

3.5 List of functions

The R2 functions are shown below.

Function		Explanation	Relation with main function		Reference
			Trans-mission	Recep-tion	
Main function	Non-procedural communication function	Non-procedural data transmission/reception with external device such as barcode reader, ID controller, general-purpose personal computer.	–	–	Chapter 6
Auxiliary functions	Buffer memory automatic update	Automatically updates the buffer memory between the R2 and master station at the update timing set in each area of the R2 buffer memory.	×	×	Section 5.6
	Frame addition	Adds a frame registered for R2 at the head and end of the transmission data when transmitting data.	○	○	Chapter 7
	Monitor transmission	Automatically transmits data to the external device when the user-designated transmission conditions (changes in RX, RY, RW and status) are established.	○	○	Section 7.4
	Transmission cancellation	After transmission request is issued from the master station to R2, forcibly cancels the transmission before R2 completes transmission to external device.	○	×	Section 8.1
	Forced reception complete	Forcibly completes the reception when reception data from external device has not reached the reception complete data size, etc., and reads out the currently received data.	×	○	Section 8.2
	Flow control	Stops/resumes transmission of data from external device according to open space in R2 OS reception area. Stops/resumes transmission of data from R2 according to requests from external device.	○	○	Section 8.3
	ASCII-BIN conversion	Carries out ASCII-BIN conversion on the transmitted/received data.	○	○	Section 8.4
	RW update	Assigns master station remote register (RW) and R2 side area to be automatically updated in the buffer memory.	×	×	Section 8.5
	R2 initialization	Initializes the R2.	×	×	Section 8.6
	OS reception area clear	Clears the received data stored in the R2 OS reception area.	×	×	Section 8.7
	Registration to RS EEPROM	Registers a setting value for the R2 buffer memory's specific application area in the EEPROM, or returns the value registered in the EEPROM to the R2 default value. The value for the R2 buffer memory registered in the EEPROM (including the setting values changed by the user) is used as an initial value at the time of the R2 startup.	×	×	Section 8.8
	RS-232-C signal control	Reads the status of the RS-232-C interface signal stored in the R2 buffer memory, and controls the output.	×	×	Section 8.9

○: Related, ×: Not related

3.6 Input/output signals for master module

The input/output signals (RX/RY) for the R2 master module are explained in this section.

3.6.1 List of input/output signals

A list of the R2 input/output signals is shown below.

Signal direction Master module ← R2			Signal direction Master module → R2		
Device No. (input)	Signal name		Device No. (output)	Signal name	
RXn0	Transmission normal complete		RYn0	Transmission request	
RXn1	Transmission error complete		RYn1	Transmission cancel request	
RXn2	Reception normal read request		RYn2	Reception read complete	
RXn3	Reception error read request		RYn3	Forced reception complete request	
RXn4	Initialization normal complete		RYn4	Initialization request	
RXn5	Initialization error complete		RYn5	Use prohibited	
RXn6	OS reception area clear complete		RYn6	OS reception area clear request	
RXn7	EEPROM function normal complete		RYn7	EEPROM function request	
RXn8	EEPROM function error complete		RYn8	Use prohibited	
RXn9	Signal status	CS (CTS) signal	RYn9	Signal setting	RS (RST) signal *1
RXnA		DR (DSR) signal	RYnA		ER (DTR) signal *2
RXnB		CD signal	RYnB	Use prohibited	
RXnC to RXnD	General-purpose external input signal		RYnC to RYnD	General-purpose external output signal	
RXnE to RX(n+1)8	Use prohibited		RYnE to RY(n+1)8	Use prohibited	
RX(n+1)9	Initial data read complete		RY(n+1)9	Initial data read request	
RX(n+1)A	Error state		RY(n+1)A	Error reset request	
RX(n+1)B	Remote station ready		RY(n+1)B to RY(n+1)D	Use prohibited	
RX(n+1)C to RX(n+1)D	Use prohibited				
RX(n+1)E	Intelligent device station access complete		RY(n+1)E	Intelligent device station access request	
RX(n+1)F	Use prohibited		RY(n+1)F	Use prohibited	

n: Address assigned to master module with station No. setting.

*1 The RS signal setting is valid when the "RS signal status designation (R2 101H)" is set to "Follow RYn9 ON/OFF (1)". (Refer to section 8.9.)

*2 The ER signal setting is invalid when the "Flow control designation (R2 100H)" is set to "Carry out flow control. (DTR/DSR/ (ER/DR) control) (1)".

Important

Do not designate the RXn0 to RXn8, RXnE to RX(n+1)F, RYn0 to RYn9, RYnB, or RYnE to RY (N+1)F signals to the following functions.

- Monitor target RX/RY for monitor transmission function
- Reference RX/RY for registration frame RX/RY/RW reference special character.

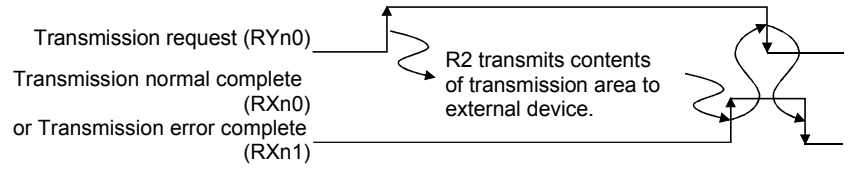
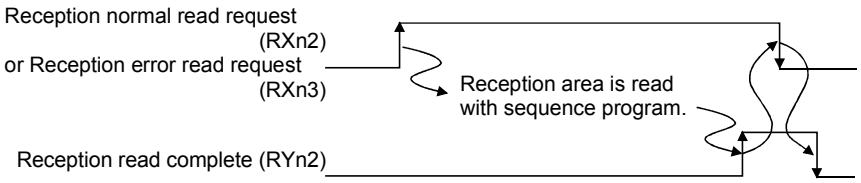
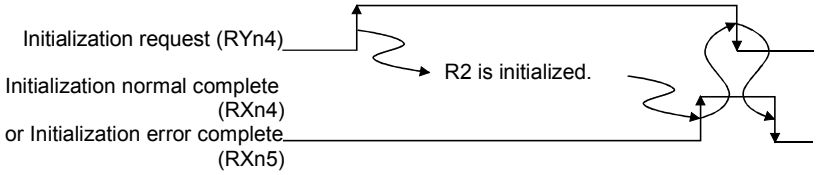
Do not output (turn ON) the usage-prohibited signals.

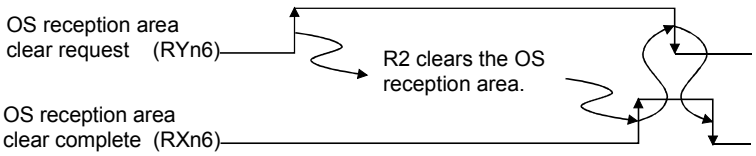
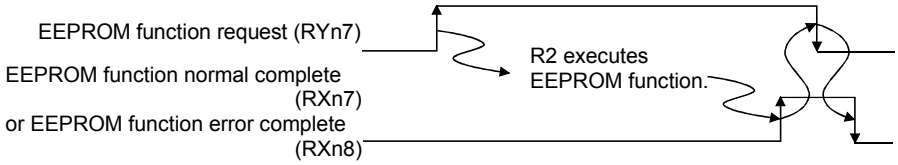
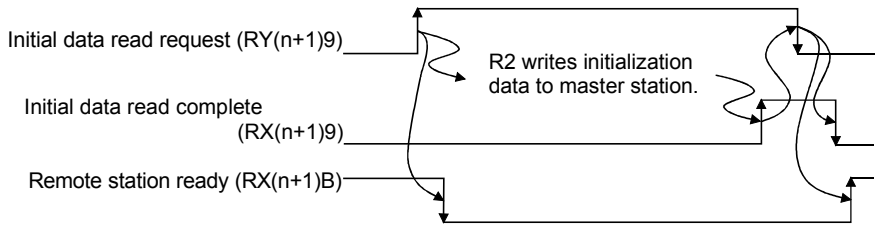
If an output is carried out to a usage-prohibited signal, the programmable controller system could malfunction.

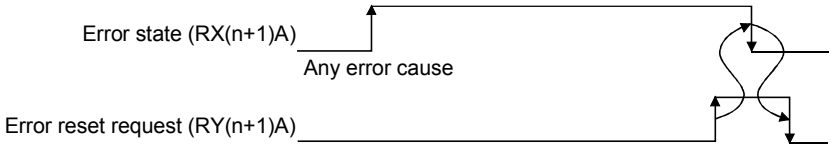
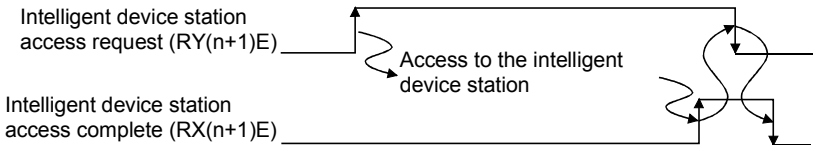
3.6.2 Details of input/output signals

A detailed explanation of the R2 input/output signals is given below.
The lines in the timing chart indicate the following details.

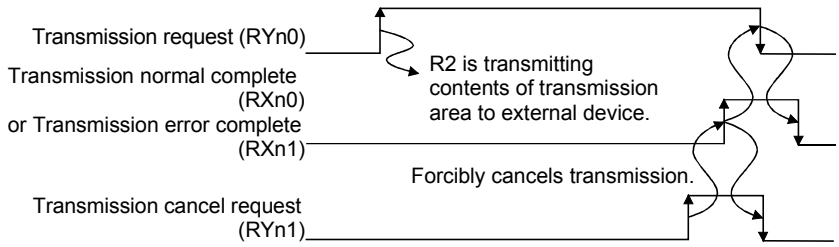
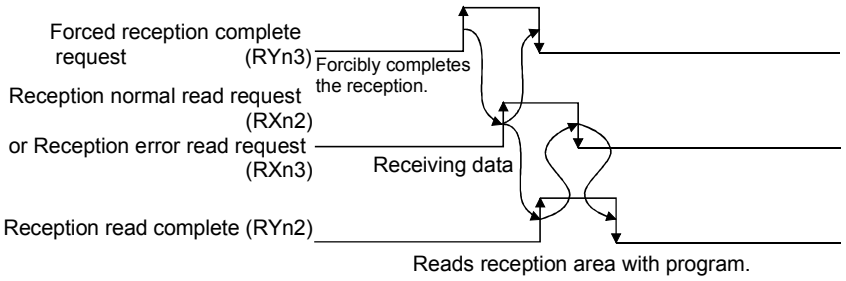
(1) Remote input (RX)

<table>
<tr><th>Device No.</th><th>Signal name</th><th>Details</th></tr>
<tr><td>RXn0</td><td>Transmission normal complete</td><td rowspan="2">When transmitting data to an external device connected to R2, after the transmission data is written into the R2 transmission area, the transmission request (RYn0) is turned ON.
When the transmission is completed normally, transmission normal complete (RXn0) turns ON, and if the transmission is completed abnormally, transmission error complete (RXn1) turns ON.
The transmission request (RYn0) turns OFF when these signals turn ON.
 
</td></tr>
<tr><td>RXn1</td><td>Transmission error complete</td></tr>
<tr><td>RXn2</td><td>Reception normal read request</td><td rowspan="2">When data is received from an external device connected to R2 and the transmission is completed normally, reception normal read request (RXn2) turns ON. If the transmission is completed abnormally, reception error read request (RXn3) turns ON.
The reception data is stored in the R2 reception area at this time.
The data in the R2 reception area is read out when these signals turn ON, and read complete (RYn2) turns OFF when the reading is completed.
 
</td></tr>
<tr><td>RXn3</td><td>Reception error read request</td></tr>
<tr><td>RXn4</td><td>Initialization normal complete</td><td rowspan="2">The initialization request (RYn4) is turned ON to initialize R2.
When the R2 is correctly initialized, initialization correct complete (RXn4) turns ON, and when the process ends abnormally, initialization error complete (RXn5) turns ON.
The initialization request signal (RYn4) turns OFF when these signals turn ON.
 
</td></tr>
<tr><td>RXn5</td><td>Initialization error complete</td></tr>
</table>

<table>
<tr><th>Device No.</th><th colspan="2">Signal name</th><th>Details</th></tr>
<tr><td>RXn6</td><td colspan="2">OS reception area clear complete</td><td>The OS reception area clear request (RYn6) is turned ON to abort the data in the R2 OS reception area.
When OS reception area clear is completed, the R2 turns the OS reception area clear complete (RXn6) ON, so the OS reception area clear request (RYn6) will turn OFF.
 
</td></tr>
<tr><td>RXn7</td><td colspan="2">EEPROM function normal complete</td><td rowspan="2">When the R2 EEPROM function is executed, after the data is read into the R2 buffer memory (1C0H), EEPROM function request (RYn7) turns ON.
When completed normally, EEPROM function normal complete (RXn7) turns ON.
When completed abnormally, EEPROM function error complete (RXn8) turns ON.
When these signals turn ON, EEPROM function request (RYn7) turns OFF.
 
</td></tr>
<tr><td>RXn8</td><td colspan="2">EEPROM function error complete</td></tr>
<tr><td>RXn9</td><td rowspan="3">Signal status</td><td>CS (CTS) signal</td><td rowspan="3">This signal indicates the control signal status (CS, DR, CD signal) during RS-232-C communication with an ON or OFF state.</td></tr>
<tr><td>RXnA</td><td>DR (DSR) signal</td></tr>
<tr><td>RXnB</td><td>CD signal</td></tr>
<tr><td>RXnC</td><td colspan="2" rowspan="2">General-purpose external input signal</td><td rowspan="2">This signal indicates the status of the R2 general-purpose external input (XC, XD) status with an ON or OFF state.
RXnC: Corresponds to XC RXnD: corresponds to XD</td></tr>
<tr><td>RXnD</td></tr>
<tr><td>RX(n+1)9</td><td colspan="2">Initial data read complete</td><td>When writing in the initialization data before executing initialization, the initial data read request (RY(N+1)9) turns ON, and the initialization data is written to the master station.
At this time, remote station ready (RX(n+1)B) turns OFF.
When the writing is completed, initial data read complete (RX(n+1)9) turns ON, and the initial data read request (RY(n+1)9) turns OFF.
When these turn OFF, initial data read complete (RX(n+1)9) turns OFF, and remote station ready (RX(n+1)B) turns ON.
 
</td></tr>
</table>

Device No.	Signal name	Details
RX(n+1)A	Error state	This signal indicates the R2 error state. If the R2 ERR.LED is lit, the error status (RX(n+1)A) turns ON, and when the ERR.LED is OFF, the status turns OFF. When an error occurs, the R2 stores the error code in the error code storage area (R2 $1A8_H$ to $1B2_H$). When the error reset request (RY(n+1)A) is turned ON after remedying the error cause, the error status (RX(n+1)A) can be turned OFF. When the initialization error complete (RXn5) is ON, review the R2 initial setting and turn ON the initialization request (RYn4) again to reinitialize the setting. When the reinitialization is completed normally and the initialization normal complete (RXn4) turns ON, the error state (RX(n+1)A) turns OFF. (When the initialization error complete (RXn5) is ON, turning ON the error reset request (RY(n+1)A) will not turn OFF the error state (RX(n+1)A).) 
RX(n+1)B	Remote station ready	This signal indicates that the R2 can operate. (Refer to the section for RX(n+1)9.) ON : The R2 is in the operatable state, and the initial data read request (RY(n+1)9) is OFF. OFF : An R2 initialization error occurred (R2 buffer memory setting value error), or when the initial data read request (RY(n+1)9) is turned ON.
RX(n+1)E	Intelligent device station access complete	This signal indicates the R2 access complete state in response to the intelligent device station access request (RY(n+1)E). If not using dedicated commands and directly reading/writing from the programmable controller CPU to the master station buffer memory, when accessing to the R2 is completed, the R2 will turn intelligent device station access complete (RX(n+1)E) ON. With this signal, the intelligent device station access request (RY(n+1)E) will turn OFF. 

(2) Remote output (RY)

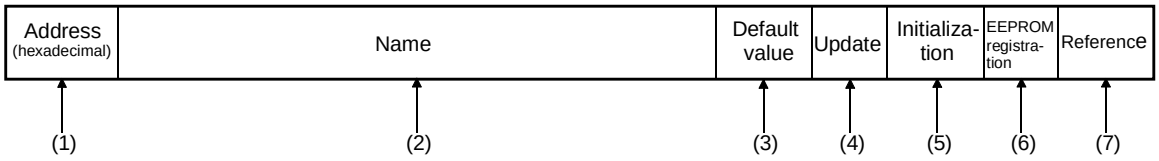
Device No.	Signal name	Details
RYn0	Transmission request	Refer to the sections on RXn0 and RXn1.
RYn1	Transmission cancel request	To cancel the transmission after requesting transmission from R2, the transmission will be canceled when the transmission cancel request (RYn1) turns ON. When the transmission is forcibly canceled, the transmission normal complete (RXn0) or transmission error complete (RXn1) will turn ON. When these turn ON, the transmission request (RYn0) and transmission cancel request (RYn1) will turn OFF. 
RYn2	Reception read complete	Refer to the sections on RXn2 and RXn3.
RYn3	Forced reception complete request	When the forced reception complete request (RYn3) turns ON, reception from the external device will be forcibly completed. When the forced reception is completed, the reception normal read request (RXn2) and reception error read request (RXn3) will turn ON. When these turn ON, forced reception complete request (RYn3) will turn OFF and reception read complete (RYn2) will turn ON. When the reception read complete (RYn2) turns ON, the reception normal read request (RXn2) and reception error read request (RXn3) will turn OFF. When this turns OFF, reception read complete (RYn2) will turn OFF. 
RYn4	Initialization request	Refer to the sections on RXn4 and RXn5.
RYn6	OS reception area clear request	Refer to the section on RXn6.
RYn7	EEPROM function request	Refer to the sections on RXn7 and RXn8.

Device No.	Signal name		Details
RYn9	Signal setting	RS(RTS) signal *1	This signal turns the RS (RTS) signal of the RS-232-C line ON or OFF. Note that when "RS (RTS) signal status designation (R2 101H)" is set to "Always ON (0)", the signal will remain ON even if the RS signal setting (RYn9) is turned ON or OFF. When controlling the RS signal with the RS (RTS) signal, set the above buffer memory to "Follow RYn9 ON/OFF (1)".
RYnA		ER(DTR) signal *2	This signal turns the ER (DTR) signal of the RS-232-C line ON or OFF. When using DTR/DSR (ER/DR) control, even if the ER (DTR) signal (RYnA) is turned ON or OFF, the process will follow the flow control designation (R2 100H) setting. If the ER signal is being controlled with the ER (DTR) signal (RYnA) set the above buffer memory to "No flow control (0)" or "Executing flow control by the DC code control (2)".
RYnC RYnD	General-purpose external output signal		This signal indicates the status of the R2 general-purpose output (YC, YD) with an ON or OFF state. RYnC: Corresponds to YC RYnD: Corresponds to YD
RY(n+1)9	Initial data read request		Refer to the section on RX(n+1)9.
RY(n+1)A	Error reset request		Refer to the section on RX(n+1)A.
RY(n+1)E	Intelligent device station access request		Refer to the section on RX(n+1)E.

3.7 R2 buffer memory list

The entire configuration of the R2 buffer memory is explained in this section.
The contents of the R2 buffer memory are cleared to the default values when the power is turned OFF.
However, if the user has registered the default values in the R2 EEPROM, the EEPROM default values will be written in when the power is turned ON.
Refer to section 8.8 for details on writing to the R2 EEPROM.

Refer to the buffer memory list in the following manner.



No.	Name	Details
(1)	Address	Indicates R2 buffer memory address as a hexadecimal.
(2)	Name	Indicates the name of the R2 buffer memory.
(3)	Default value	Indicates the default value at R2 shipment.
(4)	Update	Indicates whether the R2 buffer memory value is updated by the master station or R2. • M station : Updated by the master station • R2 : Updated by R2 • Both : Updated by both master station and R2
(5)	Initialization	Indicates whether initialization is required when the R2 buffer memory values have been changed. Refer to section 8.6 for details on initialization. • Required : Initialization is required. • Not required : Initialization is not required.
(6)	EEPROM registration	Indicates whether the contents of the R2 buffer memory can be registered in the R2 EEPROM. Refer to section 8.8 for details on registering to the EEPROM. • Possible : Registration to the EEPROM is possible. • Not possible : Registration to the EEPROM is not possible.
(7)	Reference	Indicates the chapter, section or page containing detailed explanations.

(1) Area for designating various assignments

Address (hexadecimal)	Name			Default value	Update	Initialization	EEPROM registration	Reference
R2 0H	Head address designation area		Transmission area head address designation	200H	M station	Required	Possible	Section 6.1
R2 1H			Transmission area size designation	200H				
R2 2H			Reception area head address designation	400H				Section 6.2
R2 3H			Reception area size designation	200H				
R2 4H to FH	System area (Use prohibited)			–	–	–	–	–
R2 10H	Automatic update area designation	Status storage area	Transmission size	20H	M station	Required	Possible	Section 5.6.2
R2 11H			R2 side head address	1A0H				
R2 12H			(Fixed value: 4004H)	4004H				
R2 13H			Master station side offset address	1A0H				
R2 14H		Transmission area 1	Transmission size	88H				
R2 15H			R2 side head address	118H				
R2 16H			(Fixed value: 4004H)	4004H				
R2 17H			Master station side offset address	118H				
R2 18H		Transmission area 2	Transmission size	200H				
R2 19H			R2 side head address	200H				
R2 1AH			(Fixed value: 4004H)	4004H				
R2 1BH			Master station side offset address	200H				
R2 1CH		Reception area	Transmission size	200H				
R2 1DH			R2 side head address	400H				
R2 1EH			(Fixed value: 4004H)	4004H				
R2 1FH			Master station side offset address	400H				
R2 20H		Initial setting area	Transmission size	1A0H				
R2 21H			R2 side head address	0H				
R2 22H			(Fixed value: 4004H)	4004H				
R2 23H			Master station side offset address	0H				
R2 24H		EEPROM function area	Transmission size	30H				
R2 25H			R2 side head address	1C0H				
R2 26H			(Fixed value: 4004H)	4004H				
R2 27H			Master station side offset address	1C0H				

Address (hexadecimal)	Name			Default value	Update	Initialization	EEPROM registration	Reference
R2 28H	Automatic update area designation	User registration frame area	Transmission size	29H	M station	Required	Possible	Section 5.6.2
R2 29H			R2 side head address	1C7H				
R2 2AH			(Fixed value: 4004H)	4004H				
R2 2BH			Master station side offset address	1C7H				
R2 2CH		Monitor transmission area 1	Transmission size	88H				
R2 2DH			R2 side head address	118H				
R2 2EH			(Fixed value: 4004H)	4004H				
R2 2FH			Master station side offset address	118H				
R2 30H		Monitor transmission area 2	Transmission size	200H				
R2 31H			R2 side head address	200H				
R2 32H			(Fixed value: 4004H)	4004H				
R2 33H			Master station side offset address	200H				
R2 34H to 3FH	System area (Use prohibited)			–	–	–	–	–
R2 40H	RW update interval time designation			1	M station	Required	Possible	Section 8.5
R2 41H	RWw update validity designation			0				
R2 42H	RWr update validity designation			1				
R2 43H	RW refresh destination address designation		Master station→R2 (RWw0)	118H				
R2 44H			R2→Master station (RWr0)	1B0H				
R2 45H			Master station→R2 (RWw1)	119H				
R2 46H			R2→Master station (RWr1)	1B1H				
R2 47H			Master station→R2 (RWw2)	120H				
R2 48H			R2→Master station (RWr2)	1B2H				
R2 49H			Master station→R2 (RWw3)	121H				
R2 4AH			R2→Master station (RWr3)	1B6H				
R2 4BH to 6FH	System area (Use prohibited)			–	–	–	–	–
R2 70H	Monitor interval time designation			0	M station	Required	Possible	Section 7.4
R2 71H	No. of monitor designation			0				
R2 72H to 77H	System area (Use prohibited)			–	–	–	–	–
R2 78H	Monitor designation –1		Monitor target designation	0	M station	Required	Possible	Section 7.4
R2 79H			Transmission data designation	0				
R2 7AH	Monitor designation –2		Monitor target designation	0				
R2 7BH			Transmission data designation	0				
R2 7CH to F5H	↓			0				
R2 F6H	Monitor designation –64		Monitor target designation	0				
R2 F7H			Transmission data designation	0				
R2 F8H to FFH	System area (Use prohibited)			–	–	–	–	–

(2) Parameter area

Address (hexadecimal)	Name			Default value	Update	Initialization	EEPROM registration	Reference
R2 100H	Flow control designation			1	M station	Required	Possible	Section 8.3
R2 101H	RS (RTS) signal status designation			0				Section 8.9
R2 102H	Word/byte unit designation			0				Section 6.1, 6.2
R2 103H	ASCII-BIN conversion designation			0				Section 8.4
R2 105H	Transient timeout time designation			0				Section 5.6.1
R2 106H to 107H	System area (Use prohibited)			–	–	–	–	–
R2 108H	Reception head frame No.			0	M station	Required	Possible	Section 7.3
R2 109H				0				
R2 10AH				0				
R2 10BH				0				
R2 10CH	Reception end frame No.			AH				
R2 10DH				DH				
R2 10EH				0				
R2 10FH				0				
R2 110H	Reception head frame/reception end frame abort designation			1				
R2 111H	Reception end data size designation			0				Section 6.2
R2 112H	Reception timeout time designation			0				
R2 113H to 117H	System area (Use prohibited)			–	–	–	–	–
R2 118H	Transmission frame - 1 area	Transmission head frame No.		0	M station	Not required	Possible	Section 7.2.1
R2 119H		Transmission end frame No.		0				
R2 11AH	Transmission timeout time designation			0				Section 6.1
R2 11BH to 11FH	System area (Use prohibited)			–	–	–	–	–
R2 120H	Transmission frame - 2 area	Transmission table head No. designation		0	M station	Not required	Possible	Section 7.2.2
R2 121H		No. of transmission tables		0				
R2 122H		Transmission table designation	No. 1	0				
R2 123H to 184H			↓					
R2 185H			No.100					
R2 186H to 18FH	System area (Use prohibited)			–	–	–	–	–
R2 19DH to 19FH	System area (Use prohibited)			–	–	–	–	–

(3) Setting status storage area

Address (hexadecimal)	Name	Default value	Update	Initialization	EEPROM registration	Reference
R2 1A0H	Station No. setting switch	*1	R2	Not required	Not possible	Section 8.10
R2 1A1H	Data link transmission speed setting switch					
R2 1A2H	Mode setting switch					
R2 1A3H	RS-232-C transmission speed					
R2 1A4H	RS-232-C data bit length					
R2 1A5H	RS-232-C parity bit presence					
R2 1A6H	RS-232-C stop bit length					
R2 1A7H	Buffer memory default value setting status storage	0				Section 8.8

*1 Follows switch setting

(4) Communication status storage area

Address (hexadecimal)	Name		Default value	Update	Initialization	EEPROM registration	Reference
R2 1A8H to 1AFH	Error code storage area	Error code history	0	R2	Not required	Not possible	Section 10.1.1
R2 1B0H		General error code	0				
R2 1B1H		Error code at transmission	0				
R2 1B2H		Error code at reception	0				
R2 1B3H	System area (Use prohibited)		–	–	–	–	–
R2 1B4H	Actual transmission data size storage		0	R2	Not required	Not possible	Section 6.1
R2 1B5H	Reception frame index No. storage		0				Section 7.3
R2 1B6H	No. of data items in OS reception area data size storage		0				Section 6.2
R2 1B7H to 1BEH	System area (Use prohibited)		–	–	–	–	–
R2 1BFH	Software version storage		Follows version	R2	Not required	Not possible	Section 8.10

(5) EEPROM area

Address (hexadecimal)	Name	Default value	Update	Initialization	EEPROM registration	Reference
R2 1C0H	EEPROM function designation	0	M station	Not required	Not possible	Section 8.8 and Section 7.5.2
R2 1C1H	User-registered frame No. designation	0				Section 7.5.2
R2 1C2H to 1C6H	System area (Use prohibited)	–	–	–	–	–
R2 1C7H	User-registered frame byte designation	0	Both	Not required	Not possible	Section 7.5.2
R2 1C8H to 1EFH	User-registered frame	0				
R2 1F0H to 1FFH	System area (Use prohibited)	–	–	–	–	–

(6) User free area

Address (hexadecimal)	Name	Default value	Update	Initialization	EEPROM registration	Reference
R2 200H	Default transmission data size designation area	0	M station	Not required	Not possible	Section 6.1
R2 201H to 3FFH	Default transmission data designation area	0				
R2 400H	Default reception data size designation area	0	R2	Not required	Not possible	Section 6.2
R2 401H to 5FFH	Default reception data designation area	0				
R2 600H to 7FFH	Area not used at default	0	Follows transmission/ reception area setting	Not required	Not possible	Chapter 6
R2 800H to F1FH	System area (Use prohibited)	–	–	–	–	–

3.8 Transmission delay time

The transmission delay time (time for data to be conveyed) is shown below.

(1) Calculation expressions

Details	Calculation expression (unit: ms)	
	When the master station is the A/QnA Series	When the master station is the Q Series
Master station (RX/RWr) ← R2 (RX/RWr)	SM + LS × 3 + RS	SM + LS × 3 + RS
Master station (RY/RWw) → R2 (RY/RWw)		SM + LS × 2 + RS
Master station (RX) → General-purpose input (RXnC, RXnD)	SM + LS × 3 + 10	
Master station ← General-purpose output (RYnC, RYnD)	SM + LS × 3 + 2	

SM : Master station sequence program's scan time
LS : Link scan time (Refer to Master Module User's Manual)
RS : R2 internal processing time *1

*1 R2 internal processing time
The R2 internal processing time is calculated with the following equation.

R2 internal processing time (R2) = LS × K (constant)

Transmission speed	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
K (constant)	2	2	4	8	32

(2) Calculation example

An example for calculating the transmission delay time from the master station (RX/RWr) to R2 (RX/RWr).

When only one R2 is connected with SM: 20ms, and transmission speed: 156kbps

(a) When the master station is the A/QnA Series

LS : 51.2 {29.4 + (8 × 4.8) + (8 × 9.6) + (1 + 32.4) + (1 × 4.8) + (1 × 9.6)} + 1300 ≒ 11100μs (11.1ms)

20 + 11.1 × 3 + 11.1 × 2 = 75.5ms

(b) When the master station is the Q Series

LS : 51.2 {27 + (8 × 4.8) + (8 × 9.6) + (1 × 30) + (1 × 4.8) + (1 × 9.6)} + 1300 + 0 + 0 ≒ 10854μs (10.9ms)

20 + 10.9 × 2 + 10.9 × 2 = 63.6ms

3.9 Transmission/reception time

The transmission/reception time is shown below.

3.9.1 When using buffer memory automatic update function

The transmission time is the time from when the transmission request (RYn0) turns ON to when the R2 turns the transmission normal complete (RXn0) ON.
The reception time is the time from when the R2 starts receiving the data to when the reception normal read request (RXn2) and reception error read request (RXn3) are turned ON by the R2.

(1) Calculation expressions

Details		Calculation expression (unit: ms)
When the master station is the A/QnA Series	Transmission time	SM × 2 + LS × 6 + RS + data transmission time *1 + request/response scan time of area to be updated at transmission *2
	Reception time	SM + LS × 3 + RS + data reception time *1 + request/response scan time of area to be updated at reception *2
When the master station is the Q Series	Transmission time	SM × 2 + LS × 4 + RS + data transmission time *1 + request/response scan time of area to be updated at transmission *2
	Reception time	SM + LS × 2 + RS + data reception time *1 + request/response scan time of area to be updated at reception *2

SM : Master station sequence program's scan time
LS : Link scan time (Refer to Master Module User's Manual.)
RS : R2 internal processing time (Refer to section 3.8 (1).)

*1 Data transmission (reception) time
This time is obtained with the data size and RS-232-C transmission speed.
(Example) Data size: 200 bytes, Transmission speed: 9600bps (data bit length: 8, stop bit length: 1, parity bit: even)
$200 \times 10/9600 \fallingdotseq 0.208s$

*2 Request/response scan of area to be updated at transmission (reception)
This is the response/request scan of each area automatically updated during transmission (reception).
With the default value for transmission, the status storage area and transmission area 1 and 2 are updated. With the reception default value, the status storage area and reception area are updated.

<Request/response scan of area where data is written from master station to R2>
$\underline{(\text{Size of data to be automatically updated} + 16)/72} \times \text{LS [ms]}$
Decimal point rounded up

<Request/response scan of area where data is written from R2 to master station>
$\underline{(\text{Size of data to be automatically updated} + 16)/16} \times \text{LS [ms]}$
Decimal point rounded up

(2) Calculation example

(a) Transmission time

An example of calculating the transmission time for transmitting 10 words (20 bytes) of data is shown below.

Item	Setting details
Transmission size of each area	Default value
Transmission speed	156kbps
No. of connected modules	Only one R2 module
Master station sequence program scan time	20ms (Hypothetical)
Transmission speed	9600bps
Data bit length	8
Stop bit length	1
Parity bit	Even

1) When the master station is the A/QnA series

LS = 51.2 {29.4 + (8 × 4.8) + (8 × 9.6) + (1 × 32.4) + (1 × 4.8) + (1 × 9.6)}
+ 1300 ≒ 11100μs (11.1ms)

Data transmission time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Transmission time = 20 × 2 + 11.1 × 6 + (11.1 × 2) *1 + 20.8 *2
+ {(136 + 16)/72 × 11.1} *3 + {(512 + 16)/72 × 11.1} *4
+ {(32 + 16)/16 × 11.1} *5
= 149.6 + 3 × 11.1 + 8 × 11.1 + 3 × 11.1
= 305ms

2) When the master station is the Q series

LS = 51.2 {27 + (8 × 4.8) + (8 × 9.6) + (1 × 30) + (1 × 4.8) + (1 × 9.6)}
+ 1300 +0 +0 ≒ 10854μs (10.9ms)

Data transmission time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Transmission time = 20 × 2 + 10.9 × 4 + (10.9 × 2) *1 + 20.8 *2
+ {(136 + 16)/72 × 10.9} *3 + {(512 + 16)/72 × 10.9} *4
+ {(32 + 16)/16 × 10.9} *5
= 126.2 + 3 × 10.9 + 8 × 10.9 + 3 × 10.9
= 278.8ms

*1 R2 (R2 internal processing time)
*2 Data transmission time
*3 Transmission area 1 request/response scan (88H (136 words) worth)
*4 Transmission area 2 request/response scan (200H (512 words) worth)
*5 Status storage area request/response scan (20H (32 words) worth)

(b) Reception time

An example for calculating the reception time when receiving 10 words (20 bytes) of data is shown below.

Item	Setting details
Transmission size of each area	Default value
Transmission speed	156kbps
No. of connected modules	Only one R2 module
Master station sequence program scan time	20ms (Hypothetical)
Transmission speed	9600bps
Data bit length	8
Stop bit length	1
Parity bit	Even

1) When the master station is the A/QnA series

LS = 51.2 {29.4 + (8 × 4.8) + (8 × 9.6) + (1 × 32.4) + (1 × 4.8) + (1 × 9.6)}
+ 1300 ≒ 11100μs (11.1ms)

Data reception time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Reception time = 20 + 11.1 × 3 + (11.1 × 2) *1 + 20.8 *2
+ {(32 + 16)/16 × 11.1} *3 + {(512 + 16)/16 × 11.1} *4
= 96.3 + 3 × 11.1 + 33 × 11.1 = <u>495.9ms</u>

2) When the master station is the Q series

LS = 51.2 {27 + (8 × 4.8) + (8 × 9.6) + (1 × 30) + (1 × 4.8) + (1 × 9.6)}
+ 1300 + 0 + 0 ≒ 10854μs (10.9ms)

Data reception time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Reception time = 20 + 10.9 × 2 + (10.9 × 2) *1 + 20.8 *2
+ {(32 + 16)/16 × 10.9} *3 + {(512 + 16)/16 × 10.9} *4
= 84.4 + 3 × 10.9 + 33 × 10.9 = <u>476.8ms</u>

*1 RS (R2 internal processing time)
*2 Data transmission time
*3 Status storage area request/response scan (20H (32 words) worth)
*4 Reception area request/response scan (200H (512 words) worth)

3.9.2 When using transmission/reception buffer

The transmission time is the time from when the transmission data is stored in the R2, the transmission request (RYn0) is turned ON to when the transmission normal complete (RXn0) is turned ON by the R2.
The reception time is the time from when the R2 starts receiving the data, the reception normal read request (RXn2) and reception error read request (RXn3) are turned ON by the R2, to when the data is received.

(1) Calculation expression

Details		Calculation expression (unit: ms)
When the master station is the A/QnA Series	Transmission time	SM + 2 + LS × 6 + RS + data transmission time *1 + transient transmission time*2
	Reception time	SM + LS × 3 + RS + data reception time *1 + transient transmission time*2
When the master station is the Q Series	Transmission time	SM + 2 + LS × 4 + RS + data transmission time *1 + transient transmission time*2
	Reception time	SM + LS × 2 + RS + data reception time *1 + transient transmission time*2

SM : Master station sequence program's scan time
LS : Link scan time (Refer to Master Module User's Manual)
RS : R2 internal processing time (Refer to section 3.8 (1))

*1 Data transmission (reception) time
This time is obtained with the data size and RS-232-C transmission speed.
(Example) Data size: 200 bytes, transmission speed: 9600bps (data bit length: 8, stop bit length: 1, parity bit: even)
$200 \times 10/9600 \fallingdotseq 0.208s$

*2 Transient transmission time
During transmission, this is the time for the data to be written from the master station to the R2.
During reception, this is the time for reading the data from the R2 to the master station.
Refer to section 5.4.3 in the Q Series Master Module User's Manual for the calculation expressions.

(2) Calculation example

(a) Transmission time

An example of calculating the transmission time for transmitting 10 words (20 bytes) of data is shown below.

Item	Setting details
Transmission speed	156kbps
No. of connected modules	Only one R2 module
Master station sequence program scan time	20ms (Hypothetical)
Transmission speed	9600bps
Data bit length	8
Stop bit length	1
Parity bit	Even

1) When the master station is the A/QnA series

LS = 51.2 {29.4 + (8 × 4.8) + (8 × 9.6) + (1 × 32.4) + (1 × 4.8) + (1 × 9.6)}
+ 1300 ≒ 11100μs (11.1ms)

Data transmission time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Transmission time = 20 × 2 + 11.1 × 6 + (11.1 × 2) *1 + 20.8 *2
+ {20 + 11.1 + (11 + 16)/72 × 11.1 + 11.1 + 20
+ 11.1 × 2 + 11.1 + 11.1 + 11.1} × 1 *3
= 149.6 + (20 + 11.1 + 11.1 + 11.1 + 20 + 22.2 + 11.1
+ 11.1 + 11.1)
= 149.6 + 128.8
= 278.4ms

2) When the master station is the Q series

LS = 51.2 {27 + (8 × 4.8) + (8 × 9.6) + (1 × 30) + (1 × 4.8) + (1 × 9.6)}
+ 1300 + 0 + 0 ≒ 10854μs (10.9 ms)

Data transmission time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Transmission time = 20 × 2 + 10.9 × 4 + (10.9 × 2) *1 + 20.8 *2
+ 1 + 10.9 × [6 + {(11 + 16) / 72} × 1.13] *3
= 126.2 + 78.717
= 204.917
= 205.0ms

*1 R2 (R2 internal processing time)
*2 Data transmission time
*3 Transient transmission time (10 words + 1 word (transmission data size) worth)

(b) Reception time

An example for calculating the reception time when receiving 10 words (20 bytes) of data is shown below.

Item	Setting details
Transmission speed	156kbps
No. of connected modules	Only one R2 module
Master station sequence program scan time	20ms (Hypothetical)
Transmission speed	9600bps
Data bit length	8
Stop bit length	1
Parity bit	Even

1) When the master station is the A/QnA series

LS = 51.2 {29.4 + (8 × 4.8) + (8 × 9.6) + (1 × 32.4) + (1 × 4.8) + (1 × 9.6)}
+ 1300 ≒ 11100μs (11.1ms)

Data reception time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Reception time = 20 + 11.1 × 3 + (11.1 × 2) *1 + 20.8 *2
+ {20 + 11.1 + 11.1 + 11.1 + 20 + 11.1 × 2 + (10 + 16)/16 × 11.1 + 11.1 + 11.1} × 1 *3
= 96.3 + (20 + 11.1 + 11.1 + 11.1 + 20 + 22.2 + 11.1 + 11.1)
= 96.3 + 139.9
= 236.2ms

2) When the master station is the Q series

LS = 51.2 {27 + (8 × 4.8) + (8 × 9.6) + (1 × 30) + (1 × 4.8) + (1 × 9.6)}
+ 1300 + 0 + 0 ≒ 10854μs (10.9 ms)

Data transmission time = 20 × 10/9600 ≒ 0.0208s (20.8ms)

Transmission time = 20 × 2 + 10.9 × 2 + (10.9 × 2) *1 + 20.8 *2
+ 1 + 10.9 × [6 + {(10 + 16) / 16} × 1.067] *3
= 84.4 + 89.6606
= 174.0606
≒ 174.1ms

*1 R2 (R2 internal processing time)
*2 Data transmission time
*3 Transient transmission time (10 words worth)

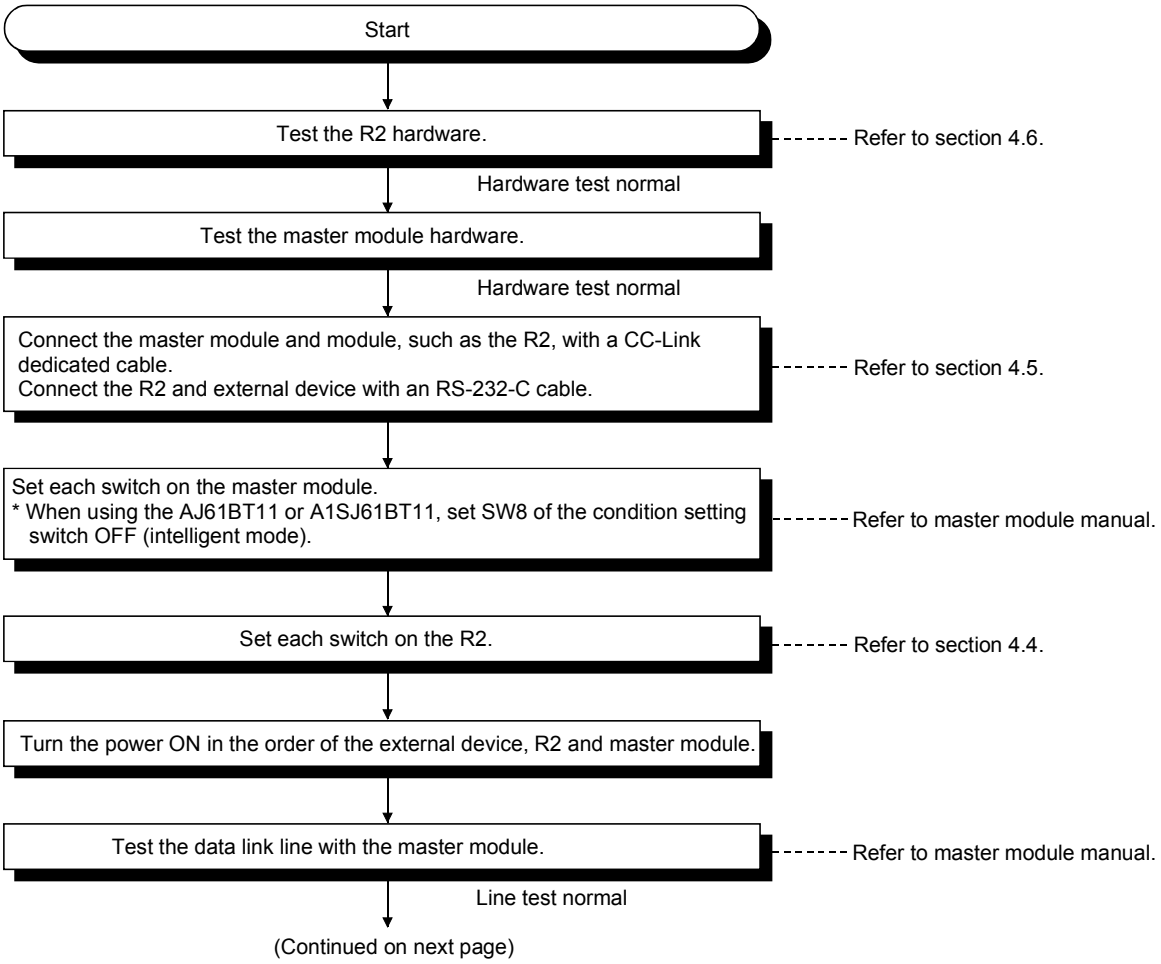
MEMO

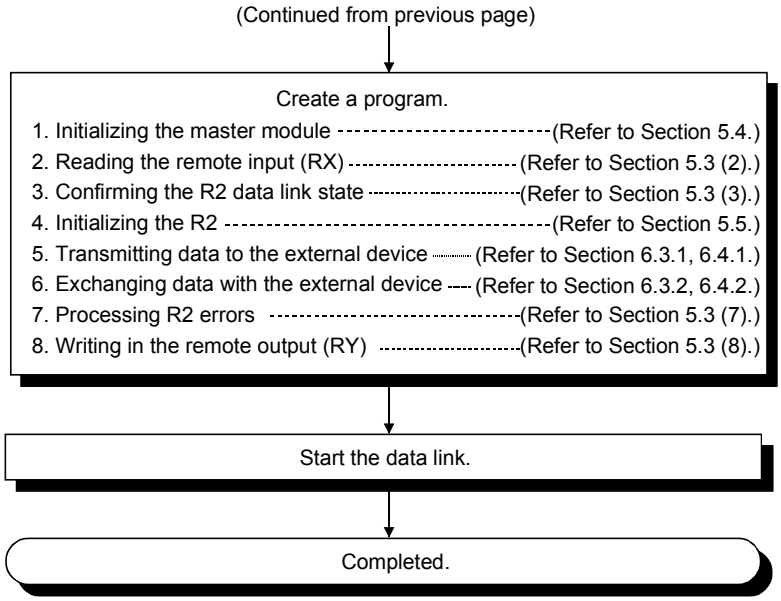
4. PROCEDURES AND SETTINGS BEFORE OPERATION

The operation procedures before starting the R2 operation, names and settings of each R2 section, wiring method and hardware test are described in this section.

4.1 Procedures before operation

The procedures before operating the R2 are explained below.




(Continued from previous page)
Create a program.
1. Initializing the master module (Refer to Section 5.4.)
2. Reading the remote input (RX) (Refer to Section 5.3 (2).)
3. Confirming the R2 data link state (Refer to Section 5.3 (3).)
4. Initializing the R2 (Refer to Section 5.5.)
5. Transmitting data to the external device (Refer to Section 6.3.1, 6.4.1.)
6. Exchanging data with the external device (Refer to Section 6.3.2, 6.4.2.)
7. Processing R2 errors (Refer to Section 5.3 (7).)
8. Writing in the remote output (RY) (Refer to Section 5.3 (8).)
Start the data link.
Completed.

4.2 Precautions for handling

The precautions for handling the R2 are shown below.

DANGER

- Do not touch the terminals or connectors while the power is ON.
  Failure to observe this could lead to electric shocks or malfunctioning.
- Do not touch the connector inside the lid at the top of the module.
  Failure to observe this could lead to module trouble or malfunctioning.

CAUTION

- Make sure that foreign matter, such as cutting chips or wire scraps, do not enter the module.
  Failure to observe this could lead to fires, trouble or malfunctioning.
- Never disassemble or modify the module.
  Failure to observe this could lead to trouble, malfunctioning, injuries or fires.
- The module case is made of resin, so do not drop it or apply strong impacts on it.
  Failure to observe this could lead to module damage.
- Tighten the terminal screws within the specified torque range.
  A loose terminal screw could lead to short-circuiting or malfunctioning.
  If the terminal screw is too tight, short-circuiting or malfunctioning could occur due to screw damage.
- Dispose of this product as industrial waste.
- Use this module within the general specification environment described in the manual.
  Use in an environment outside the general specification range could lead to electric shocks, fires, malfunctioning, product damage or deterioration.
- Securely fix the module with the DIN rail or installation screw. Tighten the installation screw within the designated torque range.
  A loose screw could lead to dropping, short-circuiting or malfunctioning.
  If the screw is too tight, dropping or short-circuiting could occur due to screw damage.
- Before installing or removing the module on the panel, be sure to shut off all phases of external power supply used by the system.
  Failure to shut off all phases could lead to module trouble or malfunctioning.

(1) Tighten the module installation screws and terminal block screws within the following range.

Screw place	Tightening torque range	Remarks
Module installation screw (M4 screw)	0.78 to 1.18N·m	-
Terminal block terminal screw (M3.5 screw)	0.59 to 0.88N·m	-
Terminal block installation screw (M4 screw)	0.98 to 1.37N·m	-
RS-232-C cable connector screw (M2.6 screw)	0.20 to 0.39N·m	Screw hole depth: L=3.2mm or less (Internal dimension from end face)

(2) When using the DIN rail adaptor, install the DIN rail while observing the following points.

(a) Applicable DIN rail type (JIS C 2812 compliant)

TH35-7.5Fe
TH35-7.5Al
TH35-15Fe

(b) DIN rail installation screw pitch

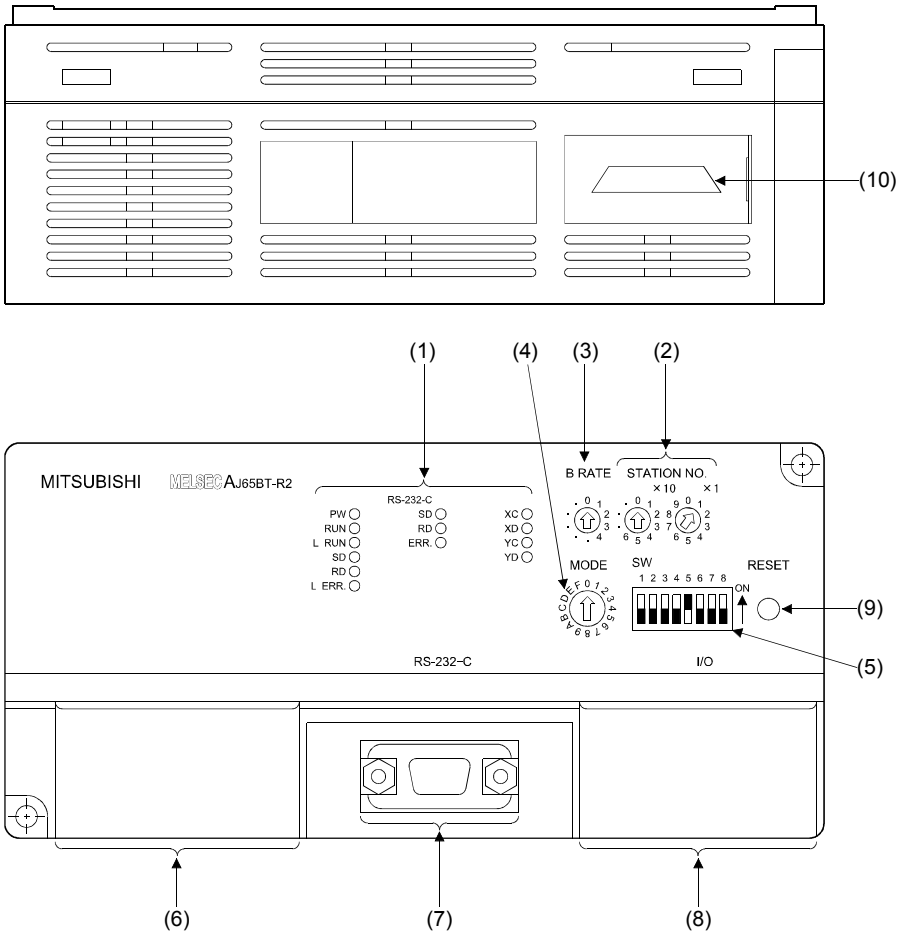
When installing the DIN rail, tighten the screws at a pitch of 200mm or less.

4.3 Installation environment

When installing the programmable controller, refer to the CC-Link system master module's User's Manual.

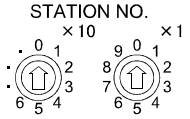
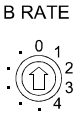
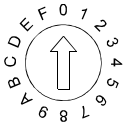
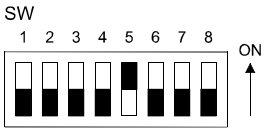
4.4 Names of each part, and settings

The names of the parts in the R2, the LED details, and the settings for each switch are explained in this section.



No.	Name	Details
(1)	Operation display LEDs RS-232-C PW ○ SD ○ XC ○ RUN ○ RD ○ XD ○ L RUN ○ ERR.○ YC ○ SD ○ YD ○ RD ○ L ERR.○	See the table below.

LED name		Details
De-fault state	PW	ON: Power is ON. OFF: Power is OFF.
	RUN	ON: Operating normally OFF: Power (24VDC) is OFF, WDT error is occurring or the switch setting is incorrect.
	L RUN	ON: Communicating normally OFF: Communication stopped (Time over error) or the switch setting is incorrect.
State	L ERR.	ON: Any transmission speed or station number out of range is set. Flickering at constant intervals : The transmission speed or station number has been changed after the power is turned on. Flickering not constant intervals : The terminating resistor is not connected. The module or CC-Link dedicated cable is being affected by noise. OFF: Communicating normally
Others	SD	ON, Flashing: Data link Sending data OFF: Data link Not sending data
	RD	ON, Flashing: Data link Receiving data OFF: Data link Not receiving data
XC, XD		ON: General-purpose input (XC, XD) is ON. OFF: General-purpose input (XC, XD) is OFF.
YC, YD		ON: General-purpose output (YC, YD) is ON. OFF: General-purpose output (YC, YD) is OFF.
RS-232-C SD		ON, Flashing: Sending RS-232-C data OFF: Not sending RS-232-C data
RS-232-C RD		ON, Flashing: Receiving RS-232-C data OFF: Not receiving RS-232-C data
RS-232-C ERR.		ON: RS-232-C transmission error OFF: No error

<table>
<tr><th>No.</th><th>Name</th><th>Details</th></tr>
<tr><td>(2)</td><td>Station No. setting switch
 
</td><td>Set the module's station No. (Default setting: 0)
Setting range: 1 to 64 (0: Master module)
"×10" sets the 10th place of the station No..
"×1" sets the 1st place of the station No..</td></tr>
<tr><td>(3)</td><td>Data link transmission speed setting switch
 
</td><td>
<table>
<tr><th>Setting</th><th>Transmission speed</th></tr>
<tr><td>0</td><td>156kbps</td></tr>
<tr><td>1</td><td>625kbps</td></tr>
<tr><td>2</td><td>2.5Mbps</td></tr>
<tr><td>3</td><td>5Mbps</td></tr>
<tr><td>4</td><td>10Mbps</td></tr>
<tr><td>-</td><td>Setting error</td></tr>
</table>
Set the module's transmission speed (for data link)
(Default setting: 0)</td></tr>
<tr><td>(4)</td><td>Mode setting switch
  </td><td>Set the module's operation state. (Default setting: 0)
<table>
<tr><th>No.</th><th>Name</th><th>Setting details</th></tr>
<tr><td>0</td><td>On-line mode (using transmission/reception buffer)</td><td>Mode for on-line communication.
Set when using the transmission/reception buffer.</td></tr>
<tr><td>1</td><td>On-line mode (using buffer memory automatic update function)</td><td>Mode for on-line communication.
Set when using the buffer memory automatic update function.</td></tr>
<tr><td>2</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>3</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>4</td><td>Use not possible</td><td>–</td></tr>
<tr><td>5</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>6</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>7</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>8</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>9</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>A</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>B</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>C</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>D</td><td>Hardware test mode</td><td>Mode for confirming that module runs independently.</td></tr>
<tr><td>E</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
<tr><td>F</td><td>Not used</td><td>Setting error ("RUN" LED turns OFF.)</td></tr>
</table></td></tr>
<tr><td>(5)</td><td>RS-232-C transmission specifications setting switch
 
</td><td>Set the RS-232-C transmission specifications.
<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Setting details</th><th colspan="2">Setting switch state</th><th>Default setting</th></tr>
<tr><th>ON</th><th>OFF</th></tr>
<tr><td rowspan="11">SW1 to 3</td><td rowspan="11">Transmission speed</td><td colspan="3">SW 1 2 3</td><td rowspan="11">OFF</td></tr>
<tr><td>0 0 0</td><td>300bps</td></tr>
<tr><td>1 0 0</td><td>600bps</td></tr>
<tr><td>0 1 0</td><td>1200bps</td></tr>
<tr><td>1 1 0</td><td>2400bps</td></tr>
<tr><td>0 0 1</td><td>4800bps</td></tr>
<tr><td>1 0 1</td><td>9600bps</td></tr>
<tr><td>0 1 1</td><td>19200bps</td></tr>
<tr><td colspan="3">0:OFF 1:ON</td></tr>
<tr><td>SW4</td><td colspan="3">Not used</td></tr>
<tr><td>SW5</td><td>Data bit length</td><td>8</td><td>7</td><td>ON</td></tr>
<tr><td>SW6</td><td rowspan="2">Parity bit</td><td>Yes</td><td>No</td><td rowspan="3">OFF</td></tr>
<tr><td>SW7</td><td>Even</td><td>Odd</td></tr>
<tr><td>SW8</td><td>Stop bit length</td><td>2</td><td>1</td></tr>
</table></td></tr>
<tr><td>(6)</td><td>Data link terminal block</td><td>Connect a CC-Link dedicated cable for power supply and data link. (2-piece terminal block)</td></tr>
<tr><td>(7)</td><td>RS-232-C interface</td><td>Connect an RS-232-C cable for connection with external device.</td></tr>
<tr><td>(8)</td><td>General-purpose input/output terminal block.</td><td>Connect the input/output wire.</td></tr>
<tr><td>(9)</td><td>Reset switch</td><td>Returns to the power ON status.</td></tr>
<tr><td>(10)</td><td>Connector</td><td>Use prohibited.</td></tr>
</table>

4.5 Wiring

4.5.1 Precautions for handling the CC-Link dedicated cables

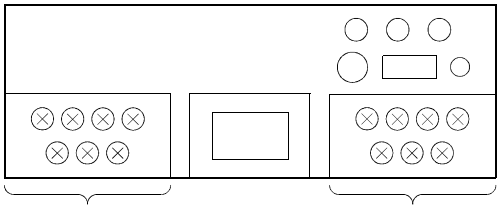
Avoid the following extreme handling. Such handling will damage the CC-Link dedicated cables.

- Compress the cable with a sharp edge.
- Twist the cable extremely.
- Pull the cable extremely hard. (More than permissible tension)
- Step on the cable.
- Put an object on the cable.
- Scratch the cable sheath.

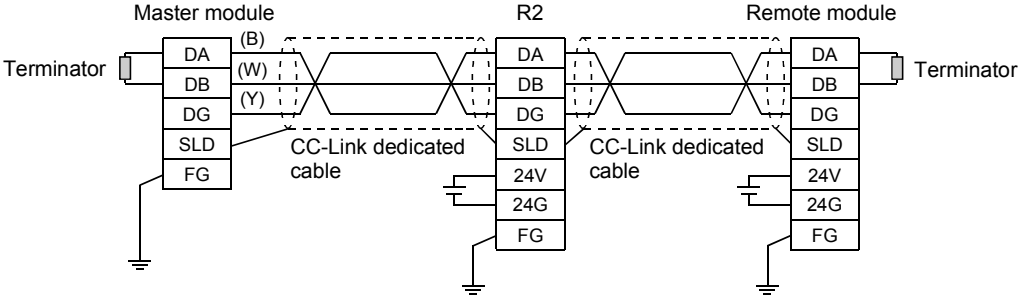
4.5.2 Connection of the CC-Link dedicated cables

⚠CAUTION

- Before starting installation or wiring work, be sure to shut off all phases of external power supply used by the system. Failure to shut off all phases could lead to electric shocks, product damage or malfunctioning.
- Always install the terminal covers enclosed with the product before turning ON the power or operating the product after installation or wiring work.
  Failure to install the terminal cover could lead to electric shocks.
- Before cleaning or tightening the terminal screws, be sure to shut off all phases of external power supply used by the system. Failure to shut off all phases could lead to module trouble or malfunctioning. A loose screw could lead to dropping, short-circuiting or malfunctioning. If the screw is too tight, dropping or short-circuiting malfunctioning could occur due to screw damage.
- Do not bind the control wire or communication cable with the main circuit or power wire, or place the control wire near these. Separate by at least 100mm or more.
  Failure to observe this could lead to malfunctions caused by noise.
- Always ground the FG terminal with Class D grounding (grounding resistance : 100Ω or less) or higher dedicated of the programmable controller.
  Failure to do so could lead to electric shock or malfunctioning.
- Always confirm the product's rated voltage and terminal layout before wiring the module. Connecting with a power supply other than the rated power supply, or incorrect wiring could lead to fires or trouble.
- Securely mount the connector of each connection cable to the mounting section.
  An incomplete connection could lead to malfunctioning causes.
- Be sure to fix the wires or cables by ducts or clamps when connecting them to the module. Failure to do so may cause damage of the module or the cables due to accidental pull or unintentional shifting of the cables, or malfunctions due to poor contact of the cable.
- Do not install the control lines together with the communication cables, or bring them close to each other. Failure to do so may cause malfunctions due to noise.
- Always connect the master module and CC-Link dedicated cable at the data link terminal block. If the data link terminal block and general-purpose output terminal block are incorrectly inserted, module trouble could occur.



The method of connecting the R2, master module and remote module with a CC-Link dedicated cable is shown below.



POINT
Always connect the modules on both ends of the data link with the "terminator" enclosed with the master module. (Connect across DA-DB)

4.5.3 Connection with external device

The method of connecting the R2 and external device with RS-232-C is show below.

(1) Example of connection for DC code control and DTR/DSR signal control

R2 side (DTE)		Cable connection and signal method	External device (DTE)
Signal abbrev.	Pin No.		Signal abbrev.
SD	3		SD
RD	2		RD
RS	7		RS
CS	8		CS
DR	6		DR
SG	5		SG
CD	1		CD
ER	4		ER

(2) Example of connection for only DC code control

R2 side (DTE)		Cable connection and signal method	External device (DTE)
Signal abbrev.	Pin No.		Signal abbrev.
SD	3		SD
RD	2		RD
RS	7		RS
CS	8		CS
DR	6		DR
SG	5		SG
CD	1		CD
ER	4		ER

(3) Precautions for connections

(a) R2 does not use the CD signal as a control signal in sending/receiving data to/from an external device.

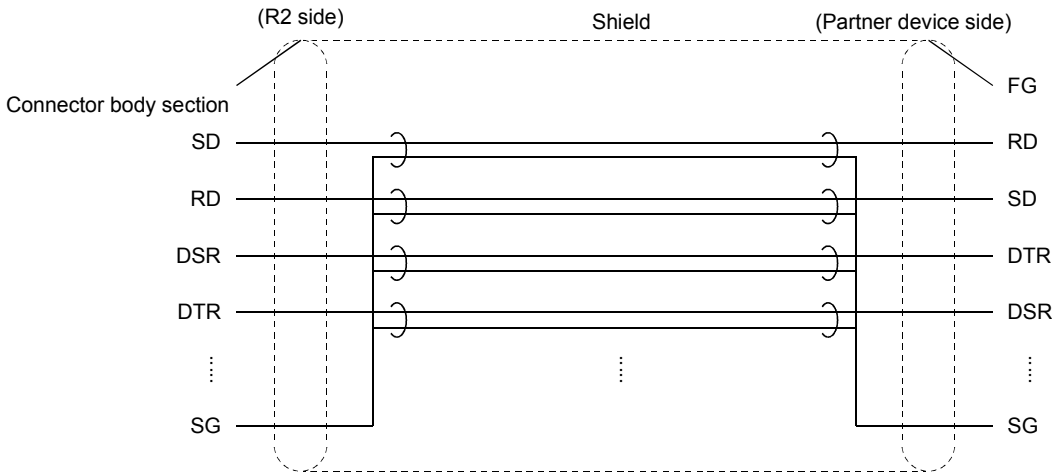
(b) Handle the connection cable's FG signal and shield as described below.

	Connection method	Remarks
FG signal	Connect to the body of the R2 connector.	• Do not short circuit the FG signal and SG signal of the connection cable. • When the FG signal and SG signal are connected internally on the external device side, do not connect the R2 side FG signal with the external device.
Shield	Connect to the body of the R2 connector. (Do not connect with the external device.)	

(c) If the data cannot be communicated due to noise from the external device, even when the above wiring and connection are used, wire and connect as shown below.

1) Connect across the FG of each station with the connection cable's shield.
For an external device, connect as explained in the instruction manual for the external device.

2) Connect the signals other than the connection cable's SG and FG as a pair with SG.

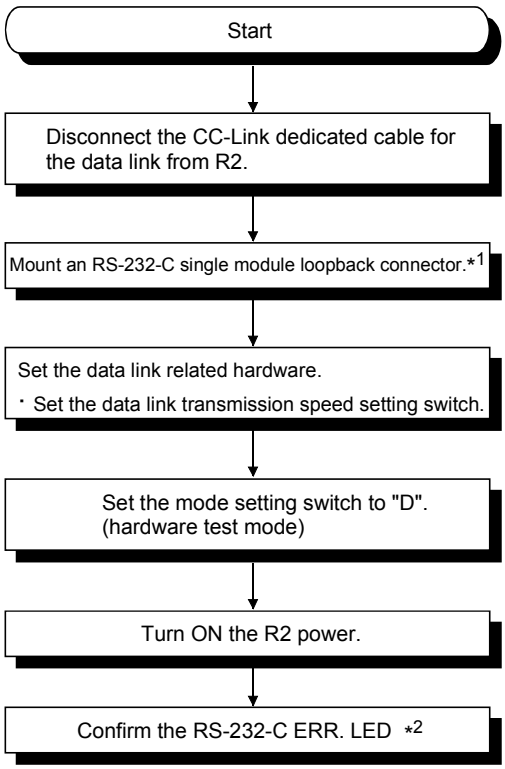


* The R2 FG is connected with the screw fixing section of the connector, and is the FG for the module body.

(d) Do not connect the RS-232-C interface with an RS-422 device.
If connected with an RS-422 device, the hardware of the connected devices's RS-422 interface could be damaged and communication inhibited.

4.6 Checking the module's state (Hardware test)

Confirm that the R2 operates normally as a single module. Always carry out this test before structuring the system.
Execute the test with the following procedure.



*1 The specifications of the RS-232-C single module loopback connector are shown below.
Create the RS-232-C single module loopback connector shown below.

R2 side (DTE)		Single module loopback connector
Signal abbrev.	Pin No.	
CD	1	
RD (RXD)	2	
SD (TXD)	3	
DTR (ER)	4	
SG	5	
DSR (DR)	6	
RS (RTS)	7	
CS (CTS)	8	
–	9	

IMPORTANT

During the hardware test mode, the check data is transmitted to the data link when checking the data link loopback, so always disconnect the data link wiring.

*2 When normal : The RS-232-C ERR.LED flickers.
The state is normal if the LED flickers for 30 seconds or more.
When abnormal : The RS-232-C ERR.LED turns ON.
The error cause is indicated with the YC LED and YD LED states.

LED state	Details	Measures
RS-232-C SD ○ XC ○ RD ○ XD ○ ERR. ● YC ○ YD ○	ROM check error	The hardware may be faulty, so contact your nearest dealer or Mitsubishi branch.
RS-232-C SD ○ XC ○ RD ○ XD ○ ERR. ● YC ● YD ○	RAM check error	
RS-232-C SD ○ XC ○ RD ○ XD ○ ERR. ● YC ○ YD ●	Hardware error, or CC-Link dedicated cable is still connected.	Disconnect the CC-Link dedicated cable. If the ERR.LED does not flicker even when the CC-Link dedicated cable is disconnected, the hardware may be faulty, so contact your nearest dealer or Mitsubishi branch.
RS-232-C SD ○ XC ○ RD ○ XD ○ ERR. ● YC ● YD ●	Hardware error, or RS-232-C loopback connector is not connected.	Mount the loopback counter. If the ERR.LED does not flicker even when loopback connector is connected, the hardware may be faulty, so contact your nearest dealer or Mitsubishi branch.

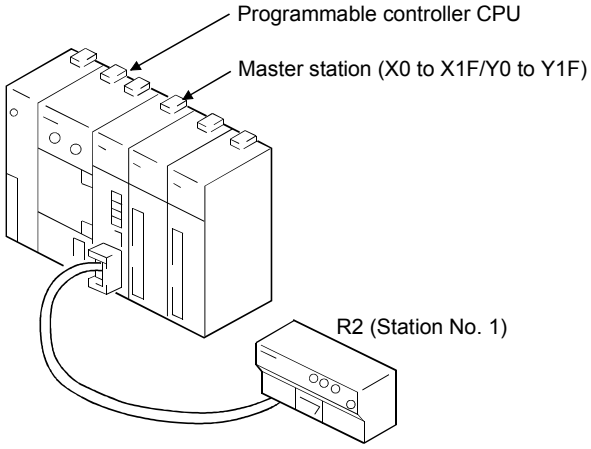
○: OFF, ●: ON

5. PRELIMINARY INFORMATION

5.1 System used in this manual

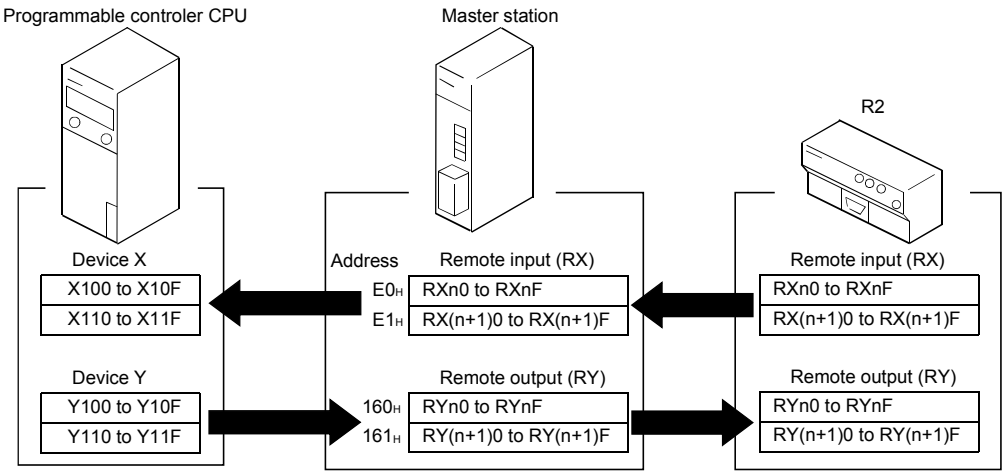
An example of the sequence program explained in this manual is described for the following system.
Refer to the CC-Link Master Module User's Manual (Details) for details on the sequence program for the entire CC-Link system.

(1) System configuration for program example



(2) Relation of programmable controller CPU, master station and R2

The contents of RXn0 to RX(n+1)F are read to X100 to X11F, and the contents of Y100 to Y11F are written into RYn0 to RY(n+1)F and used.



(3) Master station buffer memory settings (buffer memory size)

	Transmission buffer	Reception buffer	Automatic update buffer
When using the buffer memory automatic update function	0_H	0_H	600_H
When using the transmission/reception buffer	200_H	200_H	0_H

(4) R2 buffer memory setting

The R2 buffer memory is used with the factory-set state (default values).

5.2 Programming Precautions

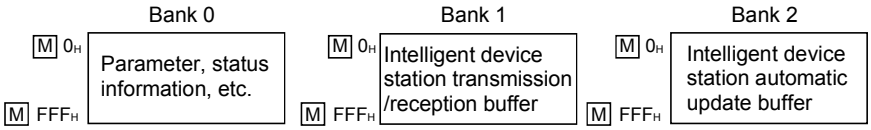
5.2.1 About bank changing of the A series master module

When using the R2, the master station's automatic update buffer or transmission/reception buffer is used.
With the A Series master module (AJ61BT11/A1SJ61BT11), the automatic update buffer and transmission/reception buffer are divided with banks. When accessing these buffers, the bank must be changed.

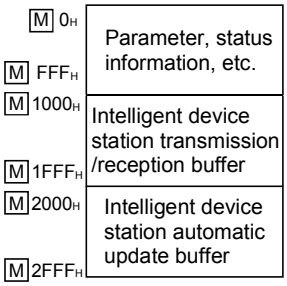
POINT

- When using dedicated commands (RITO, RIFR, RIRD, RIWT, RISEND, RIRCV), the bank is changed with the dedicated commands, and does not need to be changed by the user.
- After changing to bank 1 or bank 2 and then reading or writing, return to bank 0. The information such as RX, RY, RWw or RWr will not be updated unless the bank is changed to bank 0.

A Series master module buffer memory (AJ61BT11/A1SJ61BT11)



Q/QnA Series master module buffer memory
(AJ61QBT11/A1SJ61QBT11/QJ61BT11/QJ61BT11N)



(1) Changing the bank

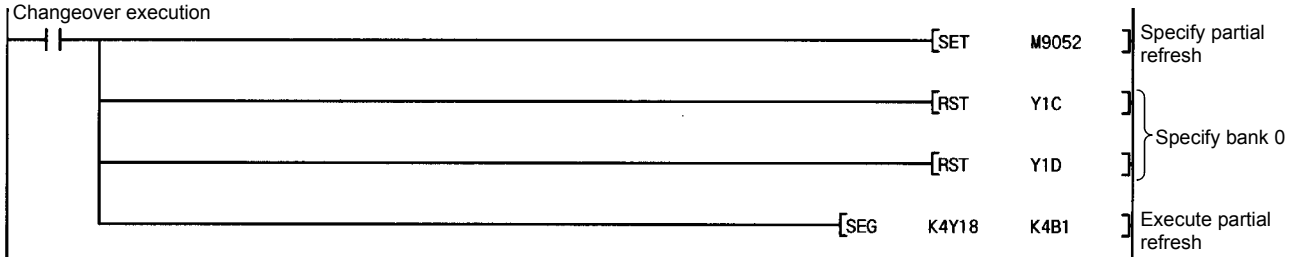
The bank can be changed by turning the master module's Y(n+1)C, Y(n+1)D ON and OFF.
n indicates the master module's head input/output No.

Y (n+1) C	Y (n+1) D	Details
OFF	OFF	Change to bank 0
ON	OFF	Change to bank 1
OFF	ON	Change to bank 2

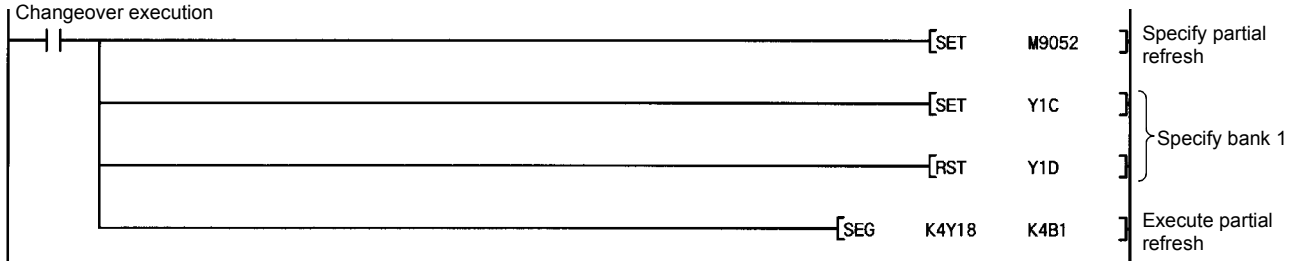
(2) Program

Create the program for changing the bank as shown below.
Refer to section 5.1 for details on the program conditions.

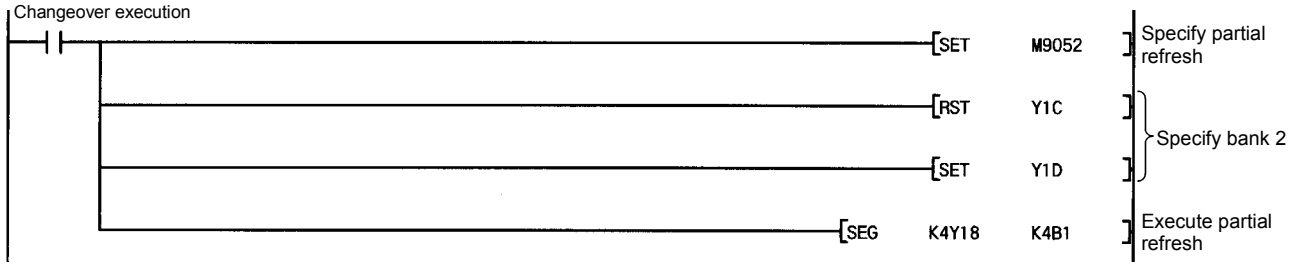
(a) Program for changing to bank 0



(b) Program for changing to bank 1



(c) Program for changing to bank 2



5.2.2 About dedicated commands for use of the buffer memory automatic update function

When the buffer memory automatic update function is used, the R2 buffer memory to be specified differs as described below between when the FROM/TO command is used and when the dedicated command is used.

(1) When the FROM/TO command is used

Specify the buffer memory address of the master station where the buffer memory of the R2 to be accessed is assigned.

(2) When the dedicated command is used

Since the station number of the R2 to be accessed can be set, specify the buffer memory of the R2 directly.

(Example) When automatic update has been set as described below, the contents of the "status storage area (R2 1A0H)" of station No. 2 are to be read.

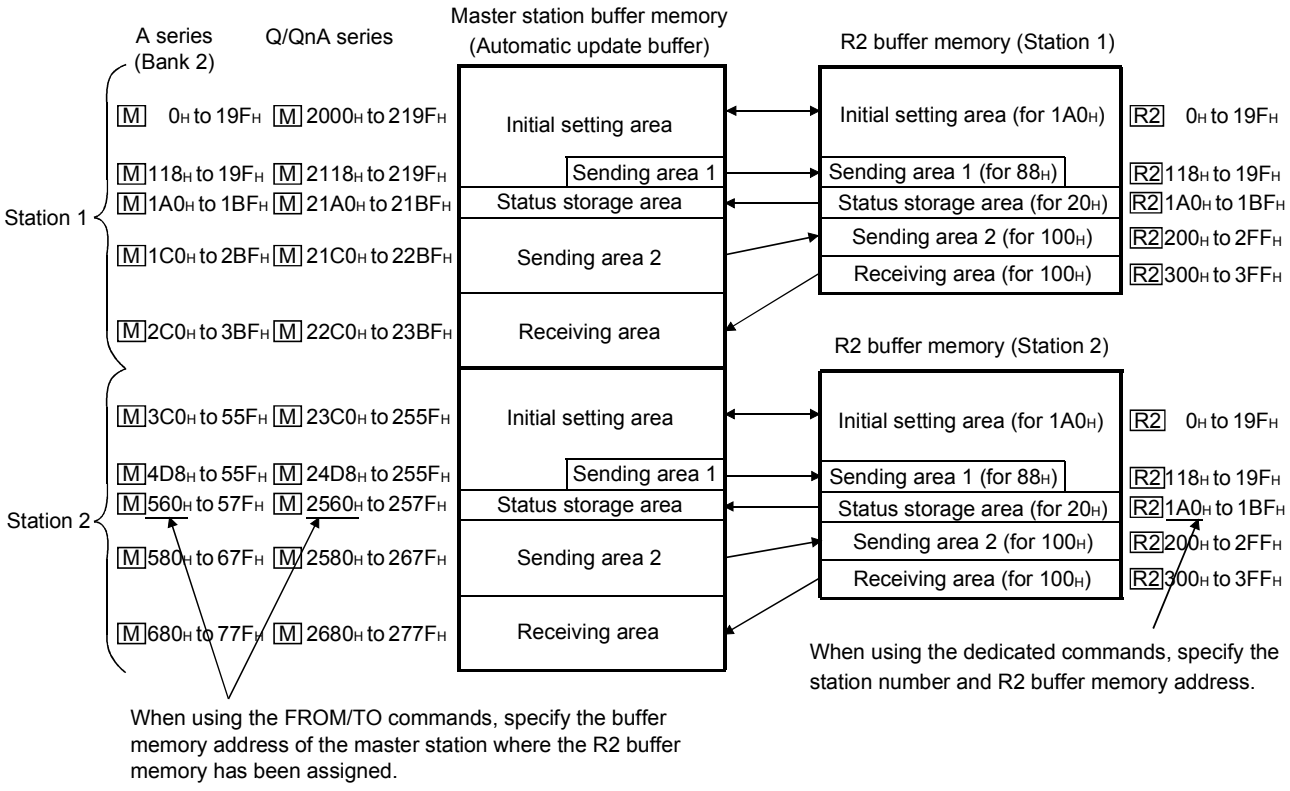
When the FROM/TO command is used:

Specify the buffer memory address of the master station.

- When the master station is the A series ..... M 560H of bank 2
- When the master station is the Q/QnA series ..... M 2560H

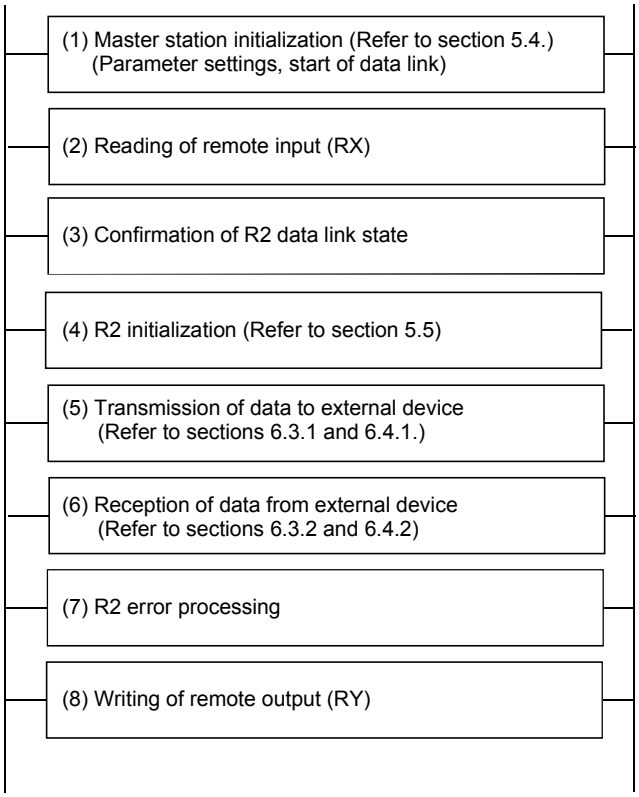
When the dedicated command is used:

Specify the station number (2) and buffer memory address (R2 1A0H) of the R2.



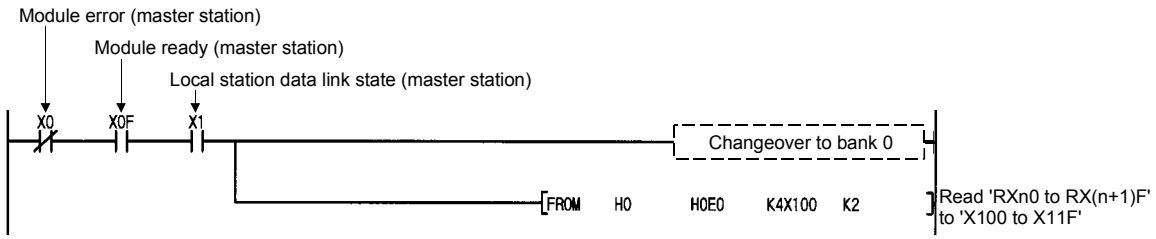
5.3 Program basic format

The basic format for creating a program is shown below.
The program is created with the following arrangement.
Refer to section 5.1 for details on the program conditions.



(1) Create a program that instructs CC-Link refreshing and then starts the data link after the parameters are set. (Refer to section 5.4.)

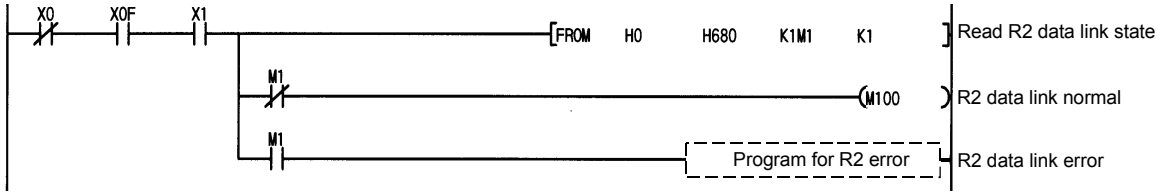
(2) Create the following program, and read RXn0 to RX(n+1)F into X100 to X11F.



POINT

When using QCPU (Q mode) or QnACPU, setting automatic refresh parameters refreshes the contents of the remote input (RX) and remote output (RY) automatically. Thus, the above program is not required.

(3) Create a program that detects the R2 data link state and establishes an interlock.

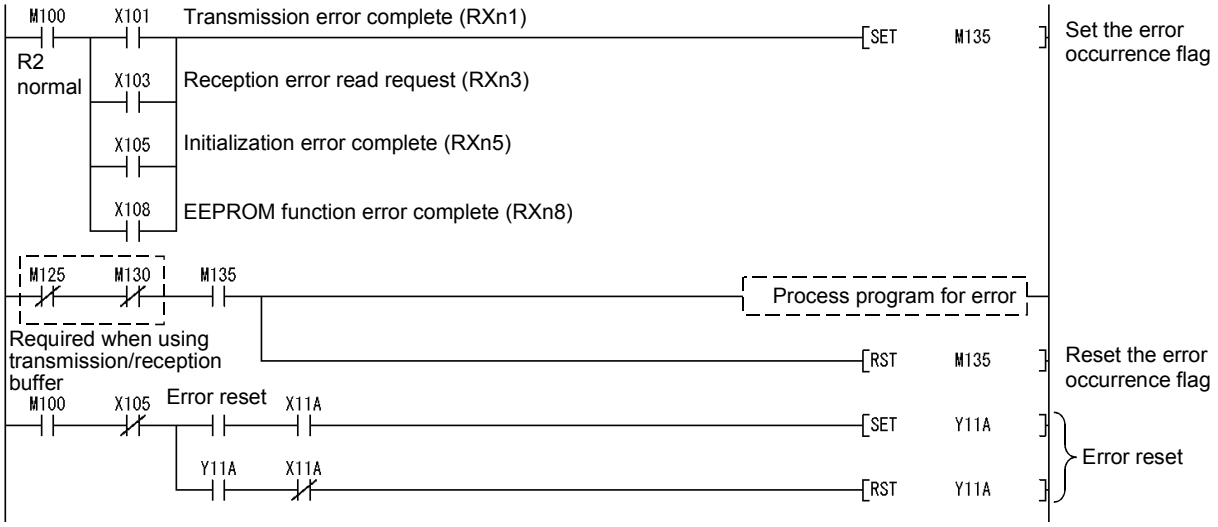


(4) Create a program that initializes the R2. (Refer to section 5.5)

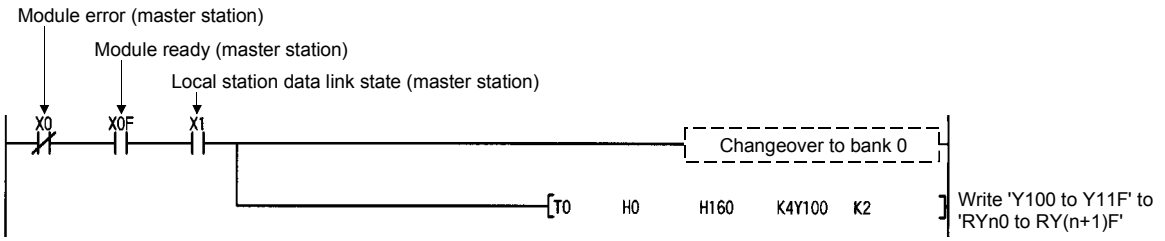
(5) Create a program that transmits data to the external device. (Refer to sections 6.3.1 and 6.4.1.)

(6) Create a program that receives data from the external device. (Refer to sections 6.3.2 and 6.4.2.)

(7) Create the following program to process the R2 error (reset the error).



(8) Create the following program and write Y100 to Y11F into RYn0 to RY(n+1)F.



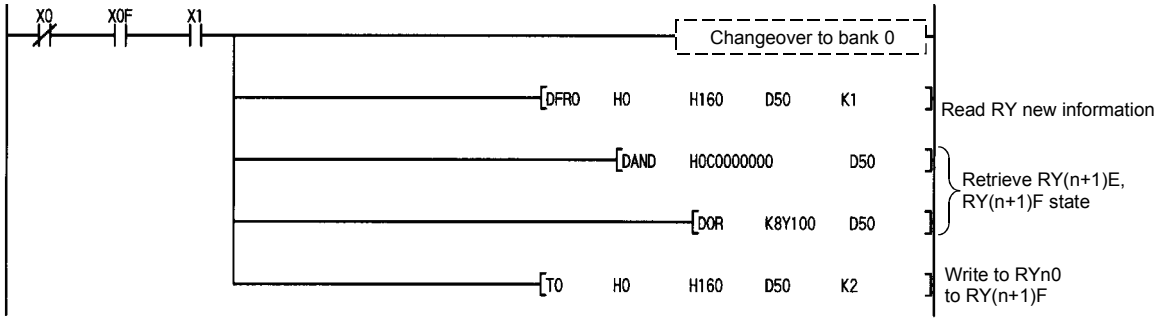
POINT

When using QCPU (Q mode) or QnACPU, setting automatic refresh parameters refreshes the contents of the remote input (RX) and remote output (RY) automatically. Thus, the above program is not required.

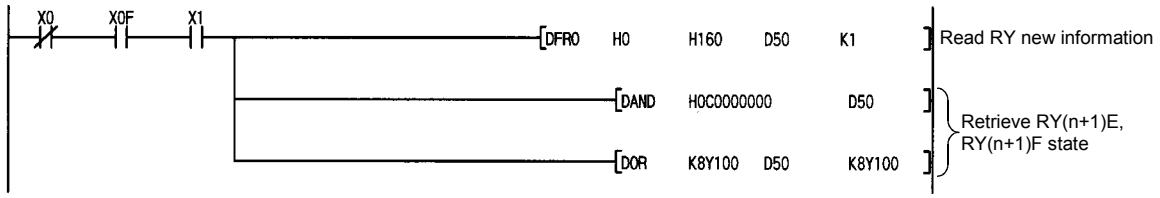
(a) Using the dedicated commands (RIRD, RIWT, RISEND, RIRCV)

When the dedicated commands (RIRD, RIWT, RISEND, RIRCV) are used, RY(n+1)E, RY(n+1)F are used with the dedicated commands, so the user must make sure that this signal information is not rewritten.
When the QCPU(Q mode) is used, such provisions need not be mode.

1) When using ACPU



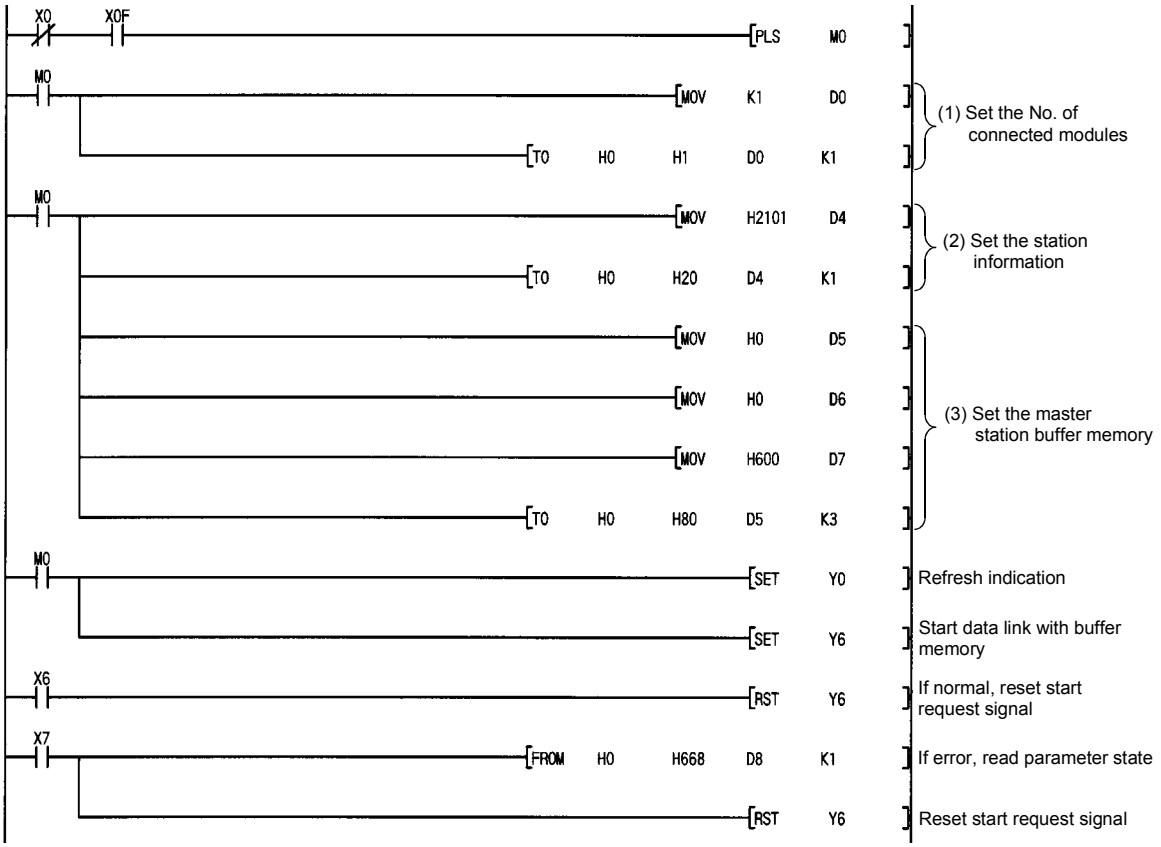
2) To set automatic refresh with QnACPU



5.4 Initializing the master station

Create the following program to initialize (set the parameters, start the data link) the master station.
Refer to section 5.1 for details on the program conditions.

(Example) No. of connected modules: One module, Connected station: R2 (Station No. 1, one station occupied)



POINT
When setting the information (1) to (3) as parameters when using QCPU (Q mode) or QnACPU, the above program is not required.

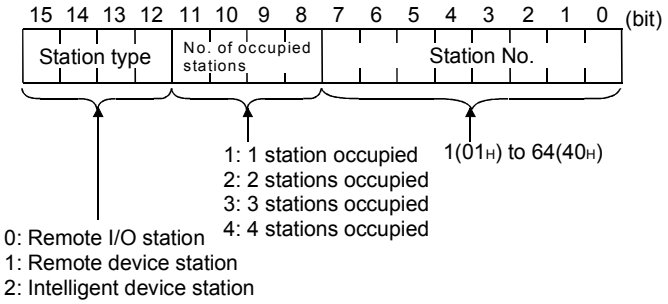
(1) No. of connected modules (M 1H)

Set the No. of remote I/O stations, remote device stations, intelligent device stations and local stations connected to the master station. (Including the reserved stations.)

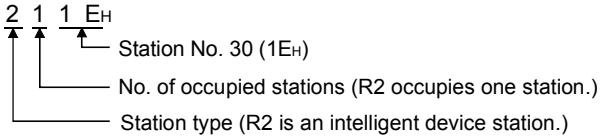
(2) Station information (M 20H (1st module) to M 5FH (64th module))

Set the type of remote I/O station, remote device station, intelligent device station and local station connected to the master station.

This must be set for each module connected.



(Example) To set R2 to station No. 30



(3) Master station buffer size

Address	Details	Default value	
M 80H	Transmission buffer	40H	1st station intelligent device station
M 81H	Reception buffer	40H	
M 82H	Automatic update buffer	80H	
≀	≀	≀	
M CBH	Transmission buffer	40H	26th station intelligent device station
M CCH	Reception buffer	40H	
M CDH	Automatic update buffer	80H	

Set the buffer memory size assignment to be used for transient transmission to the intelligent device station.

This must be set for each connected device.

Set so that the total of the transmission buffer, reception buffer and automatic update buffer is within the range of 80H to 1000H.

(a) Transmission buffer, reception buffer

Set this when communicating with R2 using the transmission/reception buffer.

Designate as the transmission/reception data size plus seven words.

(b) Automatic update buffer

Set this when communicating with R2 using the buffer memory automatic update function.

When using the R2 automatic update area with the default value, "600H " is required.

Even if the automatic update area size is set to the minimum, the default setting area amount (1A0H) + the status storage area amount (20H) must be ensured, so set "1C0H + transmission/reception size" or more.

Refer to section 5.6.2 for details on the automatic update area.

5.5 Initializing the R2

The methods for initializing the R2 are described below.

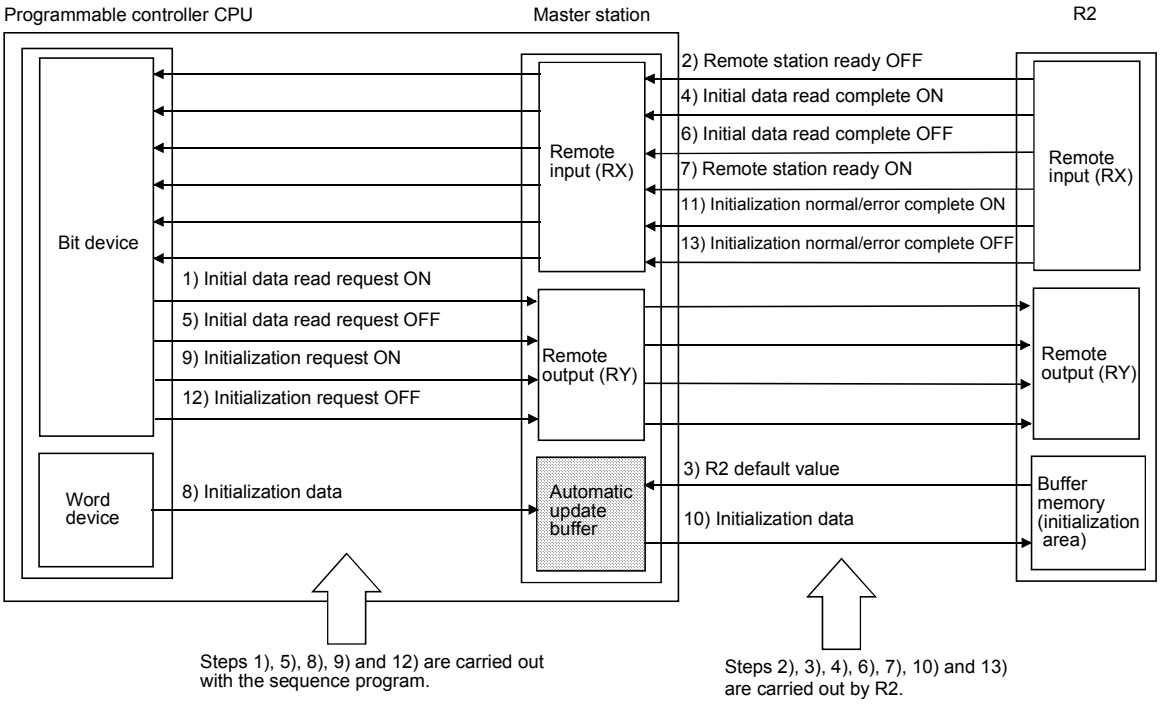
5.5.1 Using the buffer memory automatic update function

Initialization when using the buffer memory automatic update function changes the contents of R2 0H to 19FH.
The values of the initialization area (R2 0H to 19FH) can be changed by using this operation.
The transmission/reception area address, size, range of buffer memory to be automatically updated and the parameters, etc., can be set.

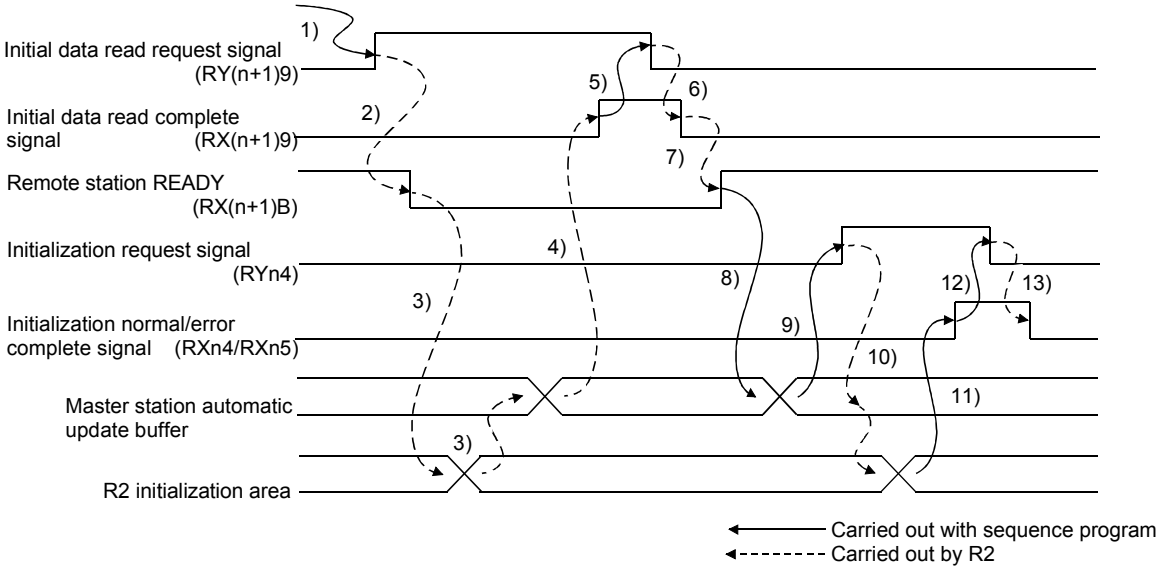
(1) Before initializing

1) Secure the automatic update buffer size (1C0H or more) by initializing the master station. (To write R2 0H to 1BFH into the master station)
2) Set the R2 mode setting switch to "1" (automatic update function enabled).

(2) Flow of process



(3) Timing chart



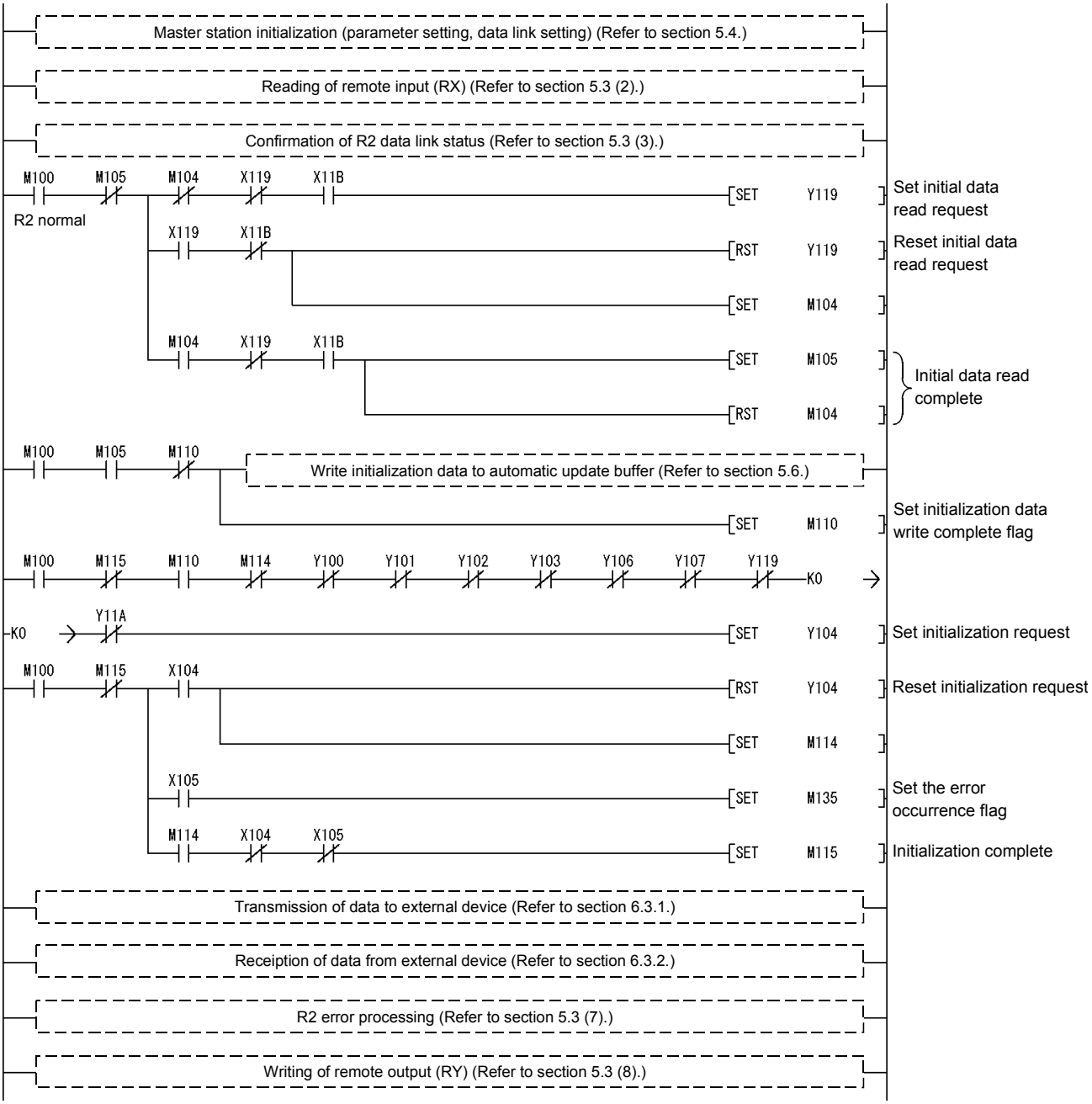
No.	Details	Control side
1)	The initial data read request signal (RY(n+1)9) turns ON.	Program
2)	The remote station READY (RX(n+1)B) turns OFF.	R2
3)	The initialization area (R2 0H to 19FH) and status storage area (R2 1A0H to 1BFH) are stored in the master station's automatic update buffer.	R2
4)	The initial data read complete signal (RX(n+1)9) turns ON.	R2
5)	The initial data read request signal (RY(n+1)9) turns OFF.	Program
6)	The initial data read complete signal (RX(n+1)9) turns OFF.	R2
7)	The remote station READY (RX(n+1)B) turns ON.	R2
8)	The values to be changed are written to the master station's automatic update buffer.	Program
9)	The initialization request signal (RYn4) turns ON.	Program
10)	The contents of the master station's automatic update buffer are stored in the initialization area (R2 0H to 19FH).	R2
11)	The initialization normal/error complete signal (RXn4/RXn5) turns ON.	R2
12)	The initialization request signal (RYn4) turns OFF.	Program
13)	The initialization normal/error complete signal (RXn4/RXn5) turns OFF.	R2

POINT

If the R2 initialization is completed with an error, remove the cause of the error, and repeat the initialization request until the process ends normally.
R2 will not accept other requests until the initialization is completed normally.
(If an initialization error occurs, the remote station READY signal (RX(n+1)B) will turn OFF.)

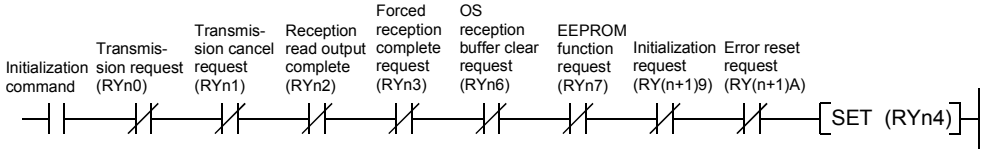
(4) Program

Refer to section 5.1 for details on the program conditions.



POINT

Create the following interlock circuit so that the initialization request is made after all request signals (RY) are turned OFF.



If initialization is carried out while RX or RY is ON, the current process will be canceled. Start initialization after turning all RY, other than RYn4, OFF.

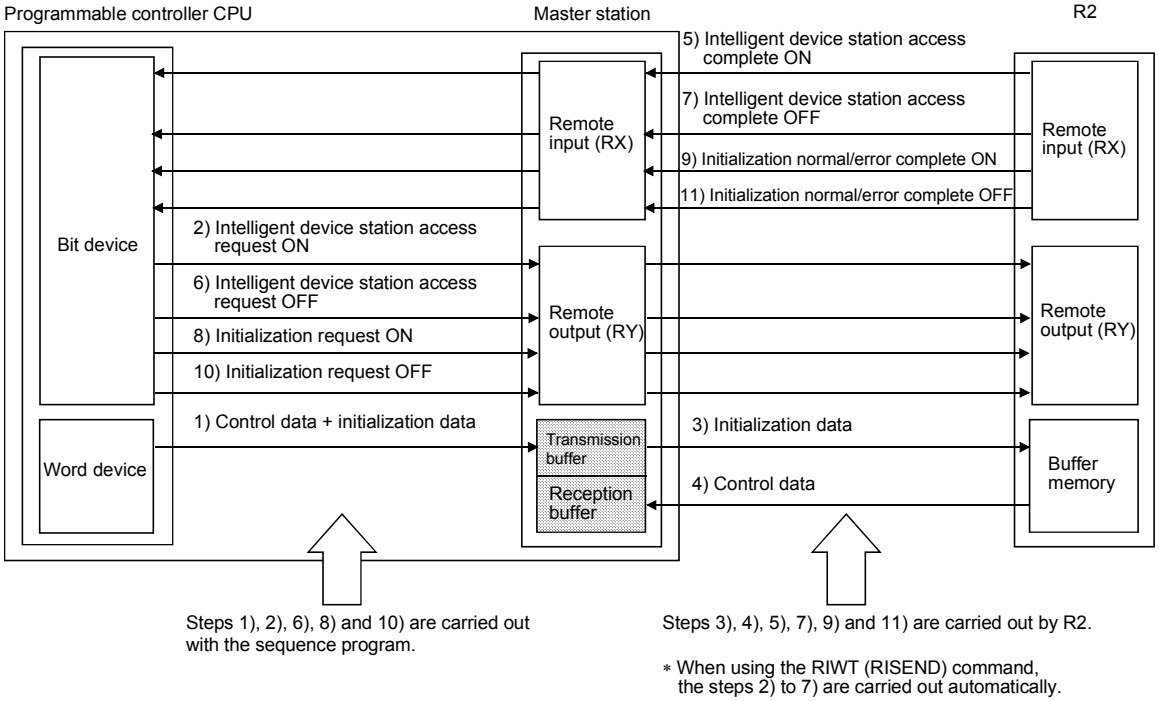
5.5.2 Using the transmission/reception buffer

Initialization using the transmission/reception buffer changes the contents of the R2 buffer memory using the transmission/reception buffer.
By using this operation, the transmission/reception area address and size, the range of the buffer memory to be automatically updated, and the parameters, etc., can be changed from the default values.

(1) Before initializing

1) Secure the transmission/reception buffer size by initializing the master station.
   Transmission buffer: Secure the transmission data size + seven words
   Reception buffer: Secure the reception data size + seven words
2) Set the R2 mode setting switch to "0" (no automatic update function)

(2) Flow of process

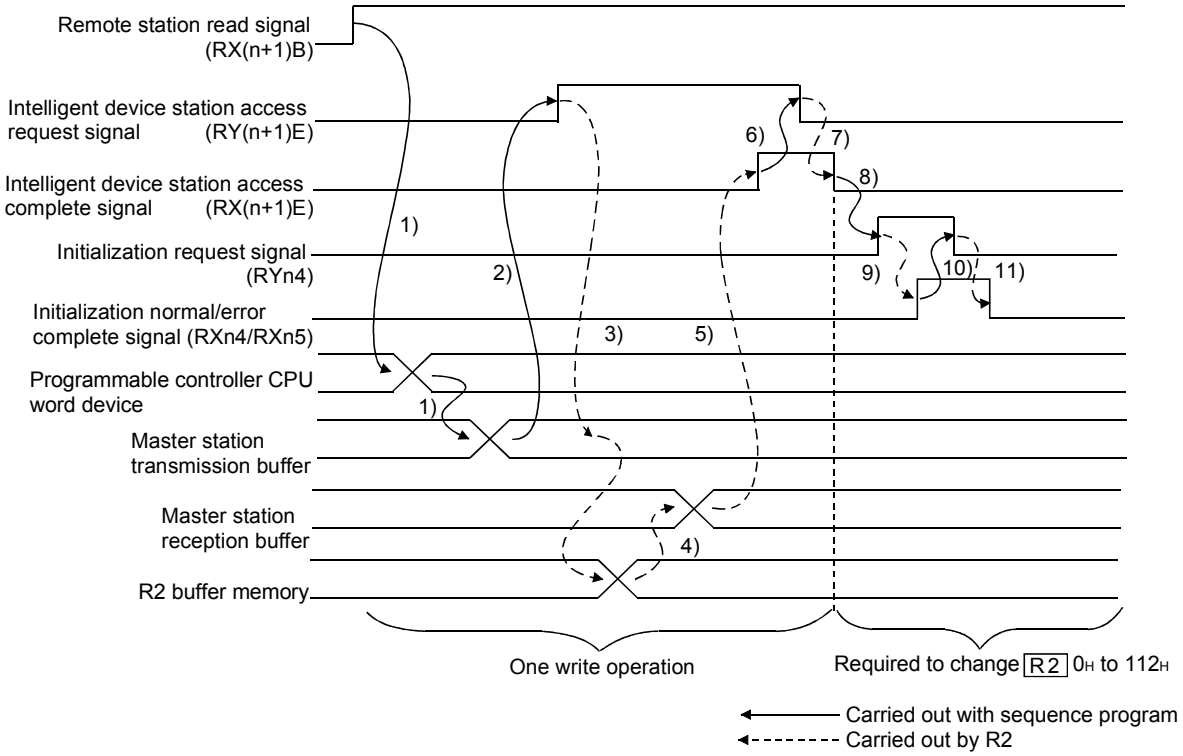


POINT

(1) Steps 1) to 7) are carried out for one write operation.
If writing is to be carried out multiple times because the addresses of the buffer memories to be written are separated, etc., carry out the steps for each write operation.

(2) Steps 8) to 11) (initialization) must be carried out when changing R2 0_H to 112_H.
Initialization is not required to change the other buffer memories.

(3) Timing chart



No.	Details	Control side
1)	The value of buffer memory to be changed and control data is written to master station's transmission buffer.	Program
2)	The intelligent device station access request signal (RY(n+1)E) turns ON.	Program
3)	The contents of the master station transmission buffer are stored in the R2 buffer memory.	R2
4)	The control data is stored in the master station reception buffer.	R2
5)	The intelligent device station access complete signal (RX(n+1)E) turns ON.	R2
6)	The intelligent device station access request signal (RY(n+1)E) turns OFF.	Program
7)	The intelligent device station access complete signal (RX(n+1)E) turns OFF.	R2
8)	The initialization request signal (RYn4) turns ON.	Program
9)	Initialization is carried out by R2, and when completed, the initialization normal signal (RXn4) or error complete signal (RXn5) turns ON.	R2
10)	The initialization request signal (RYn4) turns OFF.	Program
11)	The signal turned ON in step 9) turns OFF.	R2

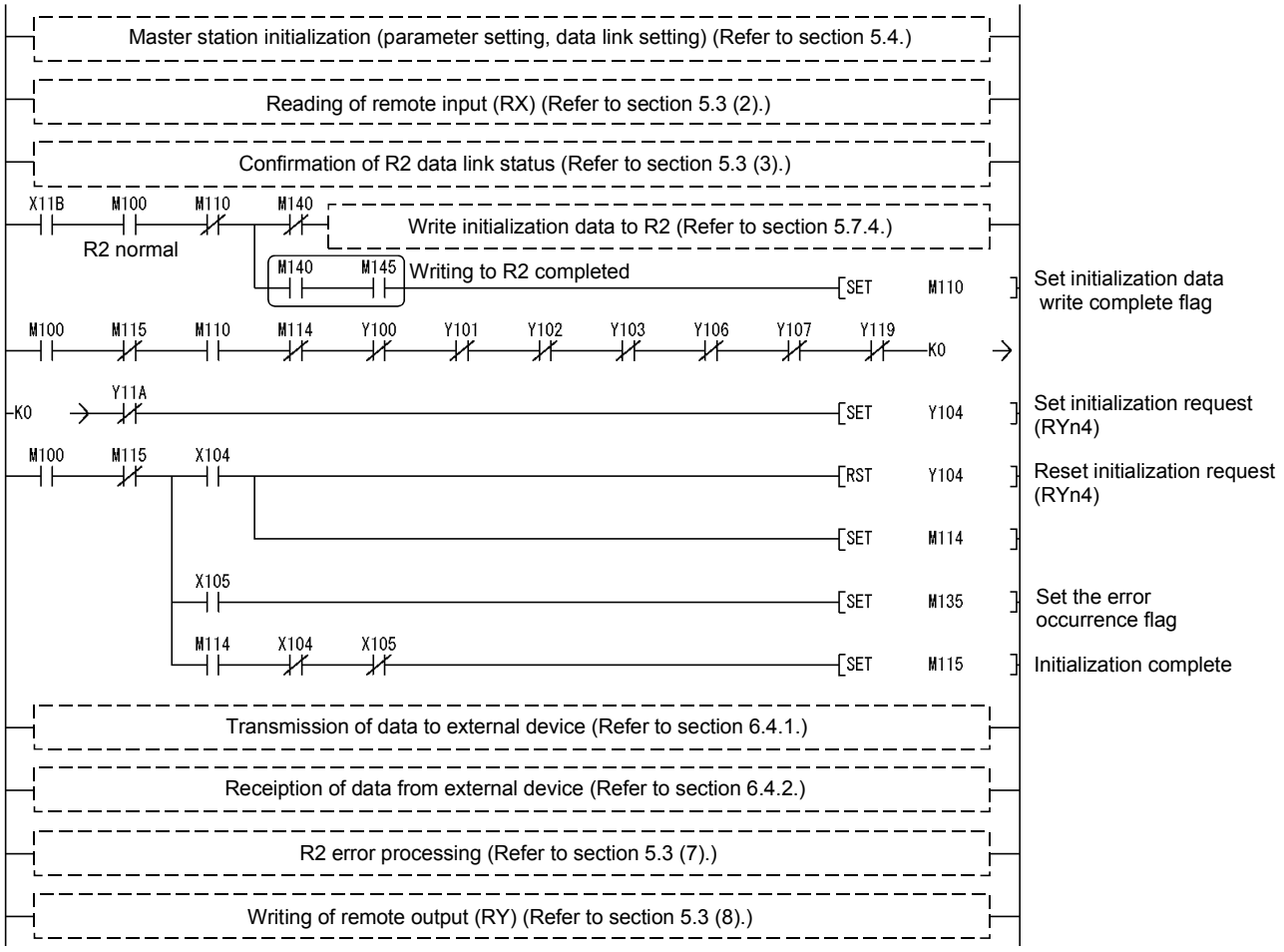
POINT

If the R2 initialization is completed with an error, remove the cause of the error, and repeat the initialization request until the process ends normally.
R2 will not accept other requests until the initialization is completed normally.
(If an initialization error occurs, the remote station READY signal (RX(n+1)B) will turn OFF.)

(4) Program

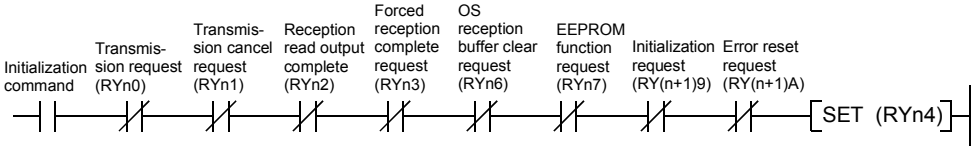
Refer to section 5.7.4 for details on writing the data using the transmission/reception buffer.

Refer to section 5.1 for details on the program conditions.



POINT

Create the following interlock circuit so that the initialization request is made after all request signals (RY) are turned OFF.



If initialization is carried out while RX or RY is ON, the current process will be canceled. Start initialization after turning all RY, other than RYn4, OFF.

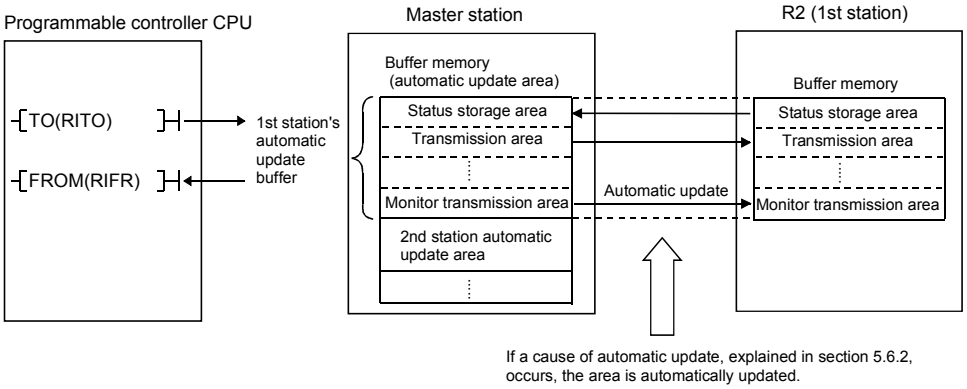
5.6 Reading and writing the buffer memory (using the buffer memory automatic update function)

The methods for reading and writing the R2 buffer memory using the buffer memory automatic update function is described in this section.
When the buffer memory automatic update function is used, data can be read and written using the FROM/TO command, so the sequence program can be simplified.

5.6.1 Outline

With the buffer memory automatic update function, if a cause of data communication between the R2 buffer memory automatic update area and master station automatic update buffer is generated, the data is automatically exchanged, and the data in the corresponding area of each station is updated.
Refer to section 5.6.2 for details on each area and the update timing.

- Reading : The master station buffer memory corresponding to the buffer memory to be read is read out with the FROM/RIFR command.
- Writing : Data is written to the master station buffer memory corresponding to the buffer memory to be written in using the TO/RITO command.



(1) Changing the bank when using the A Series master module

When using the A Series master module (AJ61BT11/A1SJ61BT11), the master station's automatic update buffer will be "bank 2".
Thus, create the program so that the bank is changed to "bank 2" when reading to or writing from the automatic update buffer, and so that "bank 0" is returned to after the reading/writing is completed.
When using the RITO/RIFR commands dedicated for the AnSHCPU, the bank will not be changed automatically by the commands. Thus, the bank must be changed by the user.
Refer to section 5.2 for details on changing the bank.

(2) Setting the timeout

By setting the following buffer memory in the R2, a timeout can be set for exchanging data between the R2 and master station when using the buffer memory automatic update function.

(a) Transient timeout designation area (R2 105H)

0: 5 seconds 1 to 360: designated time (seconds)

5.6.2 Understanding the roles of each area

When using the buffer memory automatic update function, the information of each area in the automatic update area designation (R2 10H to 33H) is important.
The timing for carrying out automatic update in each area is determined by the R2.
The application of each area differs according to the timing.

(1) Role of each area

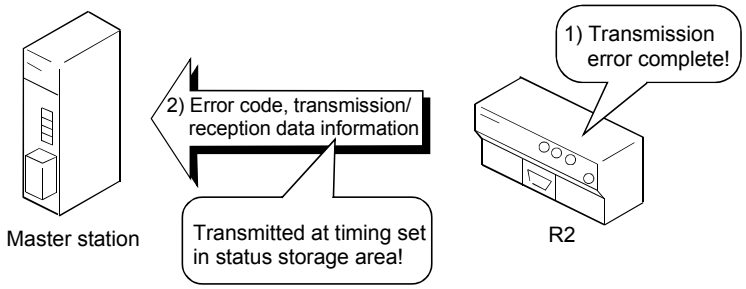
(a) Status storage area (R2 10H to 13H)

This area is used to store the error codes and transmission/reception data information in the master station.
This area is required for initialization, so use it with the default settings.

1) Update timing (Update direction: R2 to master station)

The data in the R2 buffer memory is stored in the master station at the following timing.

- Just before the R2 turns the transmission normal (error) complete signal (RXn0/RXn1) ON.
- Just before the R2 turns the reception normal (error) read request signal (RXn2/RXn3) ON.
- Just before the R2 turns the initialization normal (error) complete signal (RXn4/RXn5) ON.
- Just before the R2 turns the EEPROM function normal (error) complete signal (RXn7/RXn8) ON.
- Just before the R2 detects that the error reset request signal (RY(n+1)A) is ON.
- Just after the R2 detects an error when transmitting data with the monitor transmission function.
- Just before the R2 turns the initial data read complete signal (RX(n+1)9) ON.



(b) Transmission area (R2 14H to 17H, R2 18H to 1BH)

This area is used to store the data transmitted to the external device from the master station to the R2.

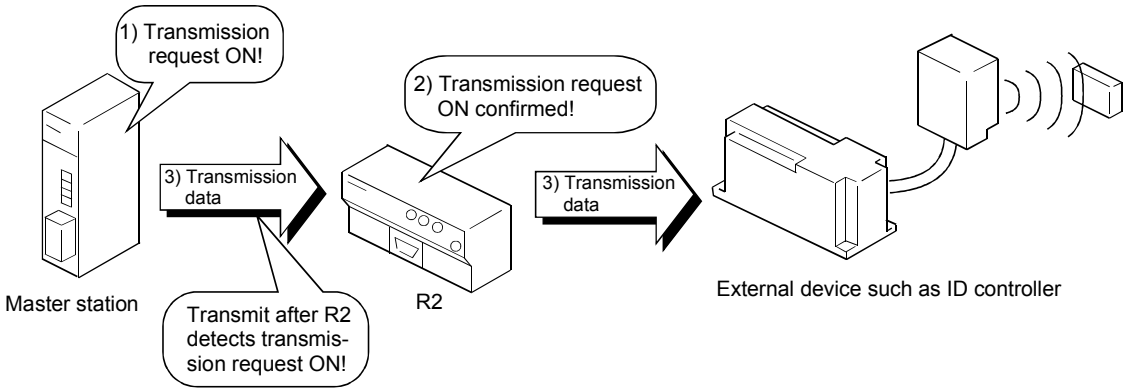
When using a reading dedicated device, such as a barcode reader, the data does not need to be transmitted, so the transmission size (R2 14H, R2 18H) can be set to "0".

The default transmission size is 200H, so the transmission side can be reduced by setting it according to the No. of words being used.

1) Update timing (Update direction: Master station to R2)

The master station data is stored in the R2 buffer memory at the following timing.

- Just after the R2 detects that the transmission request signal (RYn0) has turned from OFF to ON.



(c) Reception area (R2 1CH to 1FH)

This area is used to store the data received by the R2 from an external device to the master station.

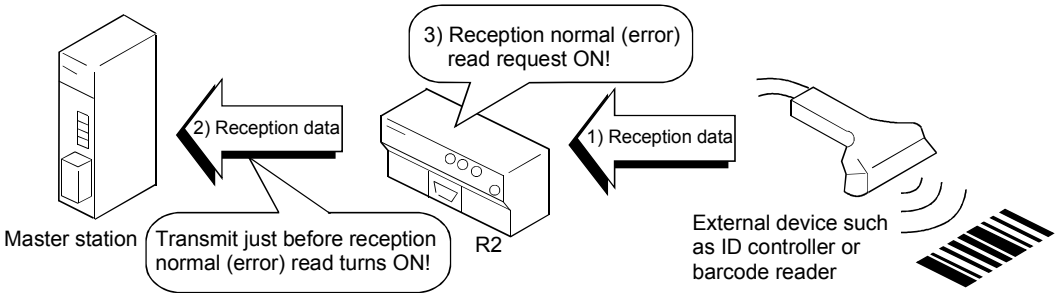
When writing with an ID controller, etc., and there is no need to receive data, the transmission size (R2 1CH) can be set to "0".

The default transmission size is 200H, so the transmission side can be reduced by setting it according to the No. of words being used.

1) Update timing (Update direction: R2 to Master station)

The master station data is stored in the R2 buffer memory at the following timing.

- Just before the R2 turns ON the reception normal read request signal (RXn2)/reception error read request signal (RXn3).



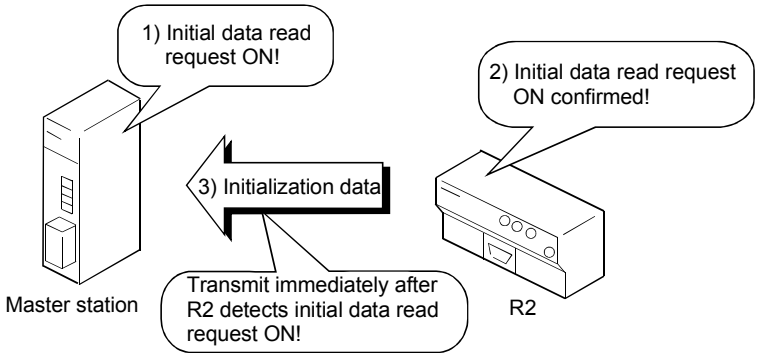
(d) Initialization area (R2 20H to 23H)

This area is used to store the initialization parameters in the master station, or to read them from the master station.
This area is required during initialization, so use the default values.

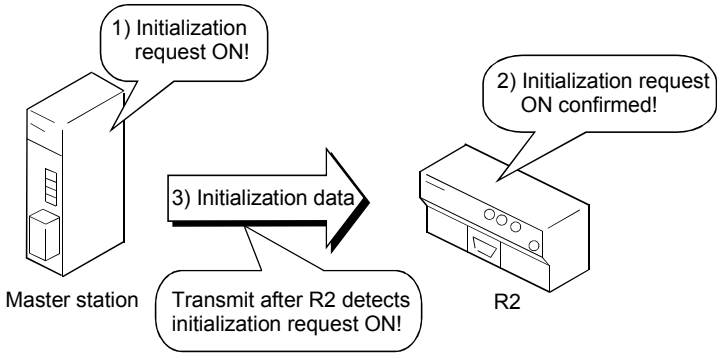
1) Update timing

The data is updated at the following timing.

- Immediately after the R2 detects that the initial data read request signal (RY(n+1)9) has turned from OFF to ON.
  (Update direction: R2 to master station)



- Immediately after R2 detects that the initialization request signal (RYn4) has turned from OFF to ON.
  (Update direction: master station to R2)



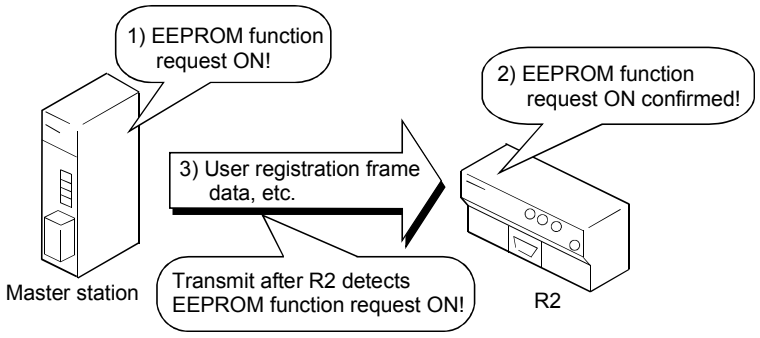
(e) EEPROM function area (R2 24H to 27H)

This area is used to initialize the EEPROM, and to register, call and delete the user registration frames.
When the EEPROM is not to be initialized, or when the user registration frames are not to be registered, called or deleted, the transmission size (R2 24H) can be set to "0".

1) Update timing (Update direction: Master station to R2)

The master station data is stored in the R2 buffer memory at the following timing.

- Immediately after the R2 detects that the EEPROM function request signal (RYn7) has turned from OFF to ON.



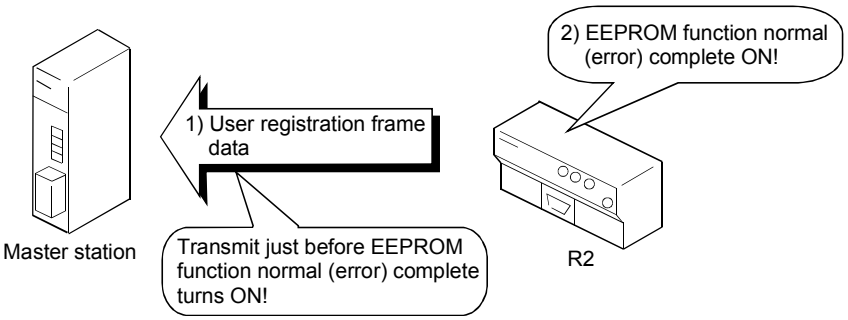
(f) User registration frame area (R2 28H to 2BH)

This area is used to store the user registration frame data after the EEPROM has been initialized, or the user registration frames have been registered, called or deleted with the EEPROM function area.
If the user registration frame state is not to be confirmed, the transmission size (R2 28H) can be set to "0".

1) Update timing (Update direction: R2 to master station)

The R2 buffer memory data is stored in the master station at the following timing.

- Just before the R2 turns the EEPROM function normal complete signal (RXn7)/EEPROM function error complete signal (RXn8) ON.



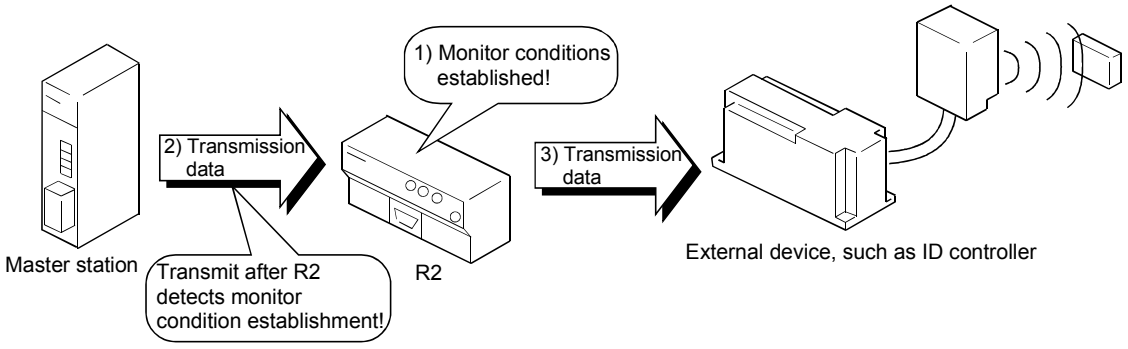
(g) Monitor transmission area (R2 2CH to 2FH, R2 30H to 33H)

This area is used to store the data transmitted from the external device using the monitor transmission function, from the master station to R2.
When not using the monitor transmission function, the transmission size (R2 2CH, R2 30H) can be set to "0".
The default transmission size is 200H, so the transmission size can be reduced by setting it according to the No. of words being used.

1) Update timing (Update direction: Master station to R2)

The master station data is stored in the R2 buffer memory at the following timing.

- Just after the conditions are established in the monitor transmission function.



(2) Buffer memory for setting each area

The buffer memories used to set each area's information (transmission size, head address, master side head offset address) are shown below.

Area name		(a) Transmission size	(b) R2 side head address	(c) Fixed value	(d) Master station side offset address
Status storage area		R2 10H	R2 11H	R2 12H	R2 13H
Transmission area	1)	R2 14H	R2 15H	R2 16H	R2 17H
	2)	R2 18H	R2 19H	R2 1AH	R2 1BH
Reception area		R2 1CH	R2 1DH	R2 1EH	R2 1FH
Initialization area		R2 20H	R2 21H	R2 22H	R2 23H
EEPROM function area		R2 24H	R2 25H	R2 26H	R2 27H
User registration frame area		R2 28H	R2 29H	R2 2AH	R2 2BH
Monitor transmission area	1)	R2 2CH	R2 2DH	R2 2EH	R2 2FH
	2)	R2 30H	R2 31H	R2 32H	R2 33H

(a) Transmission size

Designate the size (No. of addresses) to be automatically updated.

0 : No designation

Other than 0 : Transmission size (No. of words)

(b) R2 side head address

Designate the head address of the R2 side data range to be automatically updated.

(c) Fixed value

Designate 4004H.

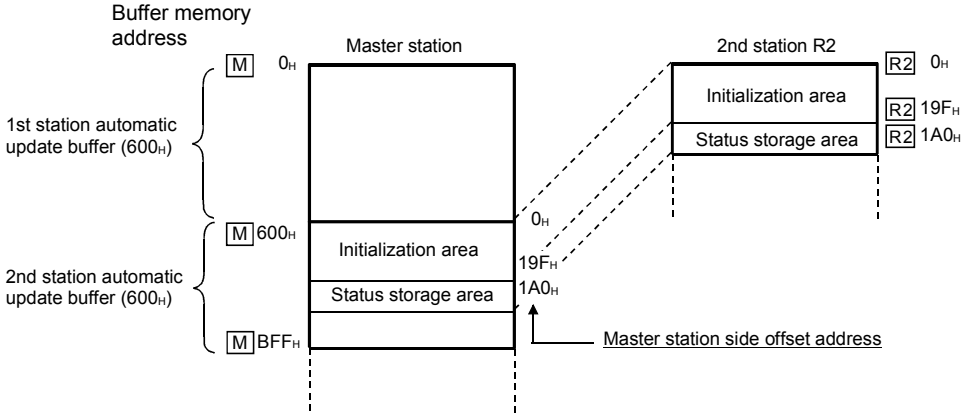
Note that the default value is 4004H, so this does not need to be changed.

(d) Master station side offset address

Designate the head address of the master station side data range to be automatically updated.

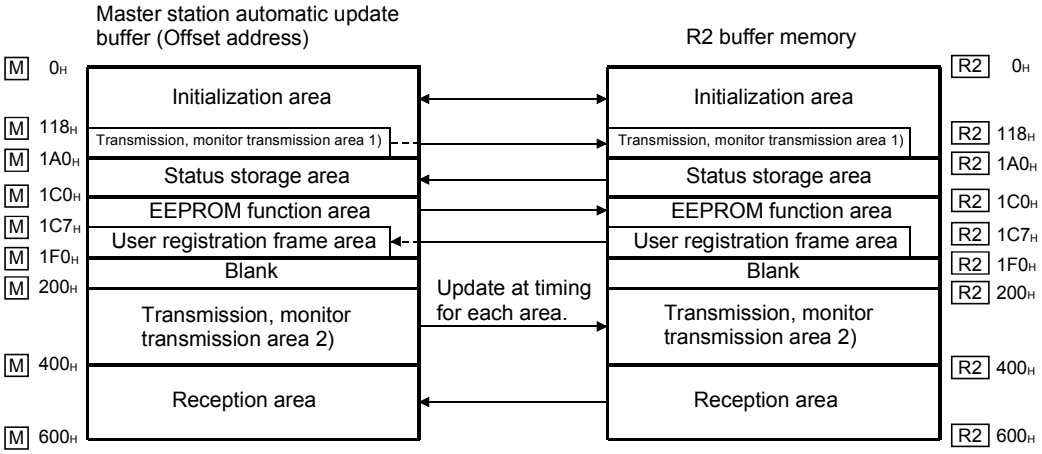
Designate using 0H for the head address of the automatic update buffer assigned for R2 in the master station automatic update buffer.

(Example) When R2 is the 2nd station



(3) Default size of each area

When totaled the default size of each area is 600H.
The size of the master station automatic update area is 1000H, so if used with the default setting, only two R2 modules can be connected.
Users using three or more R2 modules must reduce and delete the areas not being used to reduce the automatic update size (transmission size).

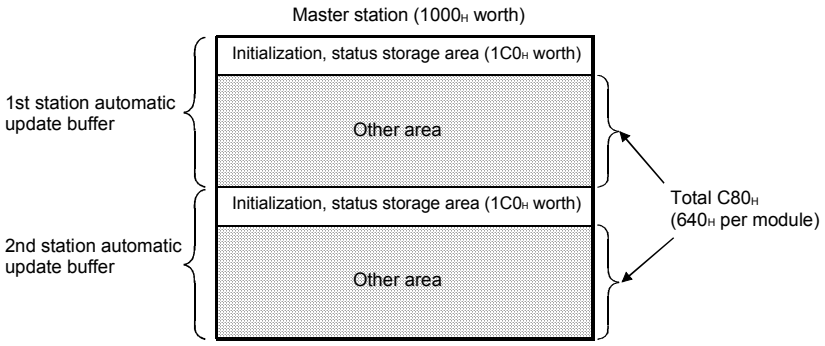


(a) Relation of No. of modules and each area size

As the No. of R2 modules being used increases, the size of the areas other than the initialization area and status storage area must be reduced or else the master station buffer memory (1000H) will be exceeded.
The sizes of the areas that can be set are described below.

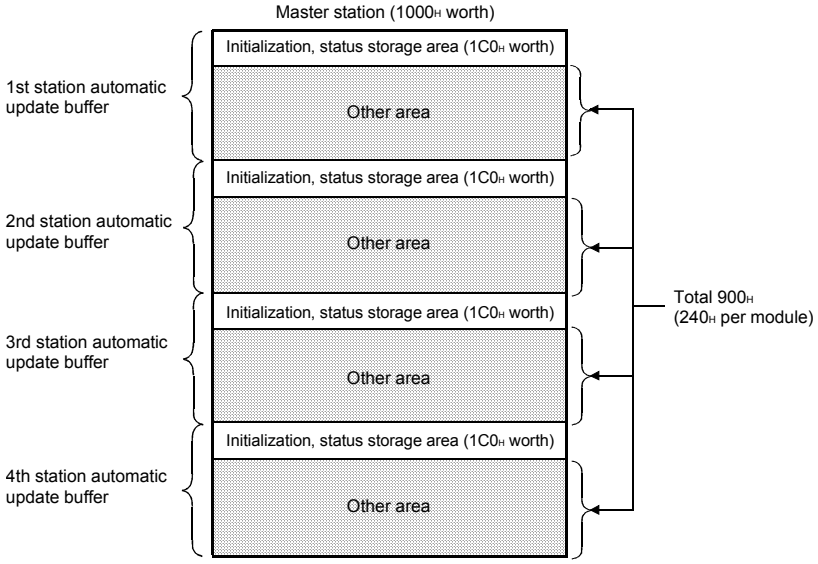
1) When connecting two R2 modules

Master station automatic update buffer (1000H) –
(Initialization (1A0H) + Status storage area (20H)) × 2 = C80H
The size of the areas, other than the initialization area, which can be used by the two R2 modules will be C80H.
The size per module will be 640H.



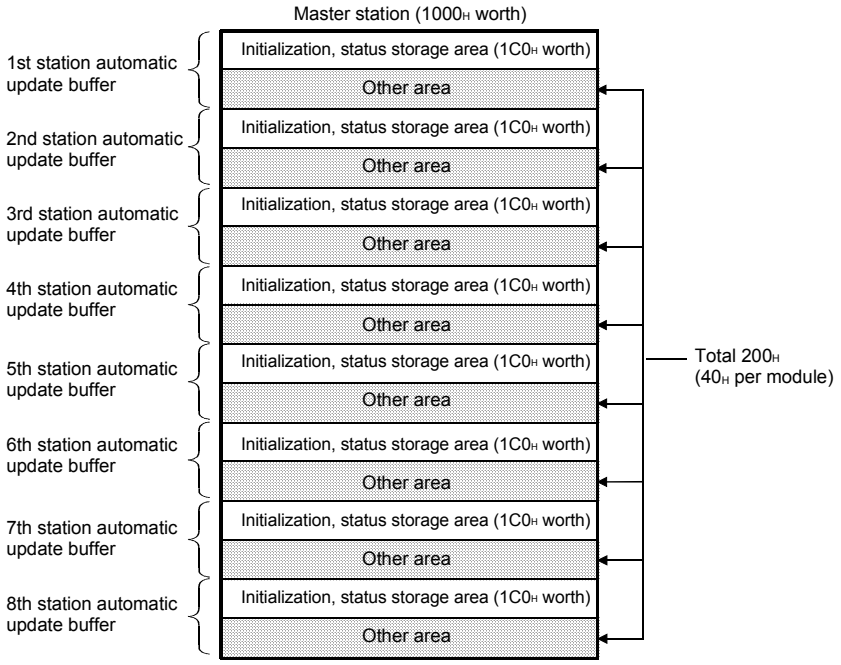
2) When connecting four R2 modules

Master station automatic update buffer (1000H) –
(Initialization (1A0H) + Status storage area (20H)) × 4 = 900H
The size of the areas, other than the initialization area, which can be used by the four R2 modules will be 900H.
The size per module will be 240H.



3) When connecting eight R2 modules

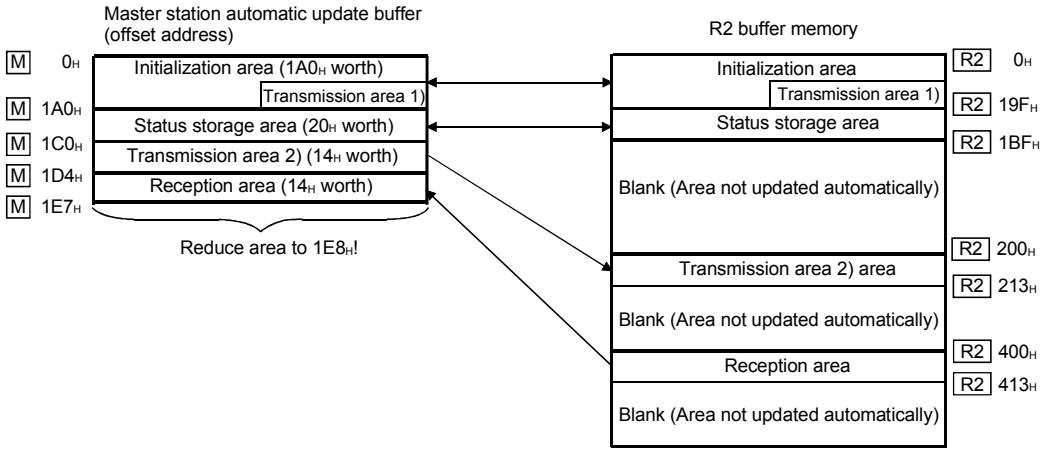
Master station automatic update buffer (1000H) –
(Initialization (1A0H) + Status storage area (20H)) × 8 = 200H
The size of the areas, other than the initialization area, which can be used by the eight R2 modules will be 200H.
The size per module will be 40H.



(b) An example for reducing each area is shown below.

(Example) To transmit and receive 20-word data to connect eight R2 modules

Area name	Transmission size		R2 side head address		Master station side offset address	
	Address	Value	Address	Value	Address	Value
Status storage area	R2 10H	Default value	R2 11H	Default value	R2 13H	Default value
Transmission area 1)	R2 14H	Default value	R2 15H		R2 17H	
Transmission area 2)	R2 18H	14H	R2 19H		R2 1BH	1C0H
Reception area	R2 1CH	14H	R2 1DH		R2 1FH	1D4H
Initialization area	R2 20H	Default value	R2 21H		R2 23H	Default value
EEPROM function area	R2 24H	0H	R2 25H		R2 27H	
User registration frame area	R2 28H	0H	R2 29H		R2 2BH	
Monitor transmission area 1)	R2 2CH	0H	R2 2DH		R2 2FH	
Monitor transmission area 2)	R2 30H	0H	R2 31H		R2 33H	

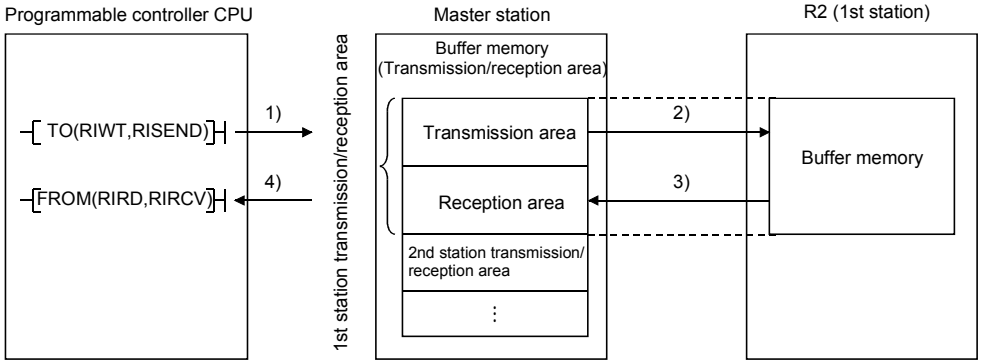


5.7 Reading and writing the buffer memory (using the transmission/reception buffer)

The method for reading and writing the R2 buffer memory using the transmission/reception buffer is described below.
When the transmission/reception buffer is used, the required size only can be adequately transmitted so excess data is not transmitted.
This allows the transmission path efficiency to be improved.

5.7.1 Outline

When reading and writing the R2 buffer memory using the transmission/reception buffer, reading and writing are carried out using the intelligent device station access request signal (RY(n+1)E) and the intelligent device station access complete signal (RX(n+1)E).
The master station buffer memory uses the transmission/reception buffer.



(1) Data (control data + transmission data) is stored in the master station transmission area.
(2) When the intelligent device station access request signal (RY(n+1)E) turns ON, the data stored in the transmission area is stored in the R2.
(3) When the intelligent device station access complete signal (RX(n+1)E) turns ON, the response is stored in the master station reception area.
(4) The data is read from the master station reception area.

POINT

When the dedicated commands RIWT/RIRD/RISEND/RIRCV are used, the intelligent device station access request signal (RY(n+1)E) and intelligent device station access complete signal (RX(n+1)E) are controlled by the dedicated commands, so the user does not need to establish an interlock.

(1) Changing the bank when using the A Series master module

When using the A series master module (AJ61BT11/A1SJ61BT11), the master station's automatic transmission/reception buffer will be "bank 1".
Thus, create a program that changes to "bank 1"when reading or writing to the transmission/reception buffer, and returns to "bank 0" when the reading/writing is completed.
When using the dedicated commands RIWT/RIRD/RISEND/RIRCV, the bank will be changed automatically by the dedicated commands, so the user does not need to change the bank.
Refer to section 5.2 for details on changing the bank.

5.7.2 Control data

When transmitting data using the transmission/reception buffer, the control data must be added to the transmission data before transmitting.
When receiving data, the control data will be added to the head of the reception data.
The following examples are explained in this section for the control data.

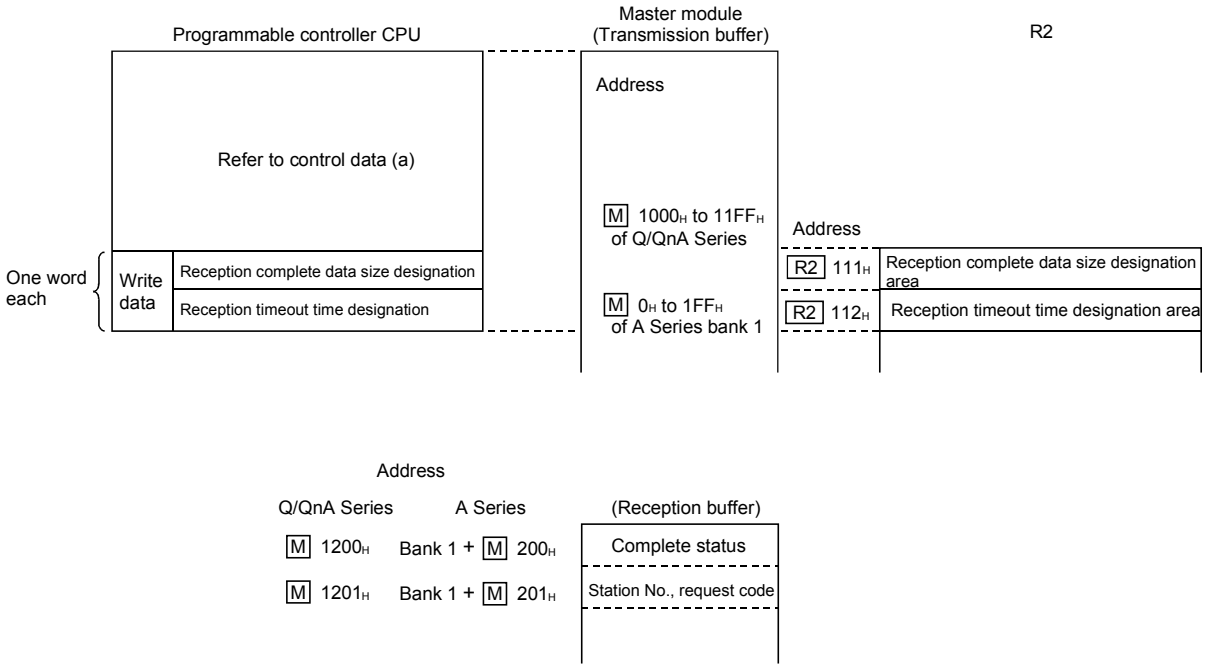
- Transmission buffer address (200H worth)
  When using A Series master station : Bank 1 M 0H to 1FFH
  When using Q/QnA Series master station: M 1000H to 11FFH
- Reception buffer address (200H worth)
  When using A Series master station : Bank 1 M 200H to 3FFH
  When using Q/QnA Series master station: M 1200H to 13FFH

POINT
Refer to the following manuals for details on the control data when using the dedicated commands (RIWT/RISEND/RIRD/RIRCV). • When using ACPU/QCPU-A (A mode) : AnSHCPU/AnACPU/AnUCPU Programming Manual (Dedicated Commands) • When using QnACPU : QnACPU Programming Manual (Special Function Module) • When using QCPU (Q mode) : QJ61BT11N/QJ61BT11 User's Manual

(1) When using the RIWT command

This is used only when writing to the R2-designated buffer memory.
When using the RIWT command, the master station buffer memory will be used as the transmission buffer for the control data and write data.
The complete status will be stored in the reception buffer.

(Example) Writing in the reception complete data size and reception timeout time



(a) Control data

Note that the control data differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU-A (A mode) as shown below.

When using ACPU/QCPU-A (A mode)

Control data

One word each	
	Complete status
	No. of write points (words)
	Access code, attribute
	Buffer memory address

When using QCPU (Q mode)/QnACPU

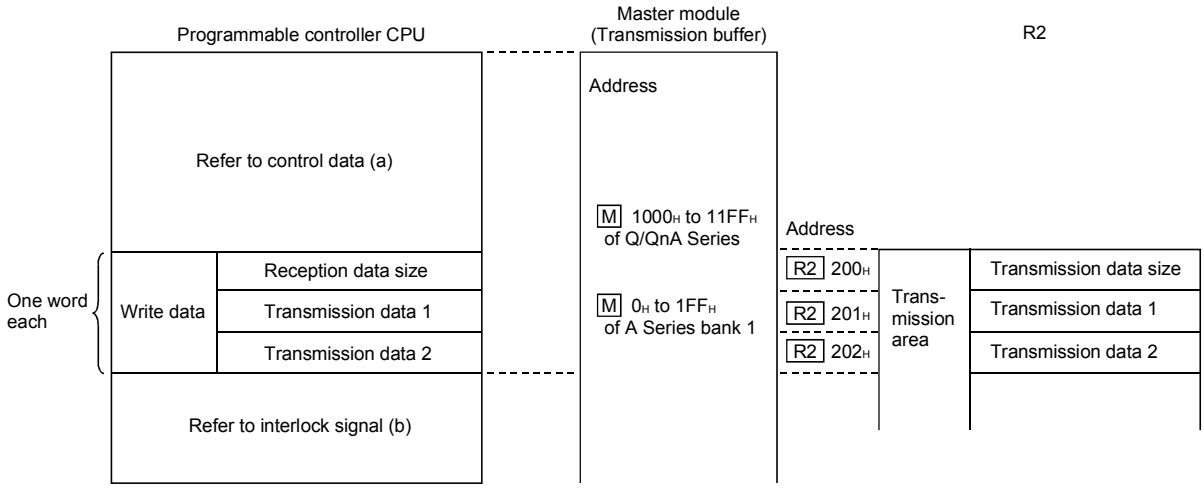
Control data

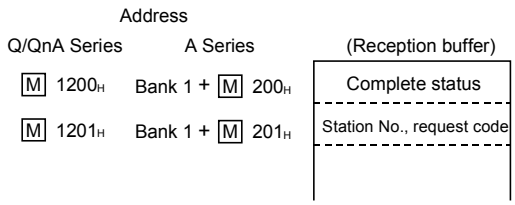
One word each	
	Complete status
	Station No.
	Access code, attribute
	Buffer memory address
	No. of write points (words)

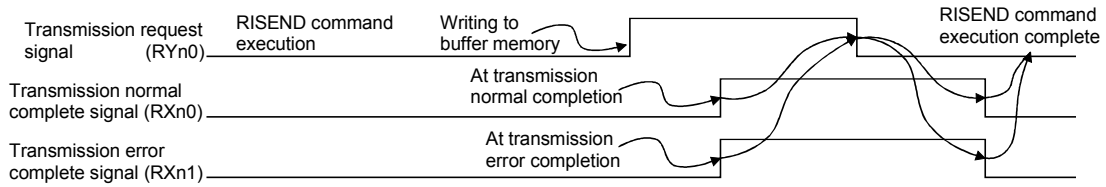
(2) When using RISEND command

This is used to write to a R2-designated buffer memory with executing handshake automatically between the master station and R2.
When using the RISEND command, the master station buffer memory will be used as the transmission buffer for the control data and write data.
The complete status will be stored in the reception buffer.

(Example) Writing and transmitting 2-word transmission data to master station







(a) Control data

Note that the control data differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU-A (A mode) as shown below.

When using ACPU/QCPU-A (A mode)

Control data

One word each	
	Complete status
	No. of write points (word)
	Fixed to 0004_H
	Error confirmation
	Buffer memory address

When using QCPU (Q mode)/QnACPU

Control data

One word each	
	Complete status
	Station No.
	Access code, attribute
	Buffer memory address
	No. of write points (word)

(b) Interlock signal

Note that the interlock signal differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU-A (A mode) as shown below.

When using ACPU/QCPU-A (A mode)

Interlock signal

	b15 to b8	b7 to b0
One word each	RX (Complete device)	RY (Request device)
	RWr (Error code storage device)	

When using QCPU (Q mode)/QnACPU

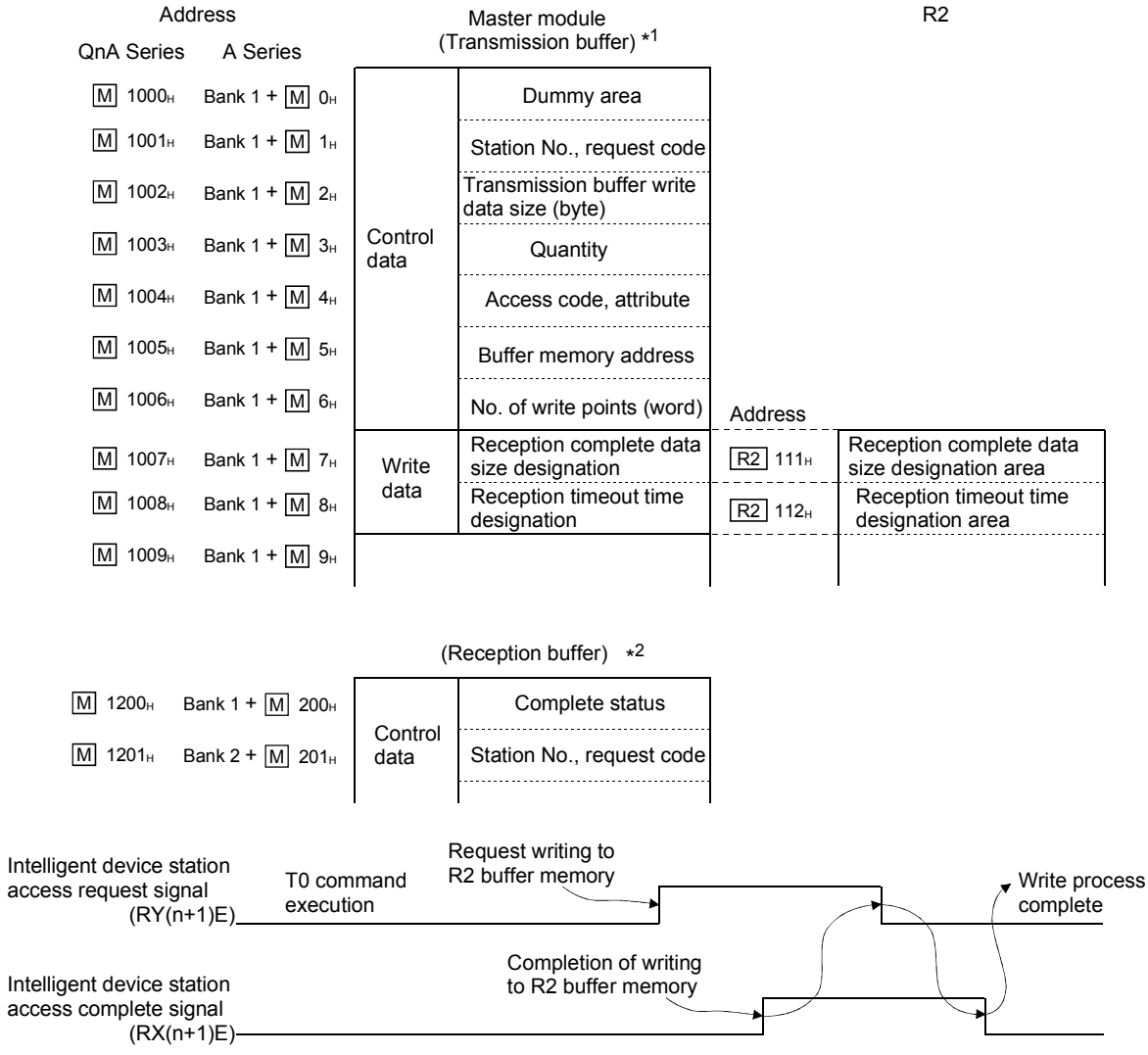
Interlock signal

	b15 to b8	b7 to b0
One word each	0	RY (Request device)
	RWr (Error code storage device)	RX (Complete device)
	Complete mode	

(3) When using the TO command (Not available when using QCPU (Q mode))

This is used only when writing to the R2-designated buffer memory.
When using the TO command, the master station buffer memory will be used as the transmission buffer for the control data and write data.
The complete status will be stored in the reception buffer.
The data designated with the transmission buffer is written to the R2 buffer memory using the intelligent device station access request (complete) signal (RY(n+1)E and RX(n+1)E).

(Example) Writing in the reception complete data size and reception timeout time



*1 When writing data to the R2 buffer memory using the TO command, the control data and write data are designated in the transmission buffer of the corresponding master station.

Designated data	Item	Details	Setting range	Setting side
Control data	Dummy area	–	–	System
	Station No., request code	Station No. (designate with high-order bytes (bits 8 to 15) Designate the station No. of the intelligent device station to be accessed.	0 to 64	User
		Request code (designate with low-order bytes (bits 0 to 7) Designate the write request code.	12H	User
	Transmission buffer write data size (byte)	Designate the total No. of bytes of the designated data from the following quality items. • Control data : Quantity to No. of write points • Write data : Data to be written into R2 buffer memory	8 + No. of write points × 2	User
	Quantity	(Fixed value)	1	User
	Access code, attribute	(Fixed value)	0004H	User
	Buffer memory address	Designate the head address (0H or higher) of the buffer memory.	0H to 5FFH	User
	No. of write points (word)	Designate the data size (No. of words) to be written in so that the R2 buffer memory address 5FFH is not exceeded. 5FFH ≥ (buffer memory address -1) + No. of write points	1 to 480	User
Write data	Designate the data to be written into the target R2 buffer memory designated with the control data buffer memory address items and No. of write point items. Designate the amount for the control data No. of write points.			User

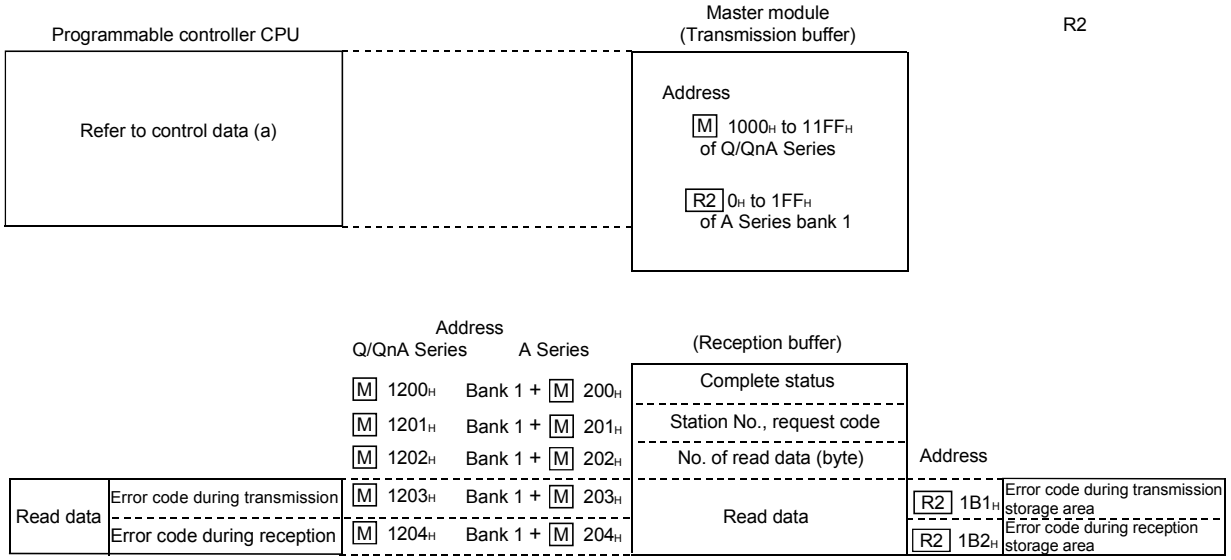
*2 The following control data is stored in the master module reception buffer.

Designated data	Details	Setting side
Complete status	The status when the command is completed is stored. 0 : Normal completion Other than 0 : Error completion (error code) Refer to the Master Module User's Manual (Details)	System
Station No., request code	Station No. (designate with high-order bytes (bits 8 to 15)) The station No. of the accessed intelligent device station is stored.	System
	Request code (designate with low-order bytes (bits 0 to 7)) The write request code (12H) is stored.	System

(4) When using the RIRD command

This is used only when reading to the R2-designated buffer memory.
When the RIRD command is used, the master station buffer memory is used for the control data size transmission buffer, and the master station buffer memory is used for the read data size reception buffer.

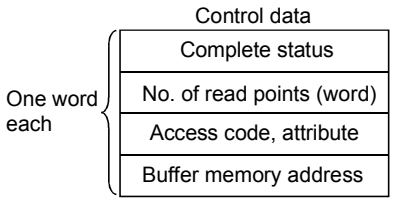
(Example) To read error code during transmission and during reception



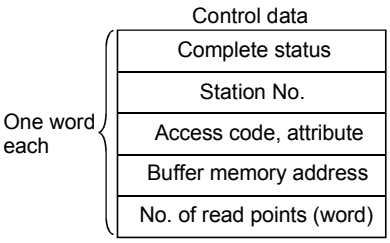
(a) Control data

Note that the control data differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU-A (A mode) as shown below.

When using ACPU/QCPU-A (A mode)



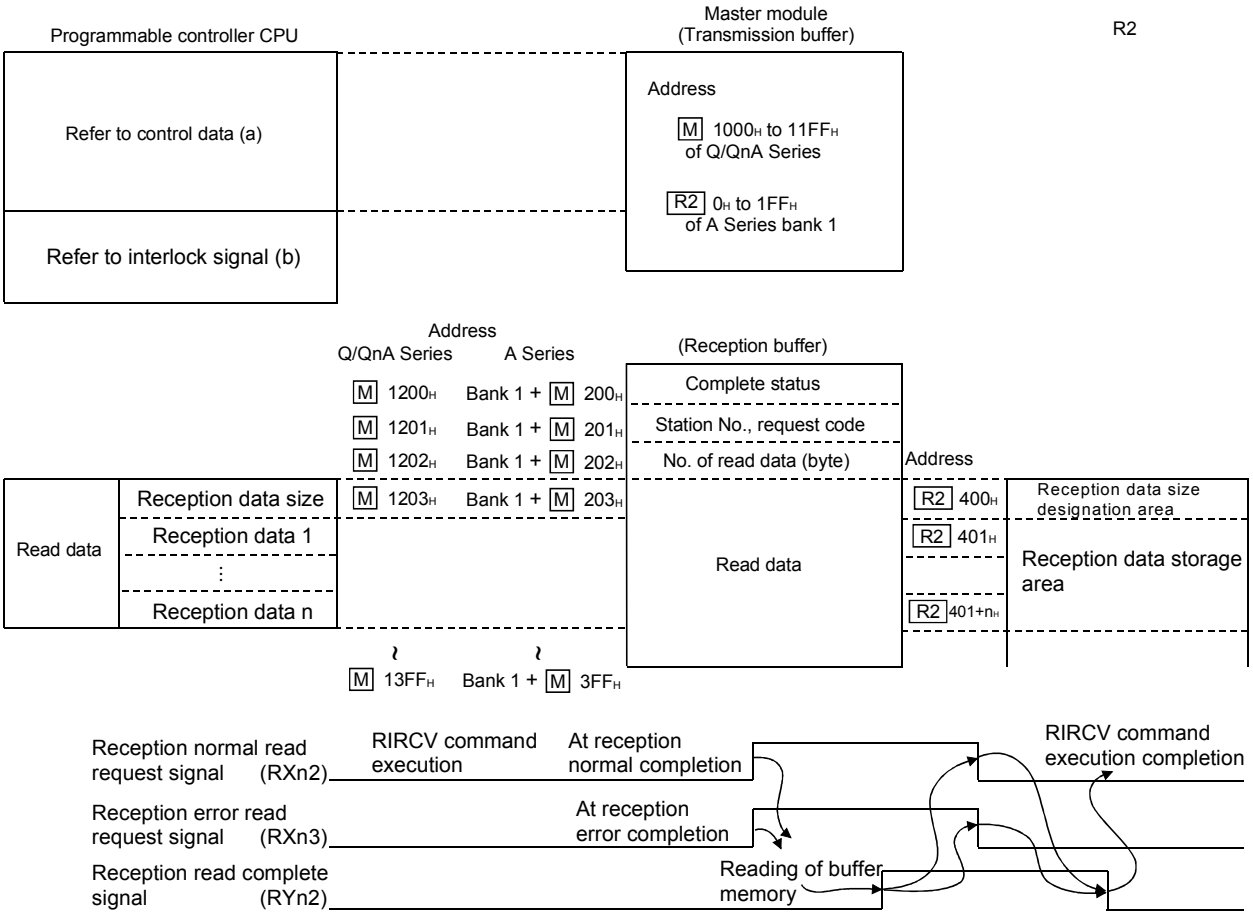
When using QCPU (Q mode)/QnACPU



(5) When using the RIRCV command

This is used to read a R2-designated buffer memory with executing handshake automatically between the master station and R2.
When the RIRCV command is used, the master station buffer memory is used for the control data size transmission buffer, and the master station buffer memory is used for the read data size reception buffer.

(Example) Reading the reception data



(a) Control data

Note that the control data differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU-A (A mode) as shown below.

When using ACPU/QCPU-A (A mode)

Control data

One word each	
	Complete status
	No. of read points (word)
	Fixed to 0004_H
	Error confirmation
	Buffer memory address

When using QCPU (Q mode)/QnACPU

Control data

One word each	
	Complete status
	Station No.
	Access code, attribute
	Buffer memory address
	No. of read points (word)

(b) Interlock signal

Note that the interlock signal differs between the QCPU (Q mode)/QnACPU and ACPU/QCPU (A mode) as shown below.

When using ACPU/QCPU-A (A mode)

Interlock signal

	b15 to b8	b7 to b0
One word each	RX (Complete device)	RY (Request device)
	RWr (Error code storage device)	

When using QCPU (Q mode)/QnACPU

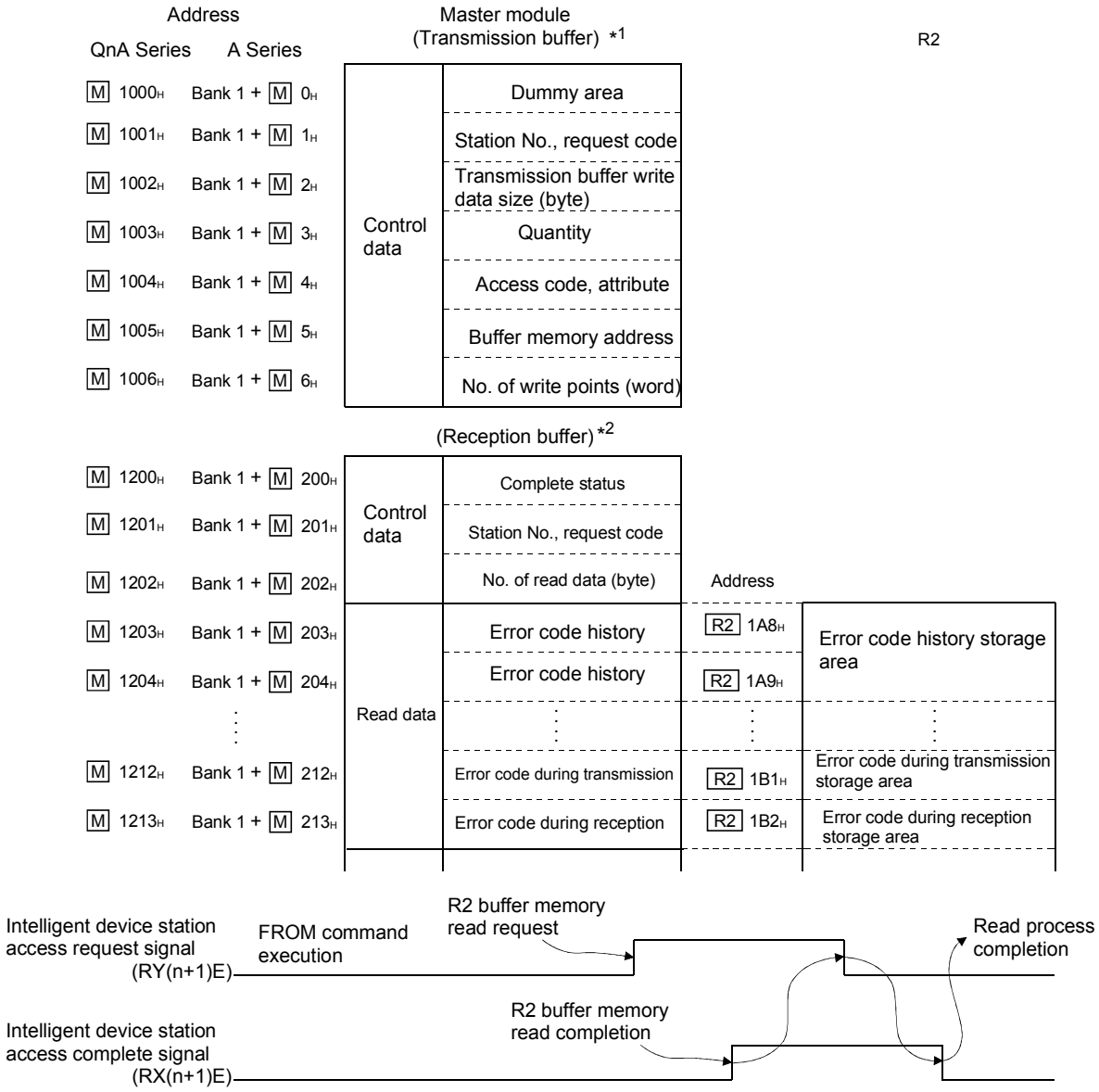
Interlock signal

	b15 to b8	b7 to b0
One word each	0	RY (Request device)
	RWr (Error code storage device)	RX (Complete device)
	Complete mode	

(6) Using the FROM command (Not available when using QCPU (Q mode))

This is used to read the R2-designated buffer memory.
When the FROM command is used, the transmission buffer (master module buffer memory) for the control data size, and the reception buffer (master module buffer memory) for the read data size are used.
The data designated with the transmission buffer is read from the R2 buffer memory using the intelligent device station access request signal and complete signal (RY(n+1)E and RX(n+1)E).

(Example) Reading the error information



*1 When reading data from the R2 buffer memory using the FROM command, the control data is designated in the transmission buffer of the corresponding master module.

Designated data	Item	Details	Setting range	Setting side
Control data	Dummy area	–	–	System
	Station No., request code	Station No. (designate with high-order bytes (bits 8 to 15)) Designate the station No. of the intelligent device station to be accessed.	0 to 64	User
		Request code (designate with low-order bytes (bits 0 to 7)) Designate the read request code.	10H	User
	Transmission buffer write data size (byte)	(Fixed value)	8	User
	Quantity	(Fixed value)	1	User
	Access code, attribute	(Fixed value)	0004H	User
	Buffer memory address	Designate the head address (0H or higher) of the buffer memory.	0H to 5FFH	User
	No. of read points (word)	Designate the data size (No. of words) to be written in so that the R2 buffer memory address 5FFH is not exceeded. 5FFH ≥ (buffer memory address -1) + No. of read points	1 to 480	User

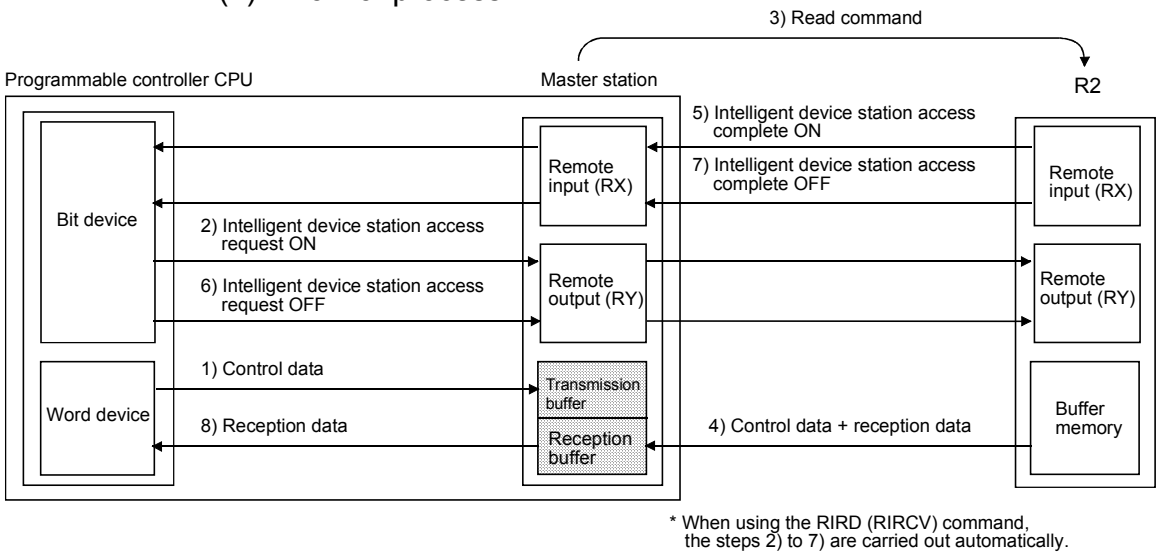
*2 The same details as the data read from the R2 buffer memory with the FROM command is stored in the reception buffer of the corresponding master module.

Designated data	Details	Setting side
Complete status	The status when the command is completed is stored. 0 : Normal completion Other than 0 : Error completion (error code) Refer to the Master Module User's Manual (Details).	System
Station No., request code	Station No. (designate with high-order bytes (bits 8 to 15)) The station No. of the accessed intelligent device station is stored.	System
	Request code (designate with low-order bytes (bits 0 to 7)) The read request code (10H) is stored.	System
Read data size (byte)	The total No. of bytes of the read data is stored.	System
Read data (byte)	The target R2 buffer memory data designated with the control data buffer memory address items and No. of read points is stored.	System

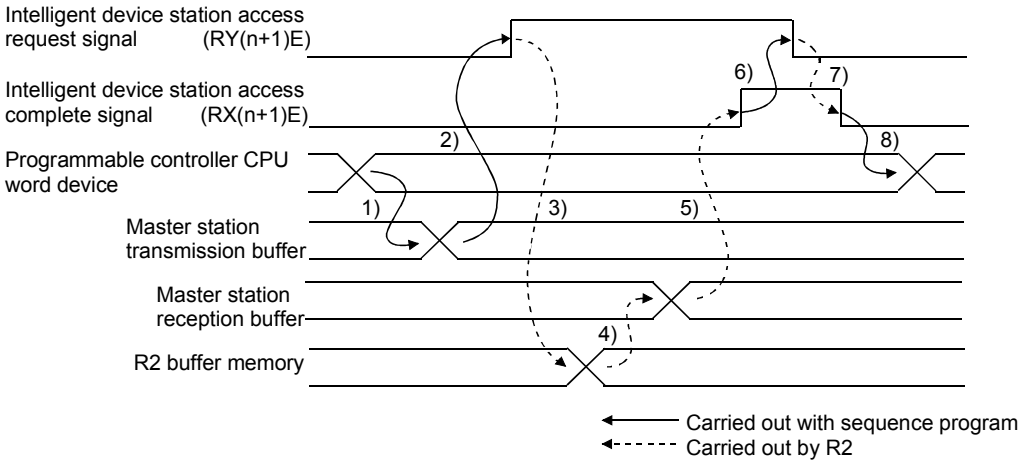
5.7.3 Reading the R2 buffer memory

When reading the R2 buffer memory using the transmission/reception buffer, after the control data is written to the transmission buffer, the data is read from the buffer memory by turning the intelligent device station access request (complete) signal (RY(n+1)E, RX(n+1)E) ON and OFF.

(1) Flow of process



(2) Timing chart



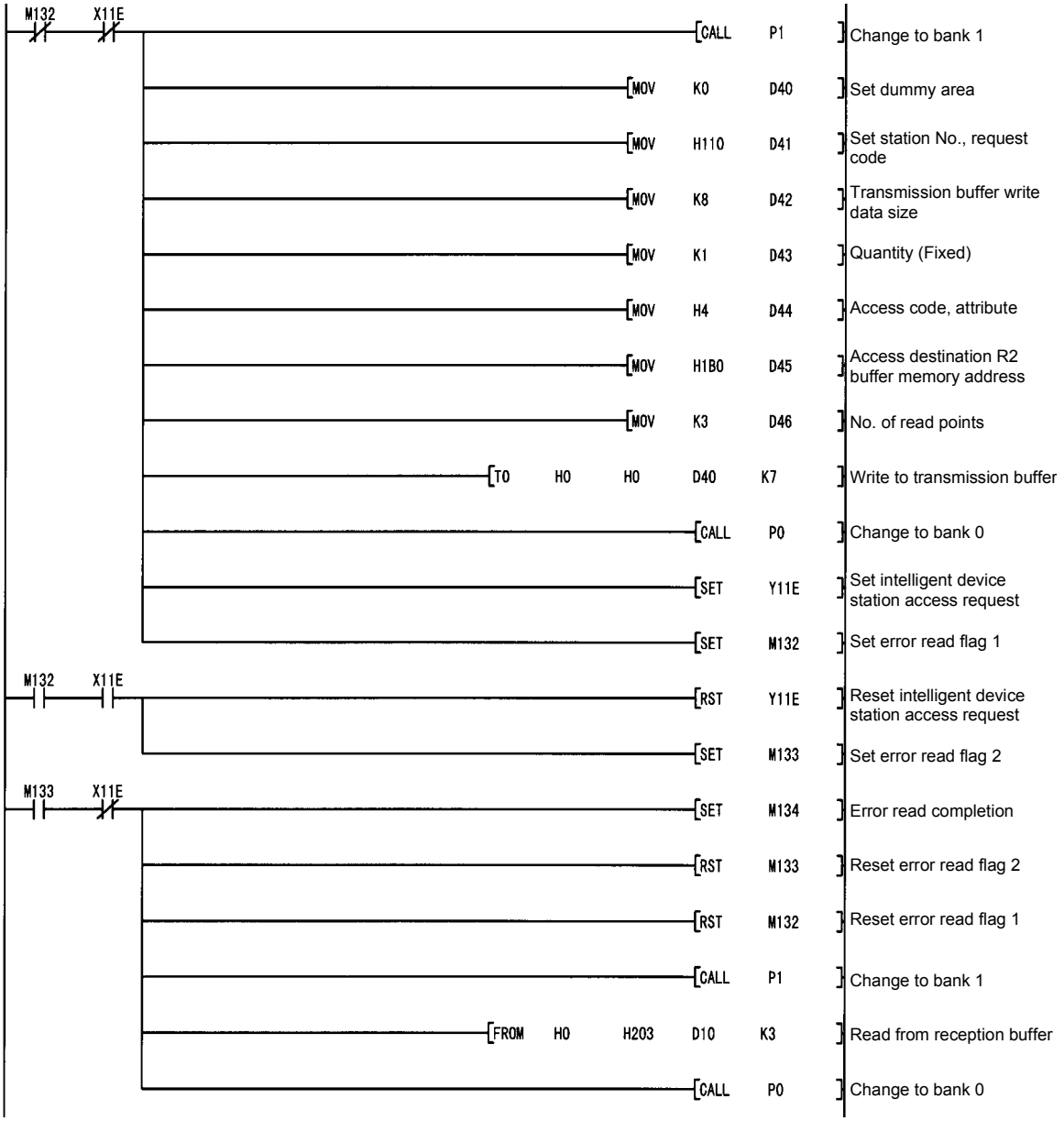
No.	Details	Control side
1)	The control data is written to the master station transmission buffer.	Program
2)	The intelligent device station access request signal (RY(n+1)E) turns ON.	Program
3)	The contents set in the control data are conveyed to the R2.	R2
4)	The control data is stored in the master station reception buffer.	R2
5)	The intelligent device station access complete signal (RX(n+1)E) turns ON.	R2
6)	The intelligent device station access request signal (RY(n+1)E) turns OFF.	Program
7)	The intelligent device station access complete signal (RX(n+1)E) turns OFF.	R2
8)	The reception data is read from the master station reception buffer.	Program

(3) Program

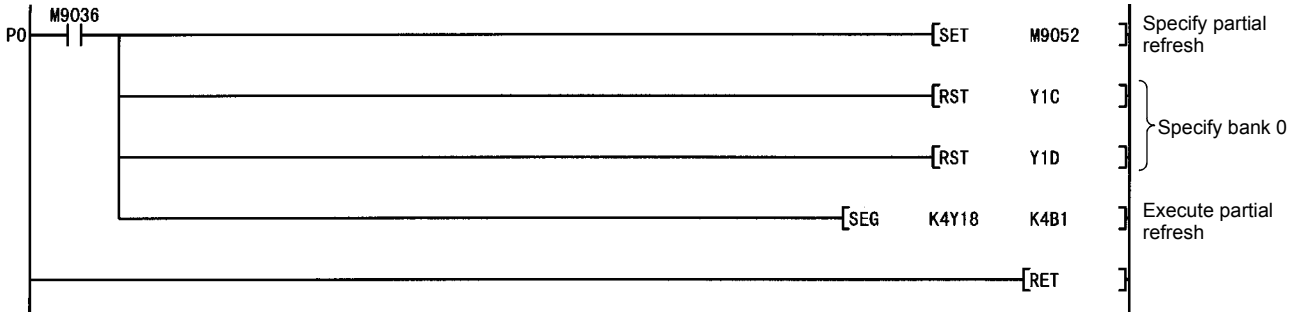
The program for reading the error codes (R2 1B0H to R2 1B2H) is shown below.

Refer to section 5.1 for details on the program conditions.

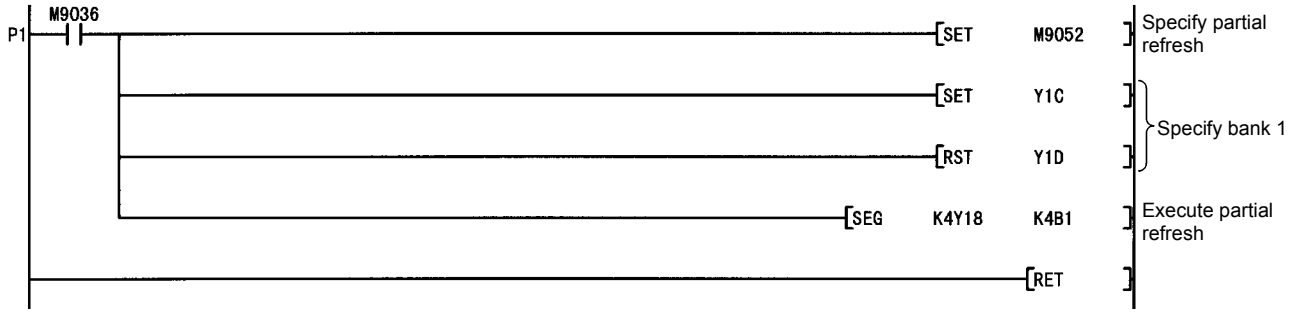
(a) To use FROM/TO command with ACPU / QCPU-A (A mode)



1) Program to change to bank 0

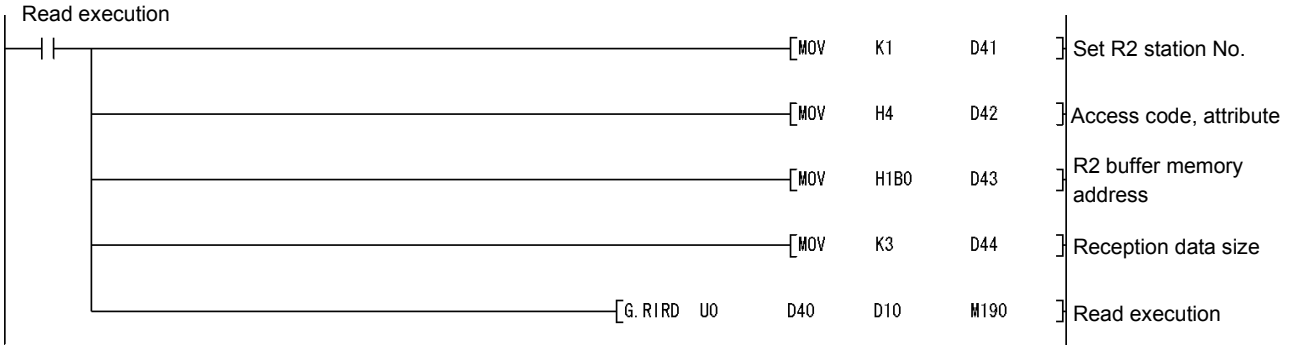


2) Program to change to bank 1



(b) When using dedicated commands (RIRD) with QCPU (Q mode) / QnACPU

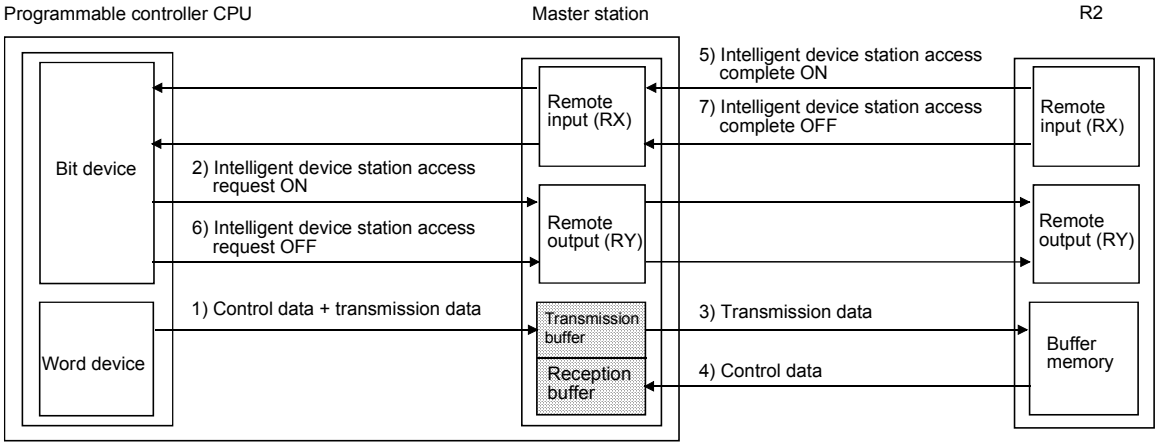
When using dedicated commands (RIRD/RIRCV), RY(n+1)E and RY(n+1)F are used with the dedicated commands, so provisions must be made to prevent the user from rewriting this signal information.
When the QCPU (Q mode) is used, such provisions need not be made.
Refer to section 5.3(8) for details.



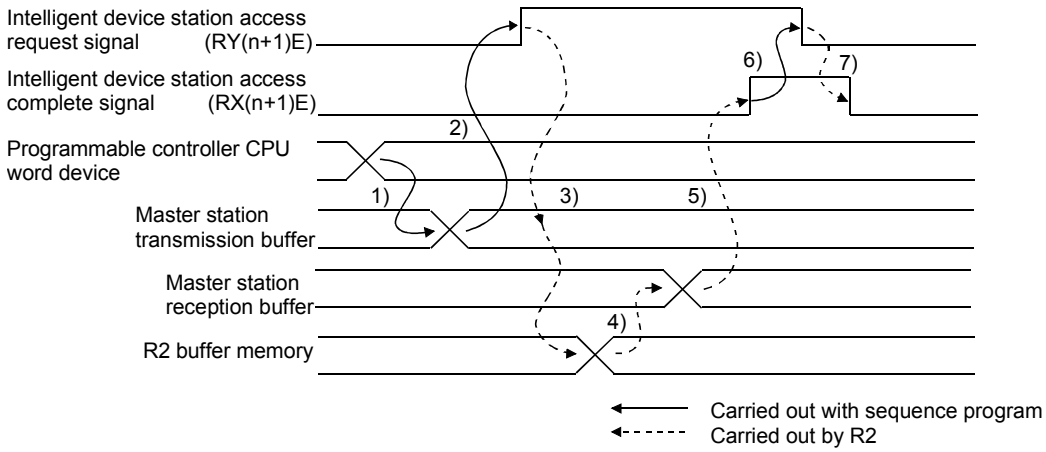
5.7.4 Writing to the R2 buffer memory

When writing to the R2 buffer memory using the transmission/reception buffer, after the control data and transmission data are written to the transmission buffer, the data can be written to the buffer memory by turning the intelligent device station access request (complete) signal (RY(n+1)E, RX(n+1)E) ON and OFF.

(1) Flow of process



(2) Timing chart



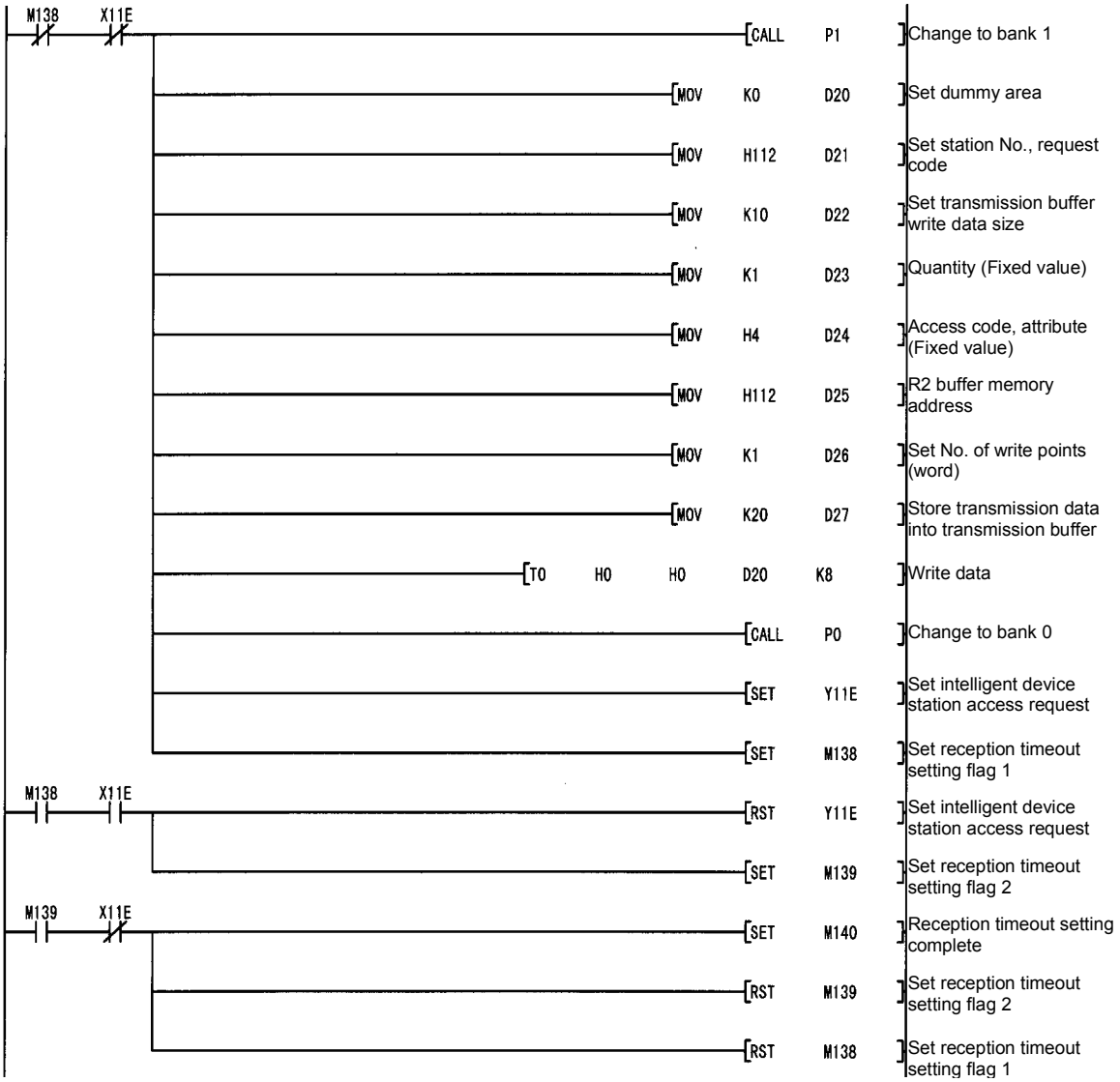
No.	Details	Control side
1)	The control data and buffer memory value to be changed are written to the master station transmission buffer.	Program
2)	The intelligent device station access request signal (RY(n+1)E) turns ON.	Program
3)	The contents of the master station transmission buffer are stored in the R2 buffer memory. (Only transmission data)	R2
4)	The control data is stored in the master station reception buffer.	R2
5)	The intelligent device station access complete signal (RX(n+1)E) turns ON.	R2
6)	The intelligent device station access request signal (RY(n+1)E) turns OFF.	Program
7)	The intelligent device station access complete signal (RX(n+1)E) turns OFF.	R2

(3) Program

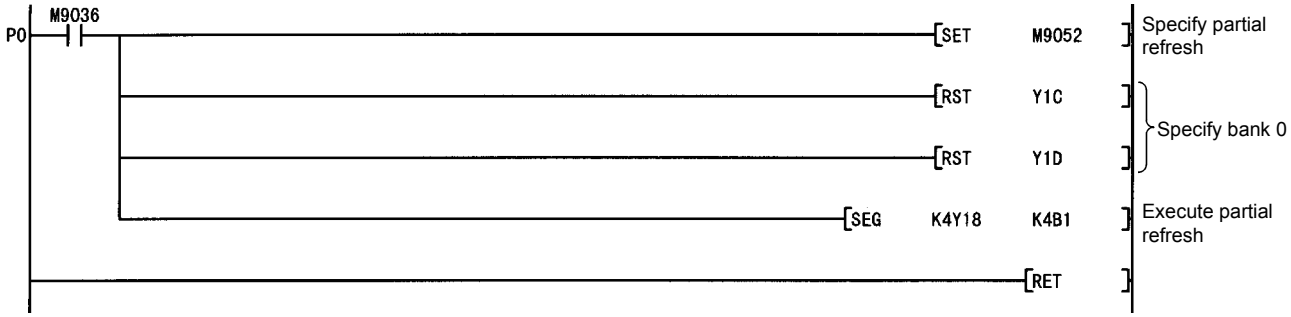
The program for writing 20 (2 seconds) to the reception timeout time designation area (R2 112H) is shown below.

Refer to section 5.1 for details on the program conditions.

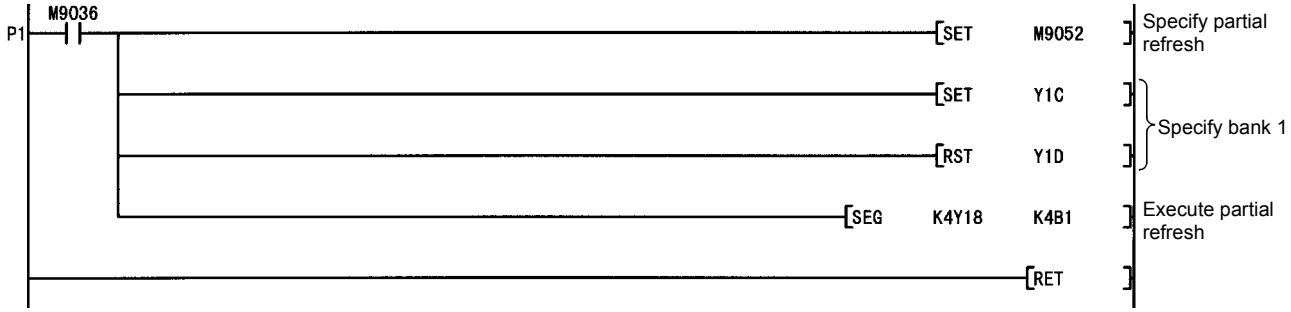
(a) To use FROM/TO command with ACPU / QCPU-A (A mode)



1) Program to change to bank 0

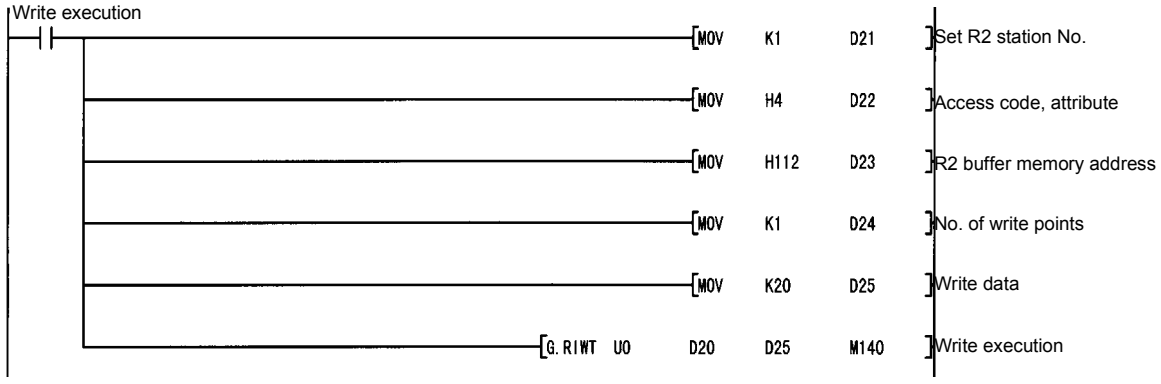


2) Program to change to bank 1



(b) When using dedicated commands (RIWT) with QCPU (Q mode) / QnACPU

When using dedicated commands (RIWT/RISEND), RY(n+1)E and RY(n+1)F are used with the dedicated commands, so provisions must be made to prevent the user from rewriting this signal information.
When the QCPU (Q mode) is used, such provisions need not be made.
Refer to section 5.3(8) for details.



MEMO

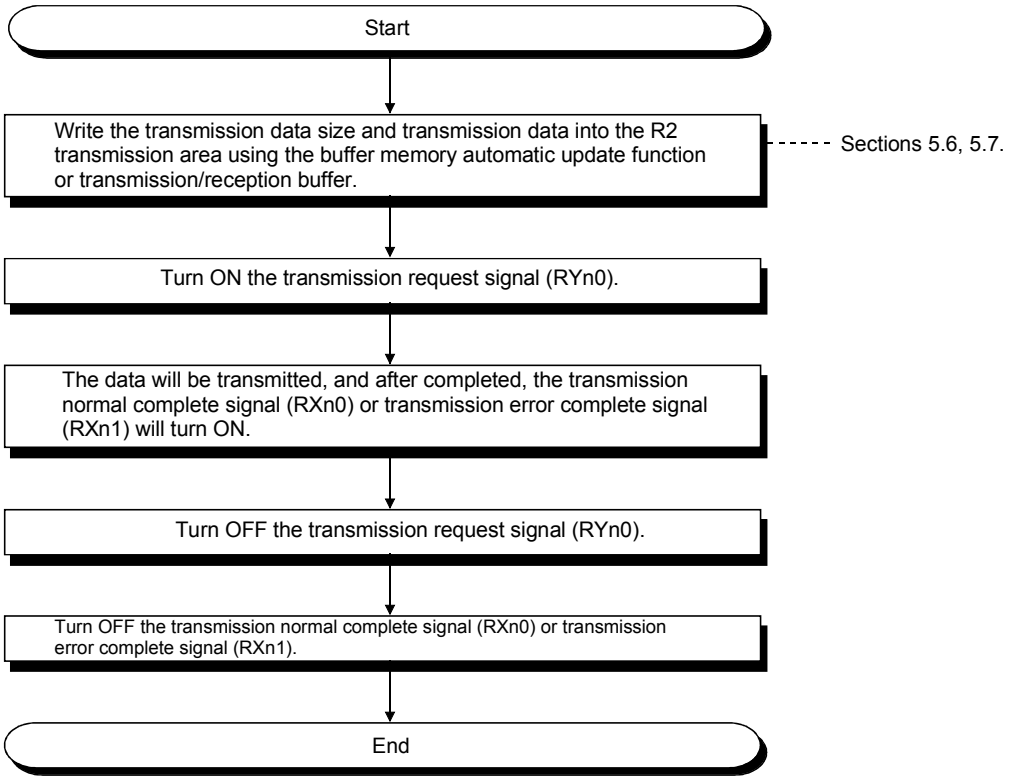
6. EXCHANGING DATA WITH AN EXTERNAL DEVICE

The methods of exchanging data with an external device are described in this section.

6.1 Matters to understand before transmitting data

When transmitting data to an external device, the data is first stored in the R2 transmission area. It is then transmitted when the transmission request signal (RYn0) turns ON.

(1) Transmission procedures



(2) Transmission area

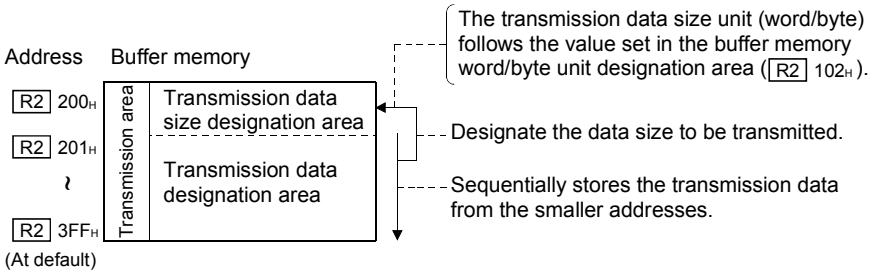
When transmitting data to an external device, the transmission data is stored in the R2 transmission area. This transmission area is an R2 buffer memory area used to write the transmission data size and transmission data to be transmitted to the external device.

The transmission area size can be set by setting the R2 0_H and R2 1_H buffer memories.

Refer to section (4) for details.

(a) Transmission area configuration

The transmission area stores the data size to be transmitted in the head word, and stores the transmission data in the second and following words.



POINT

The data amount transmitted in one session from the programmable controller CPU to the external device must be set to be smaller than the R2 transmission data storage area size.

(Transmission data storage area) ≥ (Data amount to be transmitted)

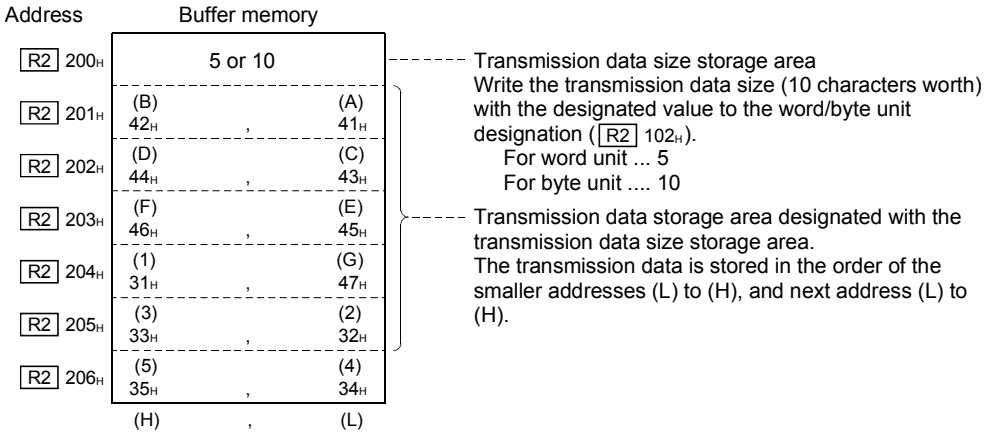
Thus, if an amount of data that cannot be stored in the default transmission area is to be transmitted, increase the transmission area.

(3) Designating and writing the transmission data

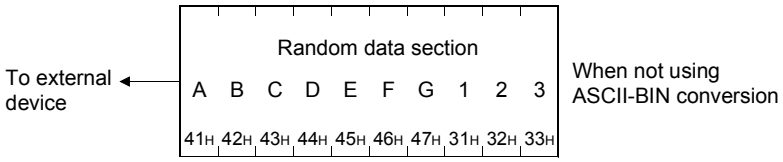
The data to be transmitted from the programmable controller CPU to the external device is designated with the R2 buffer memory transmission area.

1) Write the transmission data size in the transmission data size designation area.
   The data size unit differs according to the word/byte unit designation (R2 102_H) setting.
2) Write the data to be transmitted (random data section in transmission statement) in the transmission data storage area.

(Example) To transmit the ten characters "ABCDEFG123" (the transmission area is the default value)



When the transmission request signal (RYn0) is turned ON after storing the data as shown above, the R2 will sequentially transmit the designated data size in order of the smaller addresses in the transmission data storage area.



(4) Setting the buffer memory

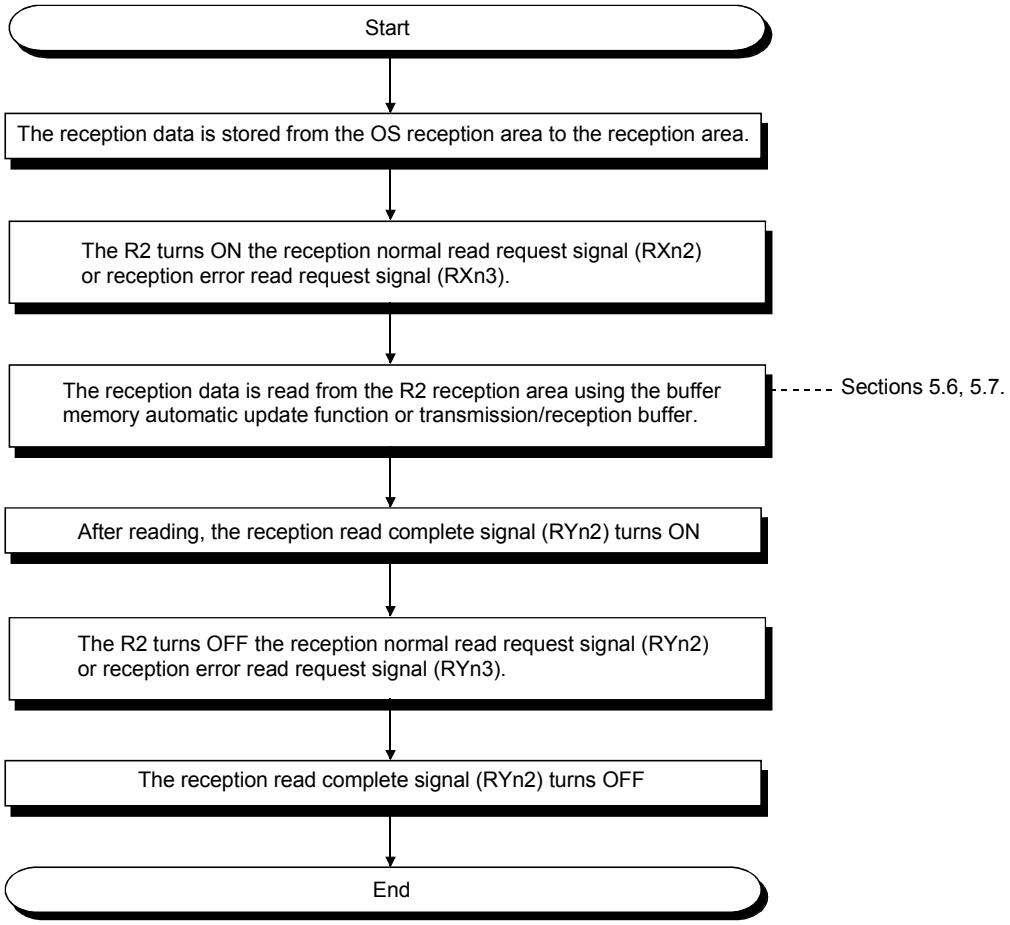
The following buffer memories are related to the transmission of data.

R2 buffer memory address	Name	Details
R2 0H	Transmission area head address designation	Designate the head address of the R2 buffer memory to be used as the transmission area. Always designate R2 200H or above, which is the user free area. Set so that the area is not duplicated with areas used by other functions. Setting range: 200H to 7FEH (Default value: 200H)
R2 1H	Transmission area size designation	Designate the size of the R2 buffer memory used as the transmission area. (Transmission data size designation area + transmission data designation area size) Set the transmission area size to be 2H or more.
R2 102H	Word/byte unit designation	Set the transmission data and reception data unit (word/byte) for when exchanging data between the R2 and external device. 0 : Word unit (default value) 1 : Byte unit * This is also used as the unit of the values handled in the actual transmission data size storage area (R2 1B4H) and OS reception area data size storage area (R2 1B6H).
R2 11AH	Transmission timeout time designation	Designate the timeout time from when the transmission request signal (RYn0) turns ON (a trigger is generated during monitor transmission), the transmission starts to when the transmission ends. When the transmission timeout is applied, the transmission error complete signal (RXn1) turns ON, and the BB11H is stored in the transmission error code area (R2 1B1H). 0 : Unlimited wait 1 to 32767 : Transmission timeout time (×100ms)
R2 1B4H	Actual transmission data size storage	The actually transmitted data size is stored when transmission is completed. When transmitting frames, the head and end frames will also be included in the transmission data size. If ASCII-BIN conversion is carried out, the transmission data size after conversion will be stored. The data size unit follows the word/byte unit designation (R2 102H).

6.2 Matters to know before receiving data

When receiving data from an external device, first it is confirmed that the reception normal read request (RXn2) or reception error read (RXn3) is ON, and then the data stored in the R2 reception area is read out.
After reading, the reception is completed by turning the reception read complete signal (RYn2) ON.

(1) Reception procedures



(2) Reception area

When data is transmitted from the external device to the R2, the data is stored in the R2 reception area.

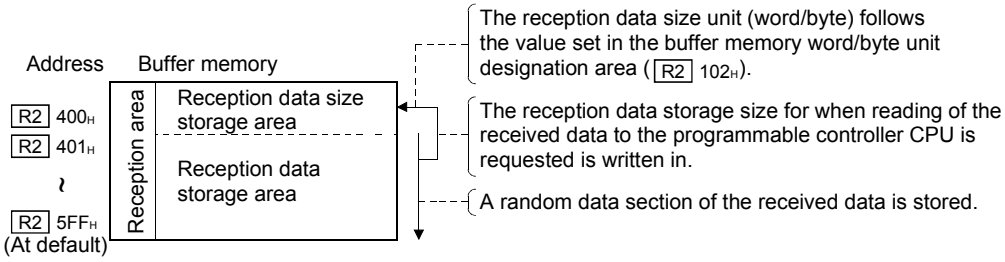
This reception area is the R2 buffer memory area where the reception data size and reception data is stored for the programmable controller CPU to read the data received from the external device.

The reception area size can be set by setting the R2 2H, R2 3H buffer memory.

Refer to section (4) for details.

(a) Reception area configuration

The reception area stores the received data size in the head word, and stores the received data in the second and following words.



POINT

The data amount transmitted in one session from the external device to the R2 must be set to be smaller than the R2 reception data storage area size.

(Reception data storage area) ≥ (Amount of data received from external device)

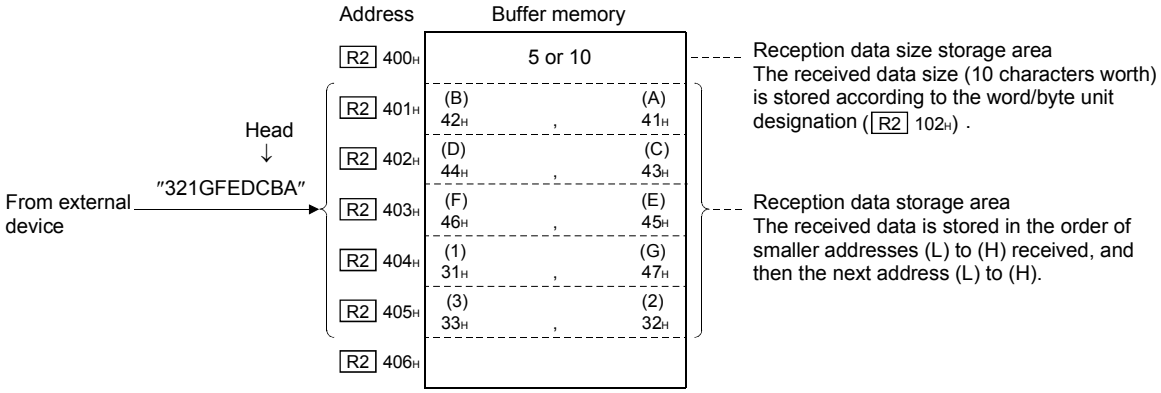
Thus, if an amount of data that cannot be stored in the default reception area is to be received, increase the reception area.

(3) Arrangement of reception data

The arrangement of the data received from the external device when stored in the reception area is shown below.

1) A random data section of the received statement is stored in the R2 buffer memory (reception data storage area).
2) When ASCII-BIN conversion is carried out, the data converted into binary data is stored.
3) The data is stored into the reception data storage area in the order of the smaller addresses (L) to (H) received, and then the next address (L) to (H).

(Example) To store the ten characters "ABCDEFG123" of the received random data
(The reception area is the default value)



When the reception complete data size data has been received, the R2 turns the reception normal read request signal (RXn2) or reception error read request signal (RXn3) ON.

(4) Setting the buffer memory

The following buffer memories are related to the reception of data.

R2 buffer memory address	Name	Details
R2 2H	Reception area head address designation	Designate the head address of the R2 buffer memory to be used as the reception area. Always designate R2 200H or above, which is the user free area. Set so that the area is not duplicated with areas used by other functions. Setting range: 200H to 7FEH (Default value: 400H)
R2 3H	Reception area size designation	Designate the size of the R2 buffer memory used as the reception area. (Reception data size storage area + reception data storage area size) Set the reception area size to be 2H or more.

R2 buffer memory address	Name	Details
R2 102H	Word/byte unit designation	Set the transmission data and reception data unit (word/byte) for when exchanging data between the R2 and external device. 0 : Word unit (default value) 1 : Byte unit * This is also used as the unit of the values handled in the actual transmission data size storage area (R2 1B4H) and OS reception area data size storage area (R2 1B6H).
R2 111H	Reception complete data size designation	Designate the reception complete data size for setting the reception data ("random data" when receiving frames" read to a fixed length. Designate the reception complete data size value so that it is smaller than the reception data storage area size. (The reception data storage area size is the reception area size minus 1.) • For word unit: Reception complete data size ≤ (Reception area size -1) • For byte unit : Reception complete data size ≤ (Reception area size -1) × 2 When receiving non-procedural data, always set the reception complete data size (1 or more). When receiving data with frames, the reception complete data size (0 or more) can be set. If the reception complete data size is 0, the reception will be completed when the reception head/end frame designated in R2 108H to 10FH is received. (Refer to section 7.3.) The data size unit follows the word/byte unit designation (R2 102H). 0 : Do not designate reception complete data size (default value) Other than 0 : Reception complete data size
R2 112H	Reception timeout time designation	Set the timeout time from when the first valid reception data is received to when the reception is completed during data reception. When the reception timeout is applied, the reception error read request signal (RXn3) will turn ON, and BB21H will be stored in the reception error code area (R2 1B2H). 0 : Unlimited wait (default value) 1 to 32767 : Reception timeout time (× 100ms) 1: For non-procedural reception The time from when the head data is received to when the reception complete data size data is received. 2: When receiving with frames "When reception head frame and reception end frame are set" Time from when head frame head data is received to when reception end frame end data is received. "When only reception head frame is set" Time from when head frame head data is received to when reception end data size data is received. "When only reception end frame is set" Time from when random data section head data is received to when reception end frame end data is received.
R2 1B6H	OS reception area data size storage	The word/byte size of the data stored in the R2 OS reception area (remaining reception data for which read has not been requested to programmable controller CPU) is stored. This is updated every 100ms. The data size unit follows the word/byte unit designation (R2 102H).

6.3 Exchanging data using the buffer memory automatic update function

When using the buffer memory automatic update function, data is transmitted and received via the master station automatic update buffer (transmission area) using the FROM/TO command or CC-Link dedicated command RITO/RIFR.
To use the buffer memory automatic update function, set the mode setting switch to "1" (buffer memory automatic update function enable), and initialize the automatic update buffer (refer to section 5.5.1 for details).

POINT

(1) The address for the automatic update buffer differs for the A Series master module and Q/QnA Series master module as follows.
Refer to section 5.2 for details on changing the banks.
- A Series master module : Bank 2 [M] 0_H to FFF_H
- Q/QnA Series master module : [M] 2000_H to $2FFF_H$

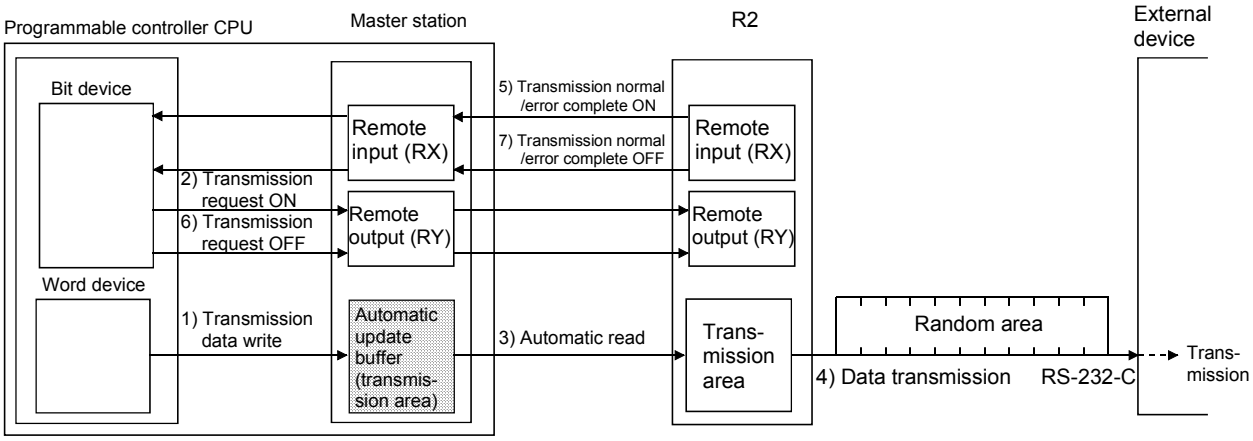
(2) When using the RITO/RIFR command, the bank is changed automatically, so it does not need to be changed by the user.

6.3.1 Transmitting data to an external device

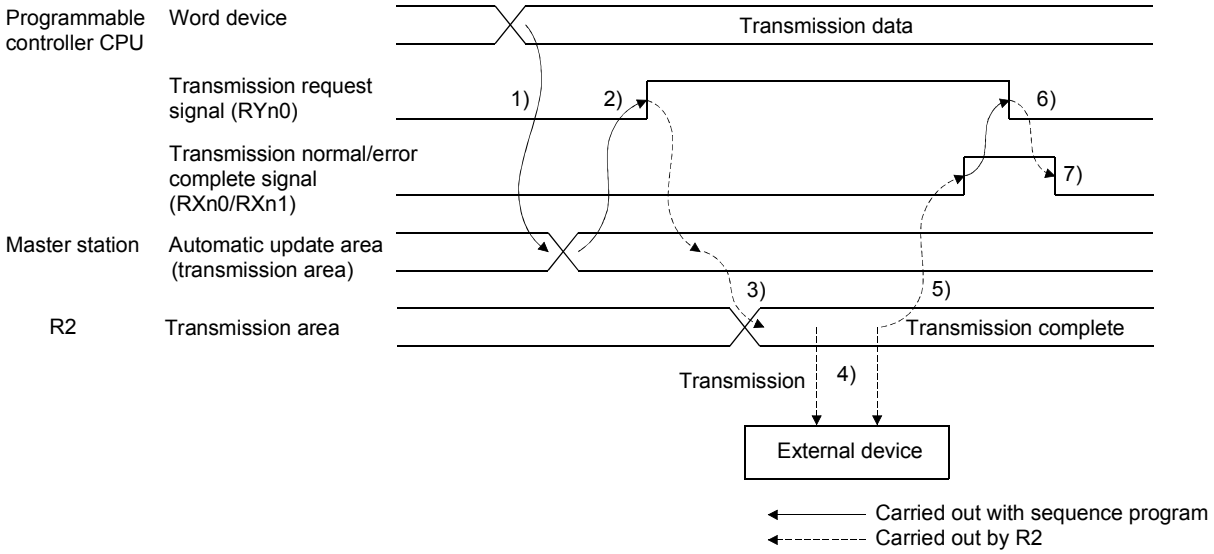
The method for transmitting data to an external device using the buffer memory automatic update function is explained in this section.

(1) Flow of process

The flow of the process for transmitting data to an external device using the buffer memory automatic update function is shown below.



(2) Timing chart

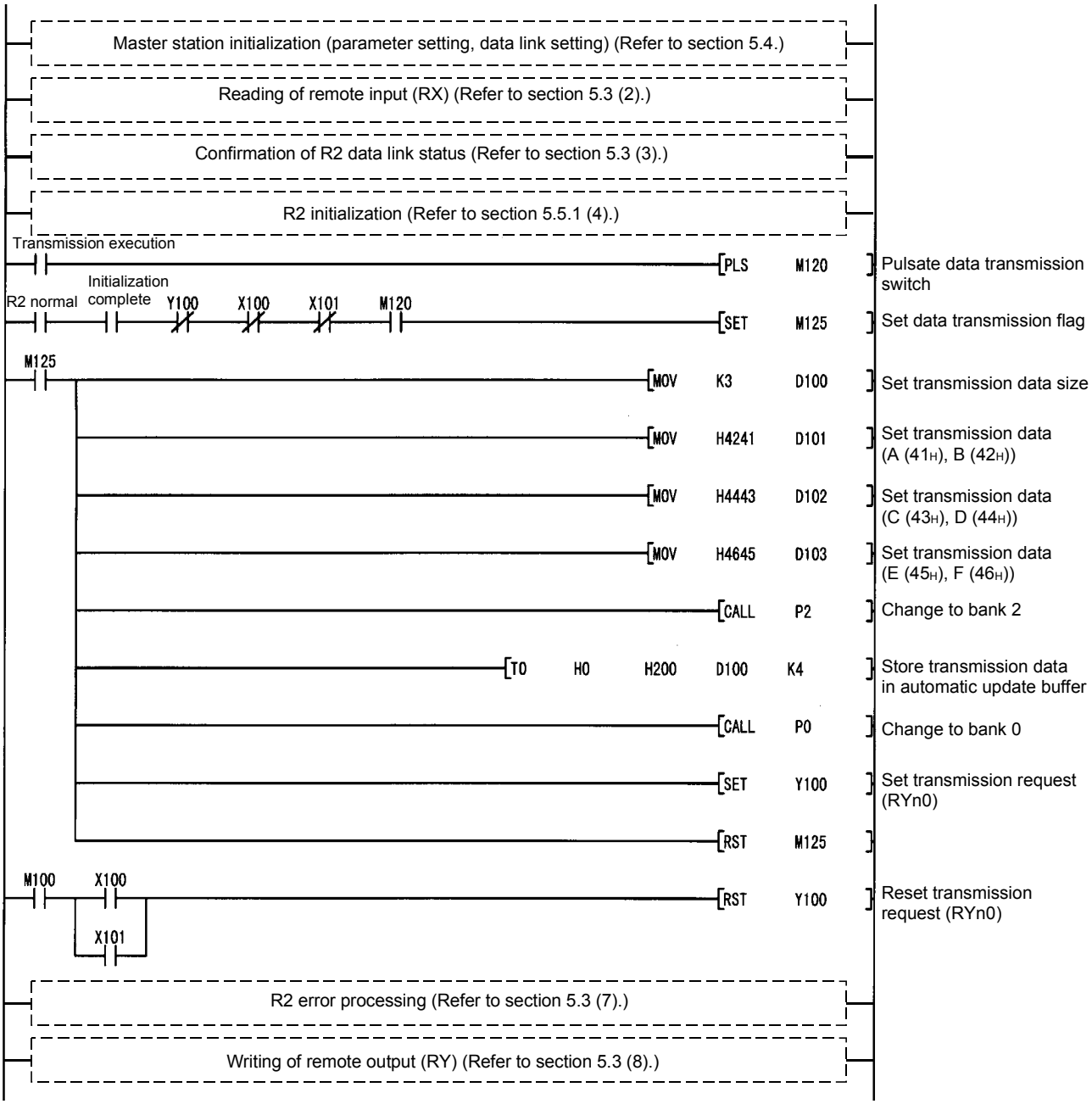


No.	Details	Control side
1)	The transmission data is written into the master station automatic update buffer (transmission area).	Program
2)	The transmission request signal (RYn0) turns ON.	Program
3)	The master station automatic update buffer (transmission area) data is read out and stored in the R2 transmission area.	R2
4)	The data is transmitted from the transmission area to the external device.	R2
5)	When the transmission to the external device is completed, the transmission normal complete signal (RXn0) or transmission error complete signal (RXn1) turns ON.	R2
6)	The transmission request signal (RYn0) turns OFF.	Program
7)	The signal turned ON in step 5) turns OFF.	R2

(3) Program

The program for transmitting the transmission data (ABCDEF) using the buffer memory automatic update function is shown below.
Refer to section 5.1 for details on the program conditions.

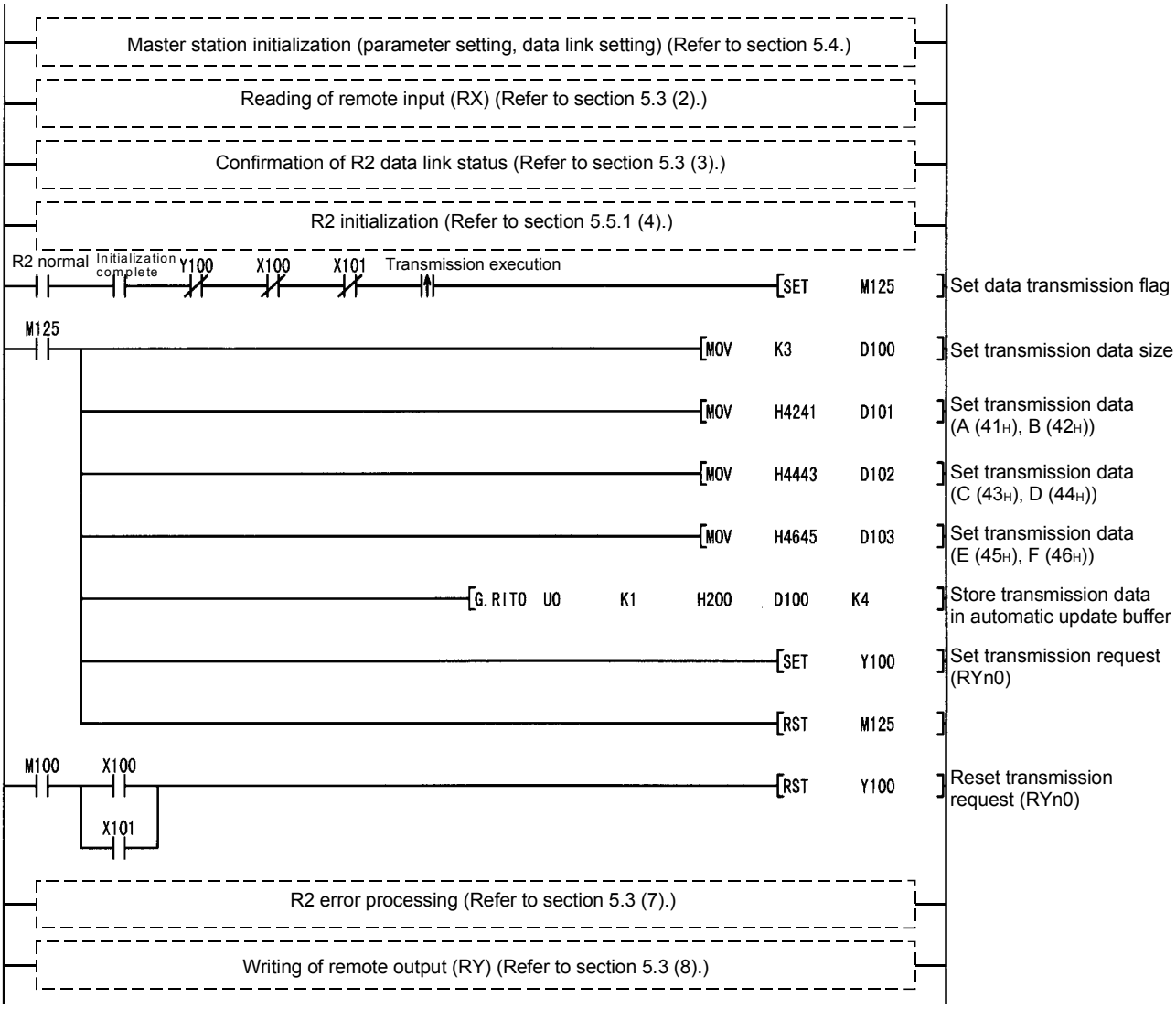
(a) When using the FROM/TO command with the ACPU / QCPU-A (A mode)



1) Program to change to bank 0

2) Program to change to bank 1

(b) When using the dedicated command (RITO) with the QCPU (Q mode) / QnACPU

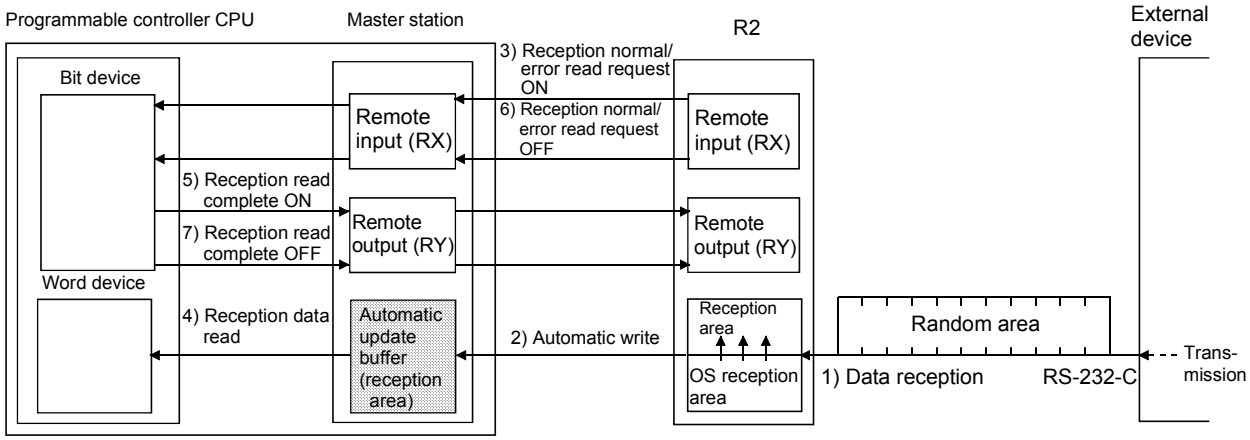


6.3.2 Receiving data from an external device

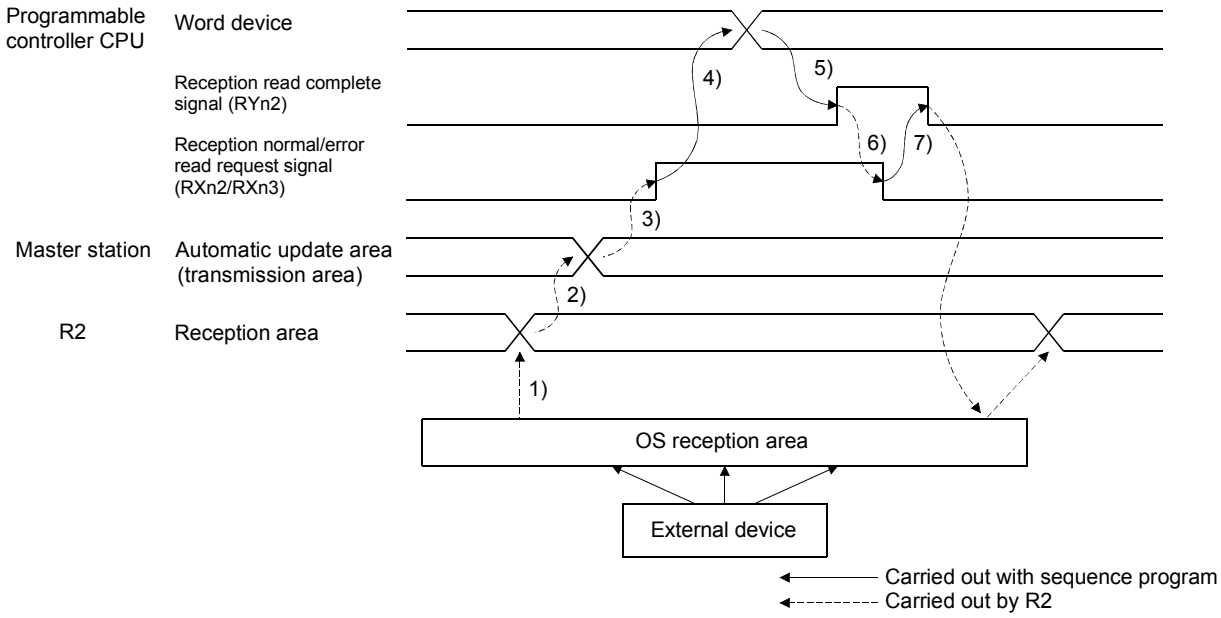
The method for receiving data from an external device using the buffer memory automatic update function is explained in this section.

(1) Flow of process

The flow of the process for reading data received from an external device using the buffer memory automatic update function is shown below.



(2) Timing chart



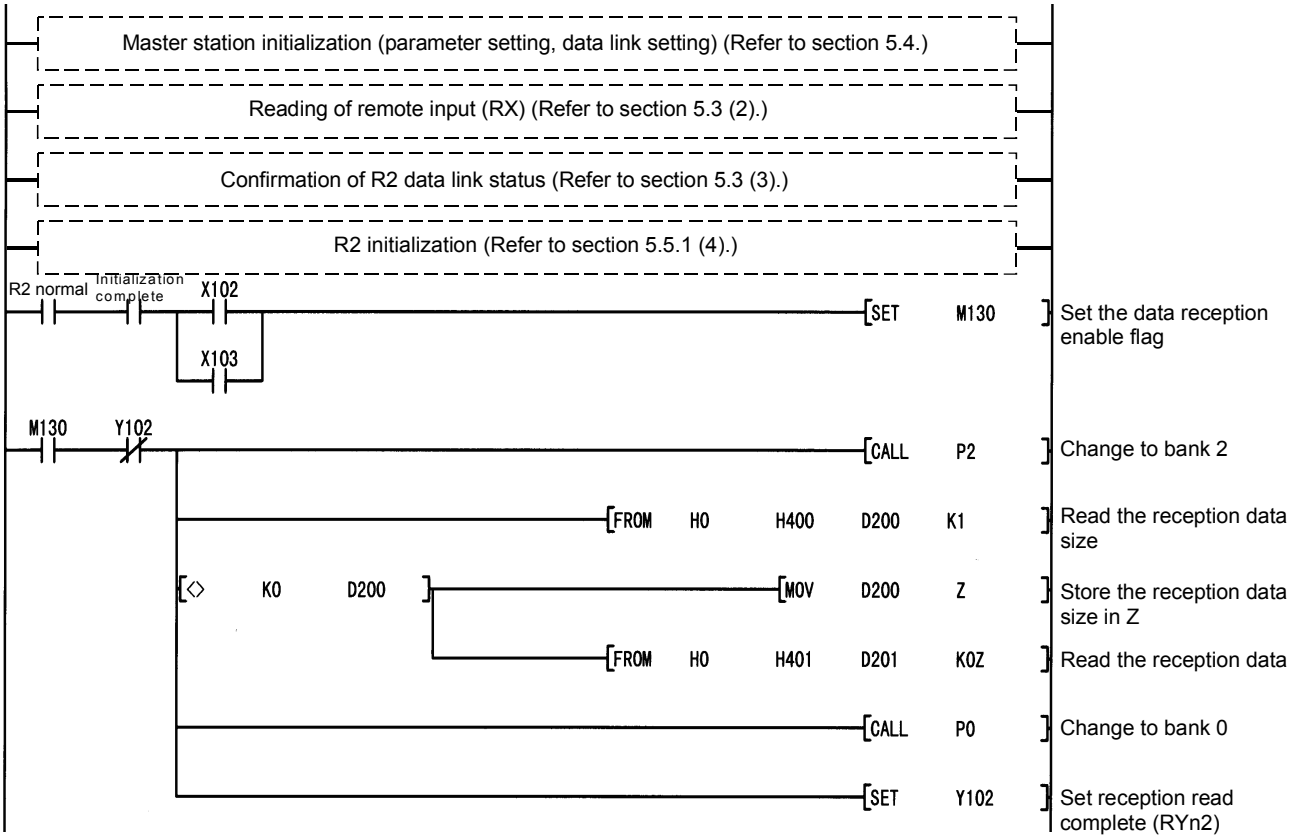
No.	Details	Control side
1)	The reception data is stored in the reception area via the OS reception area.	R2
2)	When the reception is completed (*1), the contents of the reception area are written into the master station automatic update buffer (reception area).	R2
3)	The reception normal read request signal (RXn2) or reception error read request signal (RXn3) turns ON.	R2
4)	The reception data is read from the master station automatic update buffer (reception area).	Program
5)	The reception read complete signal (RYn2) turns ON.	Program
6)	The signal turned ON in step 3) turns OFF.	R2
7)	The reception read complete signal (RYn2) turns OFF.	Program

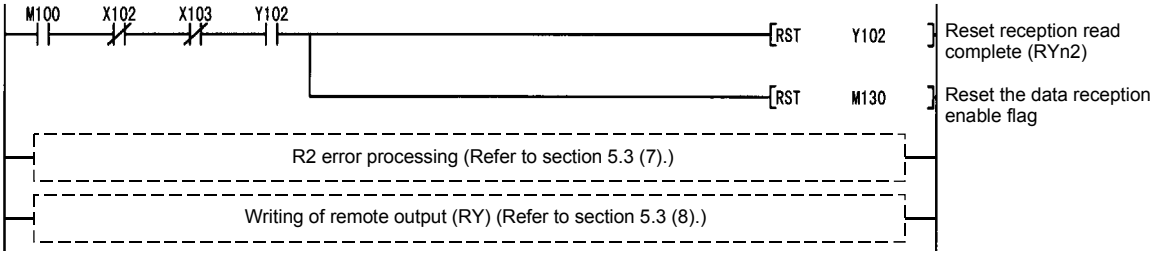
*1 Indicates the storage of the reception end data size data or the data to the reception end frame into the reception area.

(3) Program

The program for receiving data from an external device using the buffer memory automatic update function is shown below.
With the following program, the R2 buffer memory is used at the default value, so the reception is completed when LF(A_H) or CR(D_H) is transmitted from the external device.
Refer to section 5.1 for details on the program conditions.

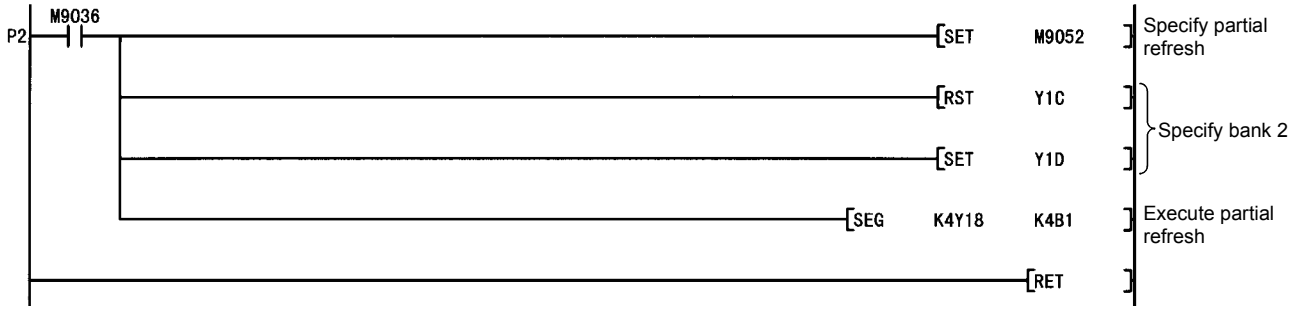
(a) When using the FROM/TO command with the ACPU / QCPU-A (A mode)



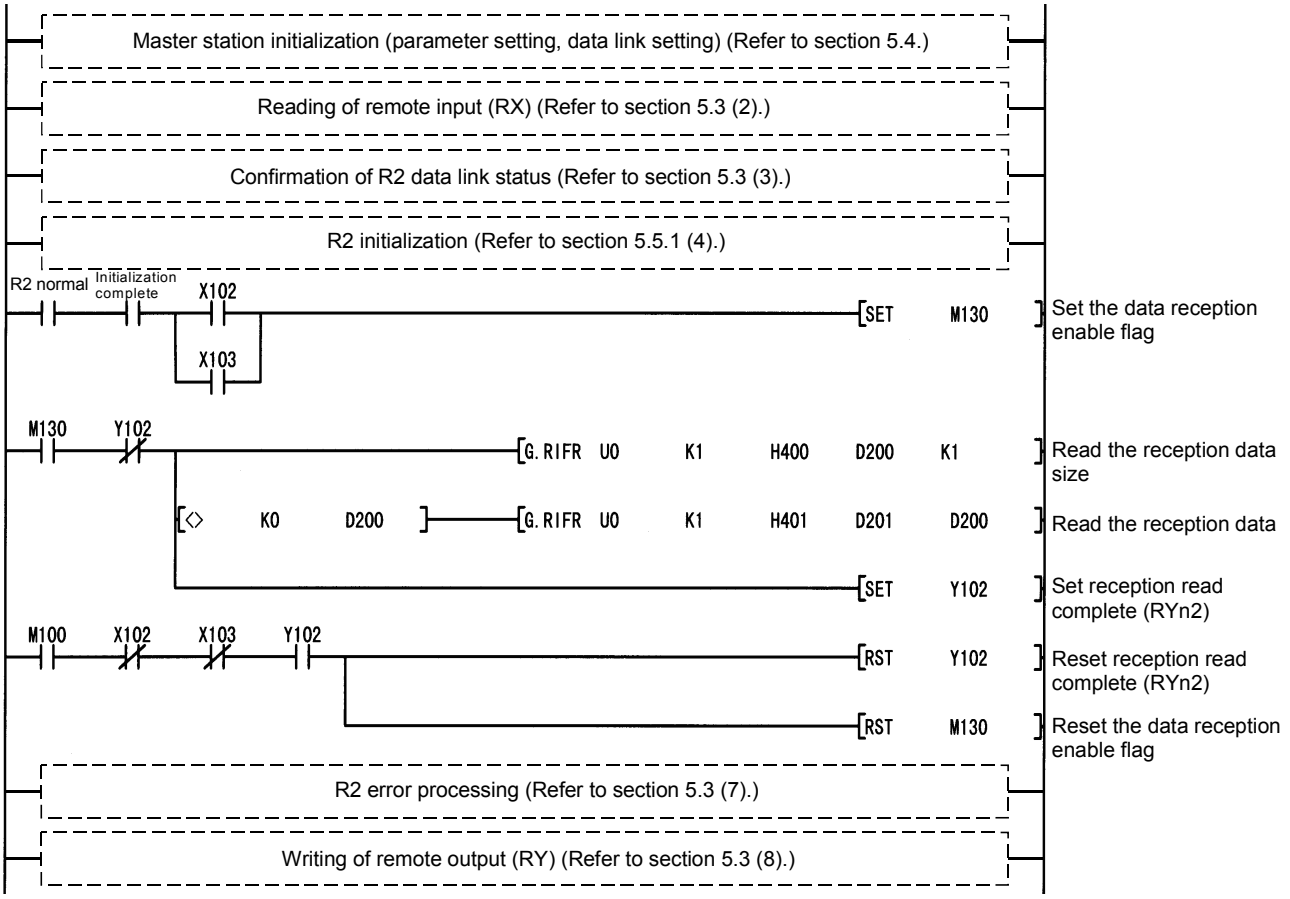


1) Program to change to bank 0

2) Program to change to bank 2



(b) When using the dedicated command (RIFR) with the QCPU (Q mode) / QnACPU



6.4 Exchanging data using the transmission/reception buffer

When using the transmission/reception buffer, data is transmitted and received via the master station transmission/reception buffer using the FROM/TO command or CC-Link dedicated commands RIWT(RISEND)/RIRD(RIRCV).

POINT

(1) The address for the transmission/reception buffer differs for the A Series master module and Q/QnA Series master module.
Refer to section 5.2 for details on changing the banks.
• A Series master module : Bank 1 [M] 0_H to FFF_H
• Q/QnA Series master module : [M] 1000_H to $1FFF_H$

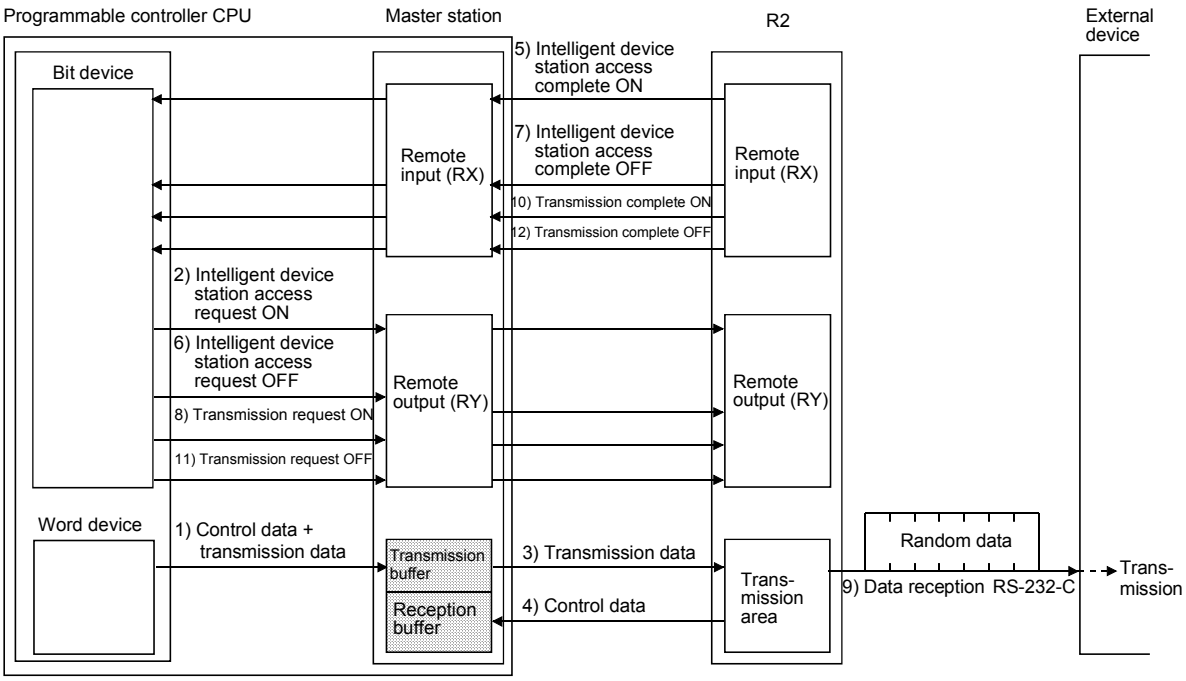
(2) When using the RIWT(RISEND)/RIRD(RIRCV) command, the bank is changed automatically, so it does not need to be changed by the user.

6.4.1 Transmitting data to an external device

The method for transmitting data to an external device using the transmission/reception buffer is explained in this section.

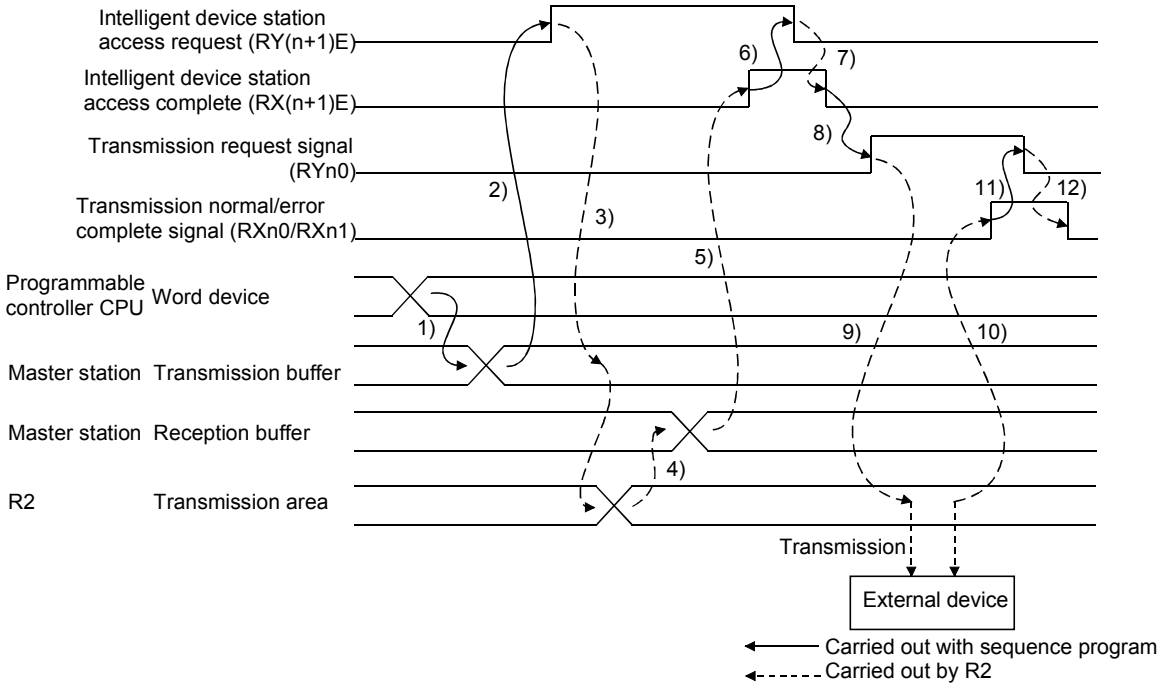
(1) Flow of process

The flow of the process for transmitting data to an external device using the transmission buffer is shown below.



* When using the RIWT (RISEND) command, the steps 2) to 7) are carried out automatically.

(2) Timing chart

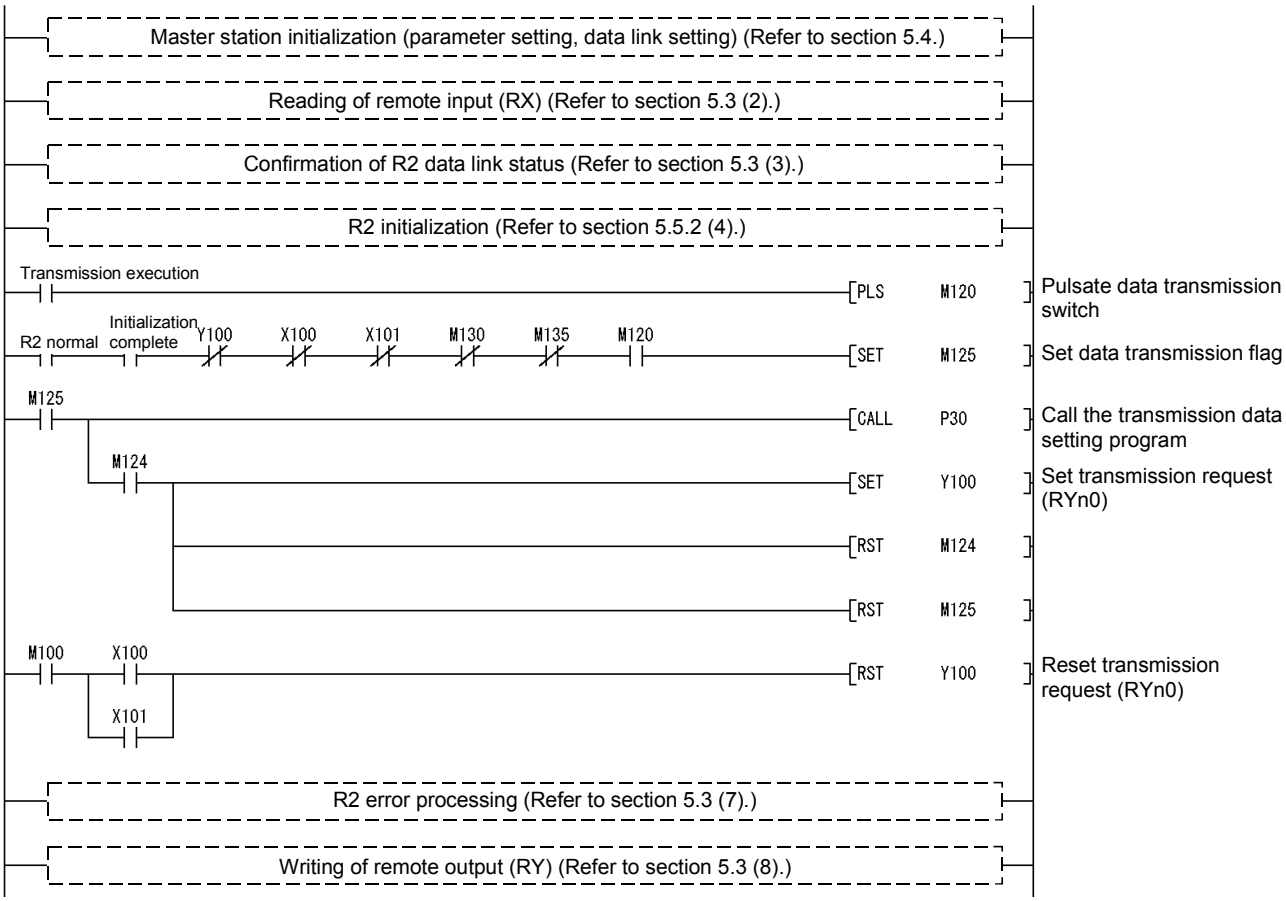


No.	Details	Control side
1)	The transmission data is written into the master station transmission buffer.	Program
2)	The intelligent device station access request (RY(n+1)E) turns ON.	Program
3)	The data in the master station transmission buffer is written into the R2 transmission area.	R2
4)	The control data is stored in the reception buffer.	R2
5)	When the writing is completed, the intelligent device station access complete (RX(n+1)E) turns ON.	R2
6)	The intelligent device station access request (RY(n+1)E) turns OFF.	Program
7)	The intelligent device station access complete (RX(n+1)E) turns OFF.	R2
8)	The transmission request signal (RYn0) turns ON.	Program
9)	The data is transmission from the R2 transmission area to the external device.	R2
10)	The transmission normal complete signal (RXn0) or transmission error complete signal (RXn1) turns ON.	R2
11)	The transmission request signal (RYn0) turns OFF.	Program
12)	The signal turned ON in step 9) turns OFF.	R2

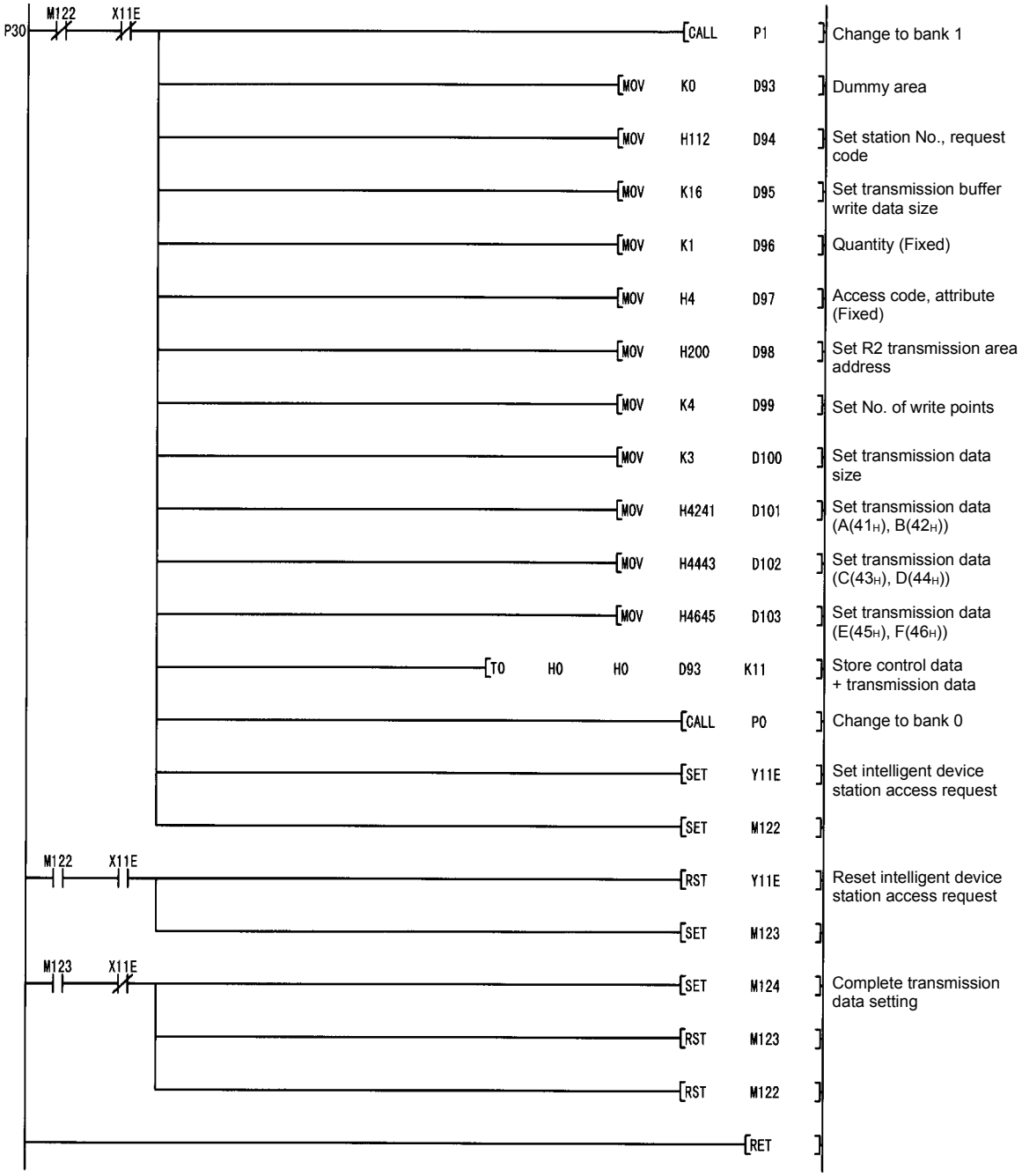
(3) Program

The program for transmitting the transmission data (ABCDEF) using the transmission/reception buffer is shown below.
Refer to section 5.1 for details on the program conditions.

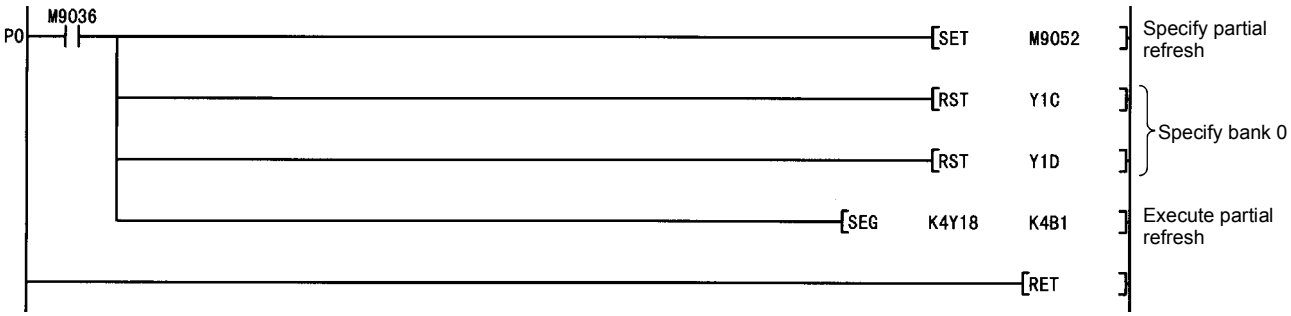
(a) When using the FROM/TO command with the ACPU / QCPU-A (A mode)



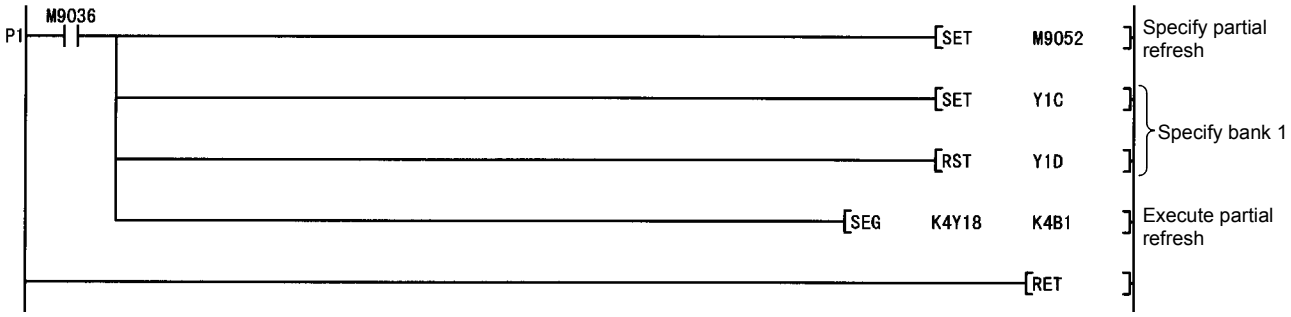
1) Program for setting transmission data



2) Program to change to bank 0

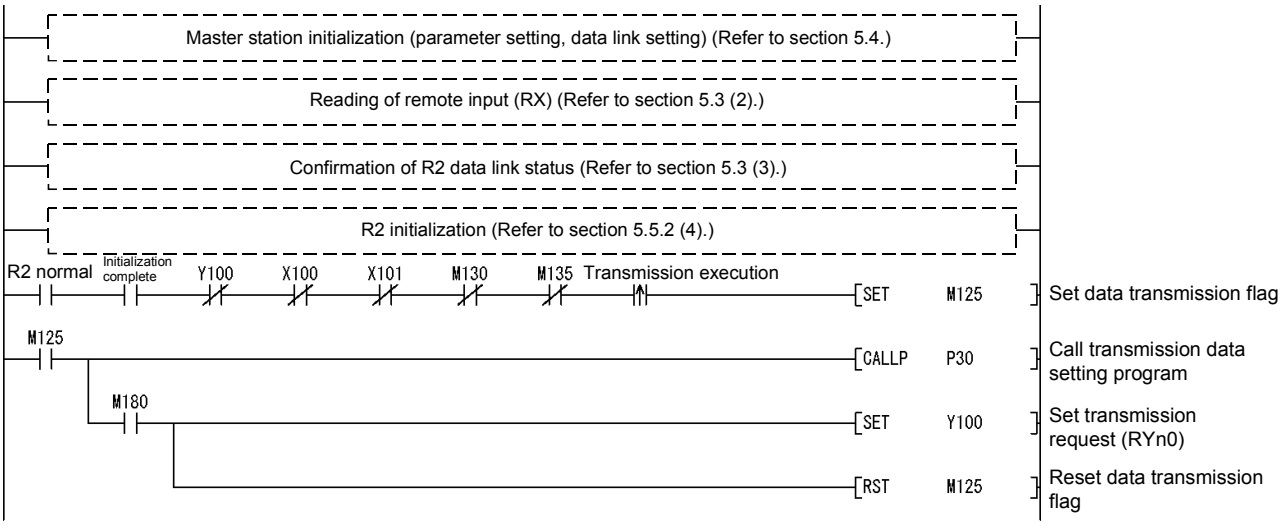


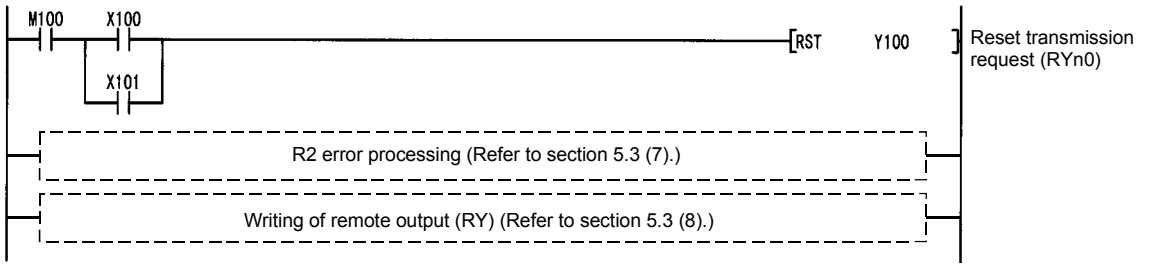
3) Program to change to bank 1



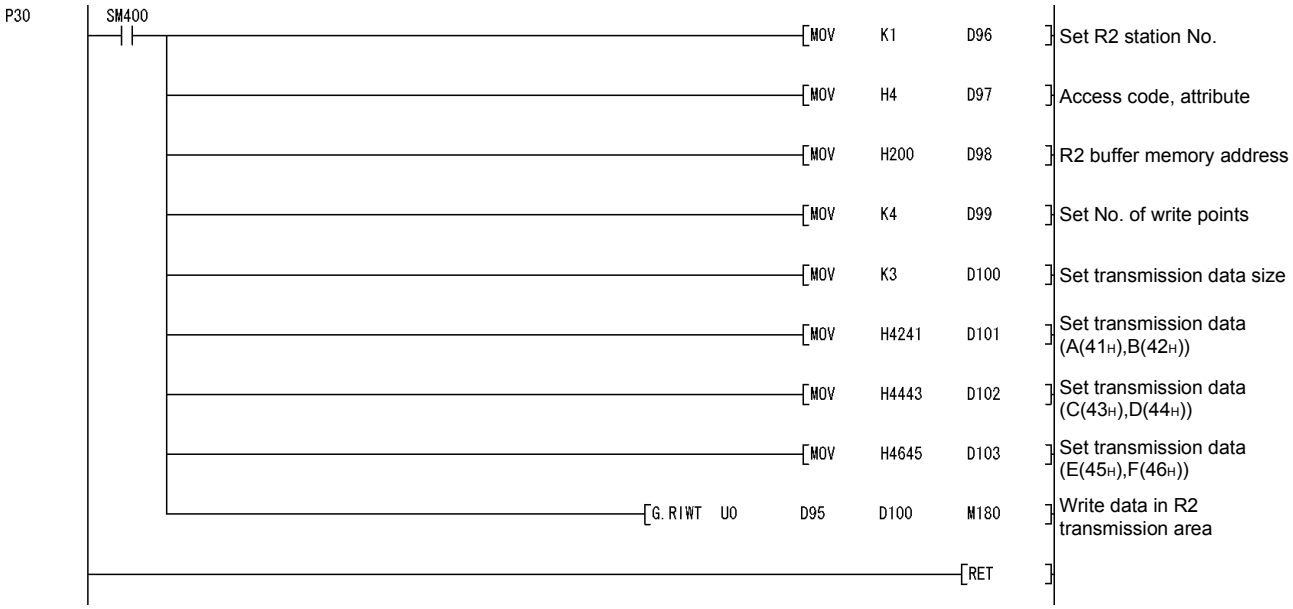
(b) When using dedicated commands (RIWT) with QCPU (Q mode) / QnACPU

When using dedicated commands (RIWT/RISEND), RY(n+1)E and RY(n+1)F are used with the dedicated commands, so provisions must be made to prevent the user from rewriting this signal information.
When the QCPU (Q mode) is used, such provisions need not be made.
Refer to section 5.3(8) for details.





1) Program for setting transmission data

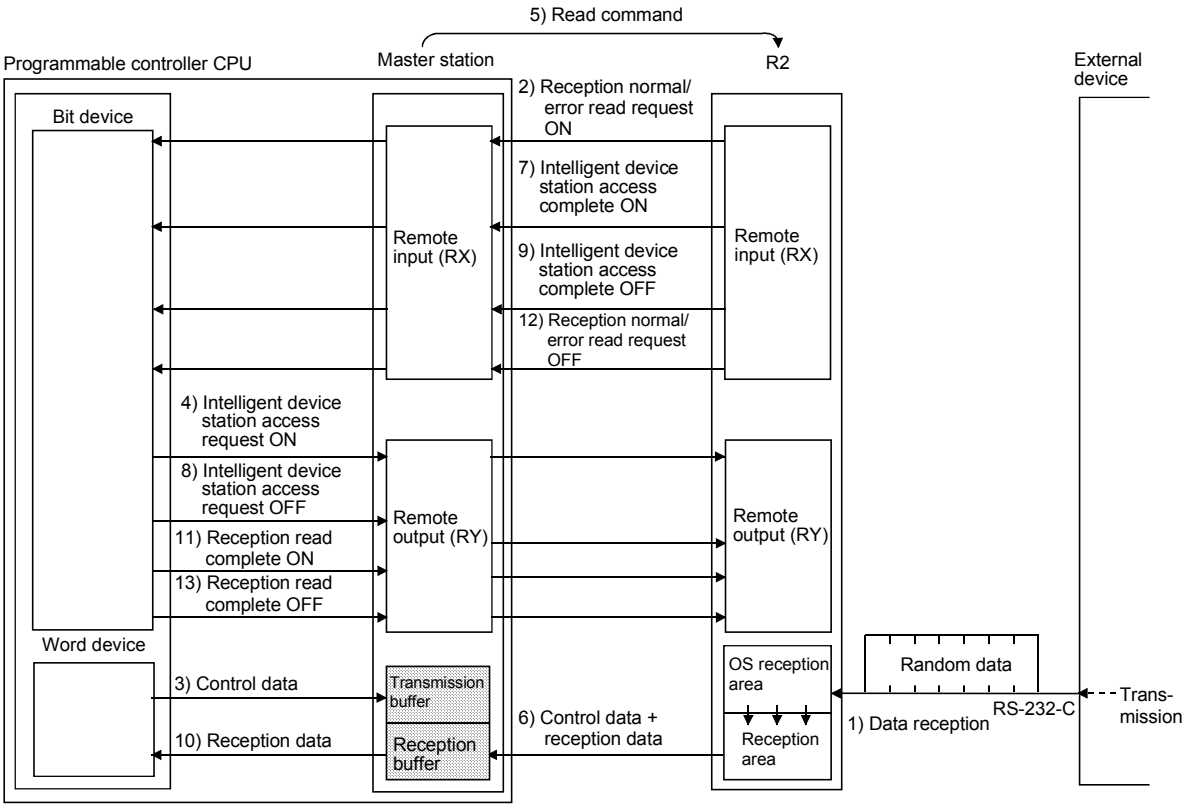


6.4.2 Receiving data from an external device

The method for receiving data from an external device using the transmission/reception buffer is explained in this section.

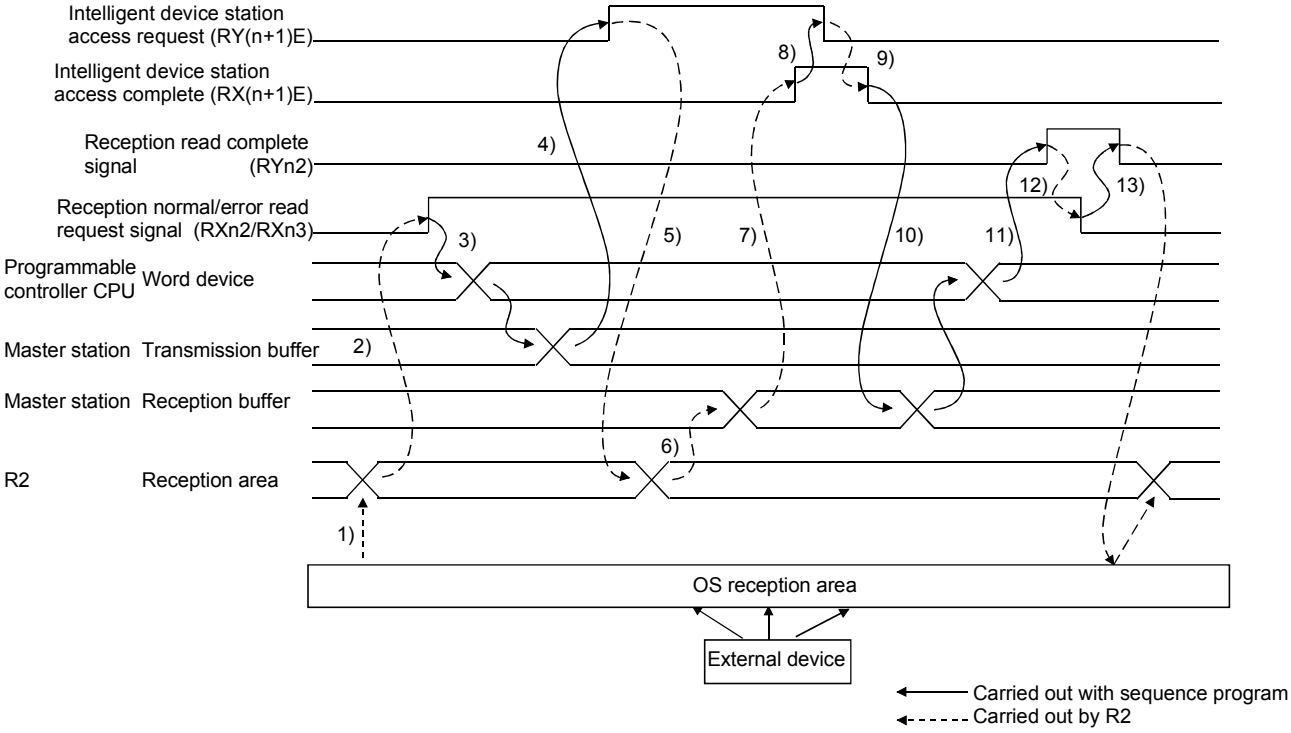
(1) Flow of process

The flow of the process for receiving data from an external device using the transmission/reception buffer is shown below.



* When using the RIRD (RIRCV) command, the steps 4) to 9) are carried out automatically.

(2) Timing chart



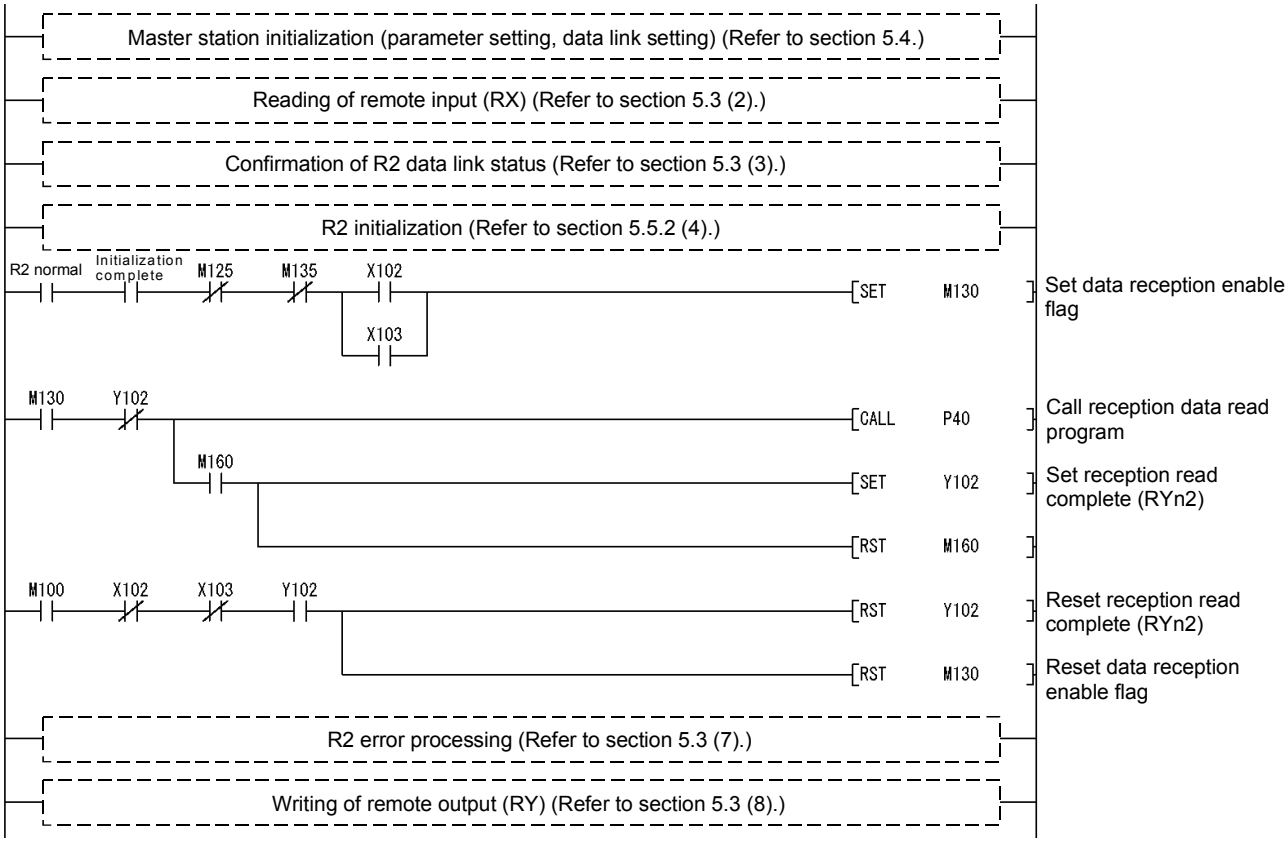
No.	Details	Control side
1)	The reception data is stored in the reception area via the OS reception area.	R2
2)	When the reception from the external device is completed (*1), the reception normal read request signal (RXn2) or reception error read request signal (RXn3) turns ON.	R2
3)	The read control data is stored in the master station transmission buffer.	Program
4)	The intelligent device station access request signal (RY(n+1)E) turns ON.	Program
5)	The contents set in the control data are conveyed to R2.	R2
6)	The control data and reception data are stored in the master station reception buffer.	R2
7)	The intelligent device station access complete signal (RX(n+1)E) turns ON.	R2
8)	The intelligent device station access request signal (RY(n+1)E) turns OFF.	Program
9)	The intelligent device station access complete signal (RX(n+1)E) turns OFF	R2
10)	The reception data is read from the master station reception buffer.	Program
11)	The reception read complete signal (RYn2) turns ON.	Program
12)	The signal turned ON in step 2) turns OFF.	R2
13)	The reception read complete signal (RYn2) turns OFF.	Program

*1 Indicates the storage of the reception end data size data or the data to the reception end frame into the reception area.

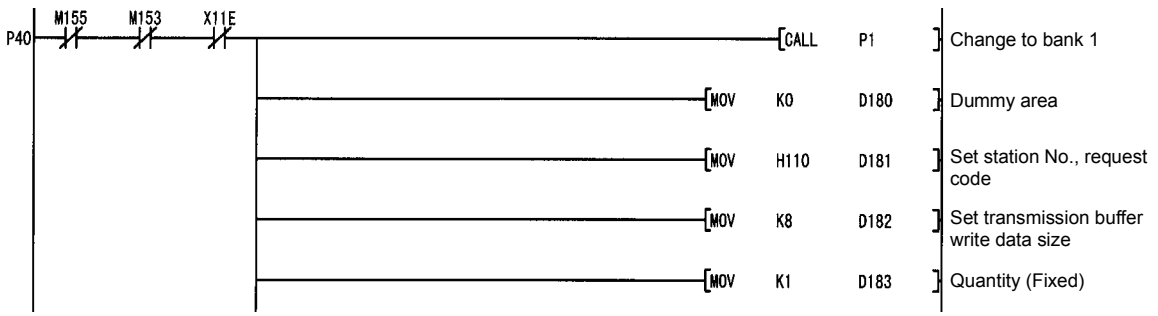
(3) Program

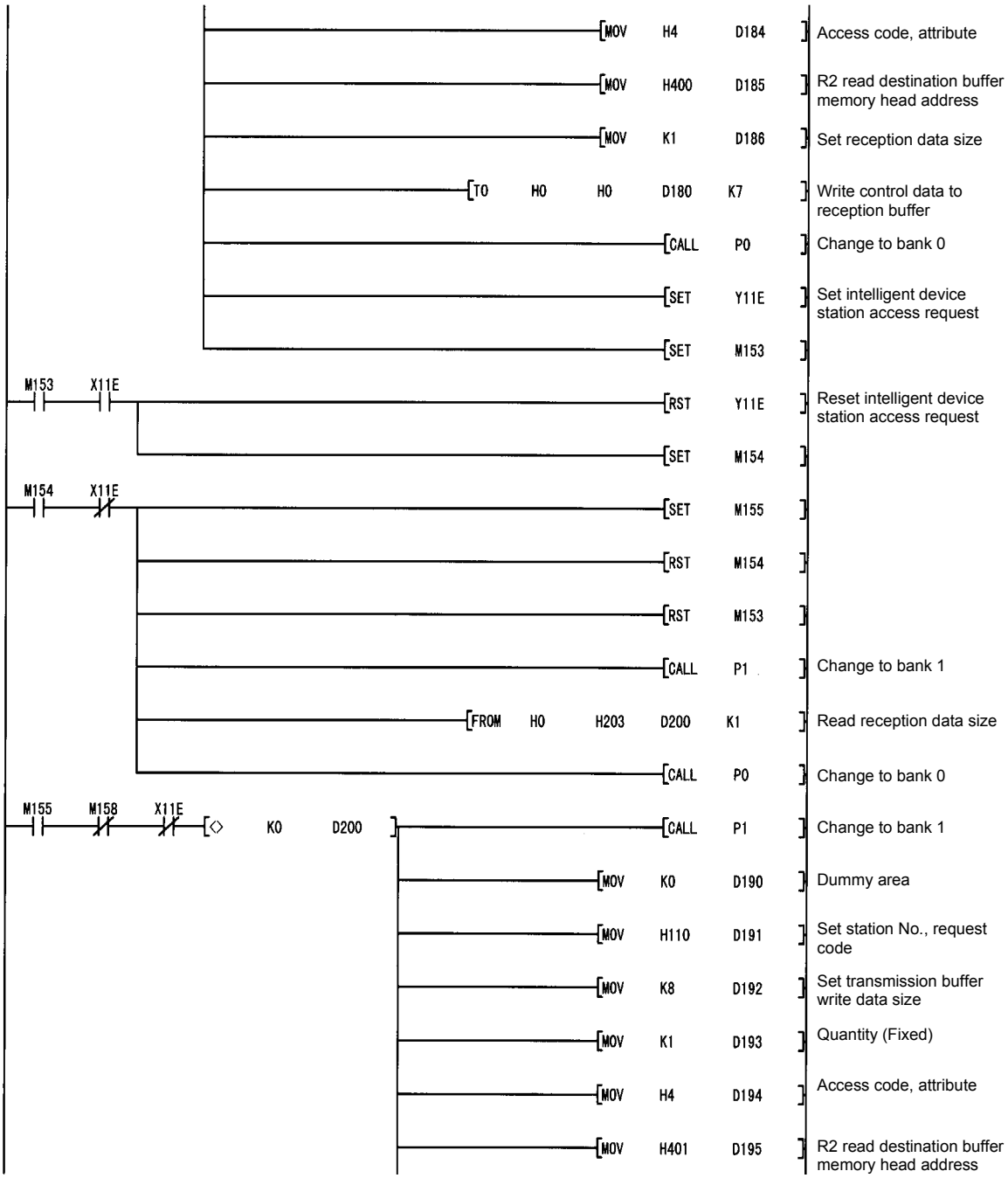
The program for receiving data from an external device using the transmission/reception buffer is shown below.
With the following program, the R2 buffer memory is used at the default value, so the reception is completed when LF(A_H) or CR(D_H) is transmitted from the external device.
Refer to section 5.1 for details on the program conditions.

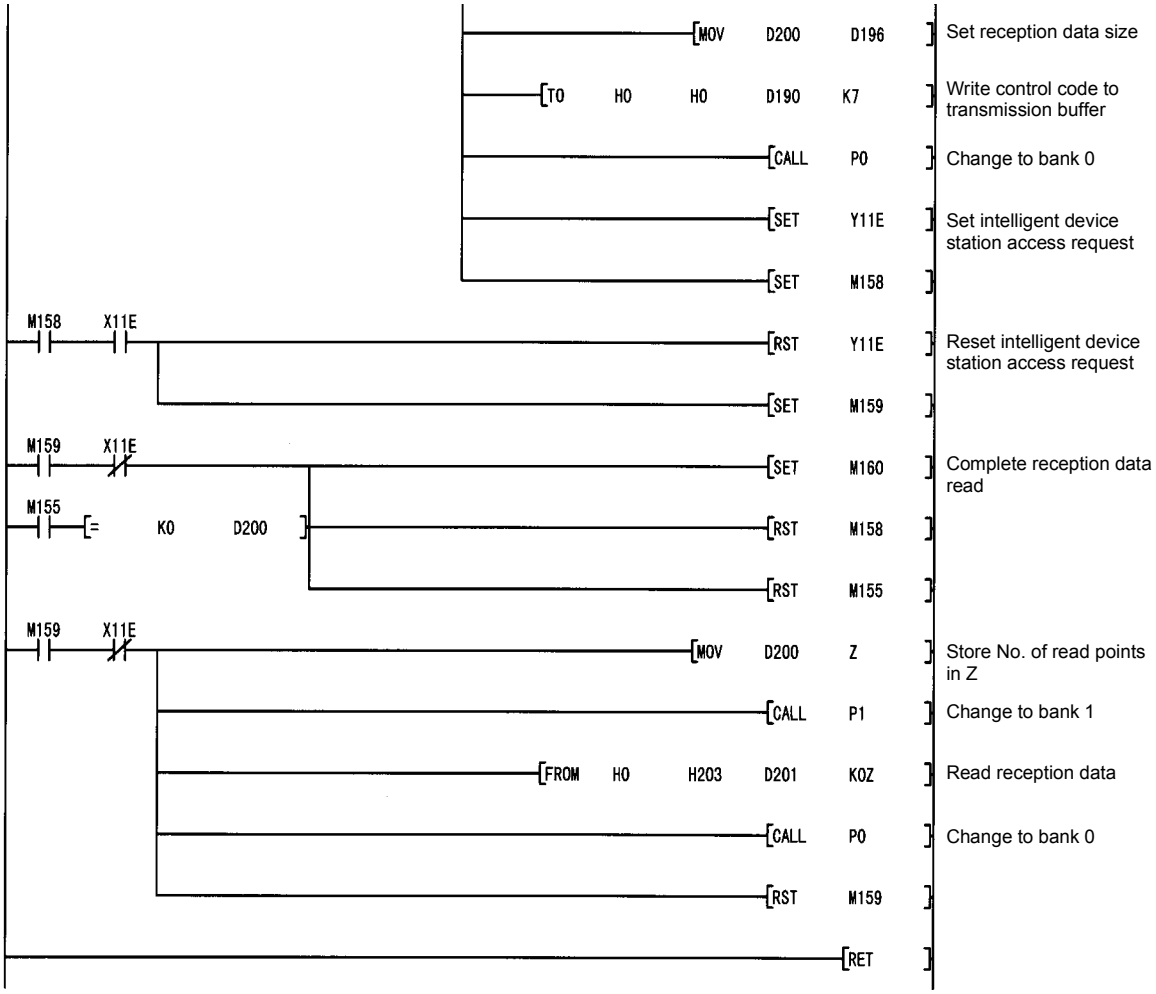
(a) When using the FROM/TO command with the ACPU / QCPU-A (A mode)



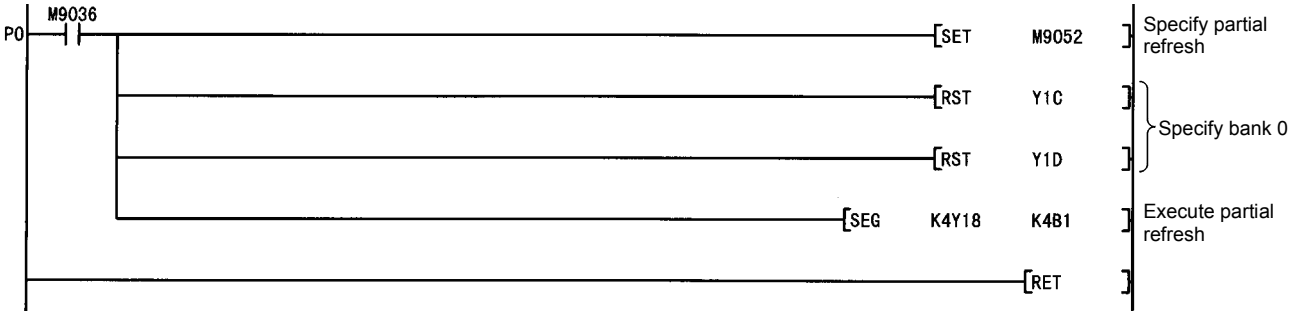
1) Program to read reception data



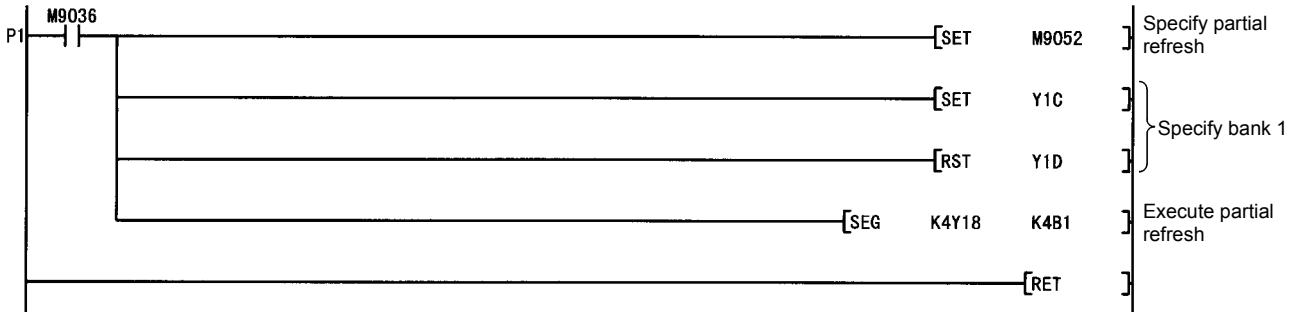

MOV H4 D184
Access code, attribute
MOV H400 D185
R2 read destination buffer memory head address
MOV K1 D186
Set reception data size
TO H0 H0 D180 K7
Write control data to reception buffer
CALL P0
Change to bank 0
SET Y11E
Set intelligent device station access request
SET M153
M153 X11E
RST Y11E
Reset intelligent device station access request
SET M154
M154 X11E
SET M155
RST M154
RST M153
CALL P1
Change to bank 1
FROM H0 H203 D200 K1
Read reception data size
CALL P0
Change to bank 0
M155 M158 X11E
<> K0 D200
CALL P1
Change to bank 1
MOV K0 D190
Dummy area
MOV H110 D191
Set station No., request code
MOV K8 D192
Set transmission buffer write data size
MOV K1 D193
Quantity (Fixed)
MOV H4 D194
Access code, attribute
MOV H401 D195
R2 read destination buffer memory head address



2) Program to change to bank 0

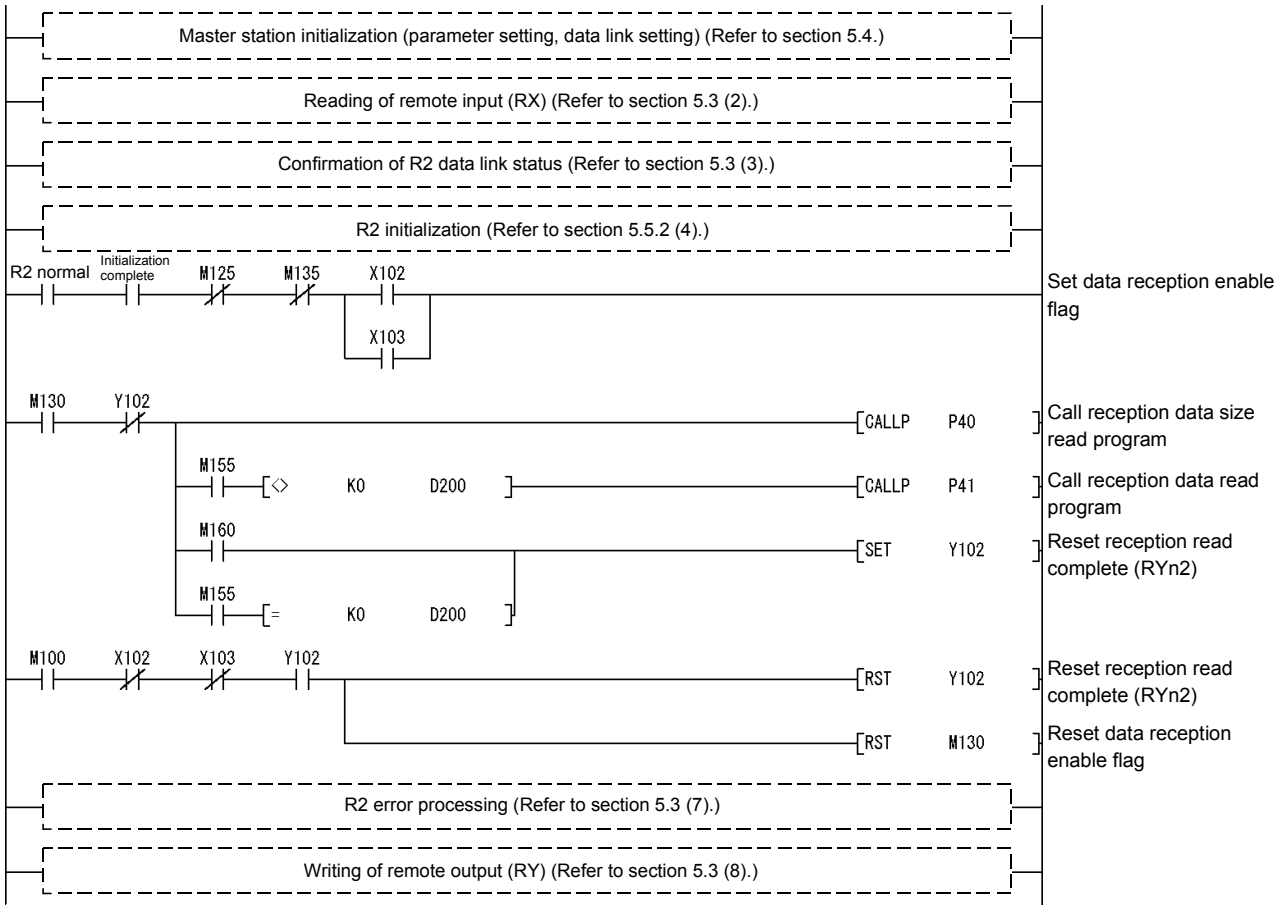


3) Program to change to bank 1

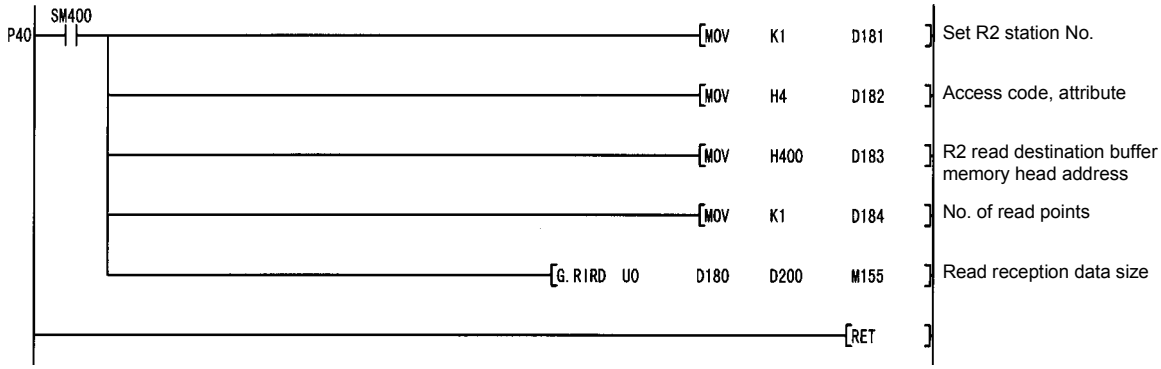


(b) When using dedicated commands (RIRD) with QCPU (Q mode) / QnACPU

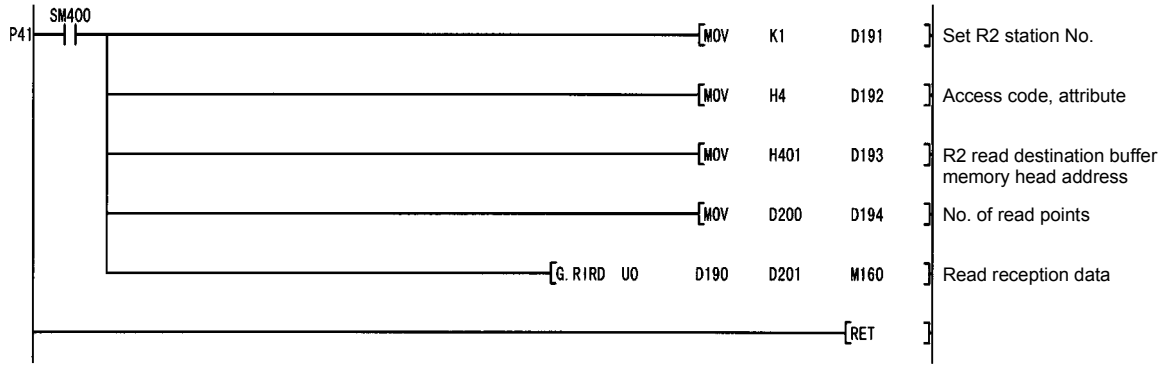
When using dedicated commands (RIRD/RIRCV), RY(n+1)E and RY(n+1)F are used with the dedicated commands, so provisions must be made to prevent the user from rewriting this signal information.
When the QCPU (Q mode) is used, such provisions need not be made.
Refer to section 5.3(8) for details.



1) Program for reading reception data size



2) Program for reading reception data



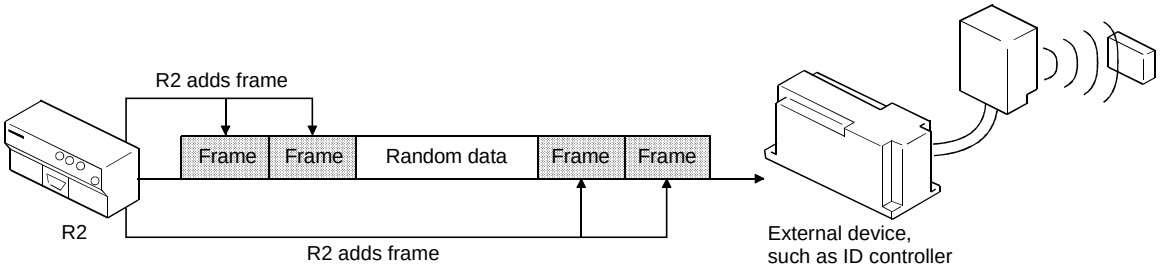
7. USING FRAMES WHEN EXCHANGING DATA

7.1 What are frames?

Frames are data added to match the external device specifications when transmitting and receiving data.
When data is transmitted using frames, the end and head of the transmission/reception data can be judged easily.
A program for adding the frame does not need to be created by the user when transmitting, so the program can be simplified.
The R2 has the following two types of frames. A statement can be transmitted and received by designating the registration No. of the default registration frame and user registration frame.

Frame type	Outline	Registration frame No. *1	Frame contents	Reference
Default registration frame	• Frame preregistered in R2. • The contents of the frame cannot be changed.	01_H to FE_H (1 to 254)	The data for codes 01_H to FE_H, corresponding to the registration No. is registered as one byte.	Section 7.5.1
		100_H to 161_H (256 to 353)	The arrangement of the data handled by the external device, and data assuming special characters are registered.	
User registration frame	• Frame in which random character string is registered by user into R2 EEPROM. • Up to 200 frames can be registered. • The contents of the frame can be changed.	$3E8_H$ to $4AF_H$ (1000 to 1199)	Random character string (1 to 80 bytes) designated by user.	Section 7.5.2

*1 Note that this is not the R2 buffer memory address.



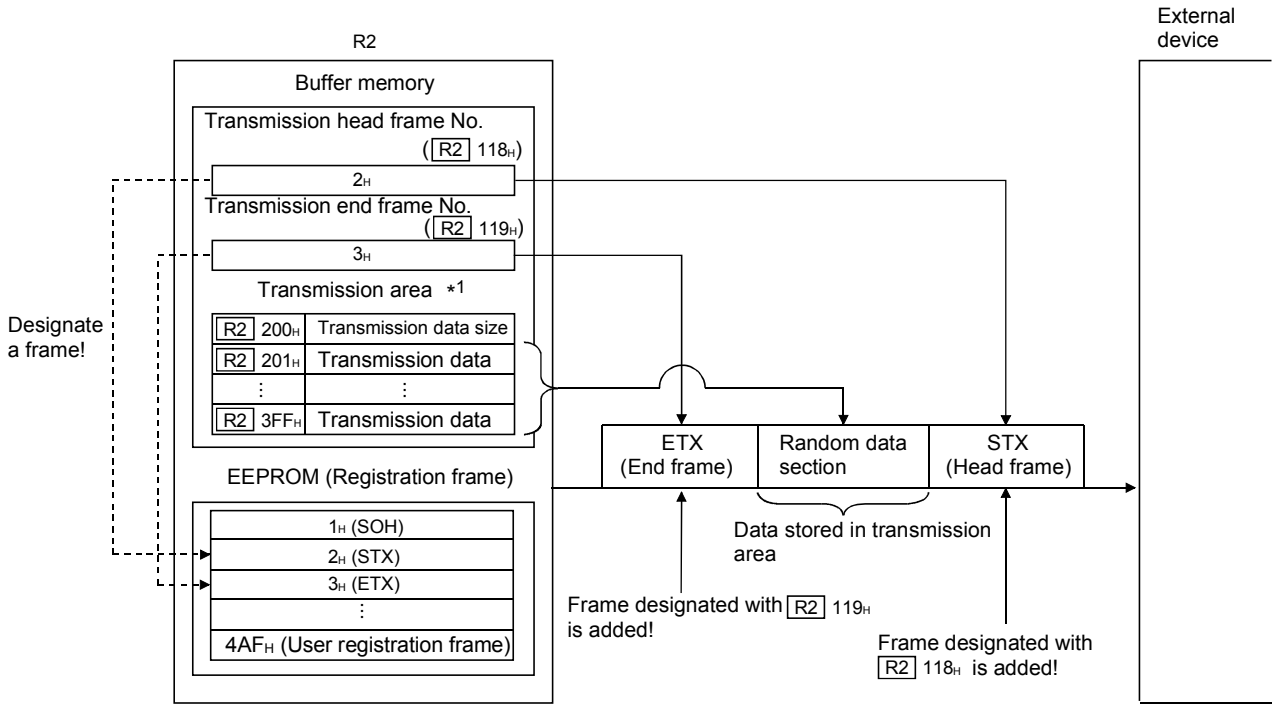
7.2 Transmitting data using frames

When transmitting data using frames, the following two frame addition methods can be used.
A word/byte unit and transmission timeout time can be designated for the random data section, in the same manner as non-procedural transmission.

- Add one frame to the head and end of a random data item, and transmit to the external device.
  (Use transmission frame 1 area)
- Add only up to 100 frames, and transmit to the external device.
  In this case, the random data being transmitted will be handled as part of the frame.
  (Use transmission frame 2 area)

7.2.1 Transmitting using transmission frame 1 area

The data can be transmitted with one frame added to the head and end of the random data.
For the transmission head frame, the registration frame No. is designated in the transmission head frame No. (R2 118_H).
For the end frame, the registration frame No. is designated in the transmission end frame No. (R2 119_H).
When designating the default registration frame, refer to section 7.5.1.
When designating the user registration frame, refer to section 7.5.2.



*1 If R2 is the default value, indicates the buffer memory address.

(1) Transmitting with a frame added

By designating the No. of the frame to be added in R2 118H and R2 119H, the frame will be automatically added when transmitting.
The data transmission method is the same as when a frame is not added (non-procedural communication), so refer to Chapter 6.

POINT

Make sure not to include data with the same arrangement as the transmission head frame and transmission end frame in the random data section.
If data with the same arrangement as the transmission head frame or transmission end frame is contained in the random data section, the partner device may incorrectly recognize that data as the transmission head frame or transmission end frame.

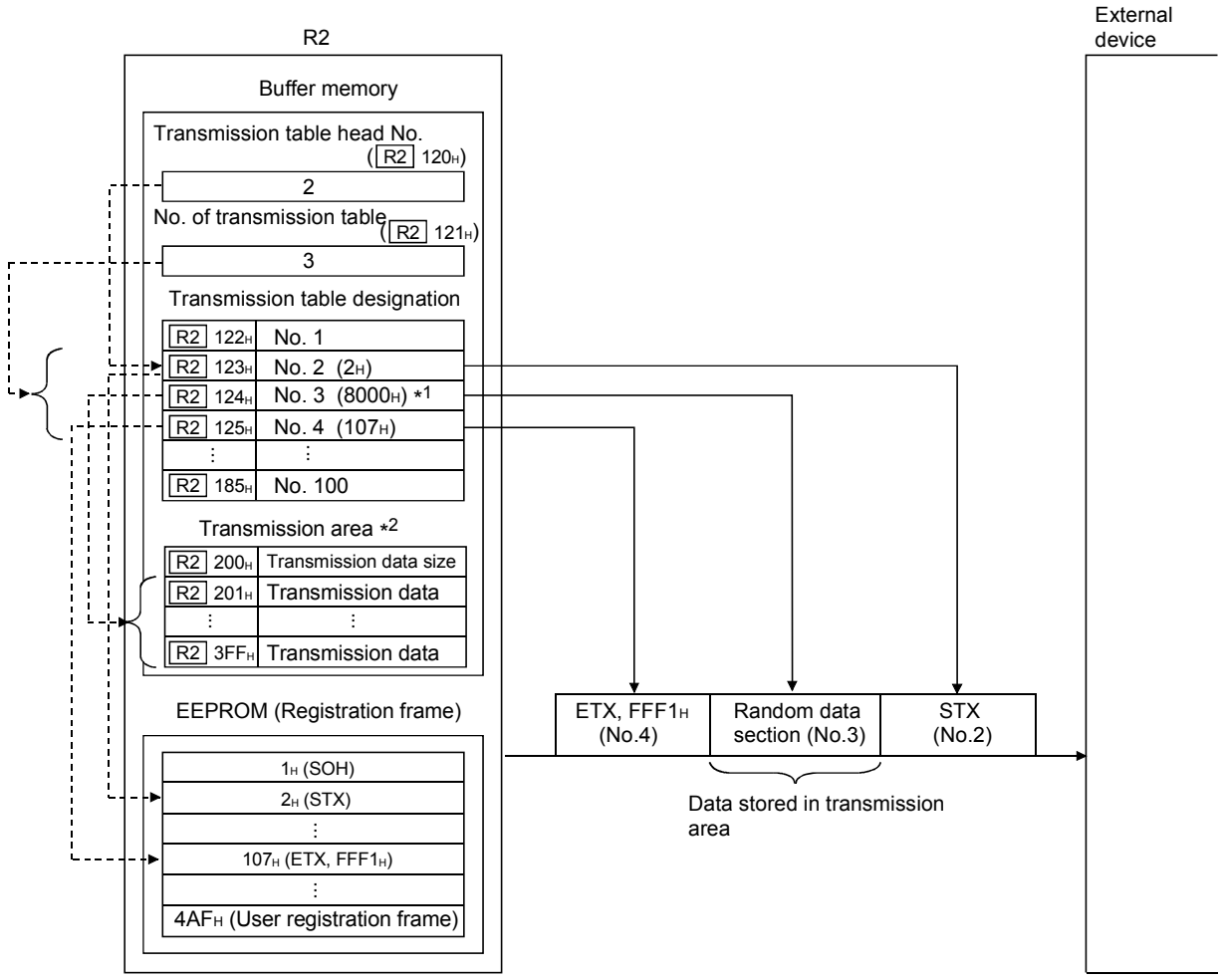
(2) Setting the buffer memory

The items to be set for the buffer memory used when transmitting data using the transmission frame 1 area are shown below.

R2 buffer memory address	Name	Details
R2 118H	Transmission head frame No.	When transmitting frames using the transmission frame 1 area, designate the No. of the frame for the data to be transmitted as the head frame. 0H (0) : No designation (default value) 1H to 161H (1 to 353) : Designate default registration frame 3E8H to 4AFH (1000 to 1199) : Designate user registration frame
R2 119H	Transmission end frame No.	When transmitting frames using the transmission frame 1 area, designate the No. of the frame for the data to be transmitted as the end frame. 0H (0) : No designation (default value) 1H to 161H (1 to 353) : Designate default registration frame 3E8H to 4AFH (1000 to 1199) : Designate user registration frame

7.2.2 Transmitting using the transmission frame 2 area

Frame transmission, with up to 100 frames added, is possible.
Using the transmission table (R2 122H to 185H) of the No. designated in the transmission table head No. designation (R2 120H), the frames corresponding to the No. of points designated in the No. of transmission table (R2 121H) are transmitted.
When designating a default registration frame for the transmission table, refer to section 7.5.1.
When designating a user registration frame, refer to section 7.5.2.



*1 When designating data written into the transmission area, designate 8000H.
*2 When R2 is the default value, indicates the buffer memory address.

(1) Transmitting with a frame added

Using the transmission table (R2 122H to 185H) of the No. designated in the transmission table head No. designation (R2 120H), the frames having the No. of points designated in the No. of transmission table (R2 121H) are transmitted.
The data transmission method is the same as when a frame is not added (non-procedural communication), so refer to Chapter 6.

(2) Designating the transmission data in the transmission area

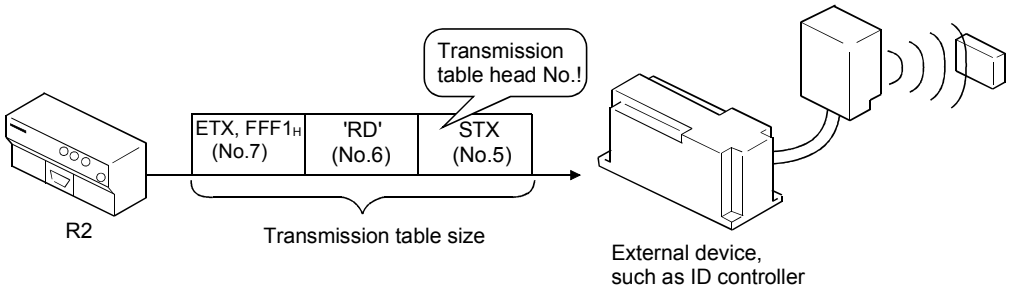
When using the transmission data in the transmission area, designate the frame No. (8000H).
The data equivalent to the word/byte size designated in the transmission data size designation area will be transmitted from the transmission area.

(3) Setting the buffer memory

The items to be set for the buffer memory used when transmitting data using the transmission frame 2 area are shown below.

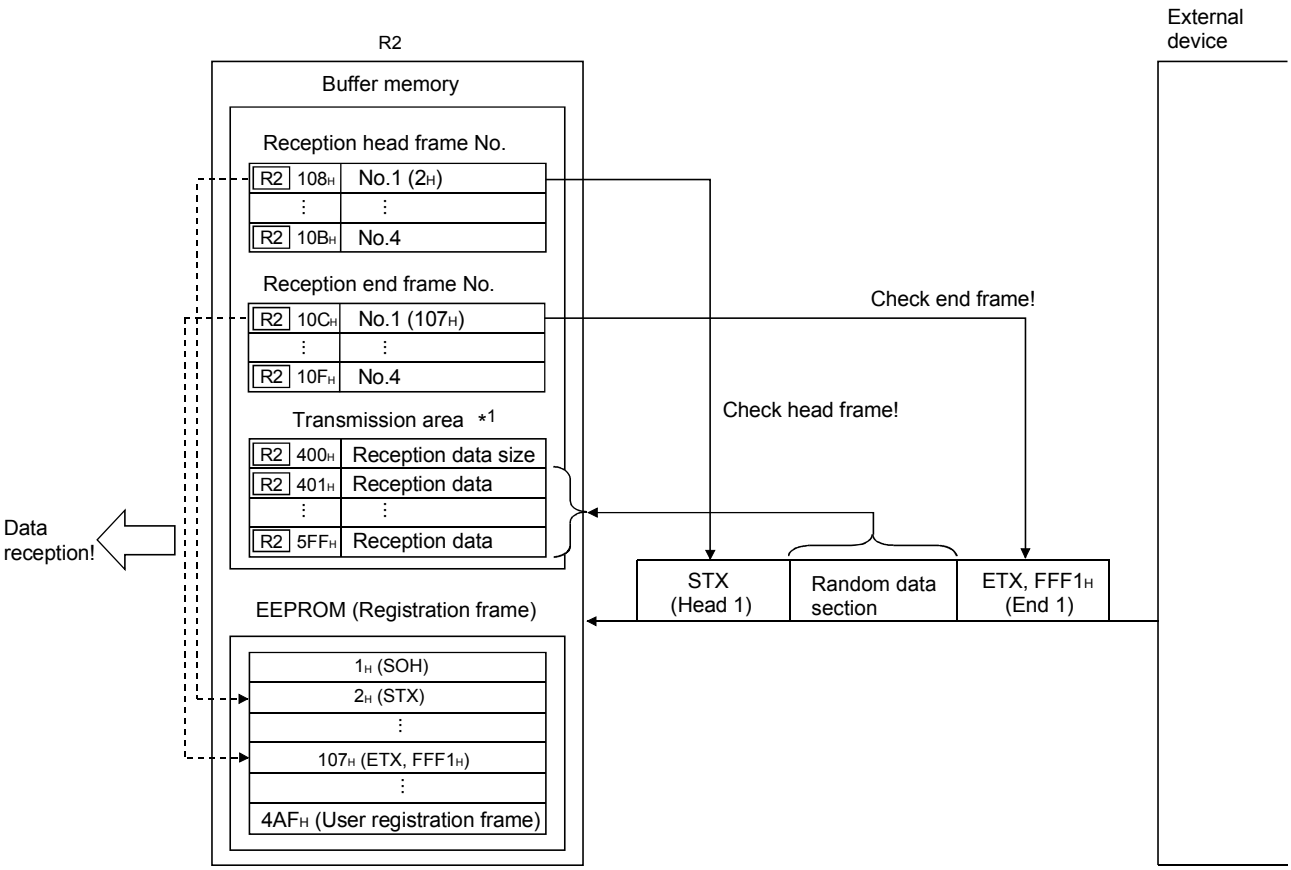
R2 buffer memory address	Name	Details
R2 120H	Transmission table head No. designation	When transmitting frames using the transmission frame 2 area, designate the head No. of the transmission table in which the data to be transmitted is designated. 0 : Do not transmit with frame 2 area (default value) 1 to 100 : Head No. of transmission data designation destination in transmission table
R2 121H	No. of transmission table	When transmitting frames using the transmission frame 2 area, designate the No. of transmission tables as 1 to 100 from the table position designated in the transmission table head No. designation (R2 120H). 0 : Do not transmit with frame 2 area (default value) 1 to 100 : No. of transmission table
R2 122H to 185H	Transmission table designation (No. 1 to No. 100)	For frame transmission or monitor transmission using the transmission frame 2 area, designate the No. of the data frame to be transmitted from the frames registered in R2. 0H (0) : No designation (default value) 1H to 161H (1 to 353) : Designate default registration frame 3E8H to 4AFH (1000 to 1199) : Designate user registration frame 8000H (–32768) : Designate transmission area data

(Example) Transmission table head No. designation: 5, transmission table size: 3,
Transmission table designation (No. 5, 6,7): 02H (STX), 138H (RD), 107H (ETX, FFF1H)



7.3 Receiving data using frames

With frame reception, when a statement containing data with the same arrangement as the frame registered in R2, the R2 checks the reception statement frame, and stores the received data in the buffer memory.
The frames checked consist of one head frame and one end frame. Up to four sets can be set.
(Reception head frame No.: R2 108H to 10BH, reception end frame No.: R2 10CH to 10FH)
With frame reception, the word/byte unit, reception timeout time or reception end data size for a random data section can be designated in the same manner as non-procedural reception.



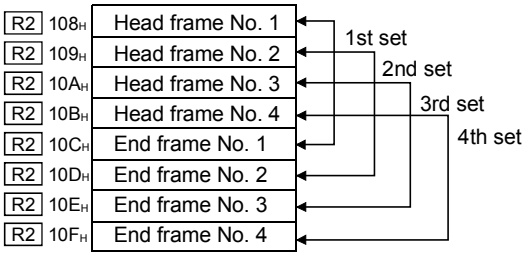
*1 When R2 is the default value, indicates the buffer memory address.

(1) Receiving using frames

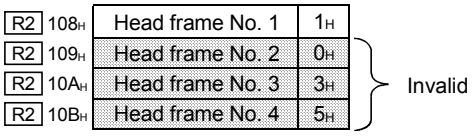
The head frame set in the reception head frame No. designation (R2 108H to R2 10BH) and the end frame designated in the reception end frame No. designation (R2 10CH to R2 10FH) are checked, and the reception data is recognized.
The data reception method is the same as when a frame is not used (non-procedural communication), so refer to Chapter 6.

(2) Setting the buffer memory

The items to be set for the buffer memory used when receiving data using frames are shown below.

<table>
<tr><th>R2 buffer memory address</th><th>Name</th><th>Details</th></tr>
<tr><td>R2 108H to 10BH</td><td>Reception head frame No. designation</td><td rowspan="2">When receiving data using frames, designate the statement's head/end frames. Designate the No. of the default (user) registration frame registered in the R2 EEPROM.
Up to four sets, each containing a reception head/end frame, can be set.
For the initial value of the reception head/end frame No, refer to section 3.7.
 

0H (0) : No designation
1H to 161H (1 to 353) : Designate default registration frame
3E8H to 4AFH (1000 to 1199) : Designate user registration frame

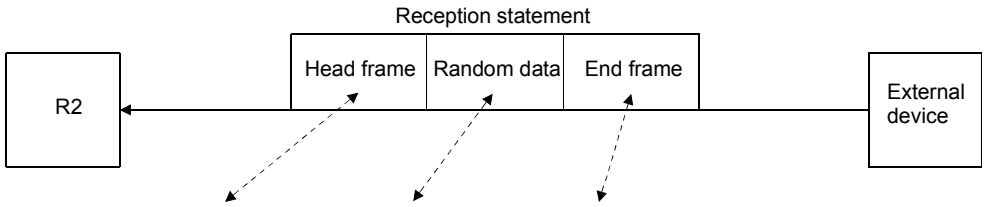
* When the reception head frame No. is set to 0, the following reception head frame Nos. will be invalid
 
</td></tr>
<tr><td>R2 10CH to 10FH</td><td>Reception end frame No. designation</td></tr>
<tr><td>R2 110H</td><td>Reception head frame/reception end frame abort designation</td><td>Designate whether the store the data at the received head frame and end frame sections in the received order into the R2 reception area in the same manner as the random data section.
When "Do not abort (0)" is designated, the reception head/end frame section data will also be stored in the reception area.
When "Abort (1)" is designated, the reception head/end frame section data will be aborted, and will not be stored in the reception area.
0 : Do not abort
1 : Abort (default value)</td></tr>
<tr><td>R2 1B5H</td><td>Reception frame index No. storage</td><td>During frame reception, the No. of registration frame set (1 to 4), designated with the reception head frame No. designation (R2 108H to 10BH) and reception end frame No. designation (R2 10CH to 10FH), used for reception and read request is stored.
0 : Do not use frames
1 to 4 : nth set designated with reception head/end frame No.</td></tr>
</table>

7.3.1 Reception data

The arrangement of data when frames are received is shown below.

(1) Reception data arrangement

The statement when receiving data with frame reception, can be received only with the group 1 (1) to 4)) or group 2 (5) to 7)) data arrangement shown in the following combination table.
Thus, the reception head/end frame No. designation (R2 108H to 10BH, R2 10CH to 10FH) setting must be carried out with group 1 or group 2.



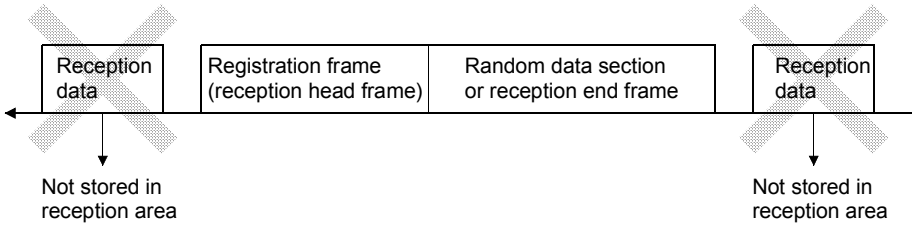
Combination	Registration frame (reception head frame)	Random data section	Registration frame (reception end frame)	Group No.
1)	○	○	○	1
2)	○	○	–	
3)	○	–	○	
4)	○	–	–	
5)	–	○	○	2
6)	–	○	–	
7)	–	–	○	

○ : Data received – : No data received

If both group 1 and group 2 (for example, 1), 2) and 5)) are designated with the head frame or end frame combination designated for the reception head/end frame No. designation (R2 108H to 10BH, R2 10CH to 10FH), only the reception data for group 1 will be received and processed.
The reception data for group 2 will be ignored or may not be correctly received and processed.

POINT

(1) If there are one or more combinations (1) to 4) in combination table) with a reception head frame designated, set the reception end data size (R2 111H) to match the length of the random data section to be received.
If the reception head frame is designated, the data between the received end frame or the reception end data size data and the next head frame will not be stored in the R2 reception area. (The data will be ignored.)



(2) Make sure not to include data with the same arrangement as the reception head frame and reception end frame in the random data section.
If data with the same arrangement as the reception head frame or reception end frame is contained in the random data section, the R2 may incorrectly recognize that data as the reception head frame or reception end frame.

(3) The length of the statement that can be received with frame reception must be shorter than the reception data storage area size.
If the length of the statement to be received exceeds the size of the reception data storage area, "reception data size over error (BBA2H)" will occur.
If the reception head frame/reception end frame abort designation (R2 110H) is set to "Do not abort (0)", the reception head frame/end frame size will be contained in the reception data size when the process is completed.
In this case, the reception data size when reading of the reception data to the programmable controller CPU is requested will be as follows.

Reception data size
= Reception end data size + (data size of the received frame data)

Thus, the reception end data size designation and reception data size will not match.

7.3.2 Reading the reception data

The method for reading the reception data during data reception with frame is explained below.

(1) Comparison with non-procedural communication

Each timing for the start and completion of reception when receiving data with frame reception and with non-procedural communication is shown below.

	For frame reception (Refer to (2) for each timing)	When receiving data with non-procedural communication
Reception start	(1) When reception head frame and reception end frame are set. When head frame is received. (2) When only reception head frame is set. When head frame is received. (3) When only reception end frame is set. When head data of random data section is received. (If there is no random data section, when reception end frame is received.)	When head data is received.
Reception completion	(1) When reception end data size is received or end frame is received. (Follows preset conditions. Refer to section (2).) (2) When reception error (reception timeout, etc.) occurs. * The data to the above reception or error occurrence is stored in the reception area of the buffer memory. (*1)	(1) When reception end data size is received. (2) When reception error (reception timeout, etc.) occurs. * All of the received data is stored in the reception area of the buffer memory.

*1 The received statement is stored with the reception head frame/reception end frame abort designation (R2 110_H).

If the reception head frame/reception end frame is not designated, only the random data section is stored in the reception area.

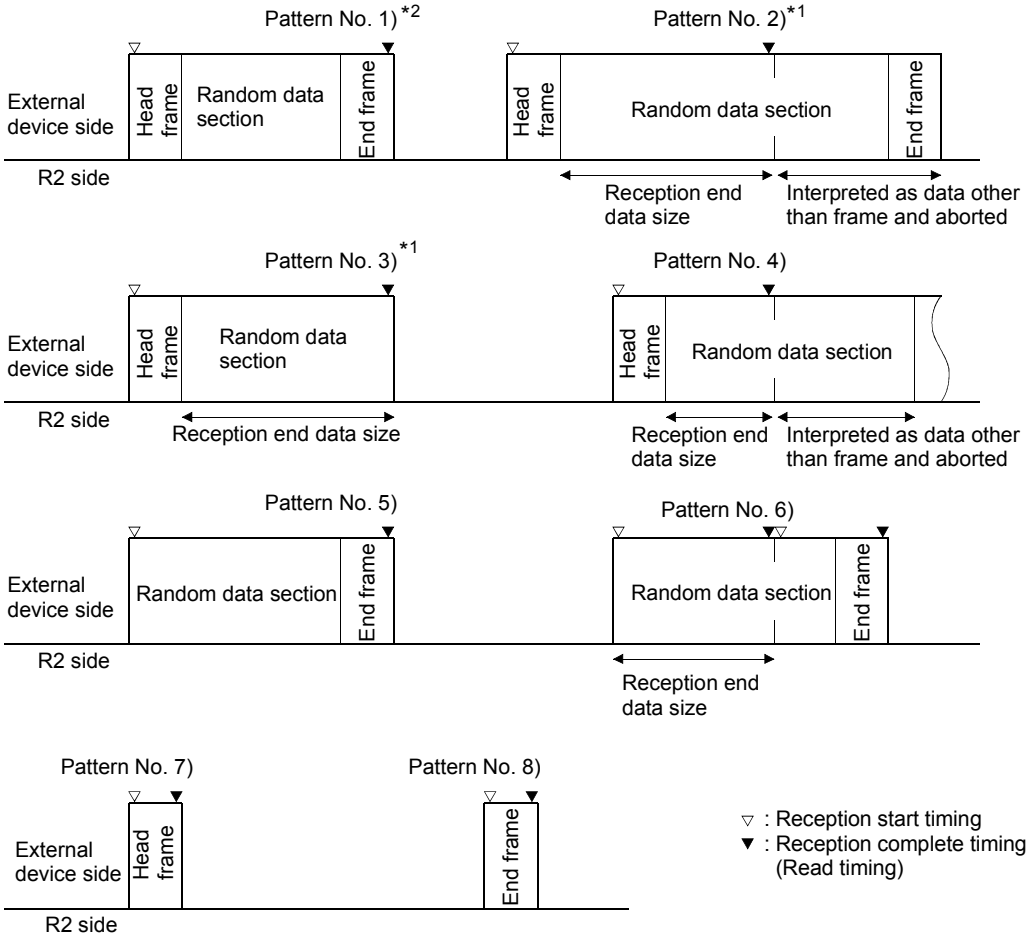
If not even one reception head frame/reception end frame is designated, the designated frame section and random data section are stored in the reception area with the received order.

(2) Reception data and read timing

The timing when the R2 requests reading of the reception data to the programmable controller CPU according to the end frame and reception end data size is shown below.

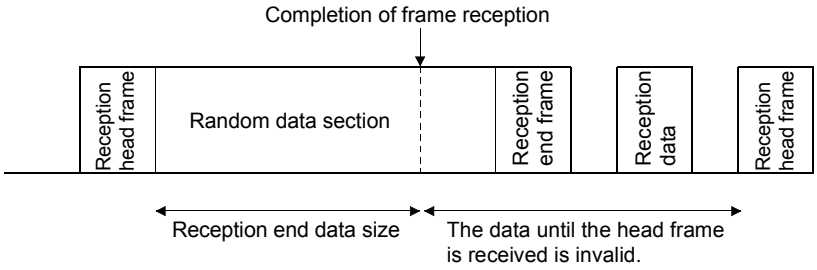
The numbers in the tables indicate the reception statement and timing pattern Nos. shown below.

Setting \ Reception data / Random data section reception data		Timing pattern No. (refer to diagrams below)			Remarks
		When head frame is received	When random data section in reception statement is received	When end frame is received	
When reception head frame and reception end frame are set	Reception data size > reception end data size	2)			Refer to section (1) *1 for details on the data that can be read by the programmable controller CPU.
	Reception data size ≤ reception end data size	1)			
	When reception end data size is 0				
When only reception head frame is set	Reception data size > reception end data size	4)			
	Reception data size ≤ reception end data size	3)			
	When reception end data size is 0	7)			
When only reception end frame is set	Reception data size > reception end data size	6)			–
	Reception data size ≤ reception end data size	5)			
	When reception end data size is 0	8)			



*1 If only the reception head frame is designated, the frame reception will be completed when the data size set in the reception end data size designation (R2 111H) is received.
If both the reception head frame and reception end frame are designated, the frame reception is completed when the reception end data size is reached. The data until the next head frame is received is invalid.

(Example)



*2 If the reception head frame and reception end frame are designated, and 0 is designated for the reception end data size, when the reception end frame is received, the frame reception will be completed.
This allows the random data section to have a varied length.

POINT
If the R2 detects an error during data reception, the random data section of the data received until immediately before is stored in the reception area of the buffer memory, and the reception error read request signal (RXn3) turns ON.

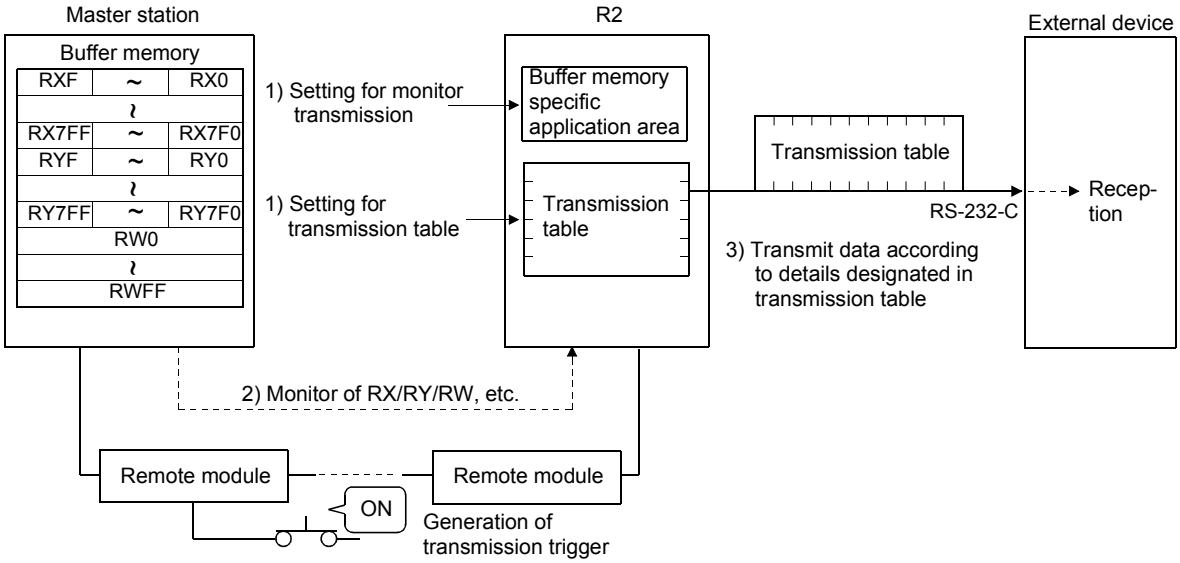
7.4 Transmitting data at the device and status change

7.4.1 Outline

With this function, the R2 monitors the device and status according to the details preset by the user. When the data transmission command (data transmission timing) is detected, the contents of the user-designated transmission table are transmission to the external device. (Monitor transmission function)
When the user transmits data with this function, the R2 process can be randomly designated by the user.

1) Device of master station or status of master station and programmable controller CPU monitored by the R2 to detect the data transmission timing
2) Conditions for establishing data transmission timing (Refer to section 7.4.2)
3) Monitor interval time for R2 to monitor device or status used as data transmission timing

By using this function, the programmable controller CPU does not need to be aware of the data transmission timing.



1) Designate the monitor transmission data in the monitor interval time designation (R2 70H), No. of monitor designation (R2 71H), and monitor designation 1 to 64 (R2 78H to F7H) areas.
Designate the No. of the registered frame to be transmitted (the transmission area can also be designated) in the transmission table designation (R2 122H to 185H).
2) R2 monitors the device or status on CC-Link.
3) When the transmission trigger is detected, the R2 follows the details of the transmission table designated by the user, and transmits the contents of the transmission table to the external device.

7.4.2 Devices and statuses that can be designated

The devices and statuses that can be monitored by the R2 to detect the timing for transmitting the data (hereinafter transmission trigger) at the device and status change are described below.
The targets of the transmission trigger that can designate transmission at the change of the device or status are shown.

(1) Transmission trigger by monitoring RX/RY/RW

The R2 monitors the following user-designated data in the master module on the CC-Link, and starts the data transmission process when the user-designated transmission conditions are established.

1) When RX, RY changes (rising edge/falling edge).
2) When the RW value changes from 0 to a value other than 0.

(2) Transmission trigger by monitoring status

The R2 monitors the following status in the master module on the CC-Link or the programmable controller CPU mounted on the master module, and starts the data transmission process when the user-designated transmission conditions are established.

1) When the CC-Link data link status (linked, stopped) changes.
2) When the programmable controller CPU operation status (running/stopped) changes.
3) When the programmable controller CPU status (normal/error) changes. (R2 makes a judgment with the normal/error access from the R2 to the programmable controller CPU.)

7.4.3 Setting the R2 buffer memory

The items to be set for the buffer memory used when transmitting data (monitor transmission) at the change of the device or status are explained below.

(1) Buffer memory setting items

The items to be set for the monitor transmission buffer memory are shown below. When carrying out monitor transmission, set the following areas, and also set the transmission table to be transmitted in the transmission table designation (R2 122H to 185H) (refer to section 7.2.2) with the sequence program.

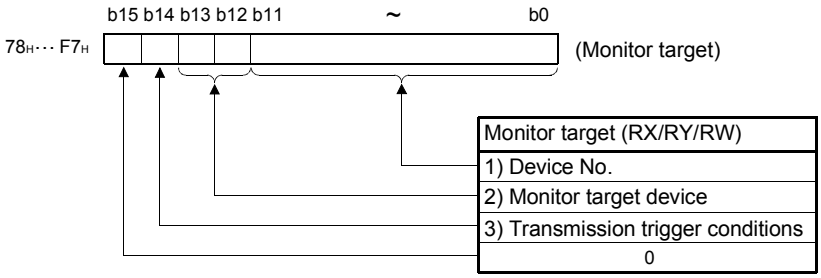
R2 buffer memory address	Name		Details
R2 70H	Monitor interval time designation		Designate the monitor interval that the R2 monitors the device or status for detecting the transmission trigger. 0 : Do not carry out monitor transmission (default value) 1 to 32767 : Designate the monitor interval time (×100ms)
R2 71H	No. of monitor designation		Set the No. of the set in the monitor designation –1 to 64 (R2 78H to F7H) by the user for the R2 to monitor the transmission trigger detection device or status. 0 : Do not carry out monitor transmission (default value) 1 to 64 : Designate the monitor designation size
R2 78H	Monitor designation –1	Monitor target designation	Designate a device or status for transmission trigger detection. When specifying a device, refer to (a) in this section. When specifying a status, refer to (b) in this section.
R2 79H		Transmission data designation	Designate which data are to be sent by the AJ65BT-R2 when a transmission trigger occurs. For details, refer to (c) in this section.
R2 7AH to F5H	↓		Same as Monitoring setting - 1
R2 F6H	Monitor designation –64	Monitor target designation	
R2 F7H		Transmission data designation	
R2 102H	Word/byte unit designation		Set the unit (word/byte) of the transmission data and reception data when exchanging data between the R2 and external device. 0 : Word unit (default value) 1 : Byte unit * This is also used as the unit of the values handled by the actual transmission data size storage area (R2 1B4H) and data size storage area in OS reception area (R2 1B6H).
R2 11AH	Transmission timeout designation		Designate the timeout time from when the transmission request signal (RYn0) turns ON during data transmission (when trigger is generated during monitor transmission) and the transmission starts to when the transmission is completed. When the transmission timeout is applied, the transmission error complete signal (RXn1) turns ON, and BB11H is stored in the transmission error code area (R2 1B1H). 0 : Infinite wait (default value) 1 to 32767 : Transmission timeout time (×100ms)

POINT

When the setting value for R2 0H to 112H has been changed, initialize the R2 as explained in section 8.6.
When the setting values for the buffer memory following R2 113H has been changed, the initialization process is not required.

(a) Monitor target designation (When designating RX/RY/RW) (R2 78H, 7AH, ··· F4H, F6H)

Set the transmission trigger detection device for the R2 when carrying out monitor transmission.



1) Device No.

Designate the RX/RY/RW No. monitored by the R2 to detect the transmission trigger using the RX/RY/RW stored in the master station buffer memory as a target.

(Example) To designate RX5 of first station's remote module: H005
To designate RX5 (RX25) of second station's remote module: H025

Master station address

		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
First station	E0H	RXF	RXE	RXD	RXC	RXB	RXA	RX9	RX8	RX7	RX6	RX5	RX4	RX3	RX2	RX1	RX0
	E1H	RX1F	RX1E	RX1D	RX1C	RX1B	RX1A	RX19	RX18	RX17	RX16	RX15	RX14	RX13	RX12	RX11	RX10
Second station	E2H	RX2F	RX2E	RX2D	RX2C	RX2B	RX2A	RX29	RX28	RX27	RX26	RX25	RX24	RX23	RX22	RX21	RX20
	E3H	RX3F	RX3E	RX3D	RX3C	RX3B	RX3A	RX39	RX38	RX37	RX36	RX35	RX34	RX33	RX32	RX31	RX30

2) Monitor target device

The monitor target device designates what the above device No. target device is.

Bit position		Monitor target device
b13	b12	
0	0	RY
0	1	RX
1	0	RWw
1	1	RWr

3) Transmission trigger conditions

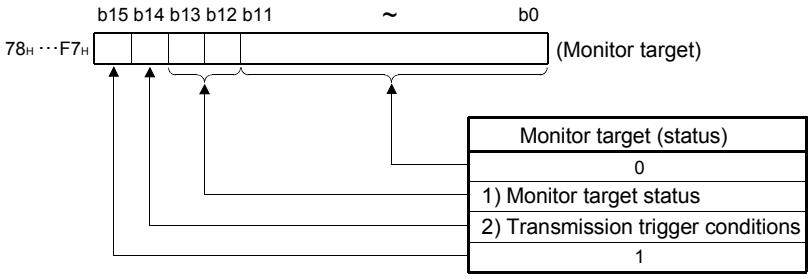
The transmission trigger conditions designate the conditions interpreted by the R2 as a data transmission trigger generation when monitoring the monitor target devices.

Monitor target	Transmission trigger generation condition setting		Timing of transmission trigger generation
	b14 = OFF	b14 = ON	
RX, RY	At rising edge detection	At falling edge detection	The transmission trigger is generated when the R2 detects a change from ON to OFF.
RWw, RWr	(b14 state is invalid)		The transmission trigger is generated when the designated RW value changes to a value other than "0".

(b) Monitor target designation (When designating a status)

(R2 78_H, $7A_H$, ··· $F4_H$, $F6_H$)

Set the transmission trigger detection status for the R2 when carrying out monitor transmission.



1) Monitor target status

The monitor target status designates the status information monitored by the R2 for detecting the transmission trigger in respect to the information held by the master station/programmable controller CPU.

Bit position		Monitor target status
b13	b12	
0	0	(Setting prohibited)
0	1	CC-Link data link status
1	0	Programmable controller CPU operation status
1	1	Programmable controller CPU status

2) Transmission trigger conditions

The transmission trigger conditions designate the conditions interpreted by the R2 as a data transmission trigger generation when monitoring the monitor target statuses.

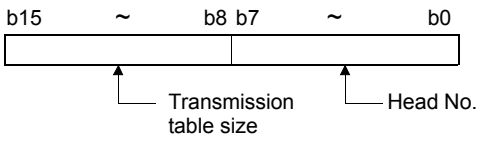
Monitor target status	Transmission trigger generation condition setting		Timing of transmission trigger generation
	b14 = OFF	b14 = ON	
CC-Link data link status	Stopped	Linked	The transmission trigger is generated when the R2 detects a change in each status.
Programmable controller CPU operation status *1	Running	Stopped	
Programmable controller CPU status	Error *2	Normal	

*1 When the parameters have been set with the GPP function or RLPA command, the master station CPU's RUN/STOP status will be the trigger generation conditions.
If the parameters have been set with the sequence program, the ON or OFF of the master module's refresh indication (Yn0) will be the trigger generation condition.
ON : CPU operation status running
OFF : CPU operation status stopped

*2 The CPU error will be the condition of generating a trigger for an error related to the stopping of the CPU.
Refer to the CPU module User's Manual for details.

(c) Transmission data designation area (R2 79H, 7BH, ··· F5H, F7H)

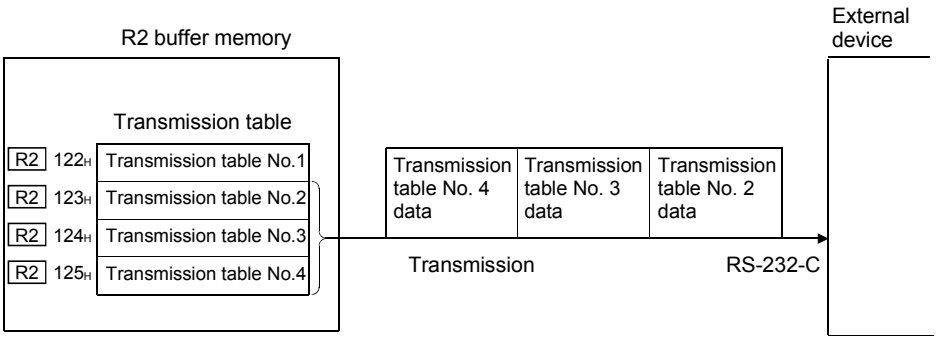
1) When monitoring the device/status with the monitor target designation, the designation destination of the data to be transmitted if the R2 detects the transmission trigger generation is designated.
2) For the transmission data designation, the head No. of the transmission table in which the transmission data is designated and the transmission table size are designated for the R2 transmission table (R2 122H to 185H).



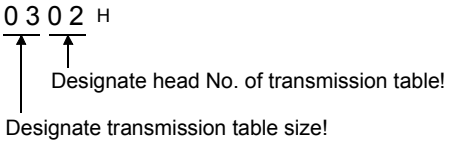
- Head No.
  Designate the No. of the transmission table, in which the data to be transmitted is designated, with a number between 1 and 100.
- Transmission table size
  Designate the transmission table size, in which the data to be transmitted is designated, with a number between 1 and 100.

(Example of setting transmission data)

To transmit the data designated in the transmission tables No. 2 to No. 4 when a transmission trigger is generated.



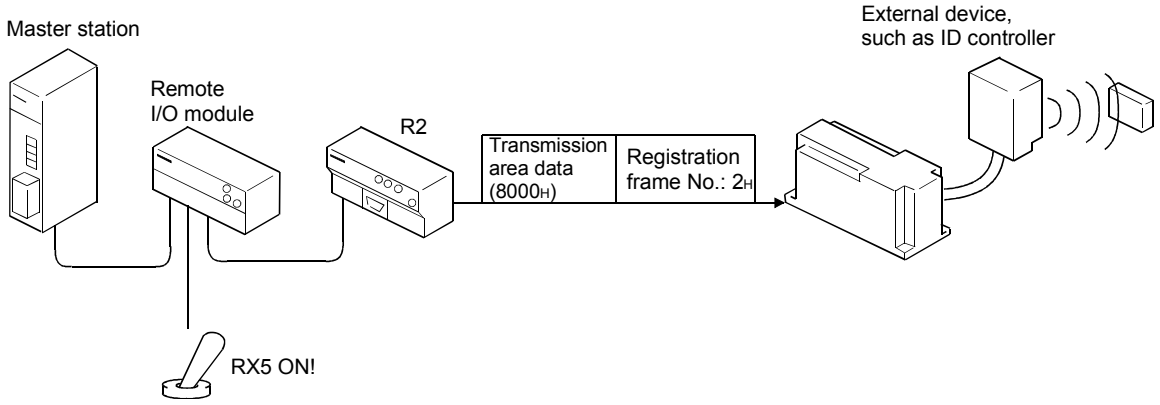
In this case, set "0302H" for the transmission data designation area.



(2) Example of setting to buffer memory

An example of setting the buffer memory for monitor transmission is shown below.

The R2 buffer memory is set as follows to monitor the RX5 in the remote I/O module of the first station, and transmits the contents of the transmission table when a transmission trigger is generated.



Address	R2		Setting value	
R2 70_H	Monitor interval time designation		2	..... Monitor interval time : 200ms
R2 71_H	Monitor designation size		1	..... Monitor designation size : 1
R2 78_H	Monitor target designation 1		1005_H	..... Monitor target: Rising edge of RX5
R2 79_H	Transmission data designation 1		0201_H	..... Transmission data designation : Data to transmission table (No. 1 to 2)
R2 $11A_H$	Transmission timeout designation		5	..... Transmission timeout time : 500ms
R2 122_H	Transmission table designation (No. 1)		2_H	..... Transmission table (No. 1) : Registration frame No. 2_H
R2 123_H	Transmission table designation (No. 2)		8000_H	..... Transmission table (No. 2) : Transmission area data

7.4.4 Precautions

Precautions for using the monitor transmission function are explained below.

(1) The device/status for transmission trigger storage is monitored at the interval designated with the buffer memory monitor interval time designation (R2 70H).
The ON/OFF status, value, status state that act as the transmission trigger generation condition must be held for longer than the monitor interval time (+100ms).
If the ON/OFF status, value, status state that act as the transmission trigger generation condition are not held for longer than the monitor interval time, the R2 may not detect the transmission trigger.

(2) If the monitor transmission process and other transmission process (non-procedural transmission/frame transmission) are overlapped, the R2 will transmit the transmission data in order of transmission process generation.

(Example) If a monitor transmission trigger is generated while the R2 is carrying out non-procedural transmission/frame transmission, the monitor transmission will be carried out after the non-procedural transmission/frame transmission process is completed.

(3) If multiple monitor transmission triggers occur simultaneously, the monitor transmission will be carried out in order of transmission trigger detection.

7.5 Registration frames

The registration frames include the "default registration frames" preregistered in the R2, and the "user registration frames" registered by the user.

Frame type	Outline	Registration frame No. *1	Frame contents	Reference
Default registration frame	• Frame preregistered in R2. • The contents of the frame cannot be changed.	01_H to FE_H (1 to 254)	The data for codes 01_H to FE_H, corresponding to the registration No. is registered as one byte.	Section 7.5.1
		100_H to 161_H (256 to 353)	The arrangement of the data handled by the external device, and data assuming special characters are registered.	
User registration frame	• Frame in which random character string is registered by user into R2 EEPROM. • Up to 200 frames can be registered. • The contents of the frame can be changed.	$3E8_H$ to $4AF_H$ (1000 to 1199)	Random character string (1 to 80 bytes) designated by user.	Section 7.5.2

*1 Note that this is not the R2 buffer memory address.

7.5.1 List of default registration frames

The default registration frames are frames preregistered in the R2.
The No. of the default registration frame and the contents of the data during transmission/reception are shown below.

Default registration frame No.		No. of registered bytes	Frame contents during transmission/reception		Remarks
Hexadecimal	Decimal				
0_H	0	–	Use prohibited		
1_H to FE_H	1 to 254	1	Same data (1 to FE_H) as registration frame No. For example, registration No. 2 is data STX(02).		
FF_H	255	–	Use prohibited		
100_H	256	1	NUL (00_H)		
101_H	257	2	FF_H (1 byte)		The actually registered value is the special character FF_H and FF_H.
102_H	258	2	CR ($0D_H$), LF ($0A_H$)		
103_H	259	2	DLE, STX		
104_H	260	2	DLE, ETX		
105_H	261	2	00_H, FE_H		
106_H	262	3	00_H, 00_H, FE_H		
107_H	263	3	ETX, sum check ($FFF1_H$)		
108_H	264	5	ETX, sum check ($FFF1_H$), CR, LF		
109_H to $12B_H$	265 to 299	–	Use prohibited		
$12C_H$	300	4	STX, '0', '0', 'G'	2600 Series (DENSEILAMBDA)	Head frame for in-zone ON command
$12D_H$	301	5	STX, '0', '0', 'S', ETX		In-zone OFF command
$12E_H$	302	4	STX, '0', '0', 'D'		Head frame of barcode data
$12F_H$	303	4	STX, '0', '0', 'E'		Head frame at barcode reader error
130_H	304	4	STX, 'B', 'R', ETX	TLMS-3500RV (TOHKEN)	Frame at no-read
131_H	305	3	STX, 'E', 'R'		Head frame at error
132_H	306	4	ESC, 'A', '0', CR		Synchronous ON command
133_H	307	4	ESC, 'A', '0', ','		Head frame of synchronous ON command at edge input
134_H	308	4	ESC, 'A', '1', CR		TOHKEN synchronous OFF command
135_H	309	4	STX, CAN, CR, LF	DS50AF (IDEC DATALOGIC)	Frame at no-read
136_H	310	4	STX, BEL, CR, LF		Frame at error
137_H	311	2	'*', CR	V620 (OMRON)	End frame
138_H	312	2	'RD'		Head frame of various commands
139_H	313	2	'WT'		
$13A_H$	314	2	'AR'		
$13B_H$	315	2	'AW'		
$13C_H$	316	2	'PR'		
$13D_H$	317	2	'PW'		
$13E_H$	318	2	'TS'		

Default registration frame No.		No. of registered bytes	Frame contents during transmission/reception		Remarks
Hexadecimal	Decimal				
13FH	319	4	'AA*', CR	V620 (OMRON)	Various command frame
140H	320	4	'XZ*', CR		
141H	321	3	Check sum (FFFAH), CR	ID/R/X (SUNX)	End frame
142H to 14CH	322 to 332	–	Use prohibited		
14DH	333	2	'ST'	ID/R/X (SUNX)	Head frame of various commands
14EH	334		'WR'		
14FH	335		'CT'		
150H	336		'RD'		
151H	337		'RA'		
152H	338		'RP'		
153H	339		'WA'		
154H	340		'WP'		
155H	341		'CL'		
156H	342		'WI'		
157H	343		'SP'		
158H	344	5	'RD6A', CR		Various command frame
159H	345		'RP5E', CR		
15AH	346		'EQ6A', CR		
15BH	347		'NC6F', CR		
15CH	348		'RI9B', CR		
15DH	349		'CP93', CR		
15EH	350		'EQ96', CR		
15FH	351	7	'SM0000', CR		
160H	352		'SM0101', CR		
161H	353		'SM0202', CR		
162H to 3E7H	354 to 999	–	Use prohibited		

7.5.2 Details of user registration frames

By preregistering the user registration frames in the EEPROM via the R2 buffer memory, these frames can be used to check the transmission/reception data transmitted or received with frames, and can be used for the transmission data during monitor transmission.

(1) Characters that can be registered as user registration frames

Up to 200 user registration frames can be registered in the EEPROM.
(Register in frame No. 3E8H to 4AFH (1000 to 1199)
The characters that can be registered as user registration frames include normal characters and special characters. Up to 80 bytes of characters can be registered.

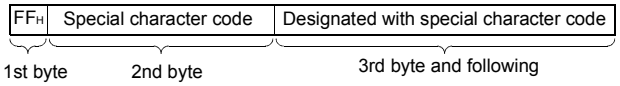
Character	Details
Normal character	One byte of data for data code 00H to FEH. These are the registration codes for the data codes to transmit and receive the 00H to FEH data.
Special character	This is a special code designated with the registration code FFH and a special character code shown in (2). (Combination of FFH + 00H to FFH)

(2) Designating a special character

Up to 80 bytes of characters, with a combination of normal characters (data code 01H to FEH) and special characters (refer to (a) to (d)) can be designated in the user registration frame area (3E8H to 4AFH).
The method for designating special characters is shown below.

(a) Confirmation of special character

The special character is configured with the following arrangement.



(b) Functions of special characters, and usability during transmission/reception

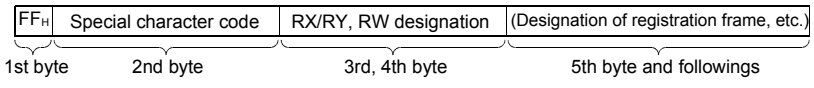
Special character code	Function during transmission/reception	Usability					
		Transmission				Reception	
		Frame transmission (Frame -1)		Frame transmission (Frame -2)	Monitor transmission	Frame reception	
		Head	End			Head	End
0H	During transmission: The data code 00H (NUL) data (1 byte) is transmitted. During reception: The check of the section corresponding to the registration frame (1 byte worth) is skipped. (Received as normal data.)	○					
1H to BFH	Use prohibited	–					
C0H to DFH	Data in a random registration frame is transmitted according to the RX and RY ON/OFF state and RW value comparison. Refer to (c) for details.	○				×	
E0H to EDH	Use prohibited	–					
EEH to FAH	The check sum corresponding to the designated range of the statement is transmitted and received for checking the statement to be transmitted or received. Refer to (d) for details.	×	○	×		×	○
FBH to FEH	Use prohibited	–					
FFH	The data code FFH data (1 byte) is received.	○					

○ : Usable, × : Not usable

(c) RX/RY/RW reference special characters

The RX/RY/RW reference special characters refer to the ON/OFF state of the master station's designated remote input(RX)/remote output (RY), and the remote register (RW) value, and transmit the designated registration frame data according to the details.

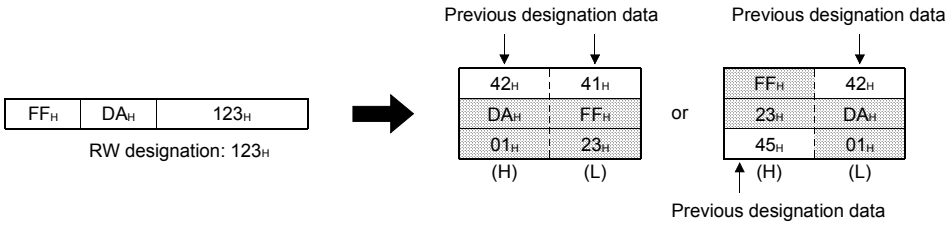
The RX/RY/RW reference special characters are designated with the following arrangement.



1) Designating to the buffer memory

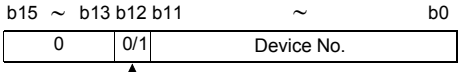
The RX/RY/RW reference special characters are written directly after the designating character.

(Example) To 123H for RW, write as follows in the buffer memory.



2) Designating RX/RY/RW

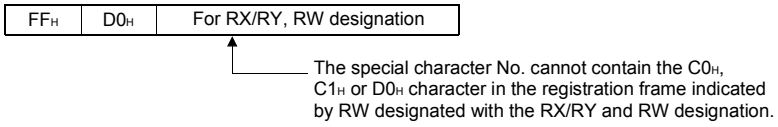
The RX/RY/RW designation in the 3rd and 4th bytes of the RX/RY/RW reference special characters are designated as follow.



Device type	For RX/RY designation	For RW designation
0	RY	RWw
1	RX	RWr

POINT

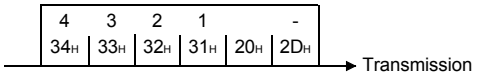
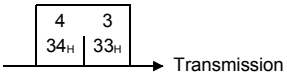
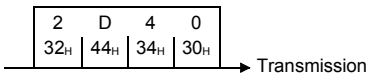
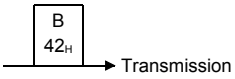
- During frame transmission or monitor transmission, if the results of analyzing and developing the user registration frame containing a special character exceeds 2048 bytes, the "transmission data size over error (BB92H) will occur.
- When using a special character (special character code C0H, C1H, D0H) to designate the registration frame No., if the same registration frame No. is designated in that designated registration frame, a special character cannot be contained.



3) Details of RX/RY/RW reference special characters

<table>
<tr><th>Special character code</th><th>Details</th></tr>
<tr><td>C0H</td><td>During frame transmission, the ON/OFF state of the remote input (RX)/remote output (RY) is referred. Depending on whether the designated RX/RY is ON or OFF, the designated registration frame's registration data is transmitted.
<table>
<tr><td>FFH</td><td>C0H</td><td>RX/RY designation *1</td><td>Registration frame No. at ON</td><td>Registration frame No. at OFF</td></tr>
</table>
(Example) To transmit designated data with RX1 ON/OFF
At RX1 ON : Transmit registration frame No. 3E8H registration data
At RX1 OFF : Transmit registration frame No. 3E9H registration data
<table>
<tr><td>FFH</td><td>C0H</td><td>0101</td><td>3E8H</td><td>3E9H</td></tr>
</table></td></tr>
<tr><td>C1H</td><td>During frame transmission, the remote register (RW) value is referred to, and the designated registration frame registration data is transmitted according to the results of the comparison with the designated value. If the RW value referred to is 8000H, the contents of the transmission area are transmitted.
<table>
<tr><td>FFH</td><td>C1H</td><td>RW designation *1</td><td>Compari-son value</td><td>Registration frame No. (RW = comparison value)</td><td>Registration frame No. (RW > comparison value)</td><td>Registration frame No. (RW < comparison value)</td></tr>
</table>
(Example) To refer to the RW123 value, and transmit the designated registration frame data at the following conditions.
When RW = comparison value: Transmit registration frame No. 3E8H registration data
When RW > comparison value: Transmit registration frame No. 3E9H registration data
When RW < comparison value: Transmit registration frame No. 3EAH registration data
<table>
<tr><td>FFH</td><td>C1H</td><td>123H</td><td>5</td><td>3E8H</td><td>3E9H</td><td>3EAH</td></tr>
</table></td></tr>
<tr><td>C2H to CFH</td><td>Use prohibited</td></tr>
<tr><td>D0H</td><td>During frame transmission, the remote register (RW) value is referred to, and depending on the value, the registration frame registration data or the contents of the transmission area are transmitted. The designated RW value is interpreted as the registration frame No. If the RW value is 8000H, the contents of the transmission are transmitted.
<table>
<tr><td>FFH</td><td>D0H</td><td>RW designation *1</td></tr>
</table>
(Example) When RW value referred to is 102H
Registration frame No. 102H data
<table>
<tr><td>LF</td><td>CR</td></tr>
<tr><td>0AH</td><td>0DH</td></tr>
</table>
→ Transmission</td></tr>
<tr><td>D1H to D7H</td><td>Use prohibited</td></tr>
<tr><td>D8H</td><td>During frame transmission, the remote register (RW) value is referred to. The value is interpreted as an unsigned value (0 to 65535), is converted into a 5-digit decimal ASCII code, and is then transmitted.
If the RW value referred to has less than 4 digits, the data will be converted into a "space string" + value ASCII code and transmitted.
<table>
<tr><td>FFH</td><td>D8H</td><td>RW designation *1</td></tr>
</table>
(Example) When designated RW value is 1234
"1234" is transmitted as ASCII code
<table>
<tr><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>34H</td><td>33H</td><td>32H</td><td>31H</td><td>20H</td></tr>
</table>
→ Transmission</td></tr>
</table>

*1 Refer to section 2) for details on designating RX/RY/RW.

Special character code	Details
$D9_H$	During frame transmission, the remote register (RW) value is referred to. The value is interpreted as a signed value (-32768 to 32767), is converted into a 6-digit decimal ASCII code, and is then transmitted. If the RW value referred to has less than 5 digits, the data will be converted into a "space string" + value ASCII code and transmitted. If the value is negative, it is transmitted with "–" as the head value, and if positive, it is transmitted with a "space" as the head character. FF_H | $D9_H$ | RW designation *1 (Example) When designated RW value is –1234 "-1234" is transmitted as ASCII code 
DA_H	During frame transmission, the remote register (RW) value is referred to. The value is interpreted as an unsigned value (0 to 65535), the last two digits are converted into a decimal ASCII code, and is then transmitted. If the RW value referred to has only 1 digit, the data will be converted into a "0" + value ASCII code and transmitted. FF_H | DA_H | RW designation *1 (Example) When designated RW value is 1234 "34" is transmitted as ASCII code 
DB_H	During frame transmission, the remote register (RW) value is referred to. The value is converted into a 4-digit hexadecimal value character string and transmitted. If the converted value has less than 3 digits, the data will be converted into a "0" + value ASCII code and transmitted. FF_H | DB_H | RW designation *1 (Example) When designated RW value is 1234 ($4D2_H$) "4D2" is transmitted as ASCII code 
DC_H	During frame transmission, the remote register (RW) value is referred to. The last byte of the value will be transmitted (binary value). (The high-order byte is not transmitted) FF_H | DC_H | RW designation *1 (Example) When designated RW value is 16706 (4142_H) "42_H" is transmitted 

*1 Refer to section 2) for details on designating RX/RY/RW.

Special character code	Details
DD_H	During frame transmission, the remote register (RW) value is referred to. Two bytes of the value are transmitted in the order of (binary value) low-order byte and high-order byte. The low-order byte of the designated RW value is the first character, and the high-order byte is the second character. FF_H | DD_H | RW designation *1 (Example) When designated RW value is 16706 (4142_H) "RW" value is transmitted A: 41_H, B: 42_H → Transmission
DE_H to DF_H	Use prohibited

*1 Refer to section 2) for details on designating RX/RY/RW.

(d) Special characters for sum check codes

The special characters for sum check codes are used to transmit and receive the sum check codes in a set range of the statement to enhance the reliability of the data exchanged with an external device.
The sum check codes and details of data during transmission/reception are shown below.

Special character code	Details of data during transmission/reception, and handling by R2		Transmission/ reception order
EE_H	The sum check codes in the range, excluding the head frame (1 frame worth) of the transmission/reception data (statement), are transmitted and received.	The low-order 2 bytes of the calculation sum check code are transmitted/received as a 2-byte binary code.	Transmitted/received in order of (L) (H)
EF_H		Use prohibited	–
$F0_H$		The low-order 1 byte of the calculation sum check code are transmitted/received as a 1-byte binary code.	–
$F1_H$		The low-order 1 byte of the calculation sum check code is converted into a 2-digit ASCII code and transmitted/received.	Transmitted/received from highest digit
$F2_H$		Use prohibited	–
$F3_H$		The low-order 4 bits of the calculation sum check code is converted into a 1-digit ASCII code and transmitted/received.	–
$F4_H$	The sum check codes in the range, including the head frame (1 frame worth) of the transmission/reception data (statement), are transmitted and received. *1	The low-order 2 bytes of the calculation sum check code are transmitted/received as a 2-byte binary code.	Transmitted/received in order of (L) (H)
$F5_H$		Use prohibited	–
$F6_H$		The low-order 1 byte of the calculation sum check code are transmitted/received as a 1-byte binary code.	–
$F7_H$		The low-order 1 byte of the calculation sum check code is converted into a 2-digit ASCII code and transmitted/received.	Transmitted/received from highest digit
$F8_H$		Use prohibited	–
$F9_H$		The low-order 4 bits of the calculation sum check code is converted into a 1-digit ASCII code and transmitted/received.	–
FA_H		The calculation sum check code is converted into a complement of 2, and the low-order 1 byte of the value is converted into a 2-digit ASCII code and transmitted/received.	Transmitted/received from highest digit

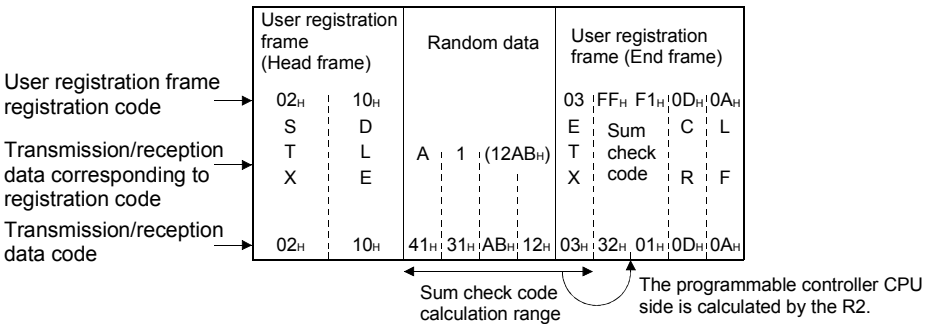
*1 If the head frame is not designated, the transmission/reception data section range will be calculated as the sum check target.

1) Transmission/reception data corresponding to EEH to F3H

The user registration frame section corresponding to the special character Nos. EEH to F3H uses the range, excluding the head frame of the transmission/reception data (statement), to transmit/receive the calculated sum check code as binary/ASCII data.

- Calculation range
  The calculation target is the range from the data following the user registration frame (1 head frame worth) at the head of the transmission/reception data to just before the sum check code is designated.

  (Example) Arrangement of data for transmission/reception



- Calculating the sum check code
  This is the value obtained by adding the data in the above range as binary data.
  (In case of example) (H)(L)
  41H + 31H + ABH + 12H + 03H = 0132H

- The details (arrangement) when transmitting/receiving the corresponding sum check code if a registration code FFH, EEH to F3H is contained in the user registration frame, is shown with the statements used in the example.

Registration code	Contents during transmission/reception (arrangement)
FFH, EEH	Transmission/reception of 01H, 32H from 32H
FFH, F0H	Transmission/reception of 32H
FFH, F1H	Transmission/reception of "3", "2" from "3"
FFH, F3H	Transmission/reception of "2"

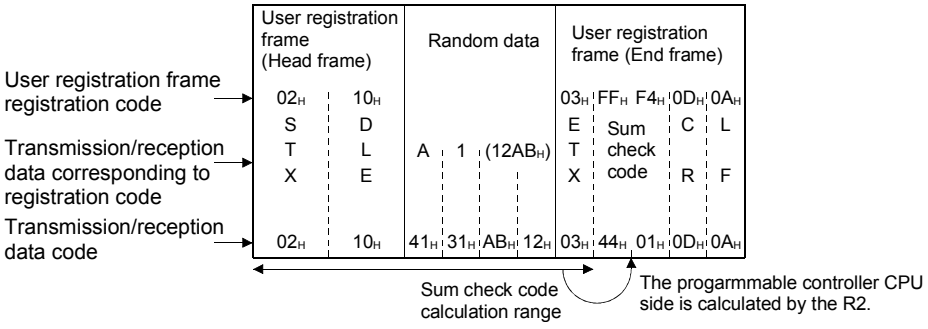
2) Transmission/reception data corresponding to F4H to F9H

The user registration frame section corresponding to the special character codes F4H to F9H transmits/receives the sum check code calculated using the range including the user registration frame (head frame) of the transmission/reception data (statement) as binary data/ASCII data.

- Calculation range

  The calculation target is the range from the user registration frame at the head of the transmission/reception data to just before the sum check code is designated.

  (Example) Arrangement of data for transmission/reception



- Calculating the sum check code

  This is the value obtained by adding the data in the above range as binary data.

  (The calculation method is the same as (a).)

  (In case of example) (H)(L)

  $02_H + 10_H + 41_H + 31_H + AB_H + 12_H + 03_H = 0144_H$

- The details (arrangement) when transmitting/receiving the corresponding sum check code if a special character code F4H to F9H is contained in the user registration frame, is shown with the statements used in the example.

Special character code	Contents during transmission/reception (arrangement)
F4H	Transmission/reception of 01H, 44H from 44H
F6H	Transmission/reception of 44H
F7H	Transmission/reception of "4", "4" from "4"
F9H	Transmission/reception of "4"

3) Transmission/reception data corresponding to FAH

The user registration frame section corresponding to the special character code FAH converts the sum check code calculated using the range including the user registration frame (head frame) of the transmission/reception data (statement) into a complement of 2. The low-order 1 byte of the converted value is expressed as ASCII data and then transmitted/received.

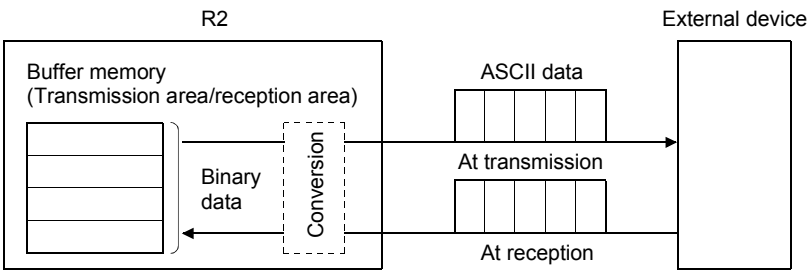
- Calculation range (Refer to 2).)
- Calculating the sum check code
  This is the value obtained adding the data in the above range as binary data and converting it into a complement of 2.
  (In case of example 2)) (H)(L)
  $02_H + 10_H + 41_H + 31_H + AB_H + 12_H + 03_H = 0144_H$

		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Addition value	0144_H	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0
Reversal (Complement of 1)	$FEBB_H$	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1
+1 (Complement of 2)	$FEBC_H$	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0

The low-order 1 byte section ("B""C") of the complement of 2 ($FEBC_H$) for 0144_H is transmitted/received from "B".

POINT

- When receiving a registration frame containing a sum check code, if the values of the received sum checks do not match, a "sum check error ($BB28_H$)" will occur.
- When transmitting a registration frame containing a special character for sum check codes, it can be used only for the end frame transmitted with the transmission frame 1 area. The frame cannot be used for the end frame of transmission with the transmission frame 2 area.
- Designation of only a special character for the sum check code in the user registration frame is not possible.
- When transmitting/receiving sum check codes, set the RS-232-C data bit length to 8 bits.
- Multiple sum checks cannot be used in one user registration frame.
- If ASCII/binary conversion is designated, when transmitting, the data will be converted into ASCII data and then the sum check will be calculated with the transmission data. When receiving, the sum check will be calculated with the reception data before binary data conversion.

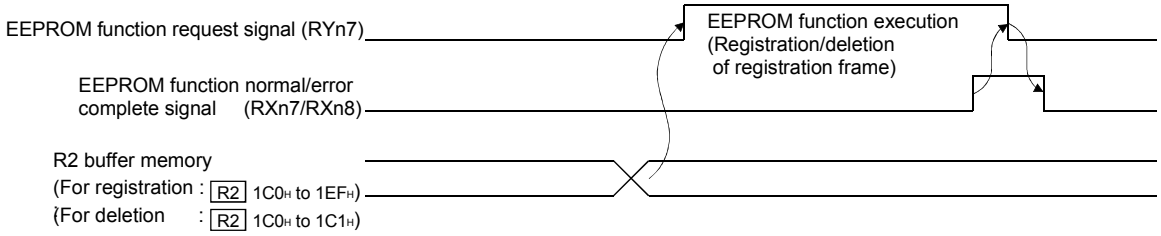


(3) Registering, reading and deleting user registration frames

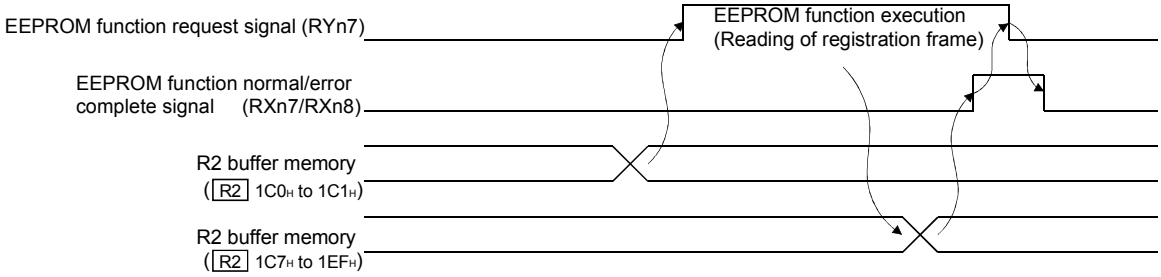
Before registering, reading or deleting a user registration frame, the EEPROM function must be designated, the registration frame must be designated, and the EEPROM function request signal (RYn7) must be turned ON in the R2 buffer memory as shown below.

The items to be set for the R2 buffer memory for registering, reading or deleting a user registration frame are shown below.

- Input/output signals for registering or deleting a user registration frame

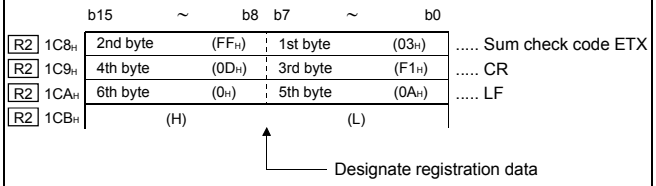


- Input/output signals for reading a user registration frame



R2 buffer memory address	Setting item	Details	Process		
			Register	Read	Delete
R2 1C0H	EEPROM function designation	Designate the EEPROM function. When using the registration frame function, designate whether to register, read or delete a registration frame. 0 : Buffer memory setting value registration 1 : User registration frame registration 2 : User registration frame read 3 : User registration frame deletion 4 : Buffer memory setting value initialization	○	○	○
R2 1C1H	User-registered frame No. designation	Designate the user registration frame registration No. when registering, reading or deleting a frame to the EEPROM. When registering the user registration frame, if a No. of a user registration frame already registered, the details registered in the EEPROM can be changed. Setting value : 3E8H to 4AFH (1000 to 1199)	○	○	○
R2 1C7H	User-registered frame byte designation	Designate the total No. of bytes of the registration frame to be registered/read to the EEPROM. Setting value : 1 to 80	○	●	×

○ : Setting possible, × : Setting not possible, ● : Stored

R2 buffer memory address	Setting item	Details	Process		
			Register	Read	Delete
R2 1C8H to 1EFH	User-registered frame	When registering a frame, designate the data to be registered in order of (L) and (H) from the head area of the user registration frame area. When reading a frame, the registered data will be stored with the same details and arrangement as registration. (Example) Details designated in user registration frame area for registering the user registration frame into the EEPROM to transmit the ETX, sum check code, CR and LF (registration code: 03H, FFH, F1H, 0DH, 0AH).  * In the above diagram, 5 is designated for the registration frame byte size designation (R2 1C7H).	○	●	×

○ : Setting possible, × : Setting not possible, ● : Stored

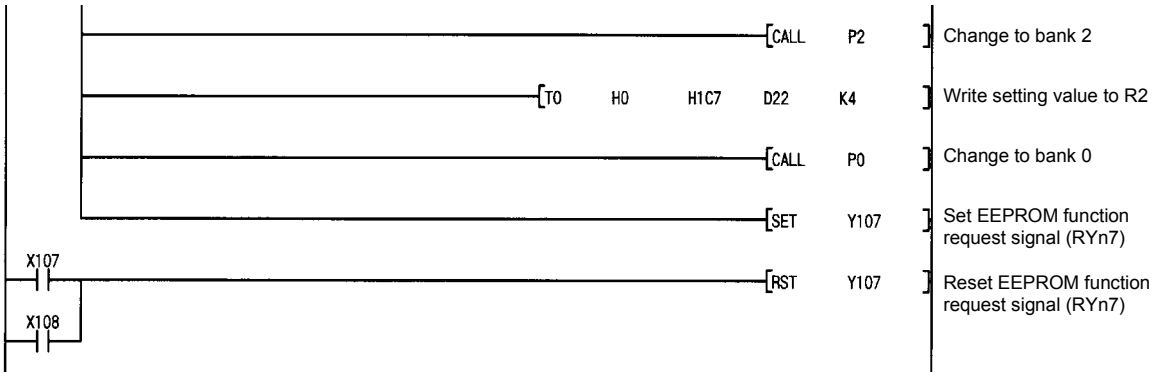
(4) Example of program for registering user registration frame

An example of a program for registering the user registration frame is shown below.

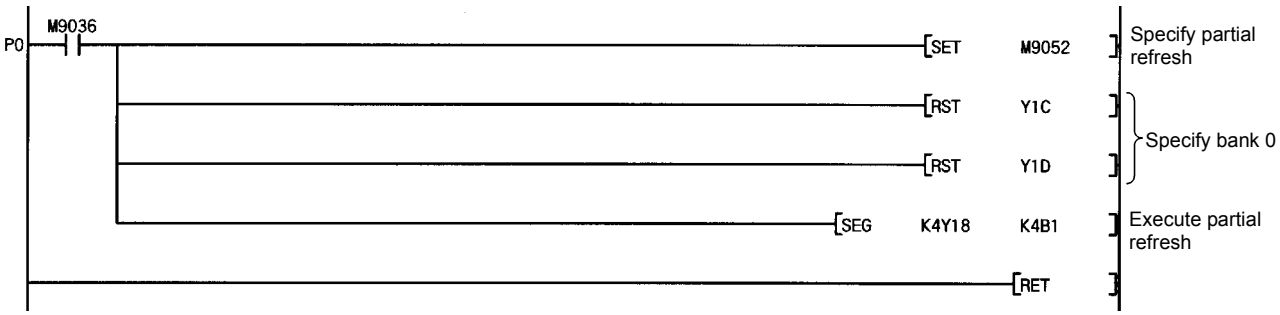
The following gives a program example for registering the user registration frame. This example assumes that the buffer memory automatic update function is used.

Refer to Section 5.1 for program conditions.

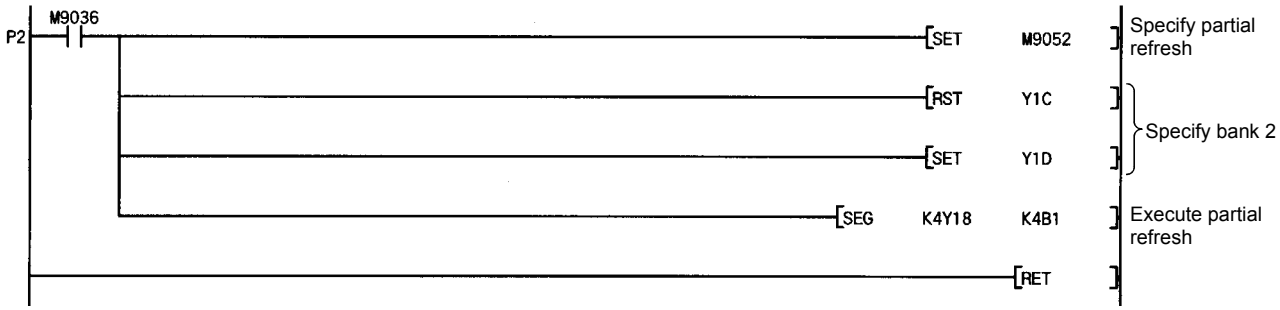
(a) When using the FROM/TO command with the ACPU/QCPU-A (A mode)



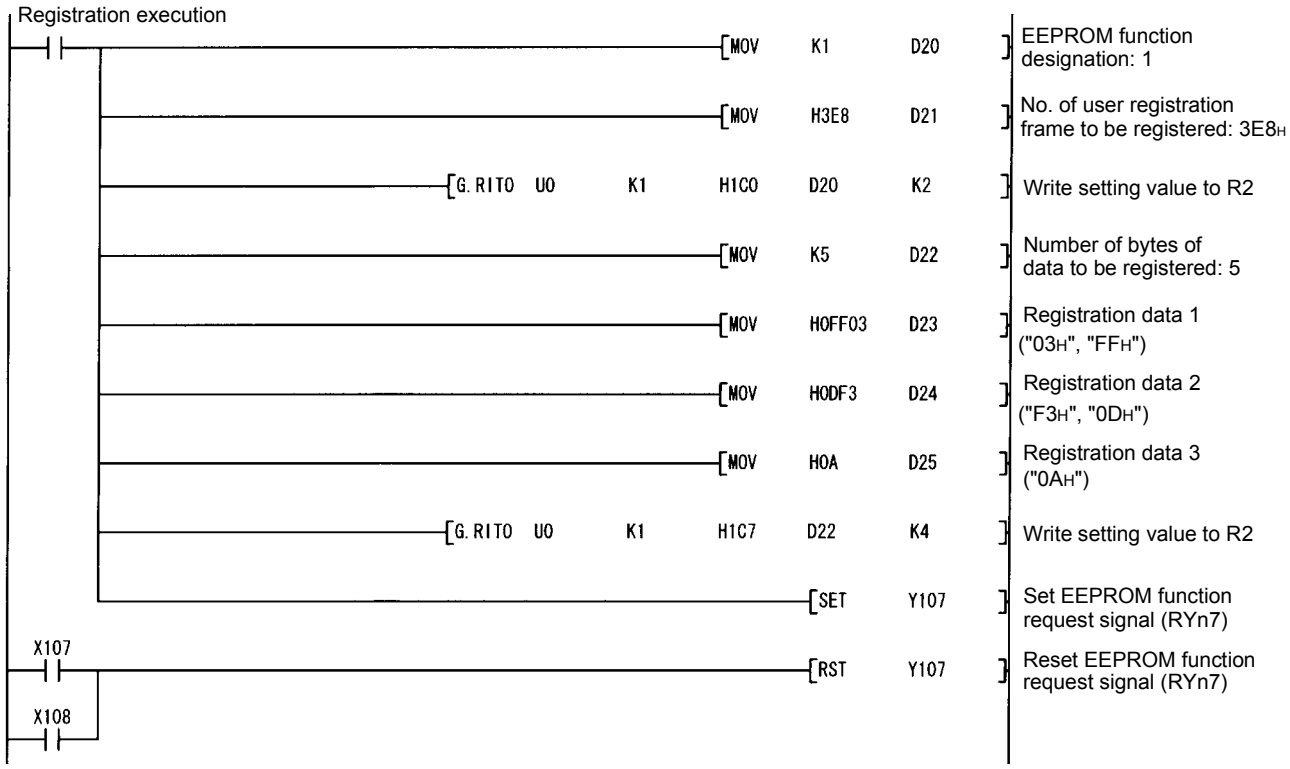
1) Program for changing to bank 0



2) Program for changing to bank 2



(b) When using the dedicated command with the QCPU (Q mode) / QnACPU



MEMO

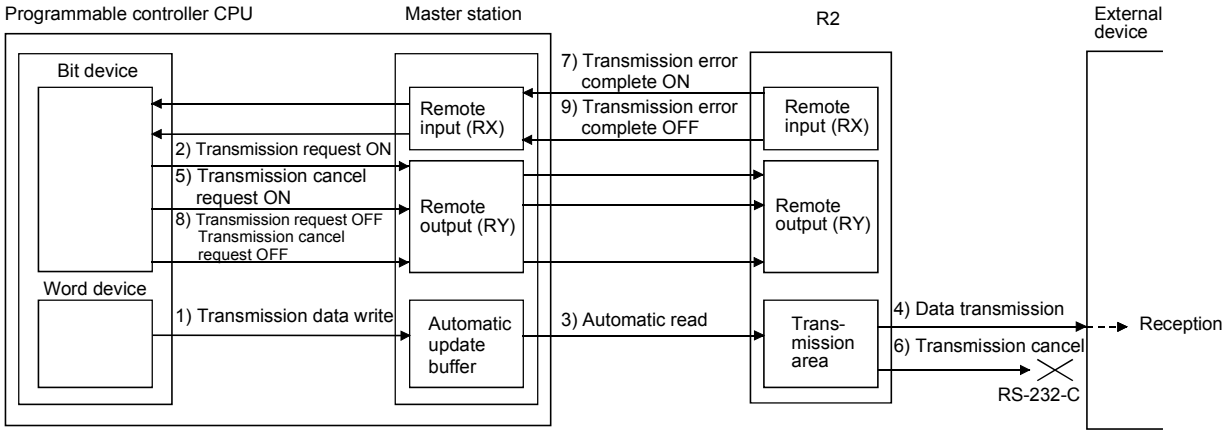
8. OTHER FUNCTIONS

R2 and functions (special functions) other than data communication with an external device are explained in this section.

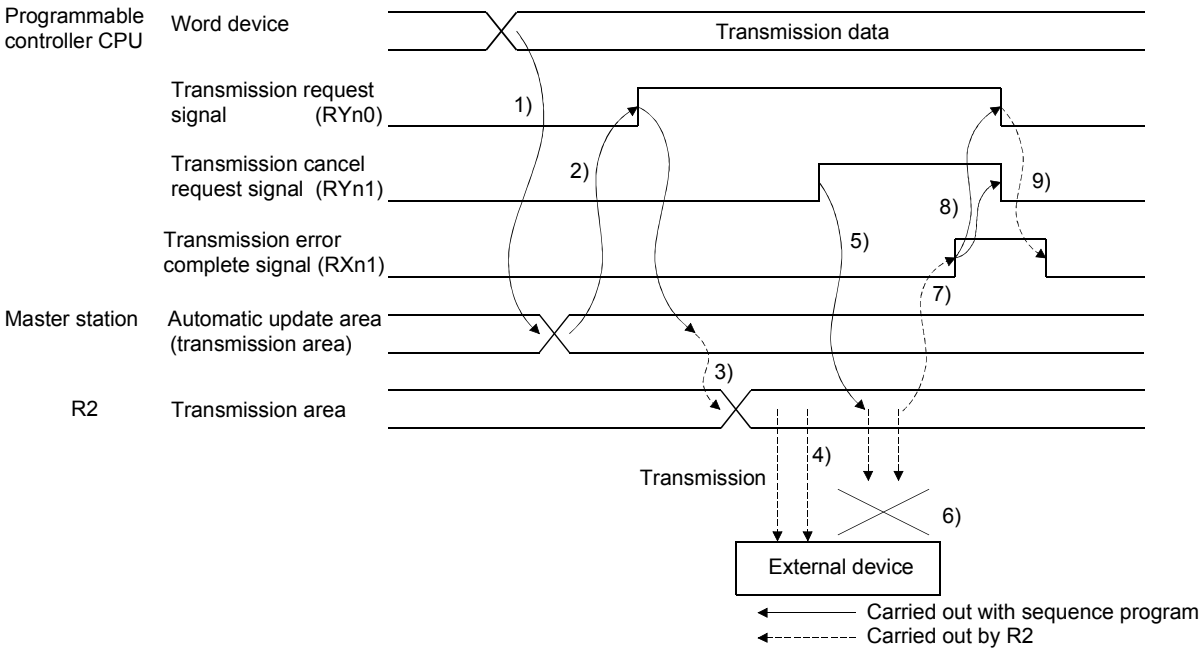
8.1 Canceling data communication to an external device

After the transmission request signal (RYn0) has been turned ON, if the transmission cancel request signal (RYn1) is turned ON before the transmission normal/error complete signal (RXn0/RXn1) turns ON, the transmission to the external device will be canceled.
When this function is executed, the transmission error complete signal (RXn1) will turn ON.
The outline of this function is explained using the buffer memory automatic update function.

(1) Flow of process



(2) Timing chart



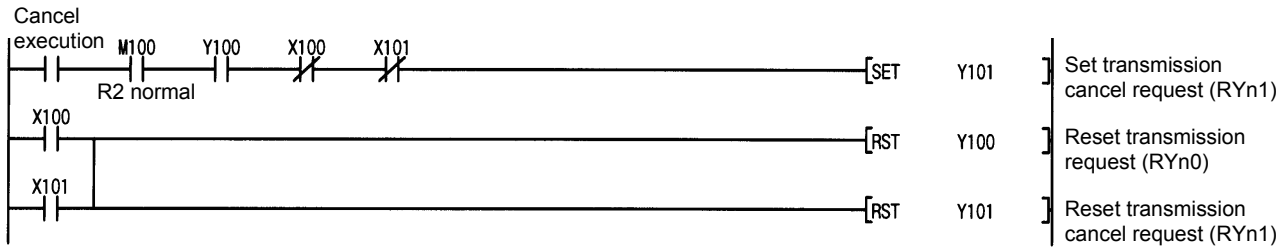
No.	Details	Control side
1)	The transmission data is written to the automatic update buffer (transmission area).	Program
2)	The transmission request signal (RYn0) turns ON.	Program
3)	The transmission data in the master station buffer memory is read out, and stored in the transmission area.	R2
4)	The transmission data is transmitted to the external device.	R2
5)	The transmission cancel request signal (RYn1) turns ON.	Program
6)	Transmission to the external device is canceled.	R2
7)	When the transmission is canceled, R2 turns the transmission error complete signal (RXn1) ON.	R2
8)	The transmission request signal (RYn0) and transmission cancel request signal (RYn1) turn OFF.	Program
9)	The transmission error complete signal (RXn1) turns OFF.	R2

POINT

- Transmission using the monitor transmission function cannot be canceled with the transmission cancel function.
- To resend data that has been canceled with the transmission cancel function, carry out the transmission process again.
  The data will be transmitted from the head.

(3) Program

The program for canceling the data transmission is shown below.
Refer to section 5.1 for details on the program conditions.



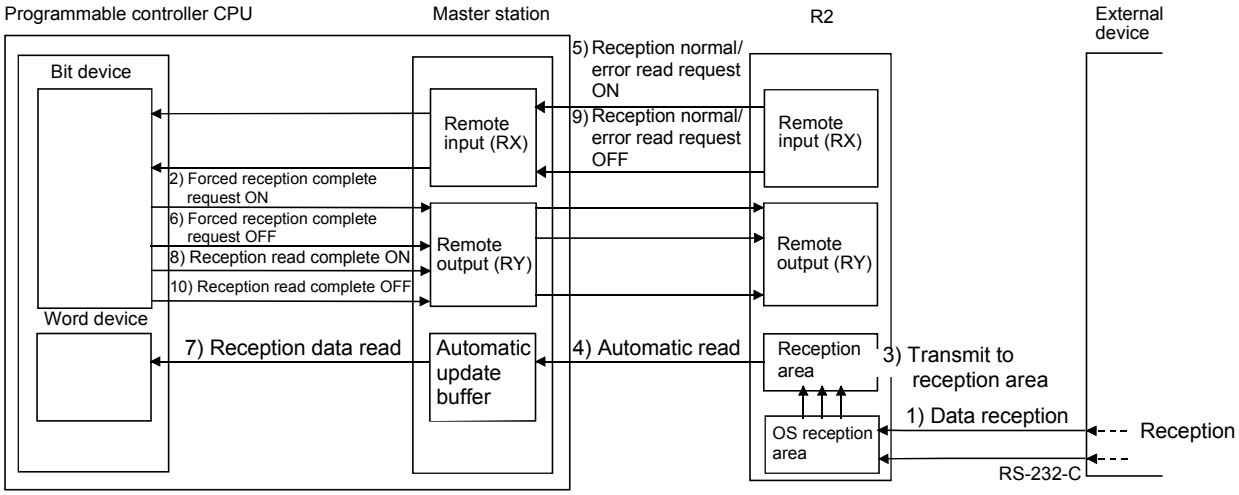
POINT

- Configure the following interlock circuit to prevent the transmission cancel request signal from being accepted during processes other than the transmission request.

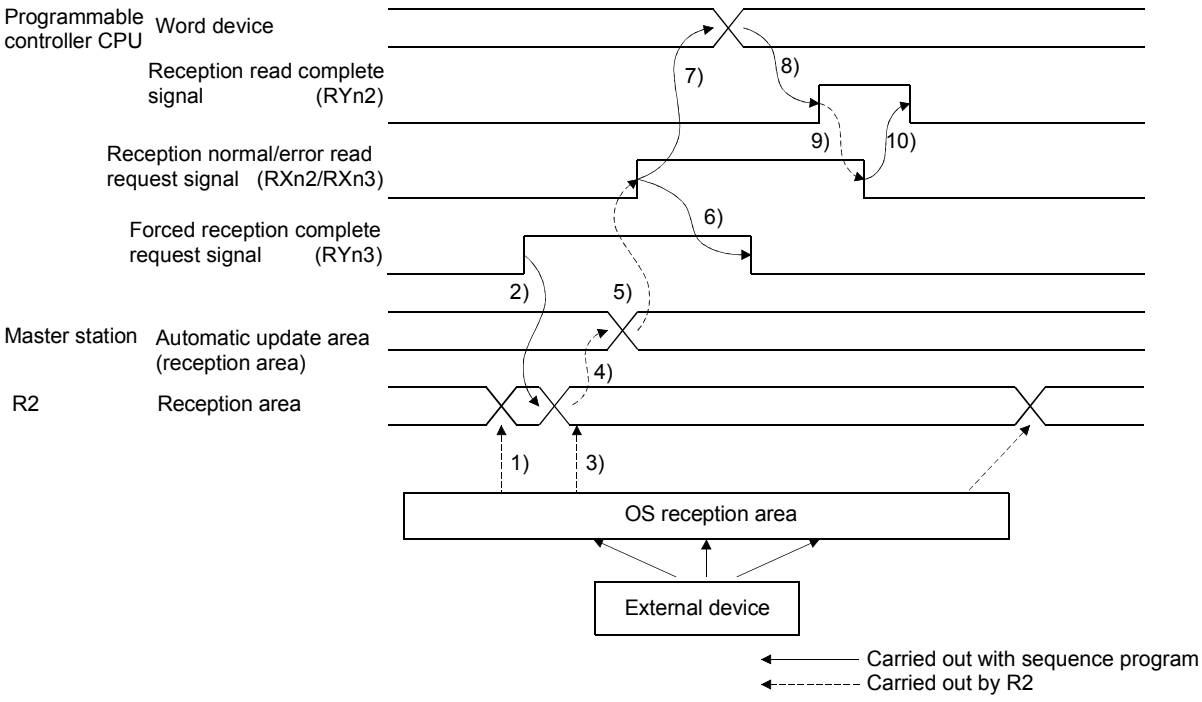
8.2 Forcibly completing reception

This function is used to forcibly complete the reception when the reception read request signal is not ON, and to read the currently received data.
With this function, if the reception data size data is not received even after a set time, the reception is forcibly completed when data, for which the head frame/end frame cannot be pinpointed, is received.
The outline of this function is explained using the buffer memory automatic update function.

(1) Flow of process



(2) Timing chart



No.	Details	Control side
1)	The data received from the external device is stored in the reception area via the OS reception area.	R2
2)	The forced reception complete request signal (RYn3) turns ON.	Program
3)	The data stored in the OS reception area is stored in the reception area.	R2
4)	The data stored in the reception area is transmitted to the master station automatic update area.	R2
5)	The reception normal/error read request signal (RXn2/RXn3) turns ON.	R2
6)	The forced reception complete request signal (RYn3) turns OFF.	Program
7)	The data stored in the master station buffer memory is read out.	Program
8)	The reception read complete signal (RYn2) turns ON.	Program
9)	The reception normal/error read request signal (RXn2/RXn3) turns OFF.	R2
10)	The reception read complete signal (RYn2) turns OFF.	Program

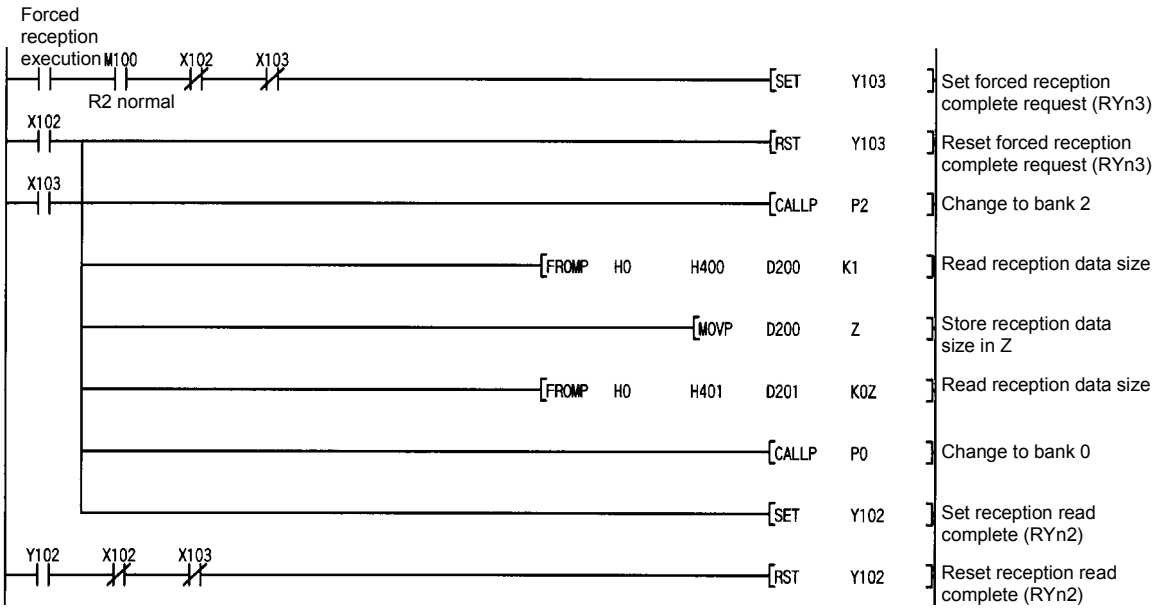
POINT

- The forced reception complete is valid only when not even one reception head frame No. is designated.
  If the reception head frame No. is designated, the forced reception complete request signal will be ignored.
- During forced reception complete, when transmitting the reception data stored in the OS reception area to the reception area, if the data in the OS reception area exceeds the reception area size, only the reception data that fits in the reception area will be stored before completing the reception.

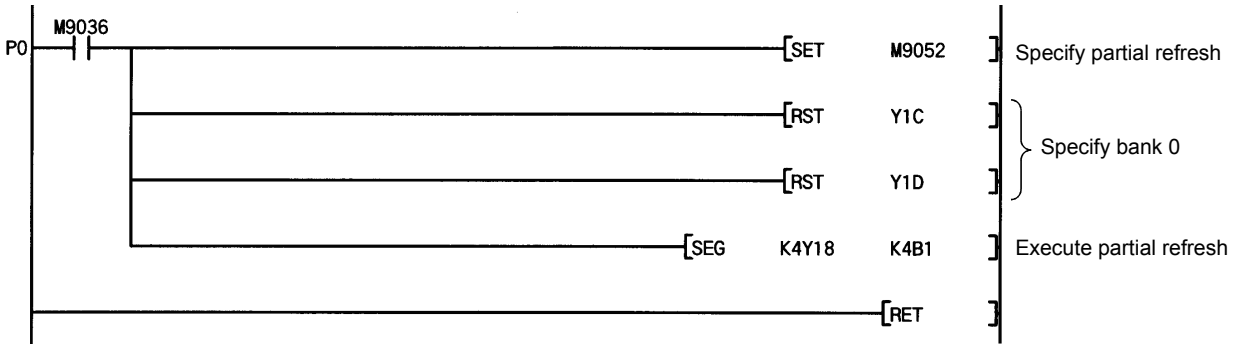
(3) Program

The following shows the program that completes reception forcibly.
The following program assumes that the buffer memory automatic update function is used.
Refer to Section 5.1 for program conditions.

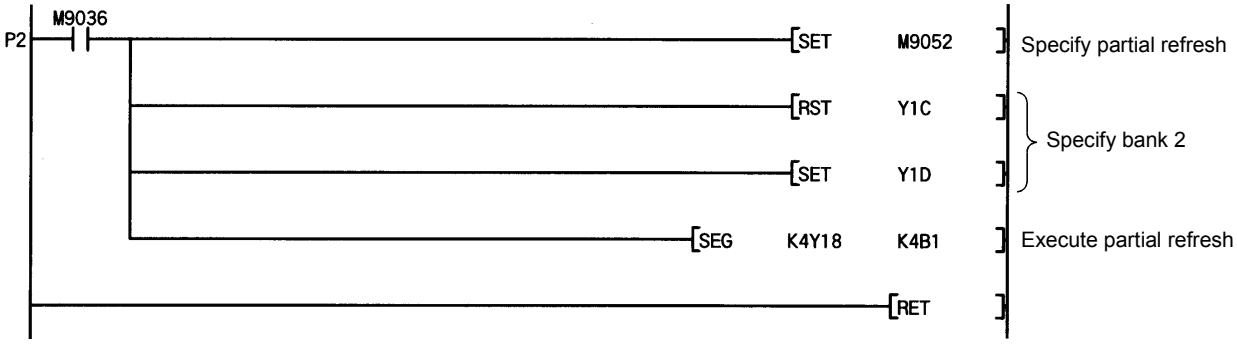
(a) When using the FROM/TO command with the ACPU/QCPU-A (A mode)



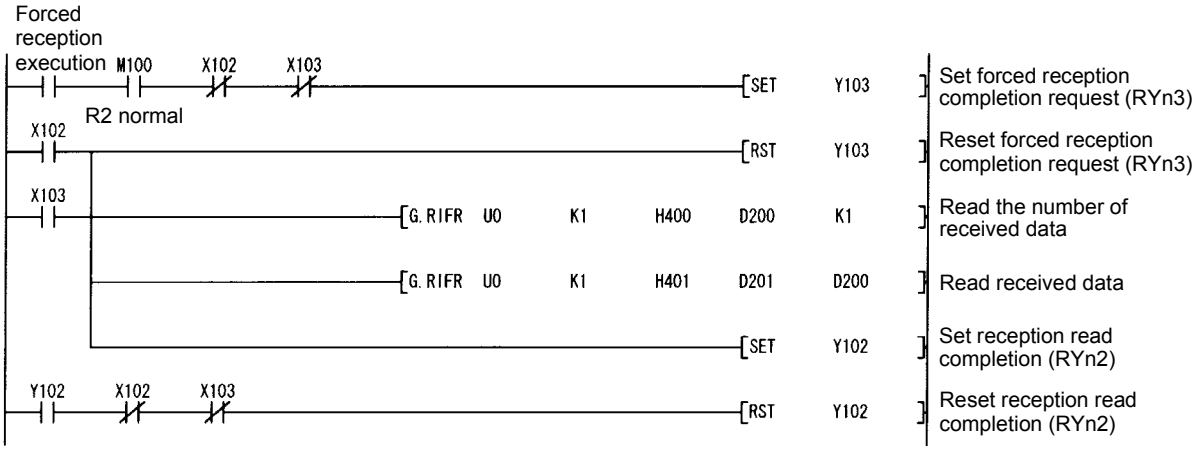
1) Program for changing to bank 0



2) Program for changing to bank 2

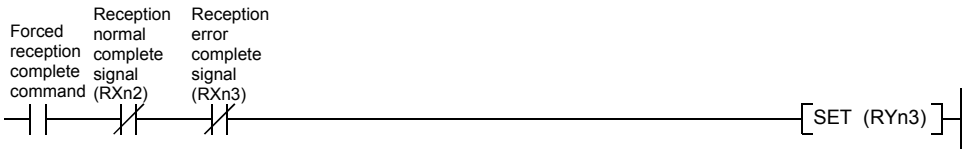


(b) When using the dedicated command with the QCPU (Q mode) / QnACPU



POINT

- Configure the following interlock circuit to prevent the forced reception complete request signal from being accepted during processes other than the reception read request.



8.3 Flow control

This function notifies the partner device whether the local station can receive data.

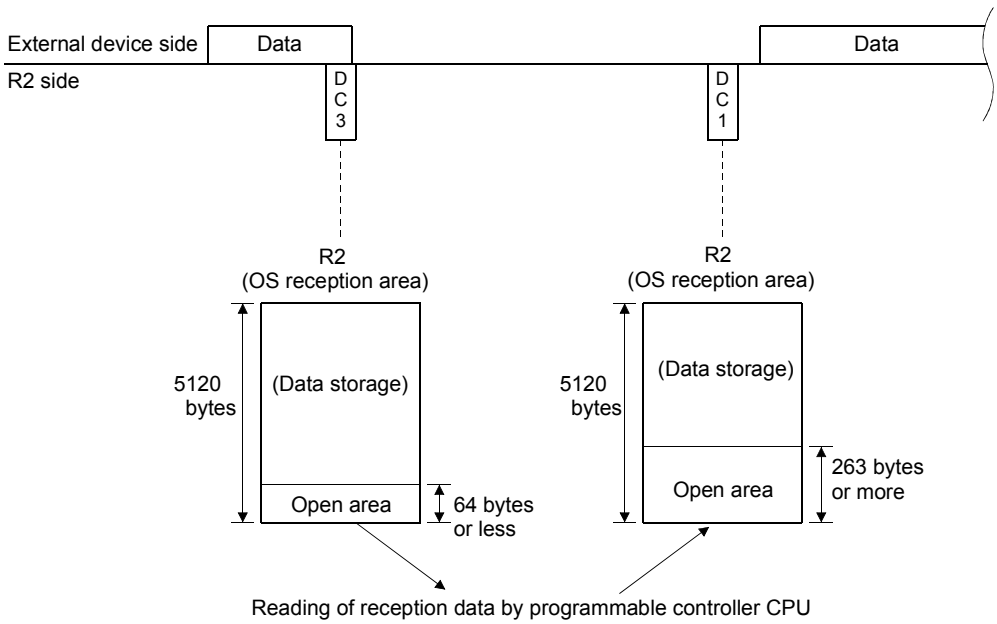
- When R2 is receiving data
  Whether to cancel/restart transmission to the R2 is notified to the external device according to the amount of space open in the R2 OS reception area.
- When R2 is transmitting data
  The transmission from the R2 is canceled/restarted according to the requests from the external device.
  The cancel/restart is notified with the DC code control or DTR (ER)/DSR (DR) signal control (hereinafter DTR/DSR signal control).

(1) DC code control

The R2 notifies the external device whether the local station can receive data by transmitting DC1, DC3. Whether the external device can receive data is confirmed by receiving DC1, DC3.

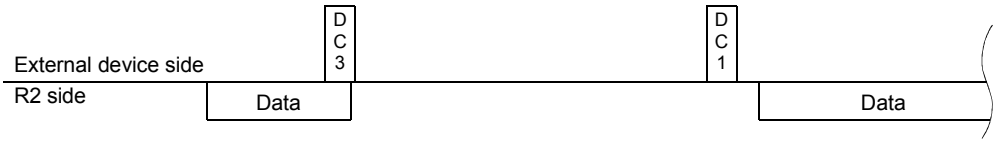
(a) DC1/DC3 transmission control

If the amount of space open in the OS reception area is less than 64 bytes, the R2 transmits DC3 to the external device, and the external device cancels the transmission to the R2.
When the reception data is read out from the programmable controller CPU and the amount of space open in the OS reception area reaches 263 bytes or more, DC1 is transmitted to the external device, and the transmission from the external device to R2 is restarted.



(b) DC1/DC3 reception control

When the R2 receives the DC3 code, the transmission to the external device is canceled. When the DC1 code is received, the transmission to the external device is restarted.



POINT

(1) When the power is turned ON or the system is initialized, the DC1 transmission state (reception enable) and DC1 reception state (transmission enable) are set.
Note that the R2 does not wait to transmit DC1 to the external device, or receive DC1 from the external device.

(2) When carrying out DC code control, the DC1/DC3 code received from the external device is not stored in the R2 reception area.

(3) The DC1 and DC3 codes are 11_H and 13_H.
The DC1 and DC3 codes cannot be changed.

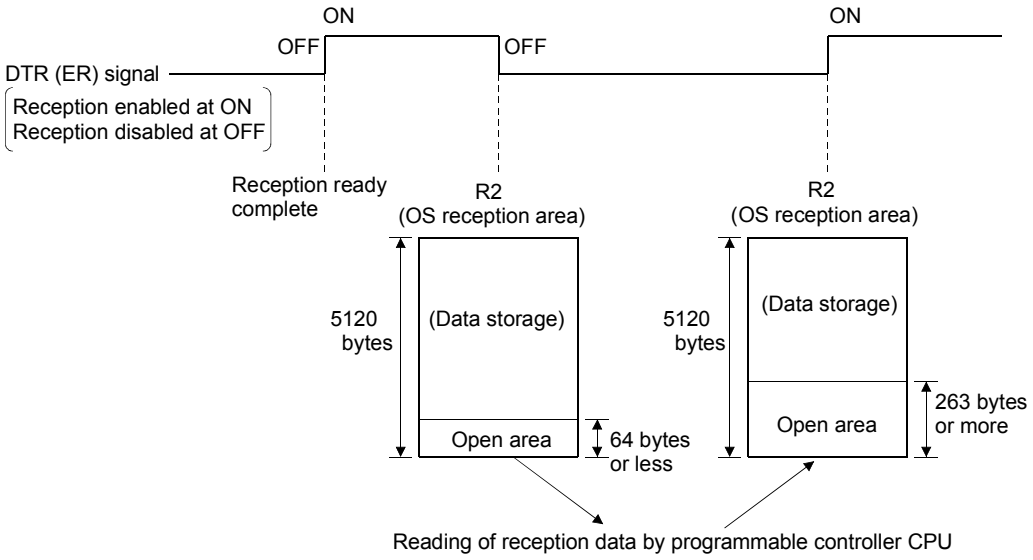
(4) When carrying out DC code control, if a DC code data (11_H, 13_H) used for the DC code control is contained in the transmission/reception data, use the ASCII-BIN conversion function.
If the ASCII-BIN conversion function is not used, DC code data used for the DC code control cannot be used.

(2) DTR/DSR signal control

The R2 notifies the external device whether the local station can receive data with the DTR(ER) signal. Whether the external device can receive data is confirmed with the DSR (DR) signal.

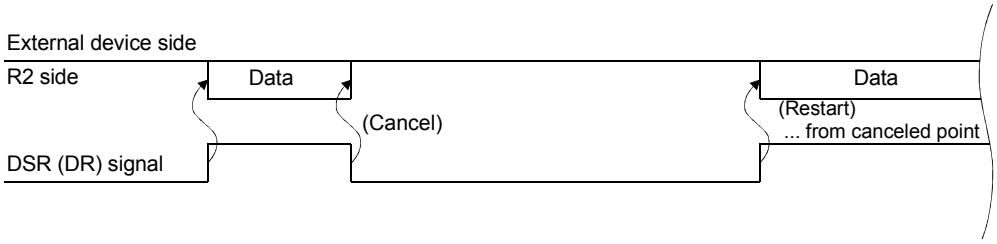
(a) DTR (ER) control

If the amount of space open in the OS reception area is less than 64 bytes, the R2 turns OFF the DTR (ER) signal, and the external device cancels the transmission to the R2.
When the reception data is read out from the programmable controller CPU and the amount of space open in the OS reception area reaches 263 bytes or more, the DTR (ER) signal is turned ON, and the transmission from the external device to R2 is restarted.



(b) DSR (DR) control

When the DSR (DR) signal is ON, if there is data to be transmitted, the R2 transmits it to the external device. If the DSR (DR) signal is OFF and there is data to be transmitted, it is not transmitted to the external device.



(3) Setting the buffer memory

When carrying out flow control, designate flow control in the R2 buffer memory shown below.

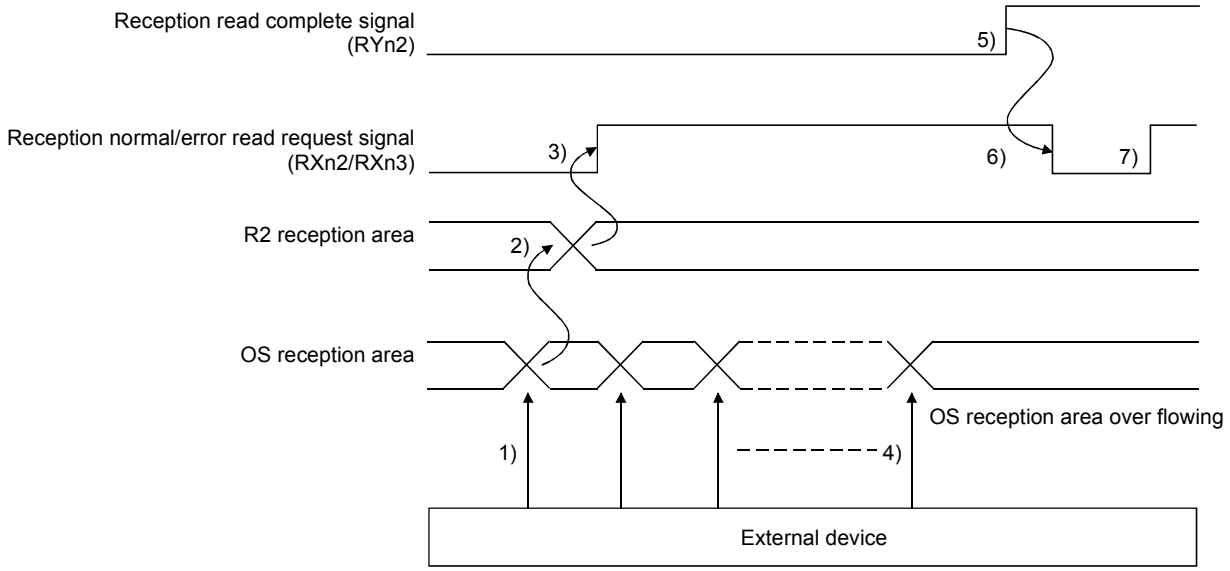
R2 buffer memory address	Name	Details
R2 100H	Flow control designation	Designate whether to carry out flow control with DTR/DSR control or DC code control when exchanging data between the R2 and external device. 0 : Do not carry out flow control. 1 : Carry out flow control with DTR/DSR control. (Default value) 2 : Carry out flow control with DC code control.

POINT

- If the buffer memory is set to "Carry out flow control with DTR/DSR signal control", the RYnA DTR (ER) signal setting will be invalid.
- When the above buffer memory setting values have been changed, initialize the R2 with the process given in section 8.6.

REMARK

In the case the OS reception area over flows (e.g. when the reception data is not read) when the flow control is not performed, the reception error read request (RXn3) turns ON (7)) immediately after the reception normal (error) read request (RXn2, RXn3) that has been ON is turned OFF (6)), and the error code is stored. In that case, data in the OS reception area are not transferred to the buffer memory. When any over flow occurs, turn ON the reception read complete (RYn2) again and clear the OS reception area.



No.	Details
1)	Data are transferred from the external device to OS reception area.
2)	Data in the OS reception area are transferred to R2 reception area.
3)	After storing data to reception area, the reception normal/error read request signal (RXn2/RXn3) turns ON.
4)	The OS reception area overflows since data is sent continuously from the external device without being read out from the reception area.
5)	Turn ON the reception read complete signal (RYn2) after reception data are read.
6)	The reception normal/error read request signal (RXn2/RXn3) turns OFF with the reception read complete signal (RYn2) ON.
7)	The reception error read request signal (RXn3) turns ON since the OS reception area has over flown.

8.4 ASCII-BIN conversion of transmission data

When exchanging data between the R2 and external device, the data is transmitted and received as ASCII code data, so ASCII-BIN conversion can be carried out.
Set according to the specifications of the external device.
The R2 converts the data as follows with ASCII-BIN conversion.

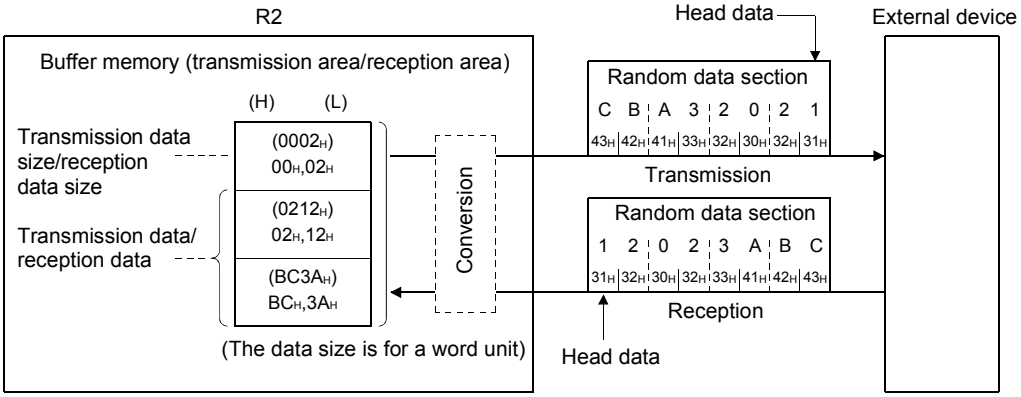
- When transmitting..... The transmission area data is interpreted as binary data, and is converted into ASCII data before transmission.
- When receiving..... The reception data is interpreted as ASCII data, and is converted into binary data before storage in the reception area.

(1) Transmission order during ASCII-BIN conversion transmission

During ASCII-BIN conversion transmission, the data is transmitted from the low-order byte, and when converted into ASCII code data, it is transmitted from the high-order byte.

(2) Reception order during ASCII-BIN conversion transmission

During ASCII-BIN conversion reception, the reception data is stored from the low-order byte. The odd character of the reception data is stored as the upper digit of the 1-byte data after conversion, and is converted into binary code data before storage in the reception area.



(3) Precautions for using ASCII-BIN conversion transmission/reception function

(a) The data codes 30H to 39H ("0" to "9") and 41H to 46H ("A" to "F") data is handled as the transmission/reception data in the conversion target range.

(b) If ASCII-BIN conversion is designated for frame transmission or monitor transmission, only the transmission data section (contents of transmission area) is converted into ASCII data.
The registration frame (head frame/end frame when transmitting with transmission frame 1 area) is not converted into ASCII data.

(c) If ASCII-BIN conversion is designated for the frame reception, only the reception data section (contents stored in the reception area) is converted into binary data.
The reception head frame/end frame are compared with the reception data as the registered data.

(d) If ASCII-BIN conversion is designated for the non-procedural transmission or monitor transmission function, and the size of the binary data before conversion exceeds 4096 bytes, the "transmission data size error (BB93H)" will occur.

(e) If ASCII-BIN conversion is designated for frame transmission/reception function, and the byte size of the data including the transmission/reception data after ASCII-BIN conversion, the head frame and end frame exceeds 4096 bytes, the following errors will occur.
- When transmitting: Transmission data size error (BB93H)
- When receiving: Reception data size over error (BBA2H)

(4) Setting the buffer memory

When carrying out ASCII-BIN conversion, designate the R2 buffer memory shown below.

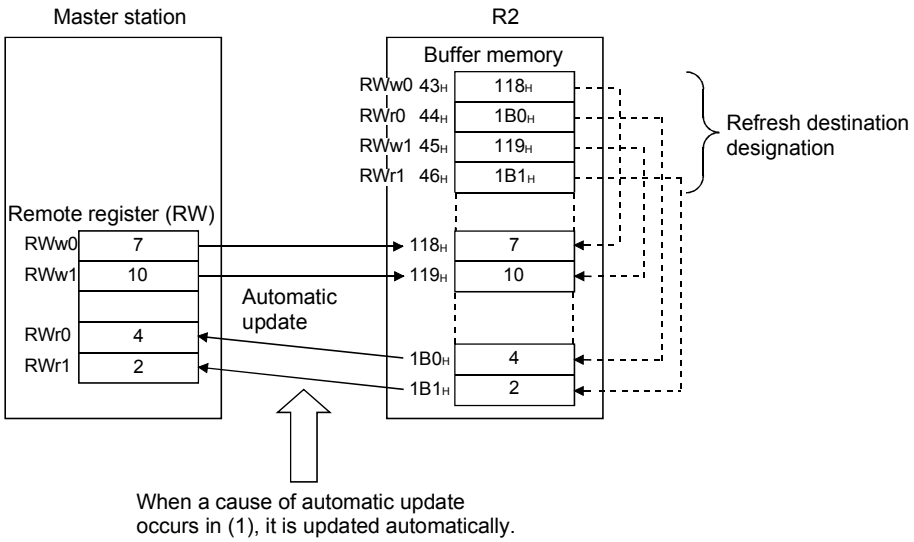
R2 buffer memory address	Name	Details
R2 103H	ASCII-BIN conversion designation	Designate whether to carry out ASCII-BIN conversion to transmit/receive data as ASCII codes when exchanging data with the external device. 0 : Do not carry out ASCII-BIN conversion. (Default value) 1 : Carry out ASCII-BIN conversion.

POINT

When the above buffer memory setting values have been changed, initialize the R2 with the process given in section 8.6.

8.5 RW update function

The RW update function assigns part of the R2 buffer memory to the remote registers (RW).
By using this function to assign the R2 buffer memory that constantly changes to the RWr, the changes can be detected at a high speed on the master station side.
If assigned to RWw, part of the R2 buffer memory contents can be changed easily.
If a cause of data communication occurs between the area designated in the R2 buffer memory's RW refresh destination address designation area (R2 43_H to $4A_H$) and the master module's remote register (RW), the R2 buffer memory data will be updated automatically.



When the RW update function is used, the data will be written as follows.

- Master station (RWw) → R2
  The data written from the programmable controller CPU to the master station's remote register (RWw) is automatically written into the R2 target buffer memory when the cause of an automatic update occurs.

- R2 → master station (RWr)
  The data in the R2 target buffer memory is automatically written into the corresponding remote register (RWr) of the master station when a cause of automatic update occurs, and can be read to the programmable controller CPU.

(1) Update timing for RW update function

The update of the data in the master module remote register (RW) and R2 buffer memory is carried out at the following timing by the RW update function.

(a) Update interval set in the RW update interval time designation (R2 40H)

(b) All timings at which following areas shown in section 5.6.2 communicate
1) Status storage area
2) Transmission area
3) Reception area
4) Initialization area
5) EEPROM function area
6) User registration frame area
7) Monitor transmission area

POINT

When using the RW update function and buffer memory automatic update function simultaneously, make sure that the update areas do not overlap.

(2) Setting the buffer memory

When carrying out RW update, designate in the R2 buffer memory shown below.

R2 buffer memory address	Name	Details
R2 40H	RW update interval time designation	Designate the data update interval time between the master station's remote register (RW) and R2 buffer memory. (Unit: 100ms) 0 : Do not update RW. 1 to 32767 : Update RW.
R2 41H	RWw update validity designation	Designate the validity of the RWw update. 0 : Update invalid (default value) 1 : Update valid
R2 42H	RWr update validity designation	Designate the validity of the RWr update. 0 : Update invalid 1 : Update valid (default value)
R2 43H to 4AH	RW refresh destination address designation area	Designate the R2 buffer memory address corresponding to the master station side remote register (RW). 1) RWw (remote register write area: R2 43H, 45H, 47H, 49H) 2) RWr (remote register read area: R2 44H, 46H, 48H, 4AH)

As the default value, the following buffer memory is set in the RW refresh destination address designation area of the buffer memory for the RW update function.
Designate the address of the R2 buffer memory to be assigned to the remote register (RW) as necessary.

	R2 buffer memory address	Remote register	Default value	R2 buffer memory indicated with default value
Master station → R2	R2 43H	RWw0	118H	Transmission head frame No.
	R2 45H	RWw1	119H	Transmission end frame No.
	R2 47H	RWw2	120H	Transmission table head No. designation
	R2 49H	RWw3	121H	Transmission table size
R2 → Master station	R2 44H	RWr0	1B0H	General error code
	R2 46H	RWr1	1B1H	Transmission error code
	R2 48H	RWr2	1B2H	Reception error code
	R2 4AH	RWr3	1B6H	Data size storage in OS reception area

POINT

- The R2 41H to 42H default values are valid only for the remote register (RWr) assignment. (The remote register (RWw) assignment is invalid.)
  To validate the remote register (RWw) assignment, change the default value for the buffer memory RWw update validity designation (R2 41H).
- When the setting values of the R2 40H to 4AH have been changed, always initialize the R2 with the process given in section 8.6.

8.6 Initializing the R2

The R2 must be initialized when the contents of the R2 buffer memory (R2 0H to 112H) have been changed.
R2 initialization refers to canceling the processes currently being carried out, and resetting the R2 to the startup state.
The R2 initialization is carried out with the sequence program.

(R2 initialization items)
During the R2 initialization, the following processes related to communication with the external device using the RS-232-C interface are carried out.

1) Canceling of transmission/reception process
2) Canceling of reception area clear process
3) Cancellation of transmission cancel process
4) Cancellation of forced reception complete process
5) Initialization of flow control process
6) Initialization of frame transmission/reception process
7) Initialization of control signal status
8) Initialization of OS reception area
9) Initialization of error causes, such as error LED OFF

* During initialization, the RX/RY/RW and buffer memory related to the R2 data link are not initialized.

(1) Flow of process

When setting the initialization data using the buffer memory automatic update function, refer to section 5.5.1 (2).
When using the transmission/reception buffer to set the initialization data, refer to section 5.5.2 (2).

(2) Timing chart

When setting the initialization data using the buffer memory automatic update function, refer to section 5.5.1 (3).
When using the transmission/reception buffer to set the initialization data, refer to section 5.5.2 (3).

(3) Program

When setting the initialization data using the buffer memory automatic update function, refer to section 5.5.1 (4).
When using the transmission/reception buffer to set the initialization data, refer to section 5.5.2 (4).

8.7 Clearing the OS reception area

This function is used to initialize the OS reception area in the R2.
When the OS reception area clear request signal (RYn6) is turned OFF by the sequence program, the R2 OS reception area will be initialized.

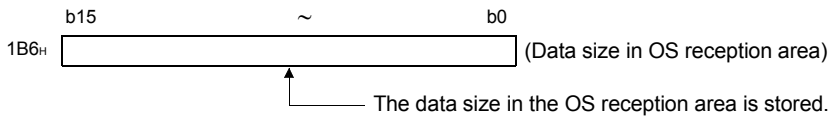
(1) OS reception area

(a) The OS reception area is the OS area used by the R2 to temporarily store the reception data.
  1) Data received before a request for reading out receive data to the programmable controller CPU is generated by the user-set "reception end data size" and "reception end frame".
  2) Data received from external device when programmable controller CPU request reading of reception data stored in buffer memory reception area.

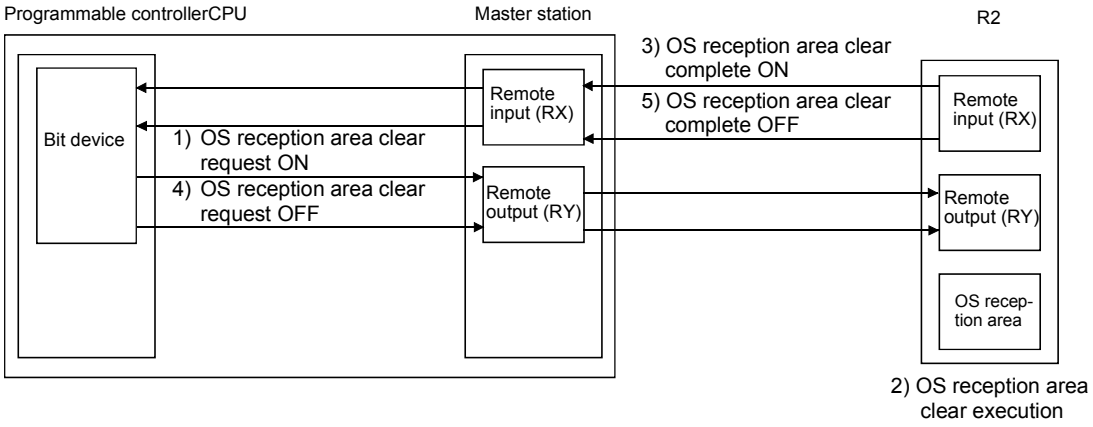
(b) The reception data stored in the OS reception area is stored (transmitted) to the buffer memory reception area by the R2 when one of the following causes occurs.
  1) When a request for reading out receive data to the programmable controller CPU is generated by the user-set "reception end data size" and "reception end frame".
  2) When reception is forcibly completed.

(c) The word/byte size of the reception data stored in the OS reception area can be confirmed with the following buffer memory.
Note that when using the buffer memory automatic update function, the buffer will be updated at the automatic update timing, so the accurate reception data size cannot be read at the reception completion timing.
To confirm the size of the reception data stored in the OS reception area, read the reception data size with the RW update function.
The contents of the OS reception area cannot be read directly from the programmable controller CPU.

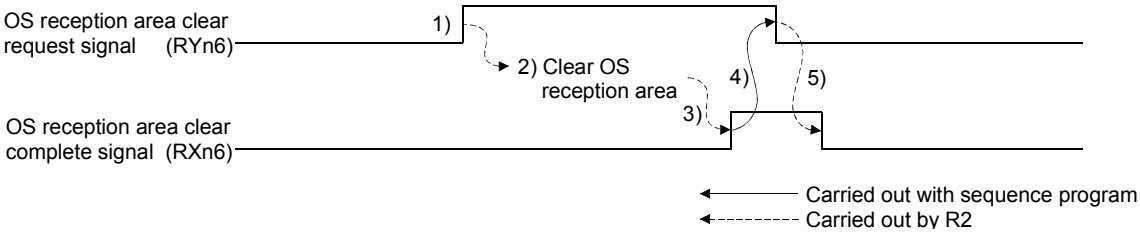
- Data size storage area in OS reception area (R2 1B6H)
  The word/byte size of the data stored in the OS reception area of the R2 (remaining reception data for which read request has not been made to programmable controller CPU) is stored.
  The data size unit follows the word/byte unit designation (R2 102H).
  The data size in the OS reception area is updated every 100ms.



(2) Flow of process



(3) Timing chart



No.	Details	Control side
1)	The OS reception area clear request signal (RYn6) turns ON.	Program
2)	Clearing of the OS reception area starts.	R2
3)	When clearing of the OS reception area is completed, the OS reception area clear complete signal (RXn6) turns ON.	R2
4)	The OS reception area clear request signal (RYn6) turns OFF.	Program
5)	The OS reception area clear complete signal (RXn6) turns OFF.	R2

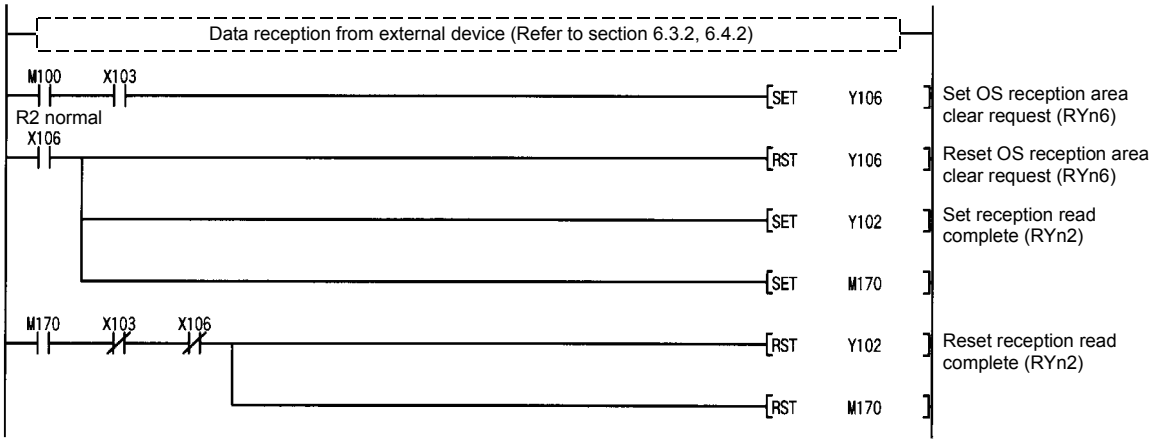
POINT

- Only the OS reception area is cleared with the OS reception area clear function.
  The R2 buffer memory reception area is not cleared.
- When using non-procedural reception or frame reception, if the OS reception area clear function is carried out, all of the reception data stored in the OS reception area will be cleared.

(4) Program

The program for clearing the OS reception area clear when the reception error read request turns ON is shown below.

Refer to section 5.1 for details on the program conditions.

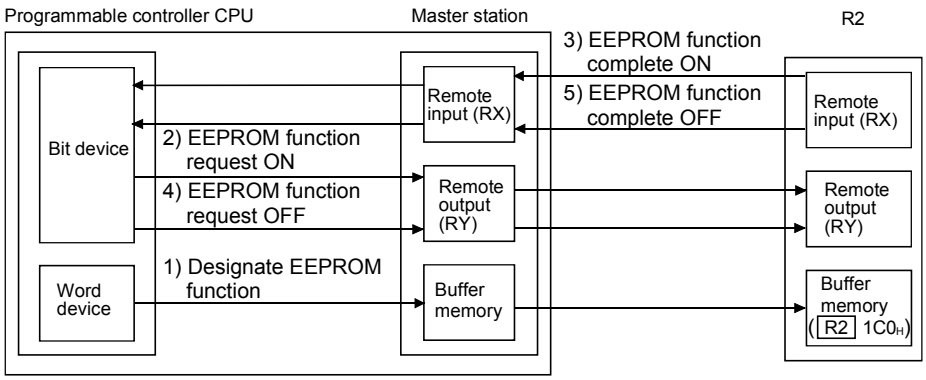


8.8 Registering and initializing the R2 EEPROM

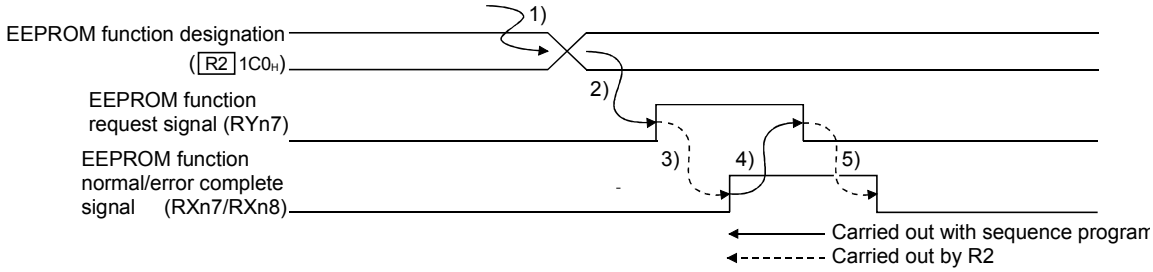
The R2 buffer memory setting values can be registered in the EEPROM, and the values registered in the EEPROM can be returned to the R2 default values.
The buffer memory setting values (including the values changed by the user) registered in the EEPROM are used as the default values when starting up the R2.
The R2 buffer memories that can be registered in the R2 EEPROM are shown in the "EEPROM registration" list in section 3.7.
After registering to the EEPROM, the sequence program for the section of the R2 buffer memory for which the default values have been changed is not required.

(1) Flow of process

To register or initialize the buffer memory setting values, designate whether to register or initialize the buffer memory setting values in the EEPROM function designation area (R2 $1C0_H$), and then turn ON the EEPROM function request signal (RYn7).



(2) Timing chart



No.	Details	Control side
1)	Designate the EEPROM function in the EEPROM function designation area (R2 1C0H). When registering the current buffer memory values as the default values, designate "0". To return the values to the default values, designate "4". When writing with the buffer memory automatic update function, refer to section 5.6. When writing with the transmission/reception buffer, refer to section 5.7.4.	Program
2)	The EEPROM function request signal (RYn7) turns ON.	Program
3)	After the EEPROM function execution is completed, the EEPROM function normal/error complete signal (RXn7/RXn8) turns ON.	R2
4)	The EEPROM function request signal (RYn7) turns OFF.	Program
5)	The EEPROM function normal/error complete signal (RXn7/RXn8) turns OFF.	R2

(3) Setting the buffer memory

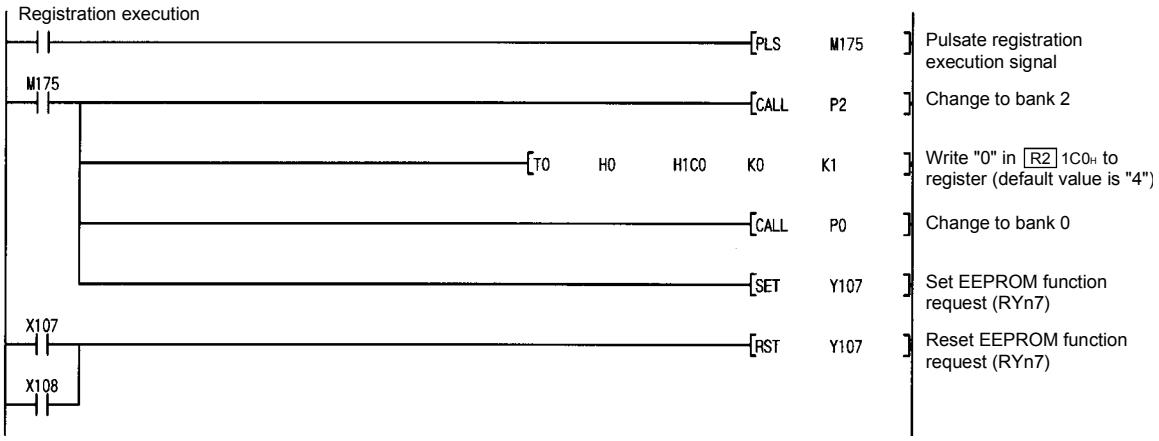
The buffer memory items to be set for registering/initializing the R2 EEPROM are shown below.

R2 buffer memory address	Name	Details
R2 1C0H	EEPROM function designation	Designate the EEPROM function. When using the buffer memory setting value registration function, designate whether to register or initialize the buffer memory setting values. 0 : Buffer memory setting value registration 4 : Buffer memory setting value initialization
R2 1A7H	Buffer memory default value setting status storage	The status of the buffer memory when the R2 is started up is stored. 0 : R2 default values (default value) 1 : Default values registered in EEPROM

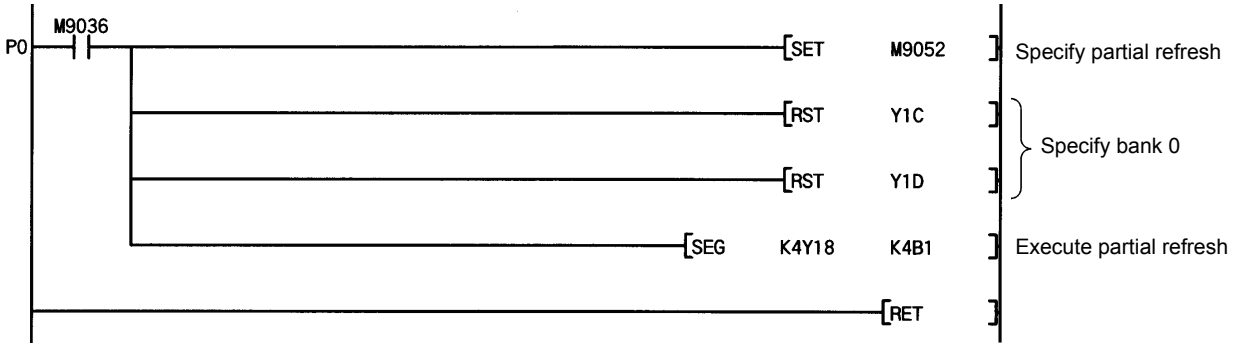
(4) Program

The following shows the program for registration to the E2PROM of the R2.
The following program assumes that the buffer memory automatic update function is used.
Refer to Section 5.1 for program conditions.

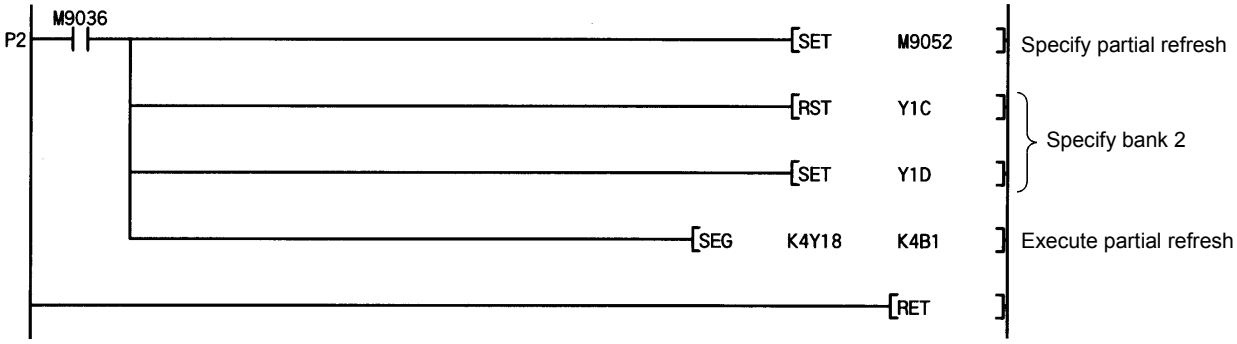
(a) When using the FROM/TO command with the ACPU / QCPU-A (A mode)



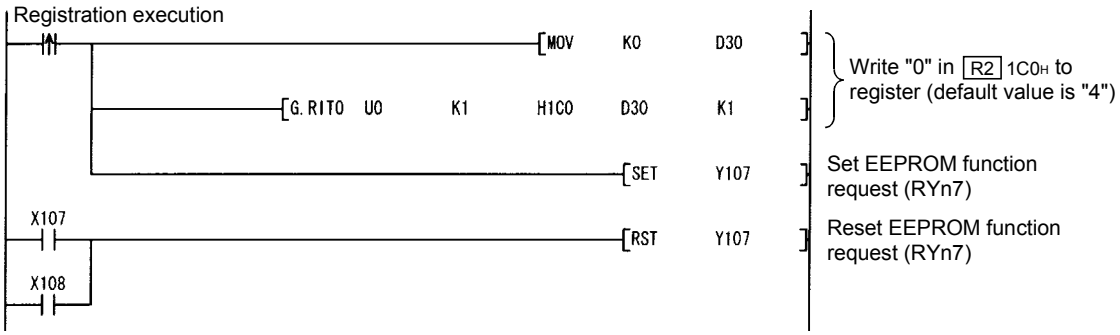
1) Program to change to bank 0



2) Program to change to bank 2



(b) When using the dedicated command with the QCPU (Q mode) / QnACPU



8.9 Controlling the RS-232-C signal

The status of the RS-232-C interface signals stored in the R2 buffer memory can be read and the output controlled.
This is carried out with the remote input/remote output (RX/RY).

8.9.1 Correspondence of RS-232-C control signal and remote input/output signal

The correspondence of the RS-232-C interface control signals and the remote input/output signals (RX/RY) is shown below.

Remote input/output signal		RS-232-C control signal	Details
Input signal	RXn9	CS (CTS) signal	The ON/OFF state of the input control signal is reflected on the corresponding remote input signal (RXn9 to RXnB).
	RXnA	DR (DSR) signal	
	RXnB	CD signal	
Output signal	RYn9	RS (RTS) signal	The ON/OFF state of the remote output signal is reflected on the corresponding control signal output.
	RYnA	ER (DTR) signal	

The area between the RS-232-C control signal and input/output signal (RX/RY) is updated every 100ms.
Refer to section 3.3 for details on each RS-232-C signal.

8.9.2 Precautions for using RS-232-C control signal read/write function

The precautions for reading the control signal status and controlling the output are given below.

(1) Controlling the RS (RTS) signal with RYn9

Designate the RS (RTS) signal status designation (R2 101H) to "1".
When "0" is designated for the RS (RTS) signal status designation (R2 101H), the RS (RTS) signal will constantly remain ON even if RYn9 is turned ON and OFF.
(Follows the buffer memory side settings.)

(2) Controlling the ER (DTR) signal with RYnA

Designate "0" or "2" for the flow control designation (R2 100H).
When "1" is designated, the RYnA ON/OFF will be ignored.

(3) Setting the buffer memory

When controlling the RS-232-C signal, designate in the R2 buffer memory shown below.

R2 buffer memory address	Name	Details
R2 100H	Flow control designation	Designate whether to carry out flow control with the DTR/DSR control or DC code control when exchanging data between the R2 and external device. 0 : Do not carry out flow control. 1 : Carry out flow control with DTR/DSR control. (Default value) 2 : Carry out flow control with DC code control.
R2 101H	RS (RTS) signal status designation	Designate whether to leave the RS signal status constantly ON or to follow the RYn9 ON/OFF state. When the RS signal follows the RYn9 ON/OFF state, the RS signal will be output as follows. RYn9 = ON → RS signal = ON, RYn9 = OFF → RS signal = OFF 0 : Always ON (RYn9 ON/OFF is invalid) 1 : Follow RYn9 ON/OFF

POINT

When the above buffer memory setting values have been changed, initialize the R2 with the process given in section 8.6.

8.10 Confirming the R2 switch states and software version

By reading the R2 buffer memory shown below, the R2 switch state and software version can be confirmed.
This is effective for confirming the state when the R2 switch settings are correct but the operation is incorrect.
When using the buffer memory automatic update function to read, refer to section 5.6.
Refer to section 5.7.3 when using the transmission/reception buffer.

R2 buffer memory address	Name	Details
R2 1A0H	Station No. setting switch	The state of the R2 station No. setting switch is stored. 1 to 64 : Station No.
R2 1A1H	Data link transmission speed setting switch	The state of the R2 data link transmission speed setting switch is stored. (Unit: kbps) 156, 625, 2500, 5000, 10000 : Set data link transmission speed
R2 1A2H	Mode setting switch	The state of the R2 mode setting switch is stored. 0H : On-line mode (using transmission/reception buffer) 1H : On-line mode (using buffer memory automatic update function) 2H to CH: Not used or Use not possible DH : Hardware test mode EH, FH : Not used
R2 1A3H	RS-232-C transmission speed	The transmission speed set in the R2 is stored. (Unit: bps) 300, 600, 1200, 2400, 4800, 9600, 19200 : Set RS-232-C transmission speed
R2 1A4H	RS-232-C data bit length	The data bit length set in the R2 is stored. 7 : 7 bits 8 : 8 bits
R2 1A5H	RS-232-C parity bit validity	The validity of the parity bit set in the R2 is stored. 0 : No parity bit 1 : Odd parity bit 2 : Even parity bit
R2 1A6H	RS-232-C stop bit length	The stop bit length set in the R2 is stored. 1 : 1 bit 2 : 2 bits
R2 1BFH	Software version storage	The R2 software version is stored as an ASCII code. 41H(A) to 5AH (Z) : R2 software version

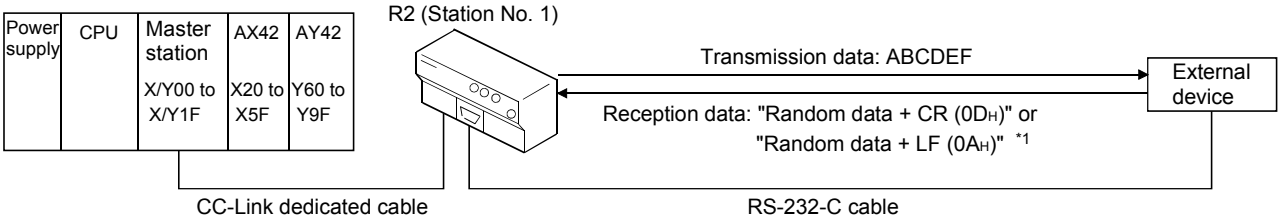
9. PROGRAM EXAMPLES

Examples of R2 programs are given in this chapter.

9.1 Conditions for program examples

The program examples in this chapter have been created with the following conditions. Refer to section 9.2.4 (1) for the conditions of the program examples when using three R2 modules.

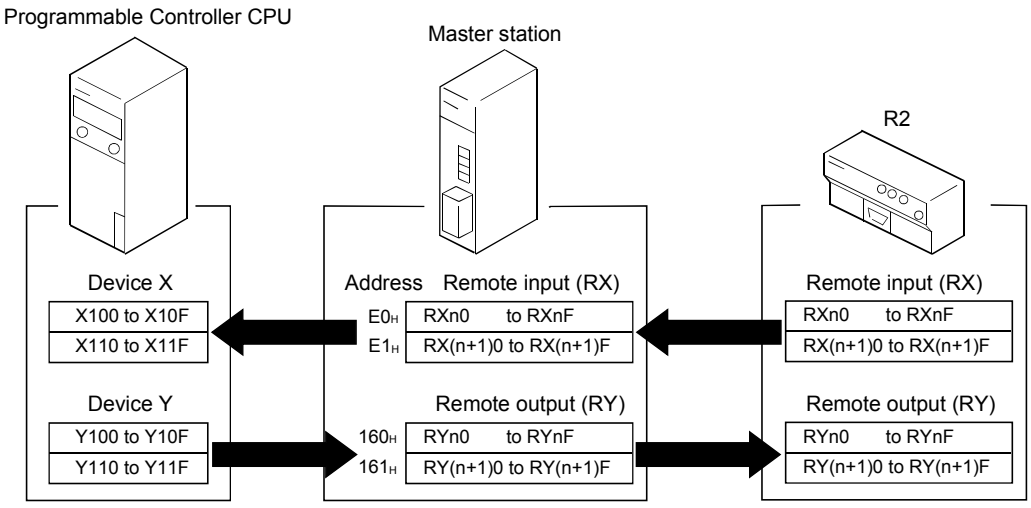
(1) System configuration



*1 In the program example shown in this chapter, the reception completion is detected by receiving the reception end frame (CR(0DH) or LF(0AH)).
To detect a reception completion by designating the number of reception data, the reception end data size designation (R2 111H) setting is required.
Refer to section 6.2 for details.

(2) Relation of programmable controller CPU, master station and R2

The contents of RXn0 to RX(n+1)F are read into X100 to X11F, and the contents of Y100 to Y11F are written into RYn0 to RY(n+1)F.



(3) Master station buffer memory settings (buffer memory size)

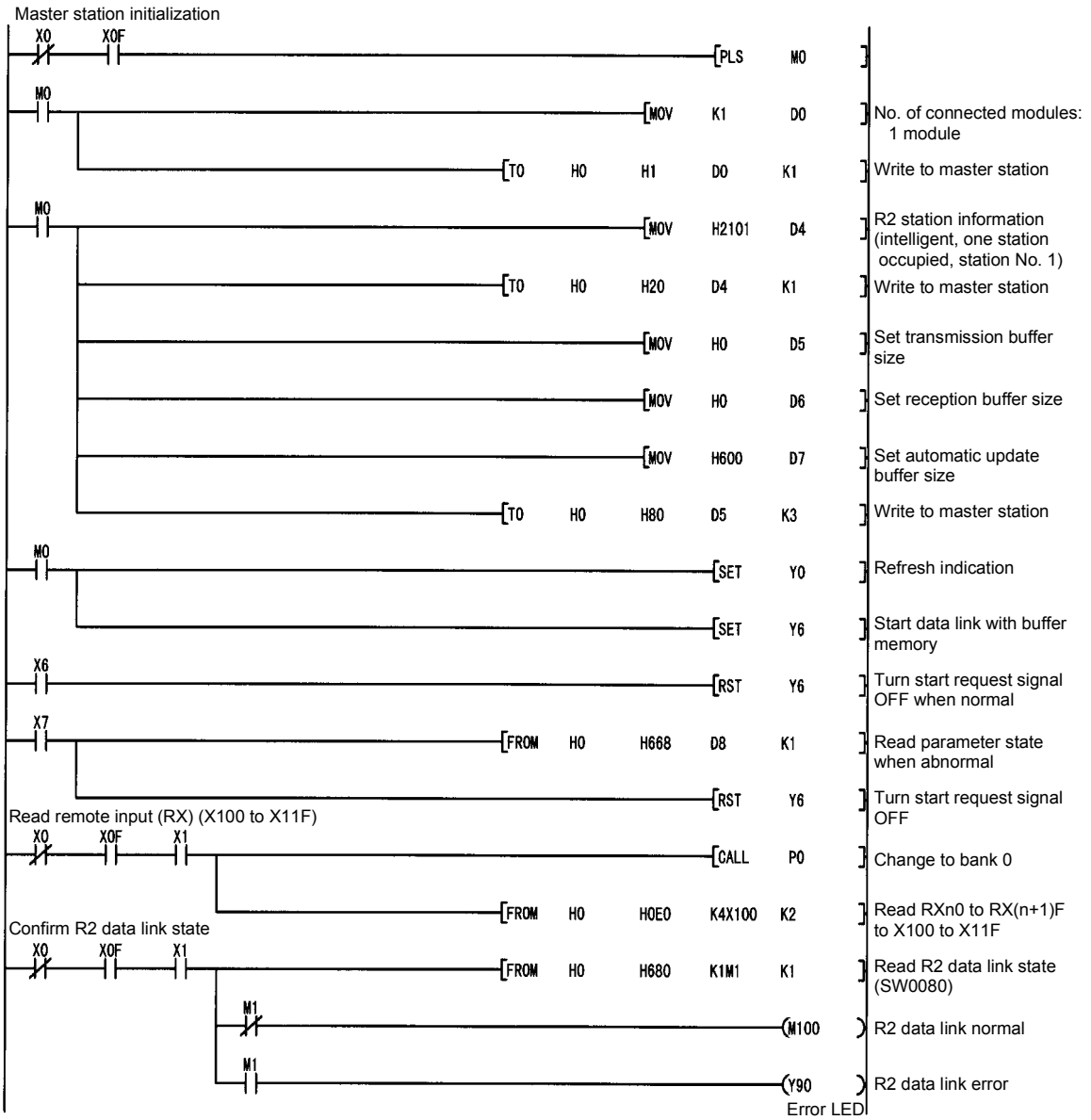
	Transmission buffer	Reception buffer	Automatic update buffer
When using buffer memory automatic update function	0H	0H	600H
When using transmission/reception buffer	200H	200H	0H

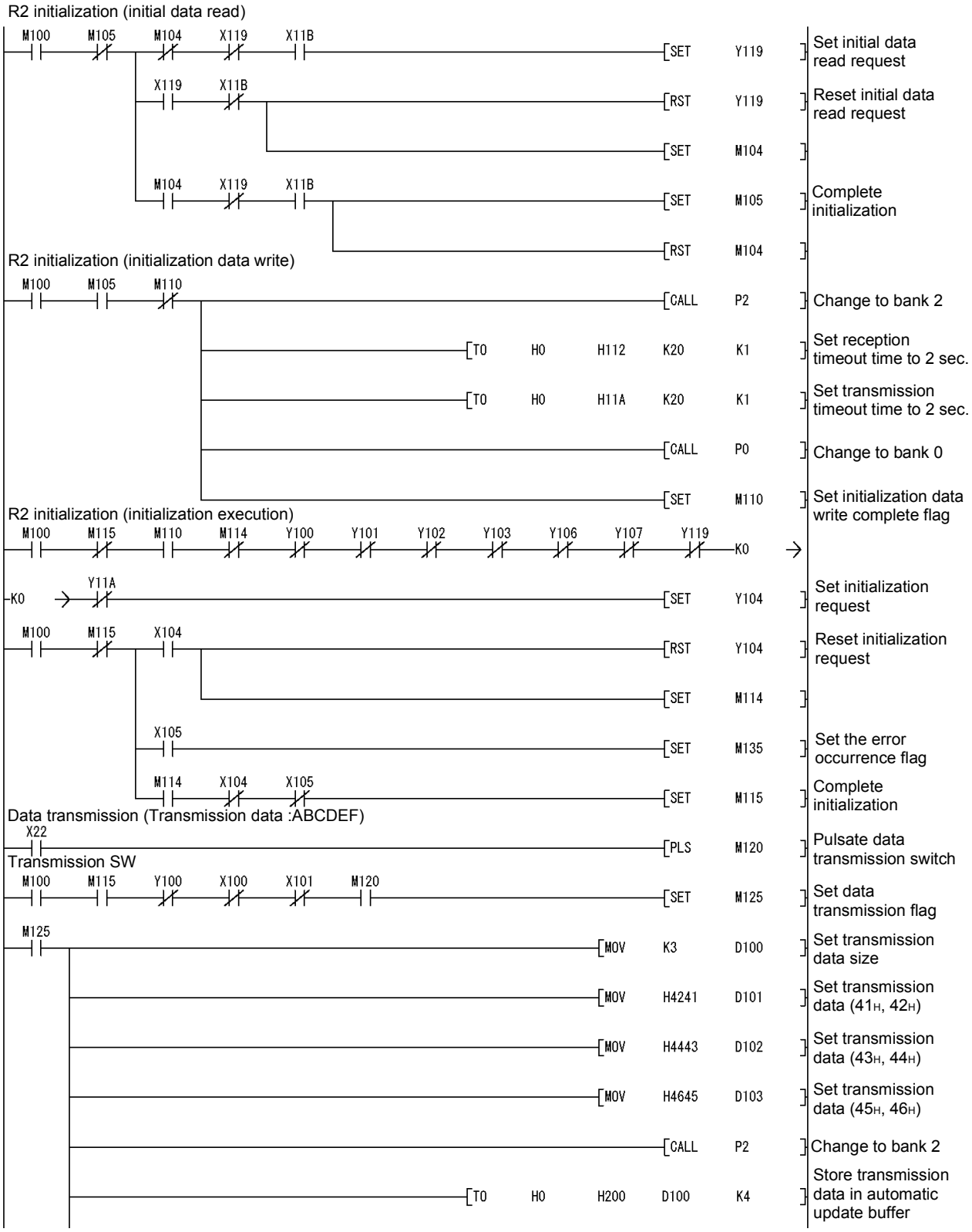
9.2 Example of program for using buffer memory automatic update function

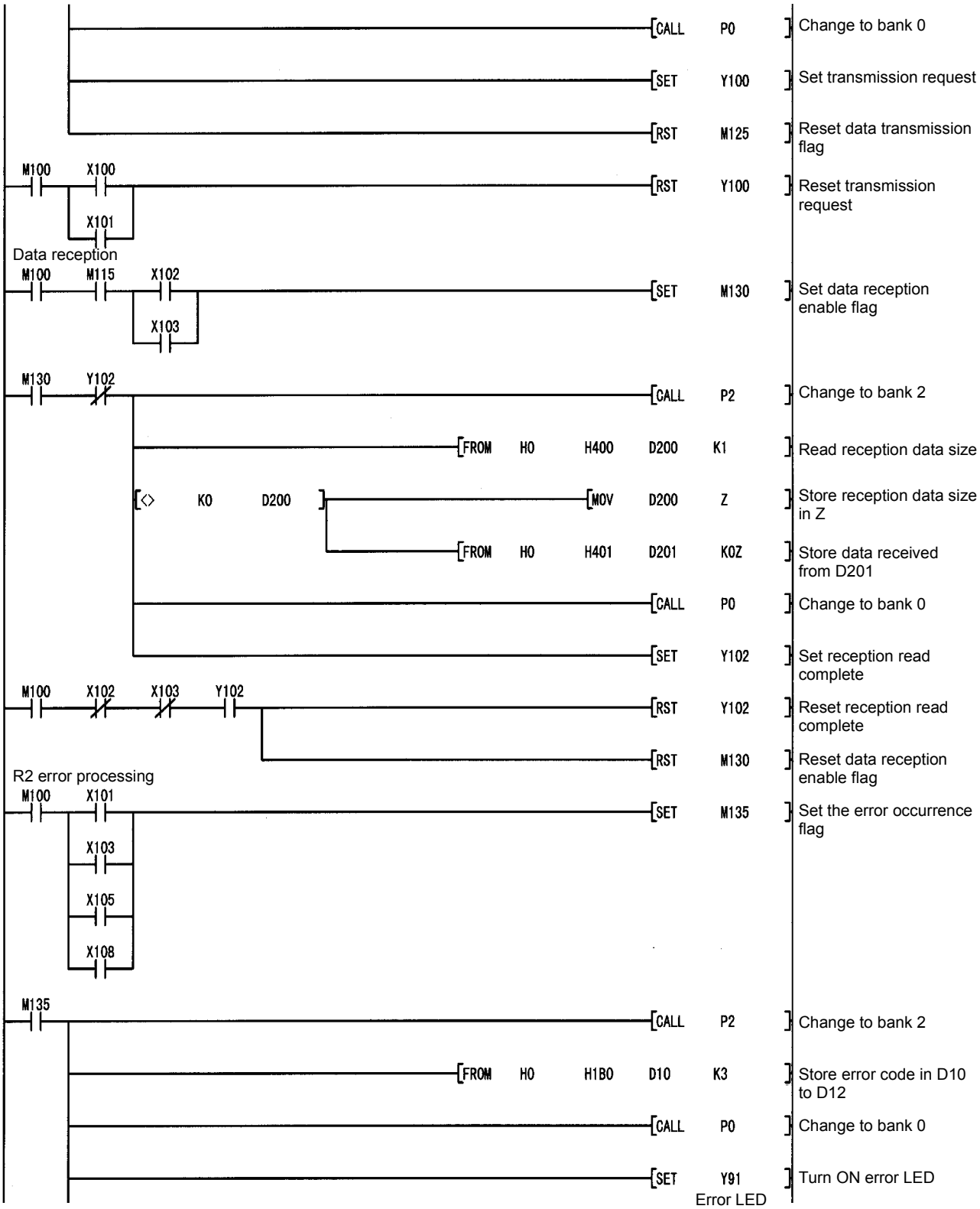
An example of the program for using the buffer memory automatic update function is given below.

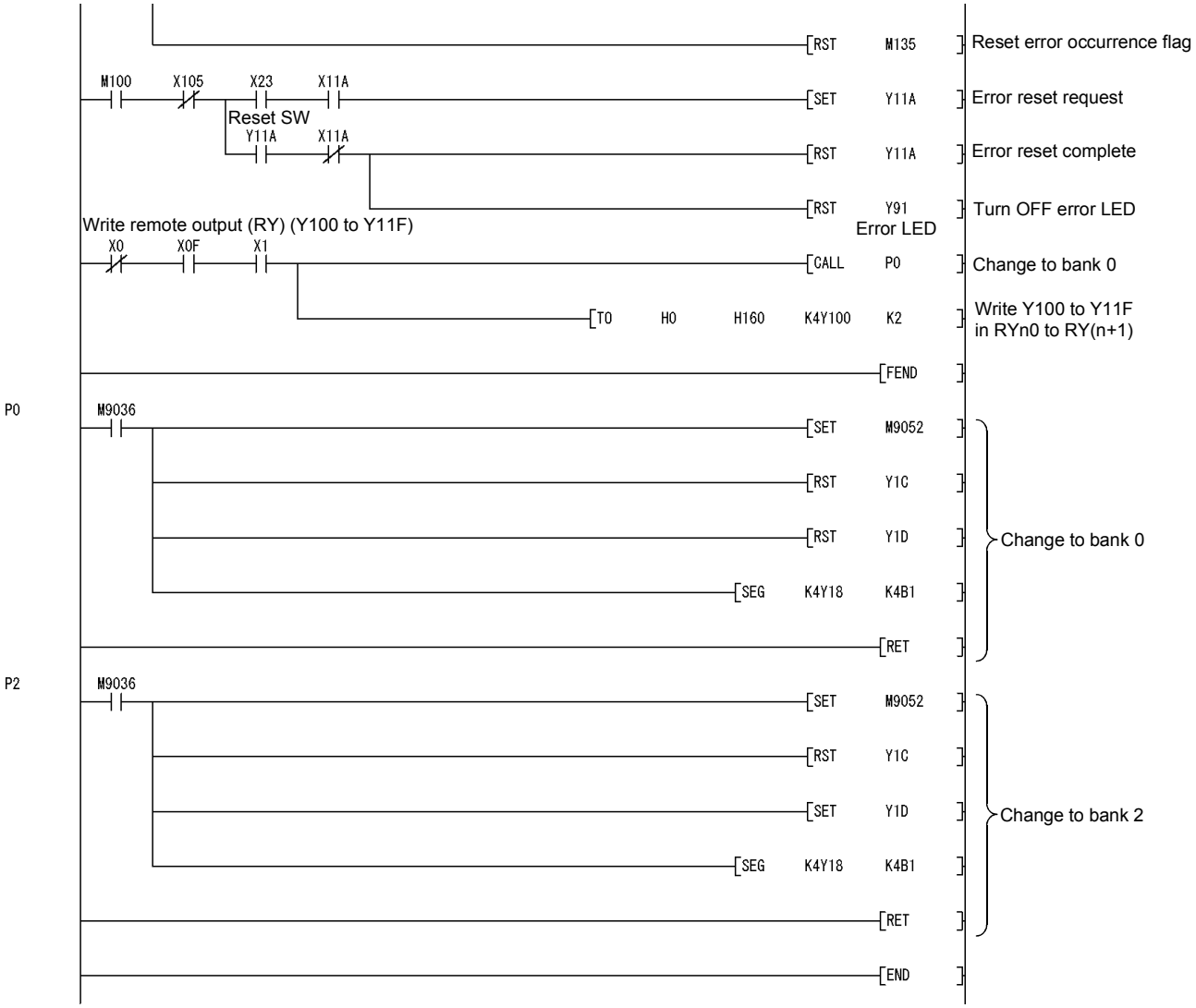
9.2.1 When using FROM/TO command with ACPU / QCPU-A (A mode)

An example of the program for using the FROM/TO command with the ACPU / QCPU-A (A mode) when using the buffer memory automatic update function is shown below.



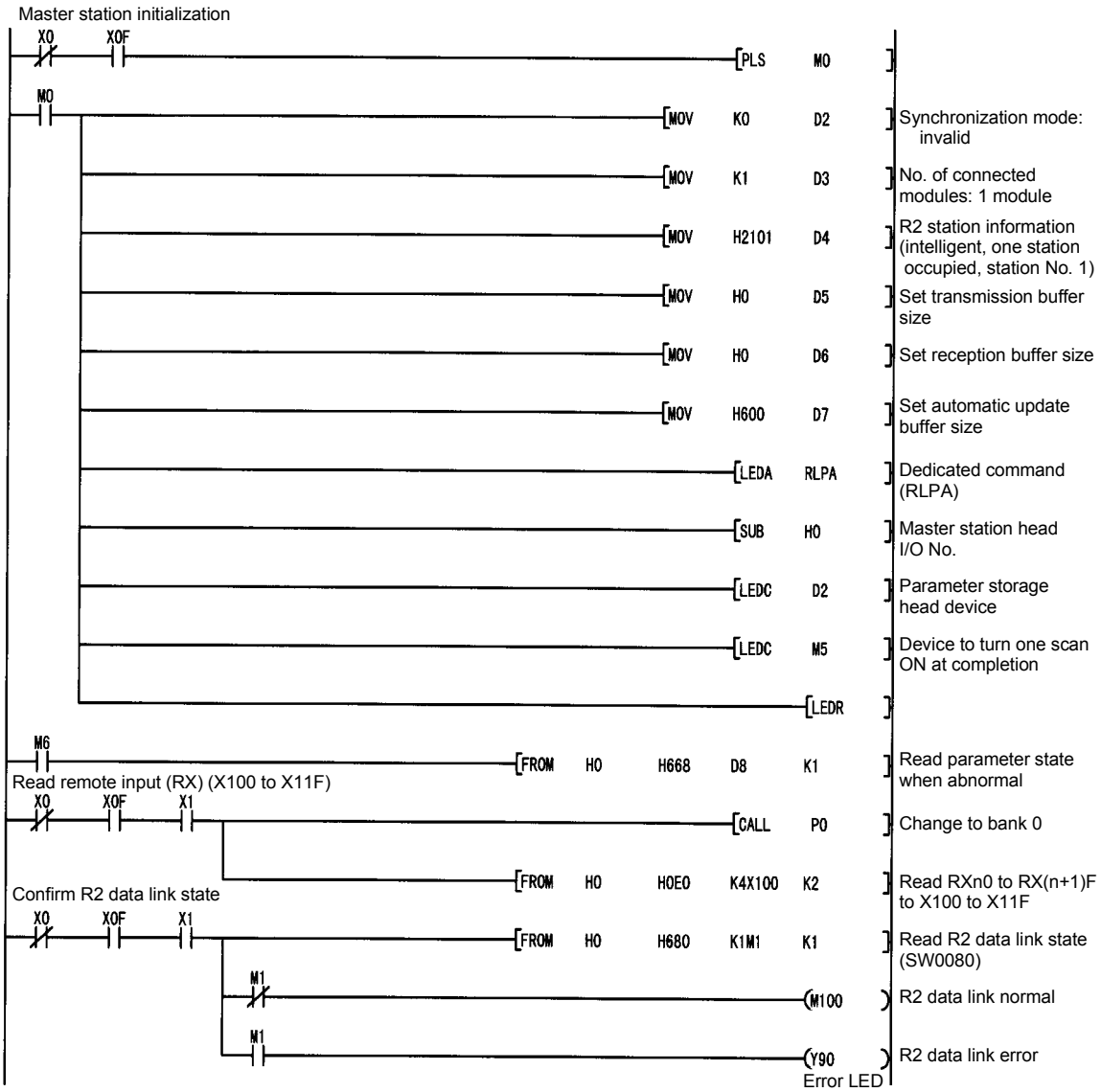

R2 initialization (initial data read)
M100 M105 M104 X119 X11B SET Y119 Set initial data read request
X119 X11B RST Y119 Reset initial data read request
SET M104
M104 X119 X11B SET M105 Complete initialization
RST M104
R2 initialization (initialization data write)
M100 M105 M110 CALL P2 Change to bank 2
T0 H0 H112 K20 K1 Set reception timeout time to 2 sec.
T0 H0 H11A K20 K1 Set transmission timeout time to 2 sec.
CALL P0 Change to bank 0
SET M110 Set initialization data write complete flag
R2 initialization (initialization execution)
M100 M115 M110 M114 Y100 Y101 Y102 Y103 Y106 Y107 Y119 K0
K0 Y11A SET Y104 Set initialization request
M100 M115 X104 RST Y104 Reset initialization request
SET M114
X105 SET M135 Set the error occurrence flag
M114 X104 X105 SET M115 Complete initialization
Data transmission (Transmission data :ABCDEF)
X22 PLS M120 Pulsate data transmission switch
Transmission SW
M100 M115 Y100 X100 X101 M120 SET M125 Set data transmission flag
M125
MOV K3 D100 Set transmission data size
MOV H4241 D101 Set transmission data (41H, 42H)
MOV H4443 D102 Set transmission data (43H, 44H)
MOV H4645 D103 Set transmission data (45H, 46H)
CALL P2 Change to bank 2
T0 H0 H200 D100 K4 Store transmission data in automatic update buffer

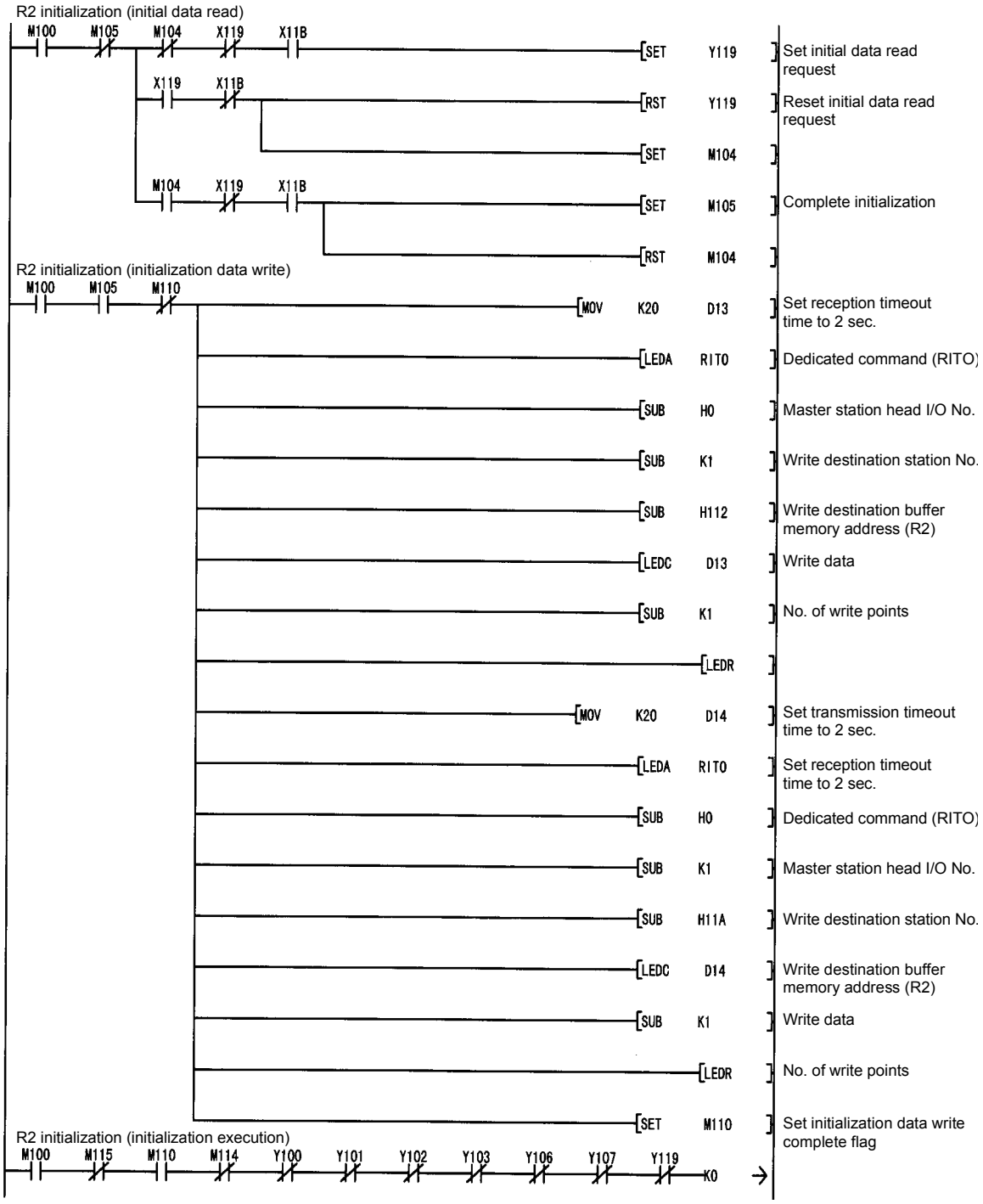

CALL P0
Change to bank 0
SET Y100
Set transmission request
RST M125
Reset data transmission flag
M100 X100
X101
RST Y100
Reset transmission request
Data reception
M100 M115 X102
X103
SET M130
Set data reception enable flag
M130 Y102
CALL P2
Change to bank 2
FROM H0 H400 D200 K1
Read reception data size
<> K0 D200
MOV D200 Z
Store reception data size in Z
FROM H0 H401 D201 KOZ
Store data received from D201
CALL P0
Change to bank 0
SET Y102
Set reception read complete
M100 X102 X103 Y102
RST Y102
Reset reception read complete
RST M130
Reset data reception enable flag
R2 error processing
M100 X101
X103
X105
X108
SET M135
Set the error occurrence flag
M135
CALL P2
Change to bank 2
FROM H0 H1B0 D10 K3
Store error code in D10 to D12
CALL P0
Change to bank 0
SET Y91
Error LED
Turn ON error LED

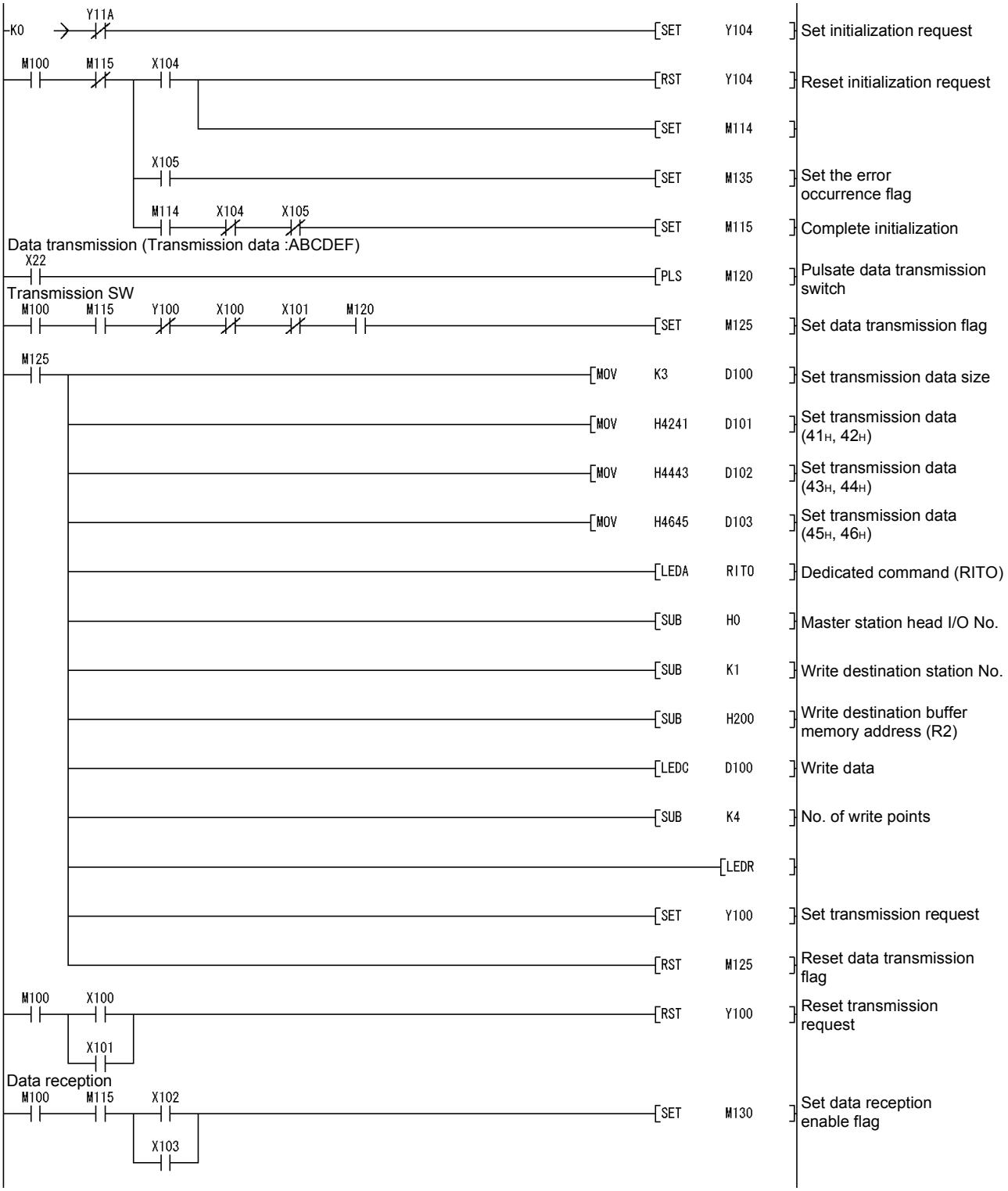

RST M135
Reset error occurrence flag
M100 X105 X23 X11A
SET Y11A
Error reset request
Reset SW
Y11A X11A
RST Y11A
Error reset complete
RST Y91
Turn OFF error LED
Write remote output (RY) (Y100 to Y11F)
Error LED
X0 X0F X1
CALL P0
Change to bank 0
T0 H0 H160 K4Y100 K2
Write Y100 to Y11F
in RYn0 to RY(n+1)
FEND
P0
M9036
SET M9052
RST Y1C
RST Y1D
Change to bank 0
SEG K4Y18 K4B1
RET
P2
M9036
SET M9052
RST Y1C
SET Y1D
Change to bank 2
SEG K4Y18 K4B1
RET
END

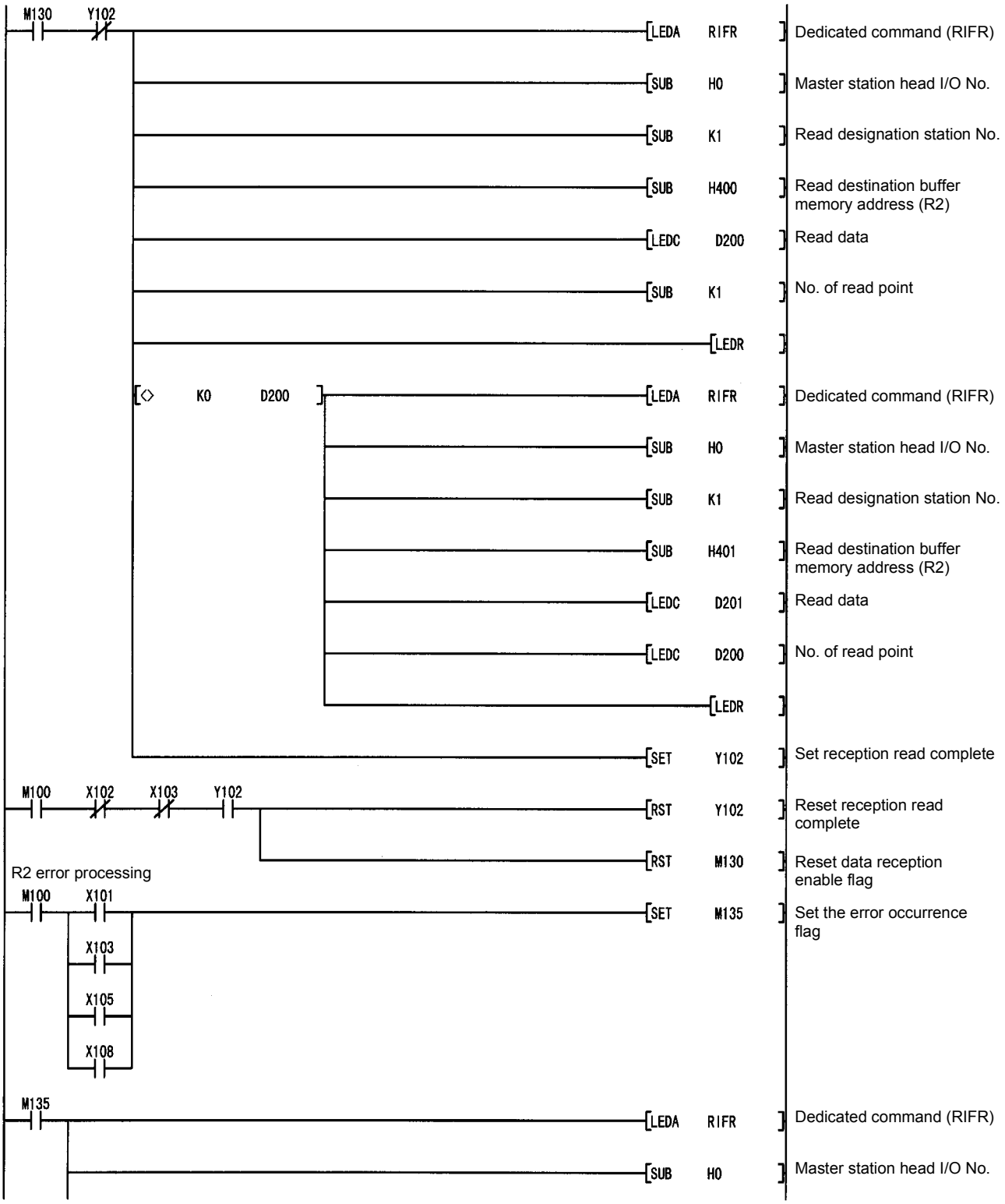
9.2.2 When using dedicated commands with ACPU / QCPU-A (A mode)

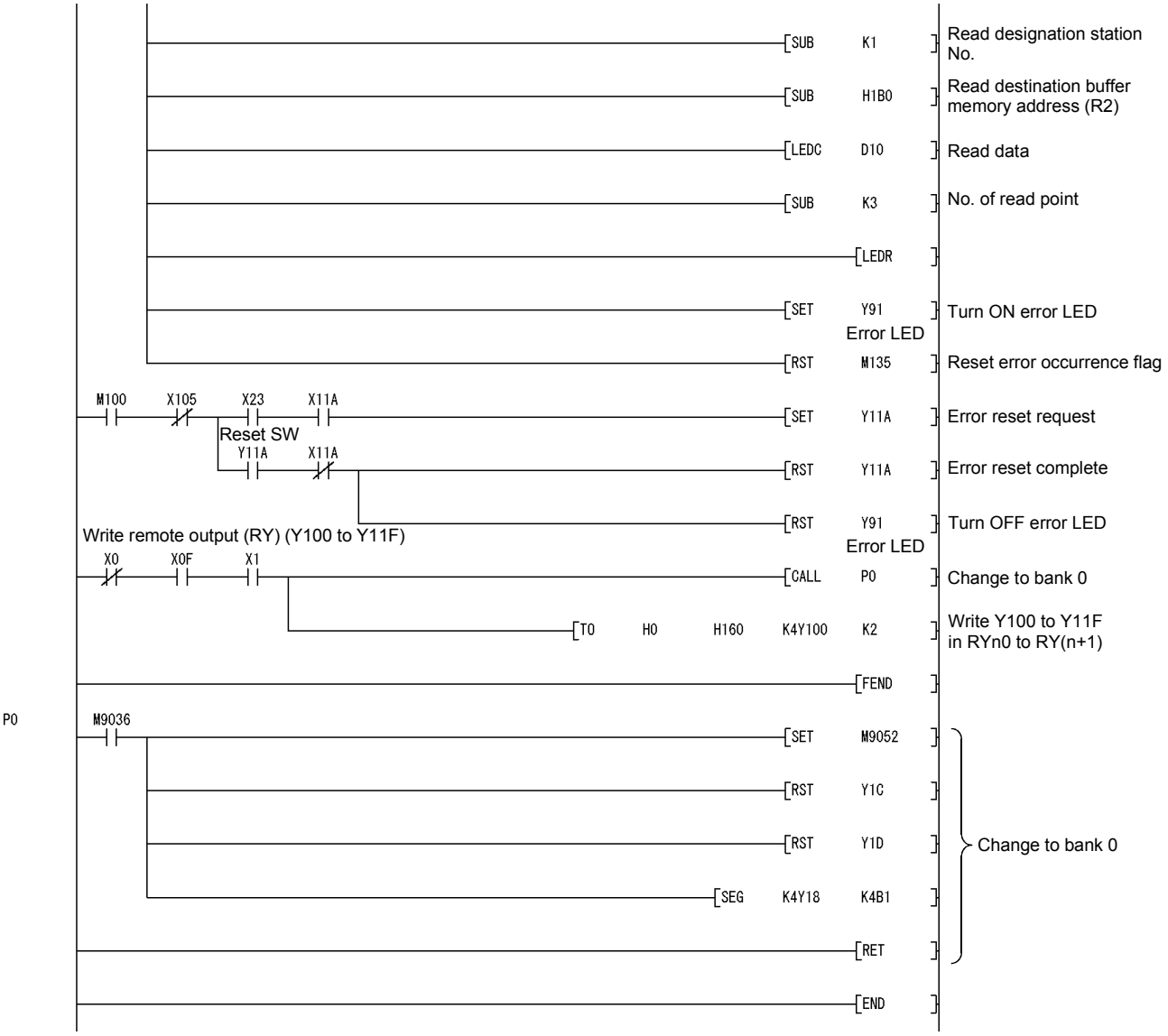
An example of the program for using the dedicated commands with the ACPU / QCPU-A (A mode) when using the buffer memory automatic update function is shown below.




R2 initialization (initial data read)
M100 M105 M104 X119 X11B
SET Y119
Set initial data read request
X119 X11B
RST Y119
Reset initial data read request
SET M104
M104 X119 X11B
SET M105
Complete initialization
RST M104
R2 initialization (initialization data write)
M100 M105 M110
MOV K20 D13
Set reception timeout time to 2 sec.
LEDA RITO
Dedicated command (RITO)
SUB H0
Master station head I/O No.
SUB K1
Write destination station No.
SUB H112
Write destination buffer memory address (R2)
LEDC D13
Write data
SUB K1
No. of write points
LEDR
MOV K20 D14
Set transmission timeout time to 2 sec.
LEDA RITO
Set reception timeout time to 2 sec.
SUB H0
Dedicated command (RITO)
SUB K1
Master station head I/O No.
SUB H11A
Write destination station No.
LEDC D14
Write destination buffer memory address (R2)
SUB K1
Write data
LEDR
No. of write points
SET M110
Set initialization data write complete flag
R2 initialization (initialization execution)
M100 M115 M110 M114 Y100 Y101 Y102 Y103 Y106 Y107 Y119
K0


K0
Y11A
SET Y104
Set initialization request
M100
M115
X104
RST Y104
Reset initialization request
SET M114
X105
SET M135
Set the error occurrence flag
M114
X104
X105
SET M115
Complete initialization
Data transmission (Transmission data :ABCDEF)
X22
PLS M120
Pulsate data transmission switch
Transmission SW
M100
M115
Y100
X100
X101
M120
SET M125
Set data transmission flag
M125
MOV K3 D100
Set transmission data size
MOV H4241 D101
Set transmission data (41H, 42H)
MOV H4443 D102
Set transmission data (43H, 44H)
MOV H4645 D103
Set transmission data (45H, 46H)
LEDA RITO
Dedicated command (RITO)
SUB H0
Master station head I/O No.
SUB K1
Write destination station No.
SUB H200
Write destination buffer memory address (R2)
LEDC D100
Write data
SUB K4
No. of write points
LEDR
SET Y100
Set transmission request
RST M125
Reset data transmission flag
M100
X100
X101
RST Y100
Reset transmission request
Data reception
M100
M115
X102
X103
SET M130
Set data reception enable flag


M130
Y102
LEDA RIFR
Dedicated command (RIFR)
SUB H0
Master station head I/O No.
SUB K1
Read designation station No.
SUB H400
Read destination buffer memory address (R2)
LEDC D200
Read data
SUB K1
No. of read point
LEDR
<> K0 D200
LEDA RIFR
Dedicated command (RIFR)
SUB H0
Master station head I/O No.
SUB K1
Read designation station No.
SUB H401
Read destination buffer memory address (R2)
LEDC D201
Read data
LEDC D200
No. of read point
LEDR
SET Y102
Set reception read complete
M100
X102
X103
Y102
RST Y102
Reset reception read complete
RST M130
Reset data reception enable flag
R2 error processing
M100
X101
SET M135
Set the error occurrence flag
X103
X105
X108
M135
LEDA RIFR
Dedicated command (RIFR)
SUB H0
Master station head I/O No.


SUB K1
Read designation station No.
SUB H1B0
Read destination buffer memory address (R2)
LEDC D10
Read data
SUB K3
No. of read point
LEDR
SET Y91
Turn ON error LED
Error LED
RST M135
Reset error occurrence flag
M100 X105 X23 X11A
SET Y11A
Error reset request
Reset SW
Y11A X11A
RST Y11A
Error reset complete
RST Y91
Turn OFF error LED
Error LED
Write remote output (RY) (Y100 to Y11F)
X0 X0F X1
CALL P0
Change to bank 0
TO H0 H160 K4Y100 K2
Write Y100 to Y11F in RYn0 to RY(n+1)
FEND
P0
M9036
SET M9052
RST Y1C
RST Y1D
Change to bank 0
SEG K4Y18 K4B1
RET
END

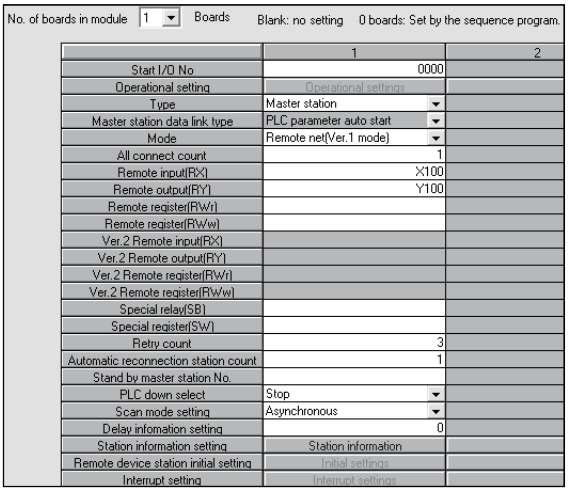
9.2.3 When using dedicated commands with QCPU (Q mode) / QnACPU

An example of the program for using the dedicated commands with the QCPU (Q mode) / QnACPU when using the buffer memory automatic update function is shown below.
With this program, it is assumed that the CC-Link parameters are set as follows.

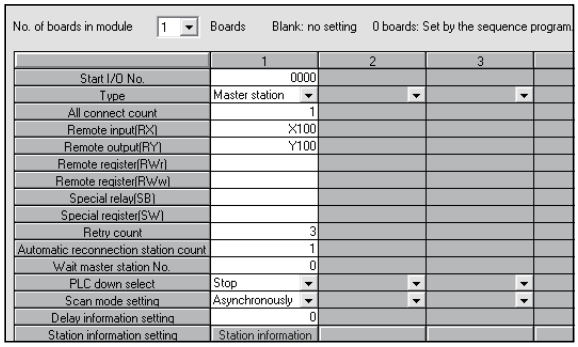
Parameter setting item		Setting value
No. of modules		1 module
Module head input/output No.		0
Module type		Master station
Total No. of connected modules		1
Batch refresh device	Remote input (RX)	X100
	Remote output (RY)	Y100
Station information	Station type	Intelligent device station
	No. of occupied stations	One station occupied
	Transmission buffer size	0
	Reception buffer size	0
	Automatic update buffer size	1536

<GPPW parameter setting screen>

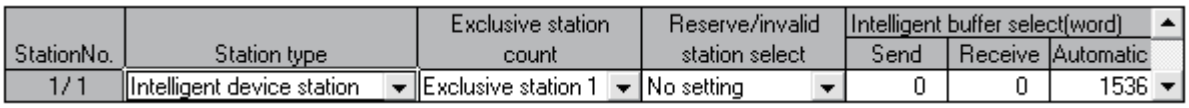
When the programmable controller series is QCPU (Q mode)

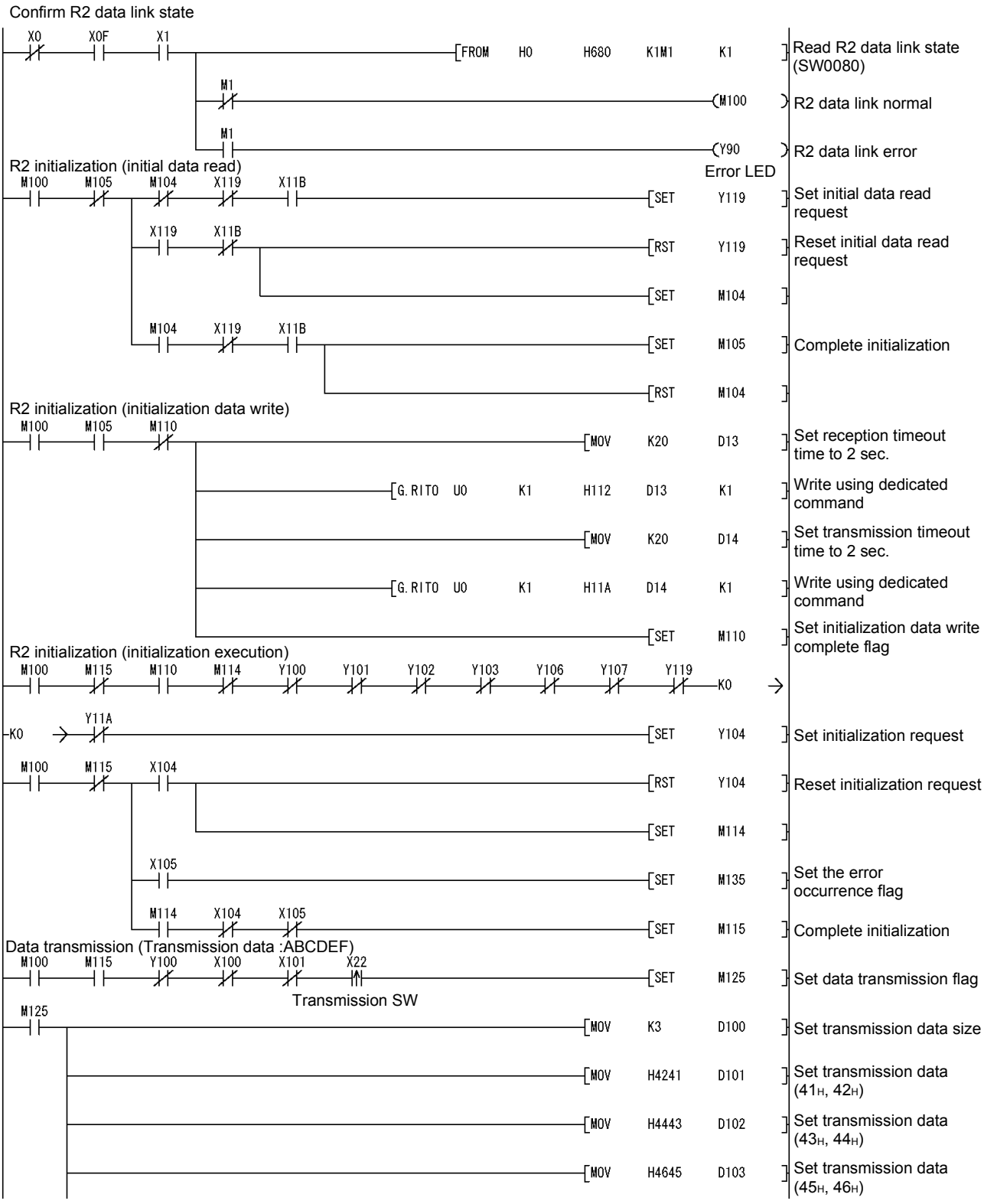


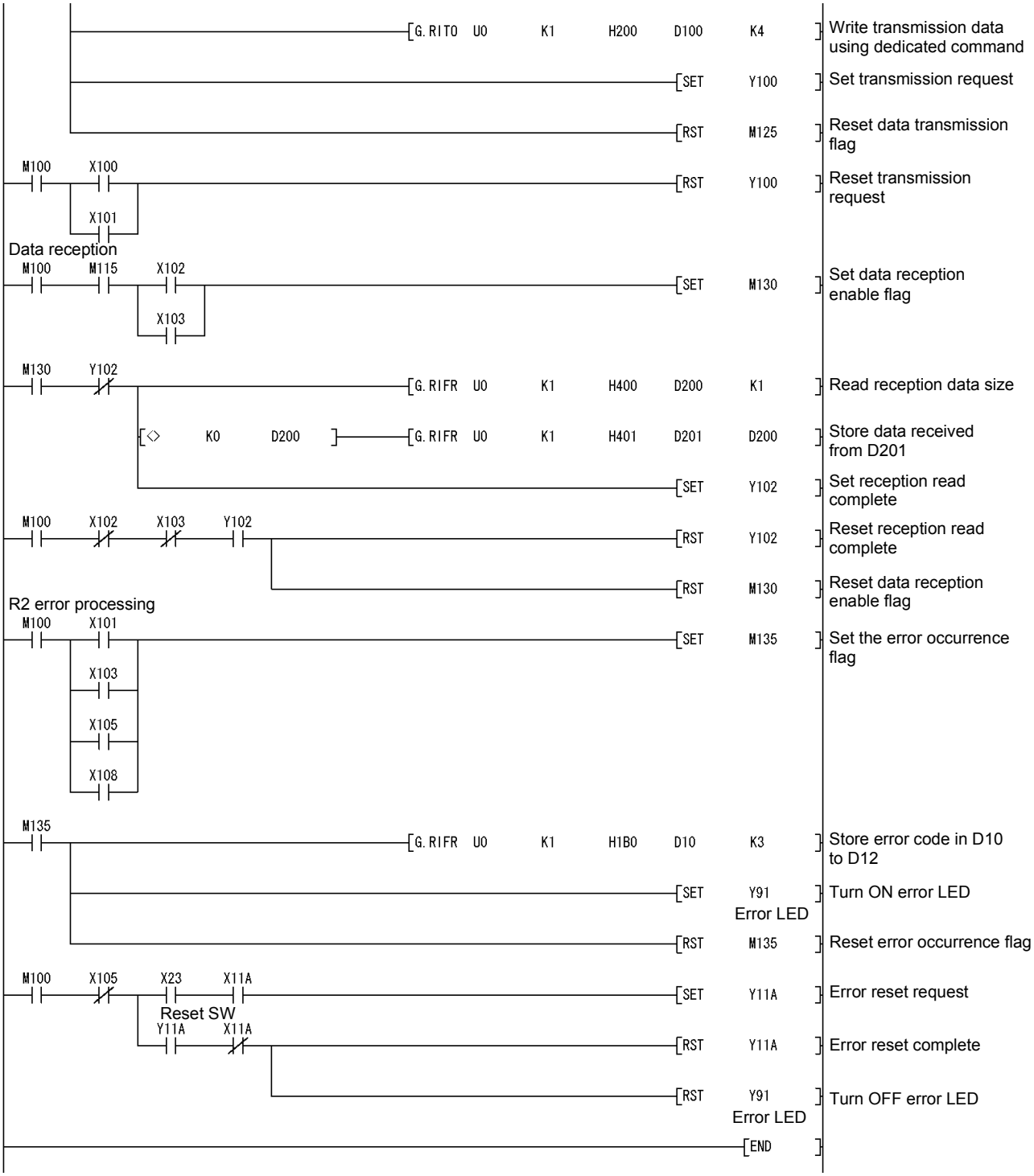
When the programmable controller series is QnACPU



<GPPW station information setting screen>




Confirm R2 data link state
X0 X0F X1 FROM H0 H680 K1M1 K1
Read R2 data link state (SW0080)
M1 M100
R2 data link normal
M1 Y90
R2 data link error
Error LED
R2 initialization (initial data read)
M100 M105 M104 X119 X11B SET Y119
Set initial data read request
X119 X11B RST Y119
Reset initial data read request
SET M104
M104 X119 X11B SET M105
Complete initialization
RST M104
R2 initialization (initialization data write)
M100 M105 M110 MOV K20 D13
Set reception timeout time to 2 sec.
G.RITO U0 K1 H112 D13 K1
Write using dedicated command
MOV K20 D14
Set transmission timeout time to 2 sec.
G.RITO U0 K1 H11A D14 K1
Write using dedicated command
SET M110
Set initialization data write complete flag
R2 initialization (initialization execution)
M100 M115 M110 M114 Y100 Y101 Y102 Y103 Y106 Y107 Y119 K0
K0 Y11A SET Y104
Set initialization request
M100 M115 X104 RST Y104
Reset initialization request
SET M114
X105 SET M135
Set the error occurrence flag
M114 X104 X105 SET M115
Complete initialization
Data transmission (Transmission data :ABCDEF)
M100 M115 Y100 X100 X101 X22 SET M125
Set data transmission flag
Transmission SW
M125 MOV K3 D100
Set transmission data size
MOV H4241 D101
Set transmission data (41H, 42H)
MOV H4443 D102
Set transmission data (43H, 44H)
MOV H4645 D103
Set transmission data (45H, 46H)


G.RITO U0 K1 H200 D100 K4
Write transmission data using dedicated command
SET Y100
Set transmission request
RST M125
Reset data transmission flag
M100 X100
X101
RST Y100
Reset transmission request
Data reception
M100 M115 X102
X103
SET M130
Set data reception enable flag
M130 Y102
G.RIFR U0 K1 H400 D200 K1
Read reception data size
<> K0 D200
G.RIFR U0 K1 H401 D201 D200
Store data received from D201
SET Y102
Set reception read complete
M100 X102 X103 Y102
RST Y102
Reset reception read complete
RST M130
Reset data reception enable flag
R2 error processing
M100 X101
X103
X105
X108
SET M135
Set the error occurrence flag
M135
G.RIFR U0 K1 H1B0 D10 K3
Store error code in D10 to D12
SET Y91
Error LED
Turn ON error LED
RST M135
Reset error occurrence flag
M100 X105 X23 X11A
SET Y11A
Error reset request
Reset SW
Y11A X11A
RST Y11A
Error reset complete
RST Y91
Error LED
Turn OFF error LED
END

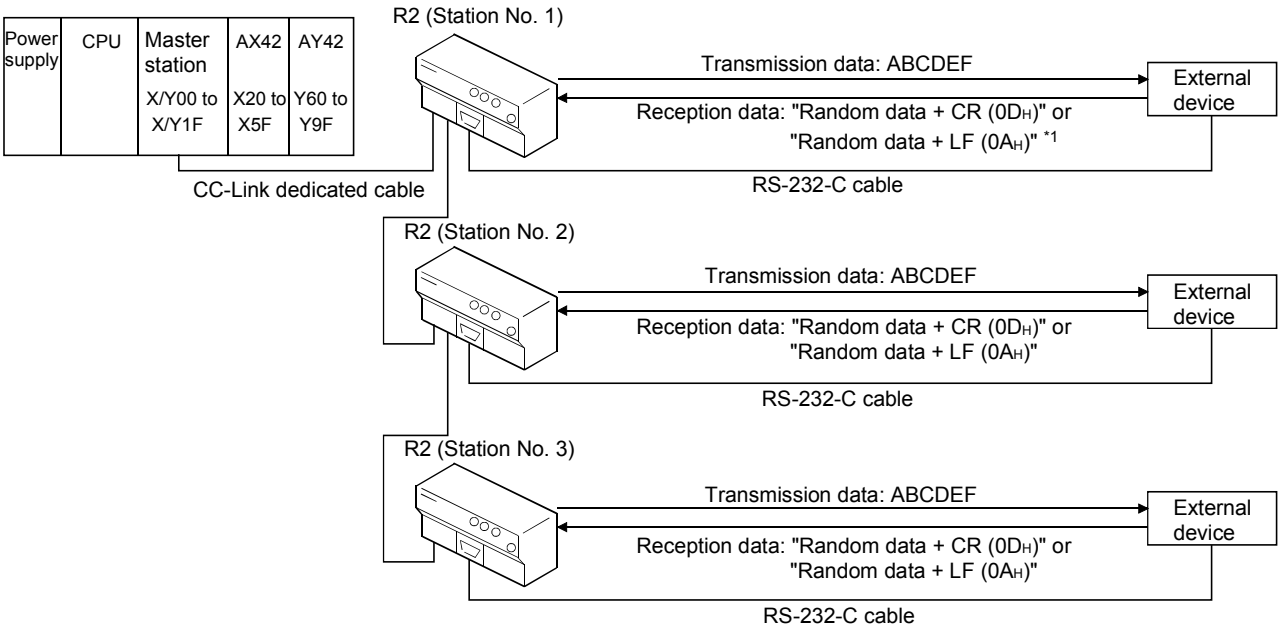
9.2.4 When using the FROM/TO commands with ACPU / QCPU-A (A mode) (Three R2 modules connected)

An example of the program for connecting three R2 modules using the FROM/TO command with the ACPU / QCPU-A (A mode) when using the buffer memory automatic update function is shown below.

(1) Conditions of program example

The program examples in this chapter have been created with the following conditions.

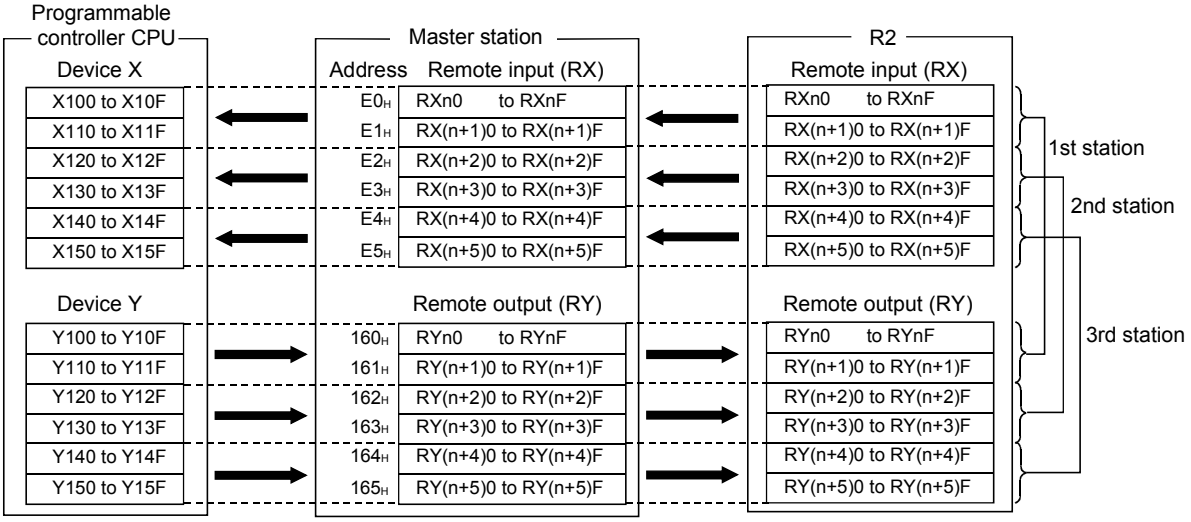
(a) System configuration



*1 In the program example shown in this section, the reception completion is detected by receiving the reception end frame (CR(0DH) or LF(0AH)).
To detect a reception completion by designating the number of reception data, the reception end data size designation (R2 111H) setting is required.
Refer to section 6.2 for details.

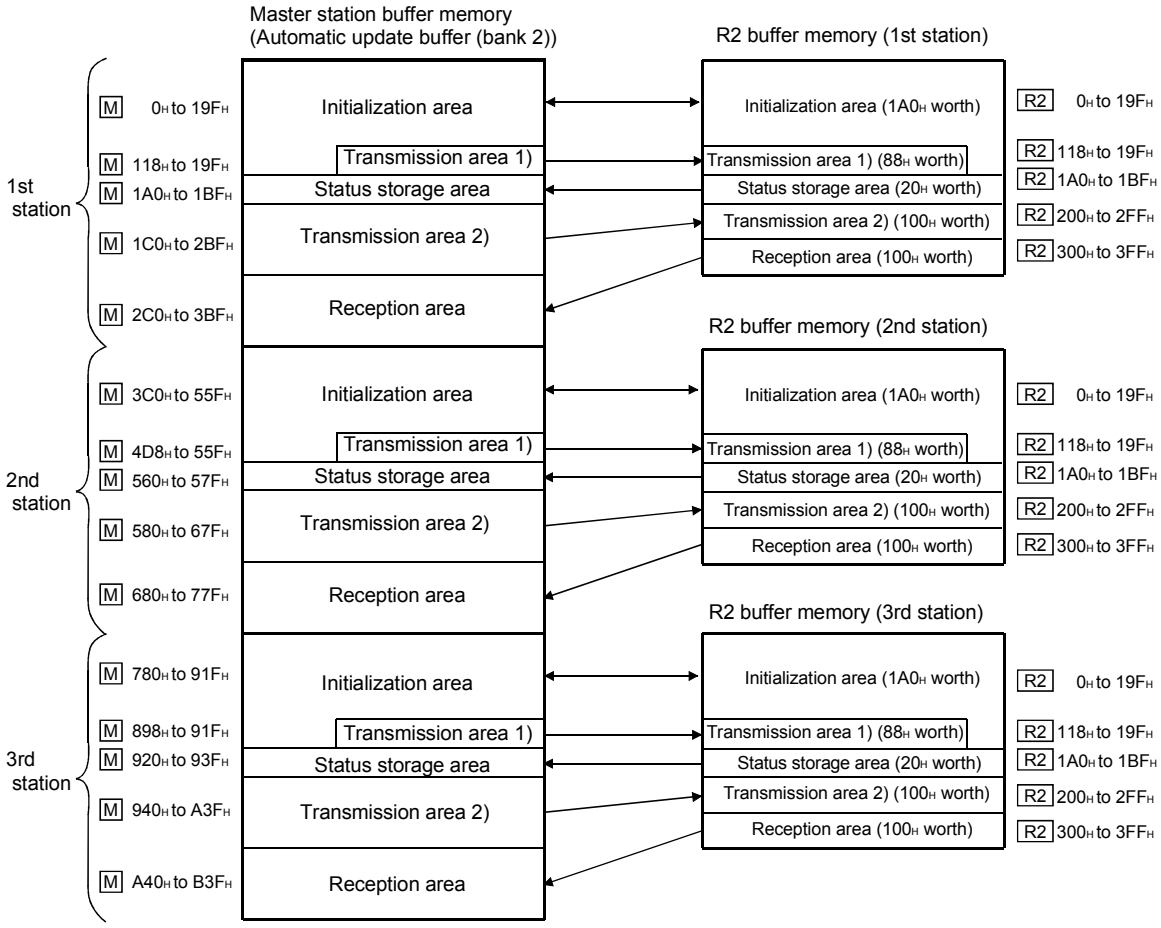
(b) Relation of programmable controller CPU, master station and R2

The contents of RXn0 to RX(n+5)F are read into X100 to X15F, and the contents of Y100 to Y15F are written into RYn0 to RY(n+5)F.



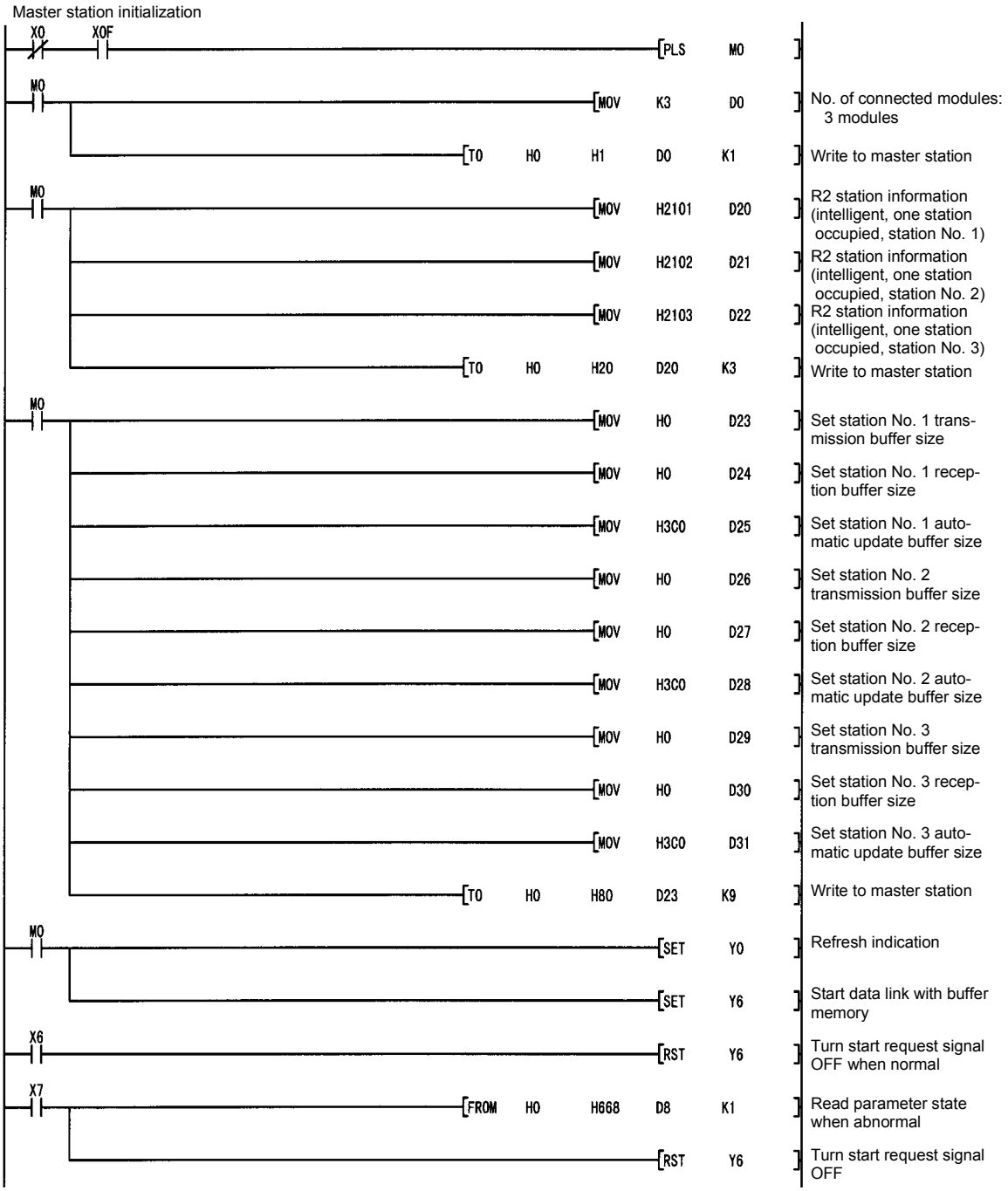
(2) Buffer memory configuration

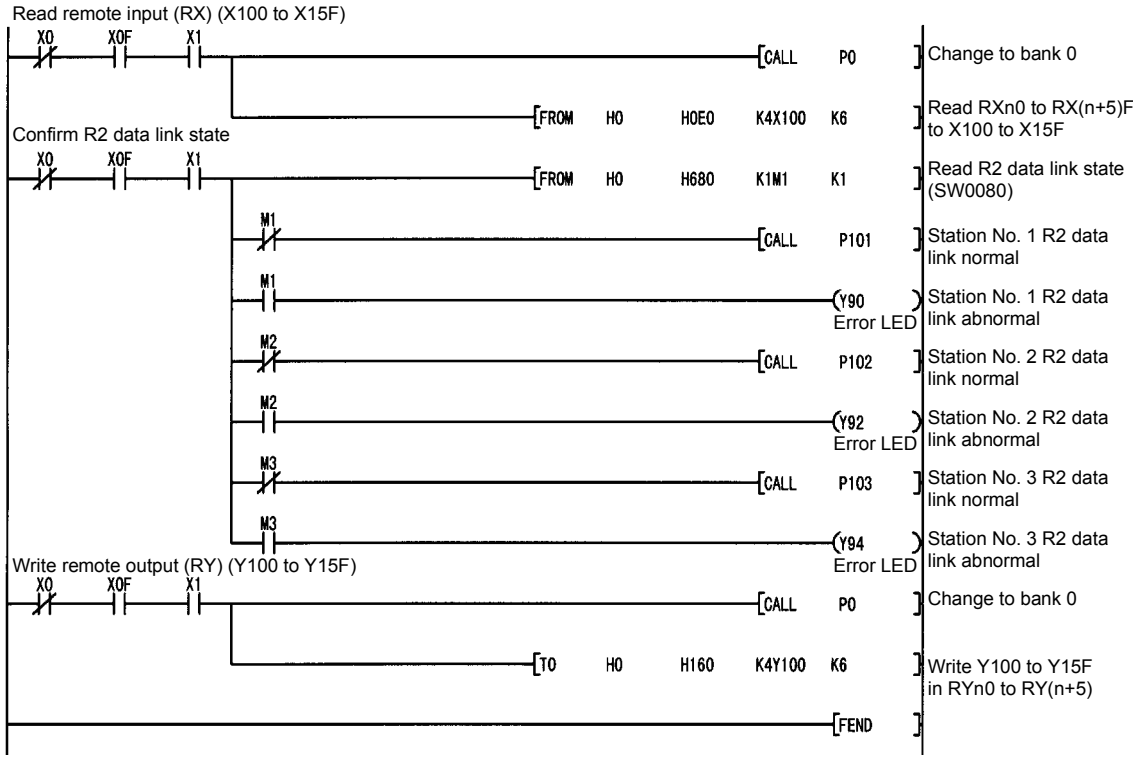
The buffer memory configuration for this program example is shown below.



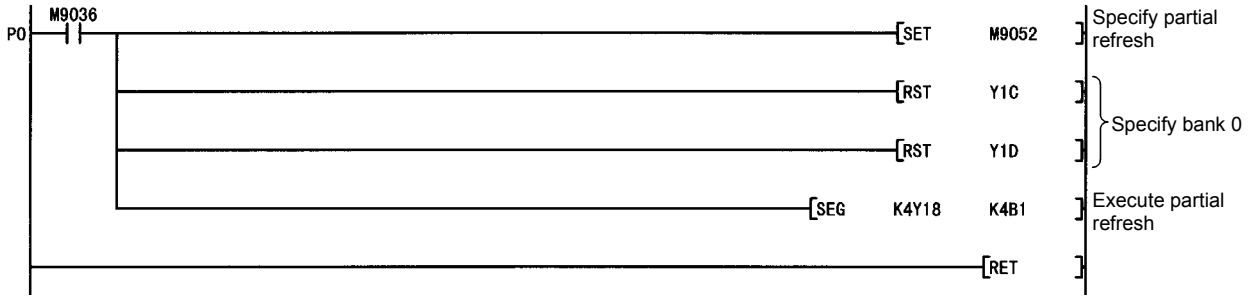
(3) Program example

(a) Main program

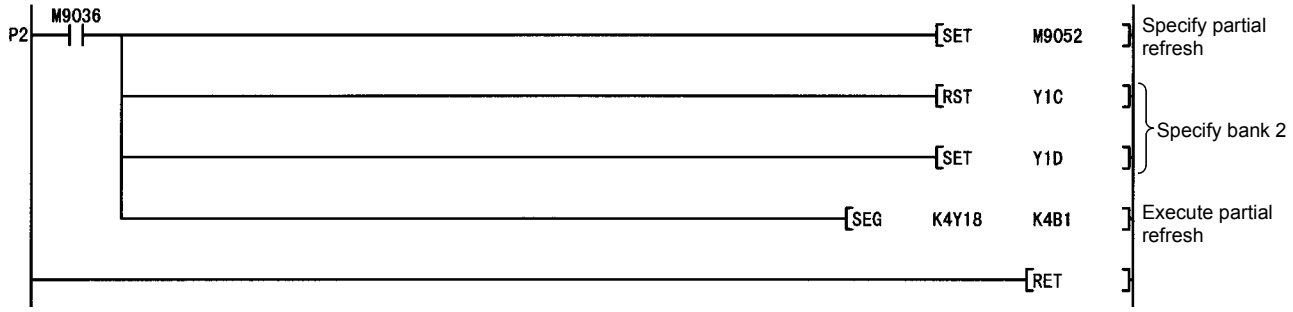




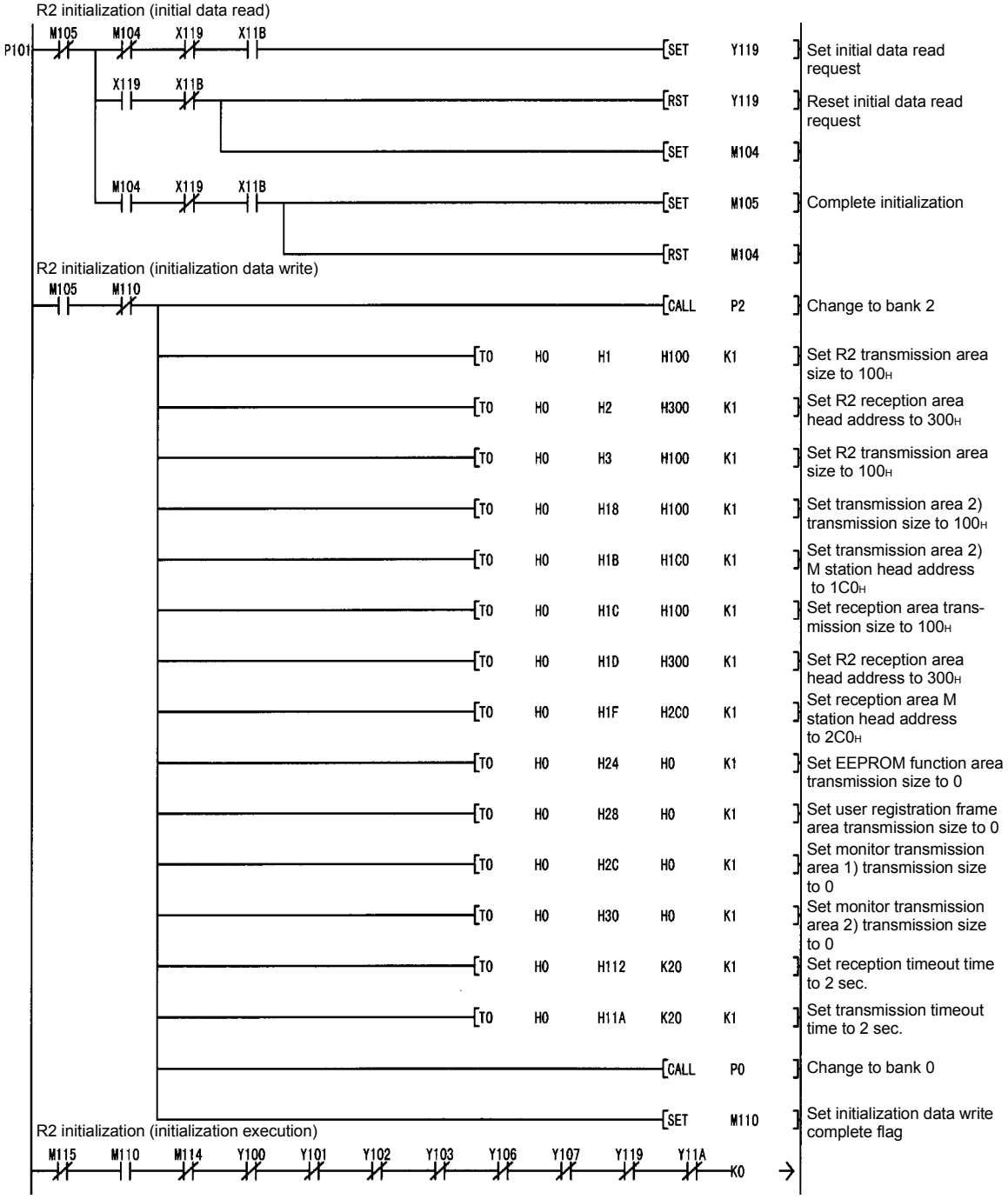
(b) Program to change to bank 0

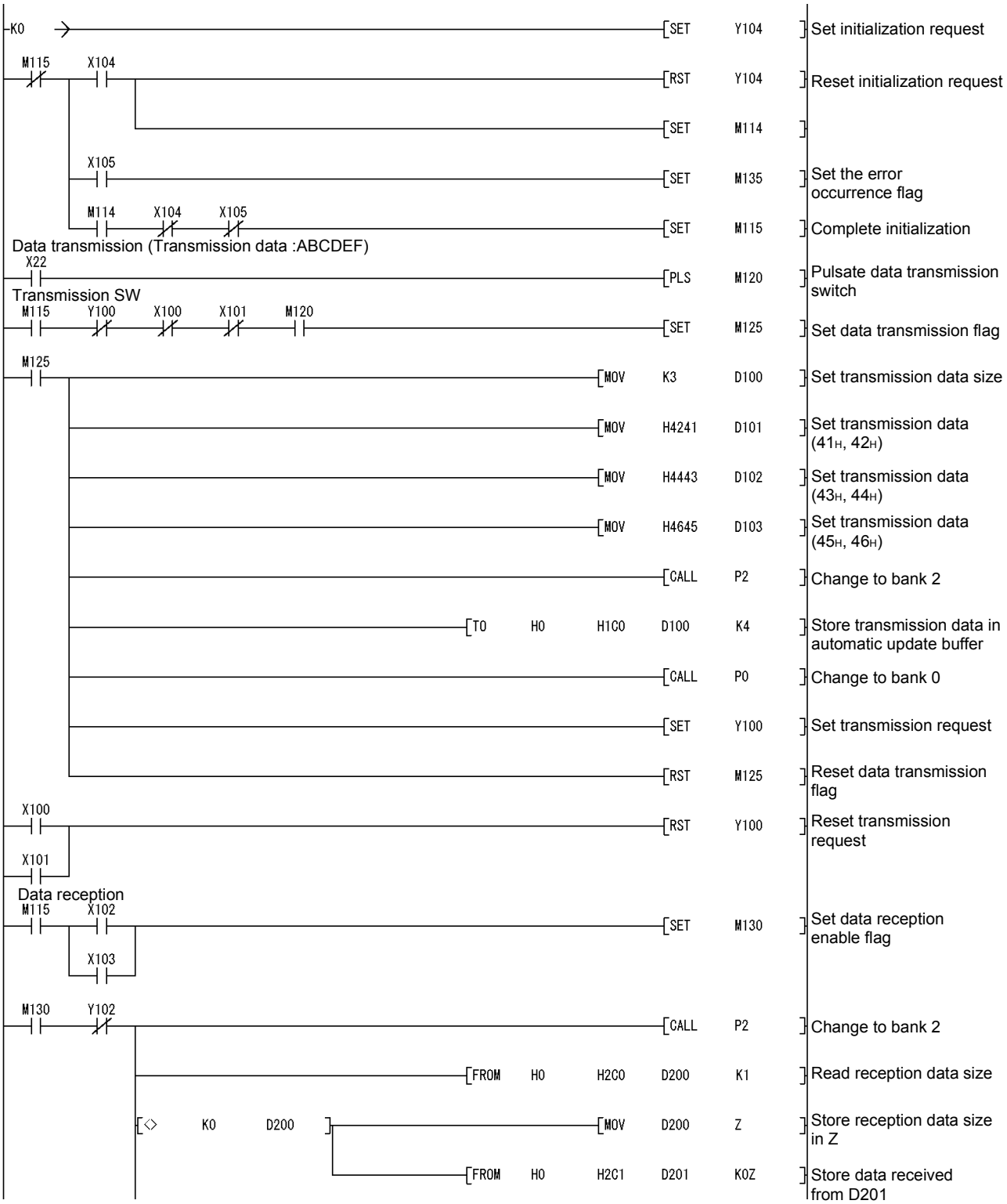


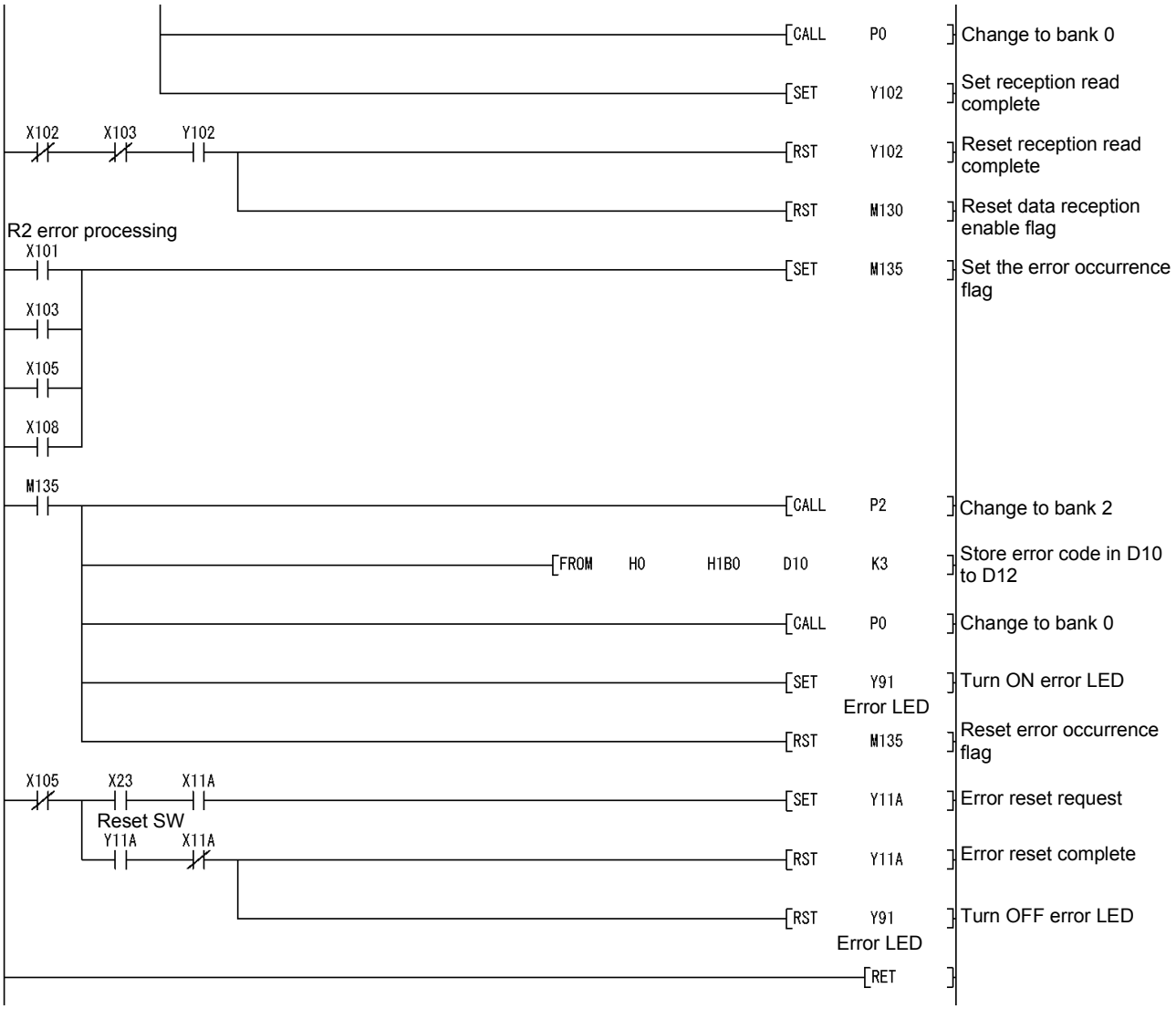
(c) Program to change to bank 2



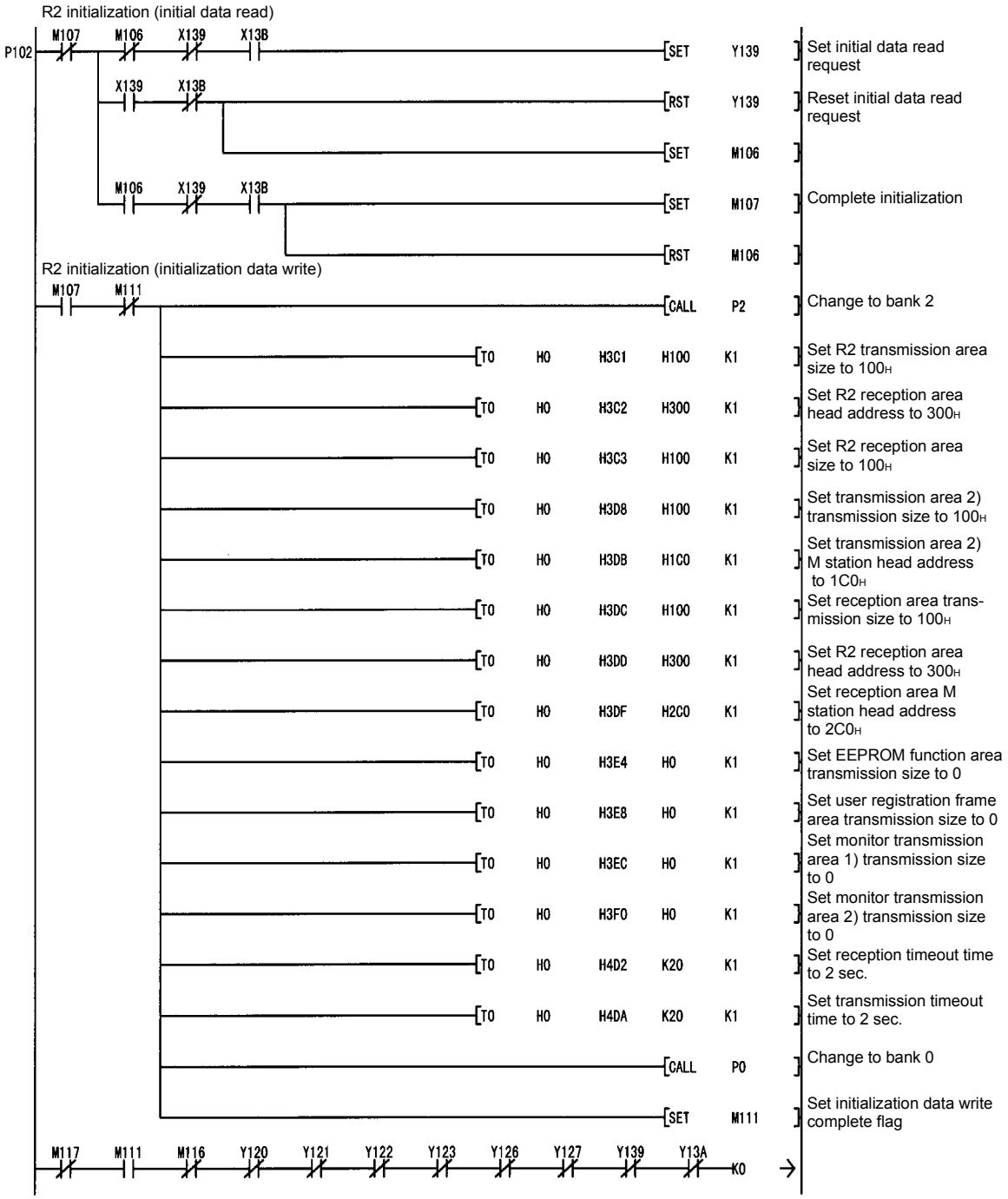
(d) Station No. 1 program

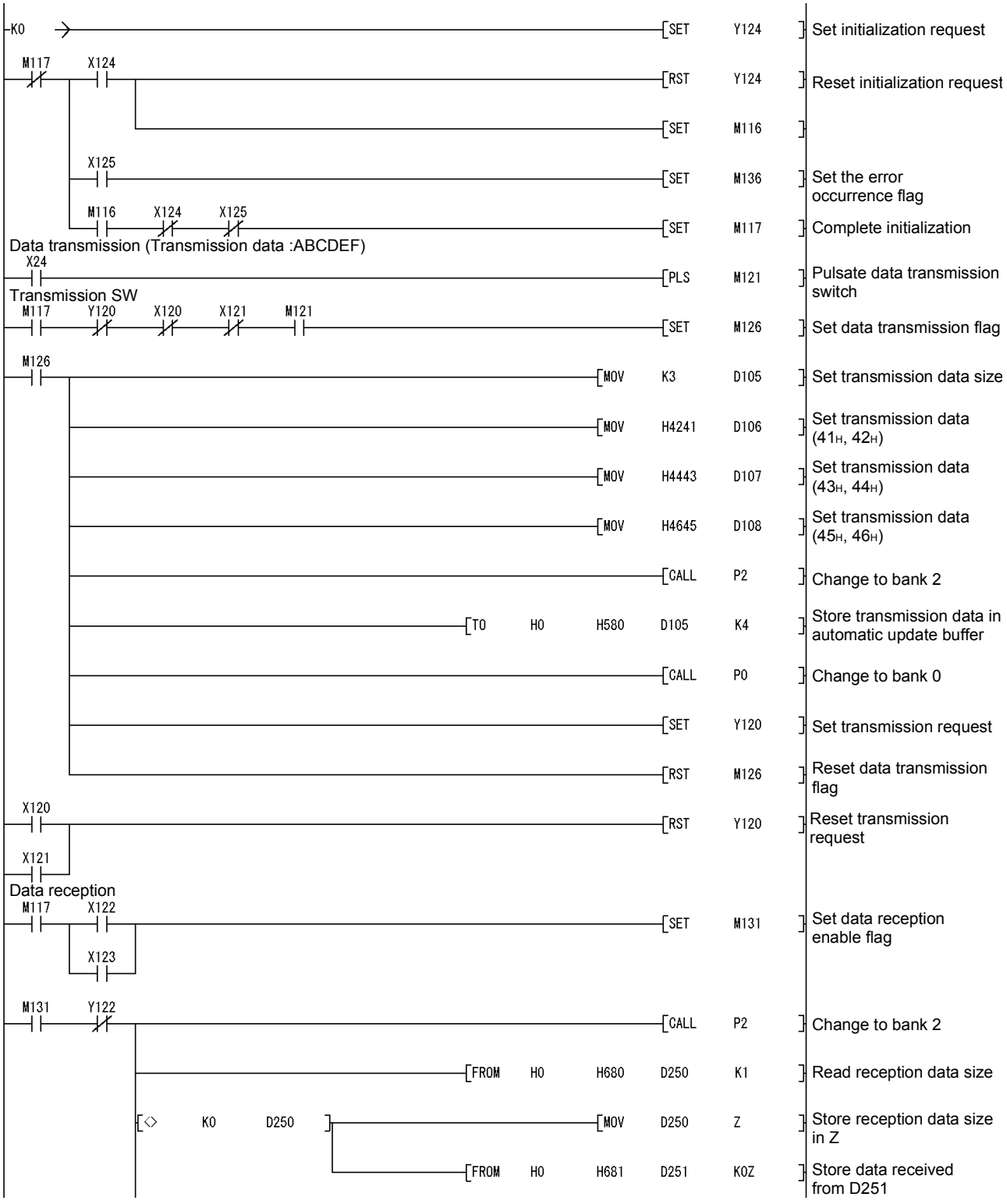


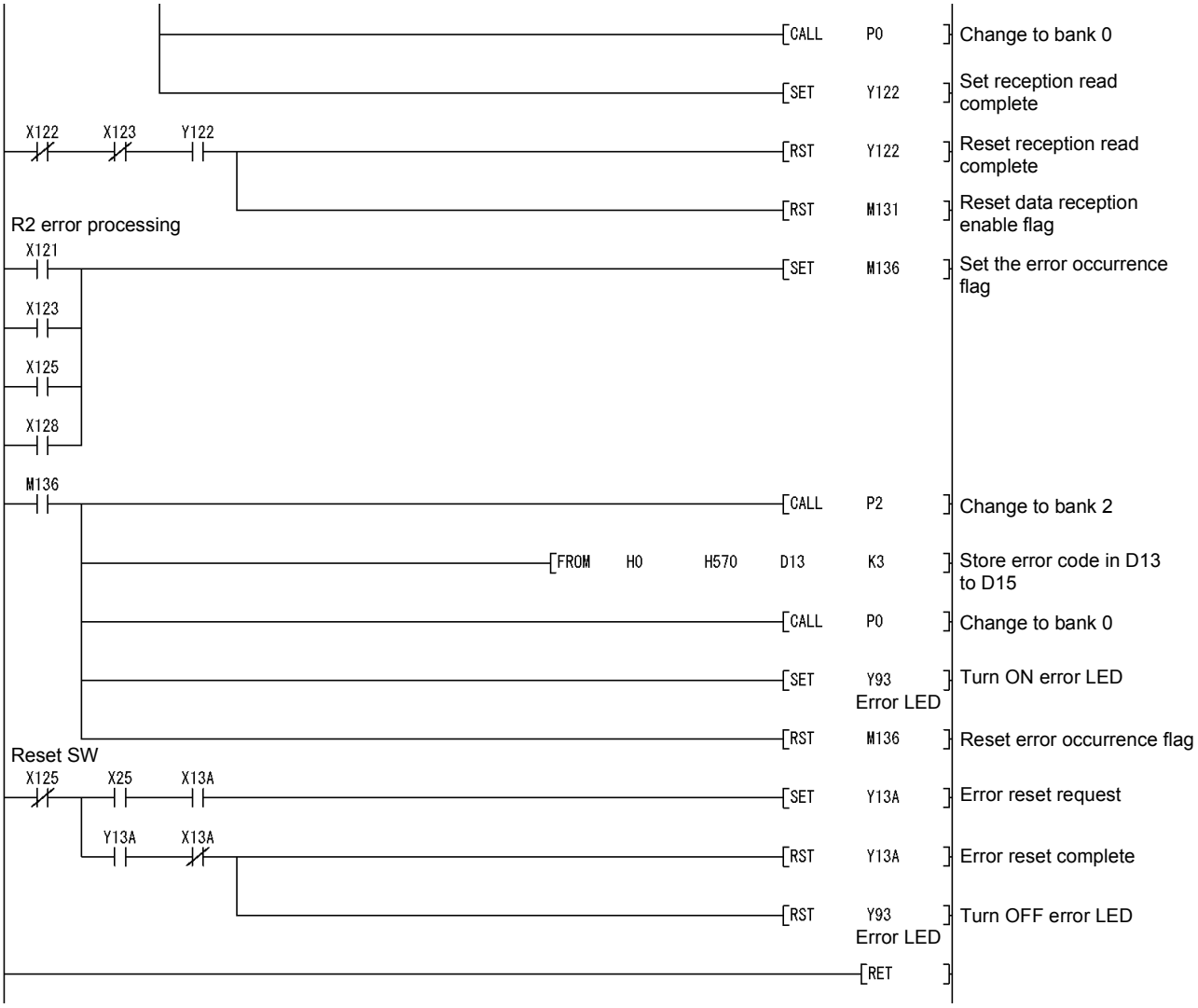

K0
SET Y104
Set initialization request
M115 X104
RST Y104
Reset initialization request
SET M114
X105
SET M135
Set the error occurrence flag
M114 X104 X105
SET M115
Complete initialization
Data transmission (Transmission data :ABCDEF)
X22
PLS M120
Pulsate data transmission switch
Transmission SW
M115 Y100 X100 X101 M120
SET M125
Set data transmission flag
M125
MOV K3 D100
Set transmission data size
MOV H4241 D101
Set transmission data (41H, 42H)
MOV H4443 D102
Set transmission data (43H, 44H)
MOV H4645 D103
Set transmission data (45H, 46H)
CALL P2
Change to bank 2
TO H0 H1C0 D100 K4
Store transmission data in automatic update buffer
CALL P0
Change to bank 0
SET Y100
Set transmission request
RST M125
Reset data transmission flag
X100
RST Y100
Reset transmission request
X101
Data reception
M115 X102
SET M130
Set data reception enable flag
X103
M130 Y102
CALL P2
Change to bank 2
FROM H0 H2C0 D200 K1
Read reception data size
<> K0 D200
MOV D200 Z
Store reception data size in Z
FROM H0 H2C1 D201 KOZ
Store data received from D201


CALL P0
Change to bank 0
SET Y102
Set reception read complete
X102 X103 Y102
RST Y102
Reset reception read complete
RST M130
Reset data reception enable flag
R2 error processing
X101
SET M135
Set the error occurrence flag
X103
X105
X108
M135
CALL P2
Change to bank 2
FROM H0 H1B0 D10 K3
Store error code in D10 to D12
CALL P0
Change to bank 0
SET Y91
Error LED
Turn ON error LED
RST M135
Reset error occurrence flag
X105 X23 X11A
SET Y11A
Error reset request
Reset SW
Y11A X11A
RST Y11A
Error reset complete
RST Y91
Error LED
Turn OFF error LED
RET

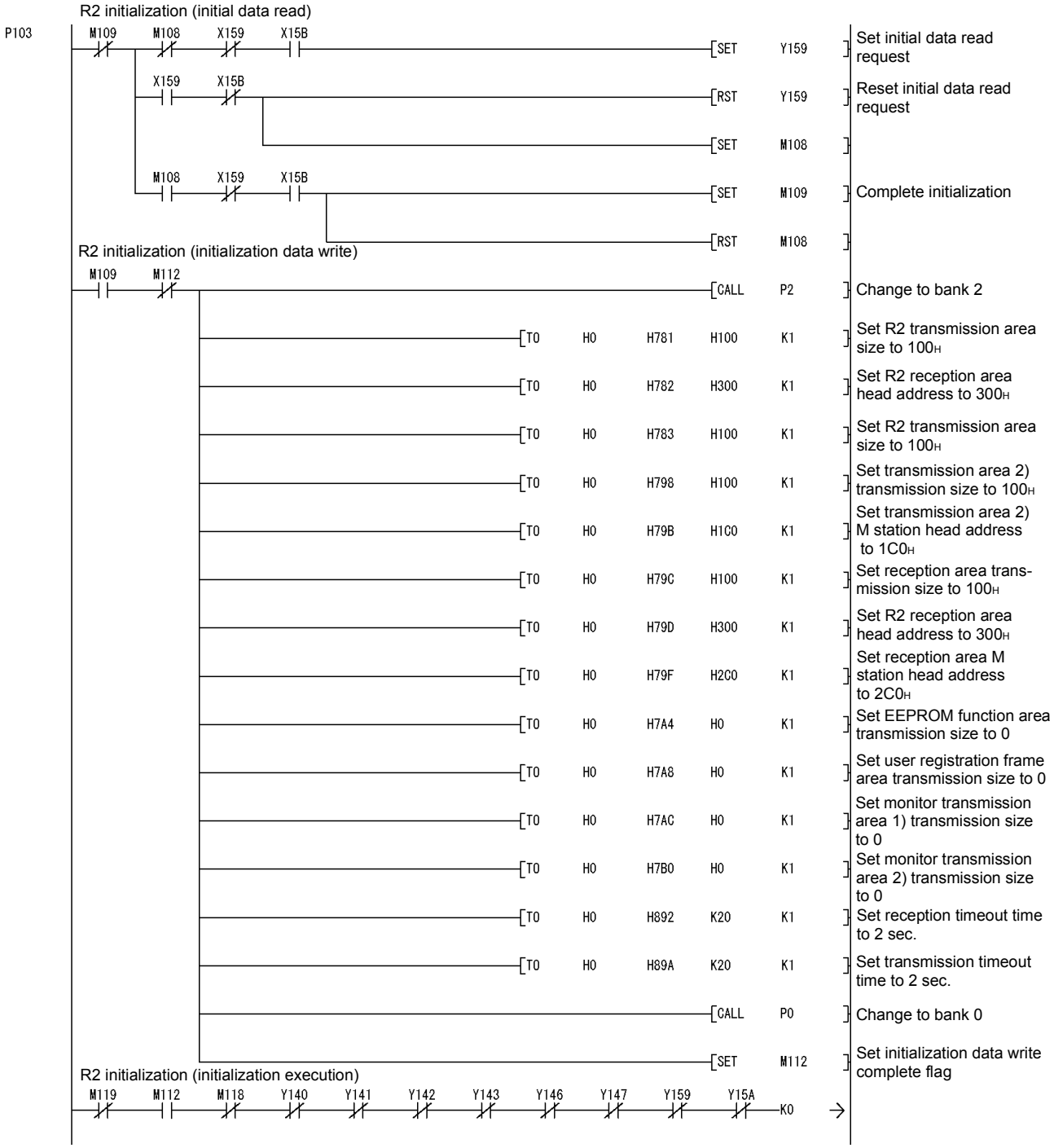
(e) Station No. 2 program

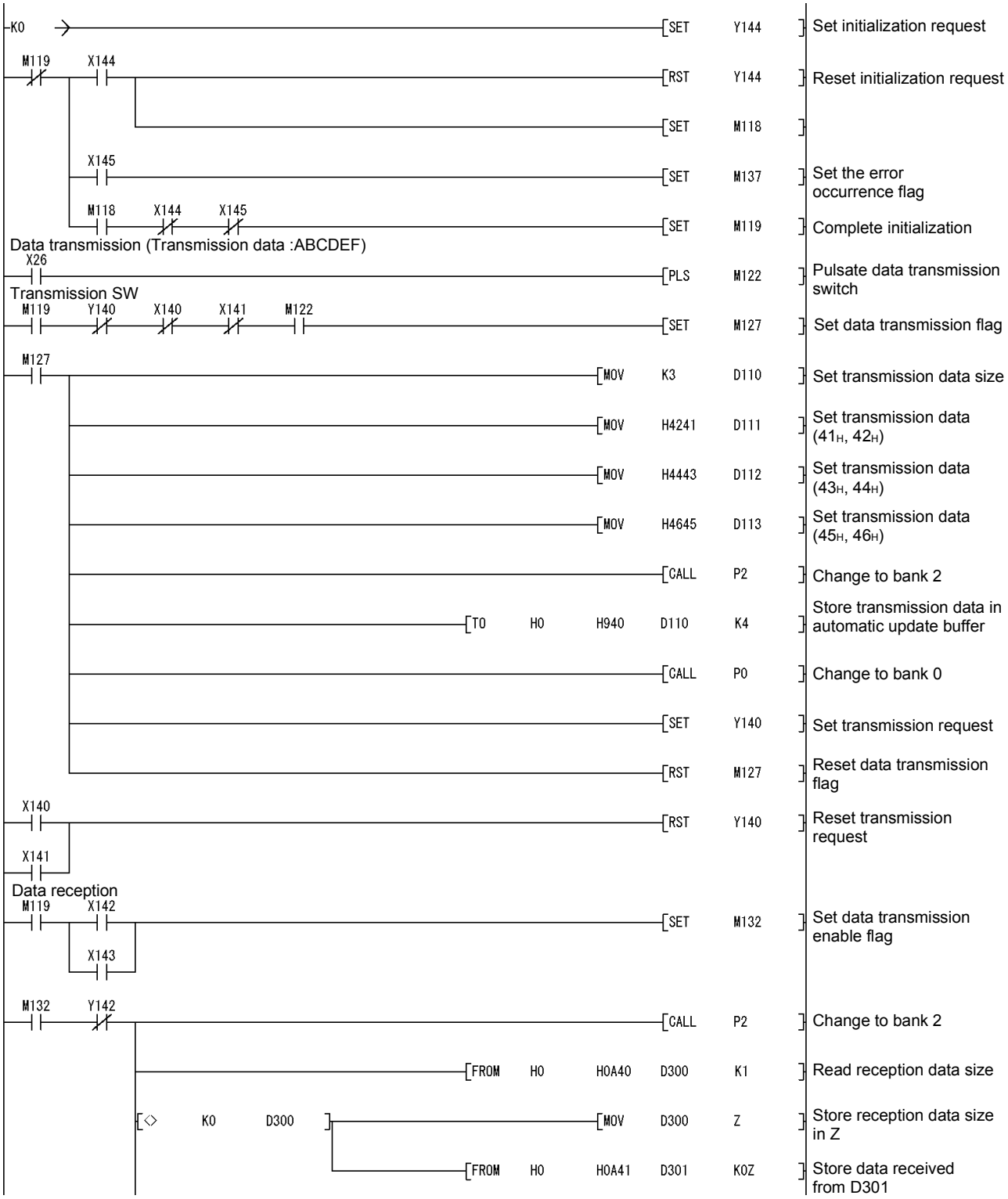


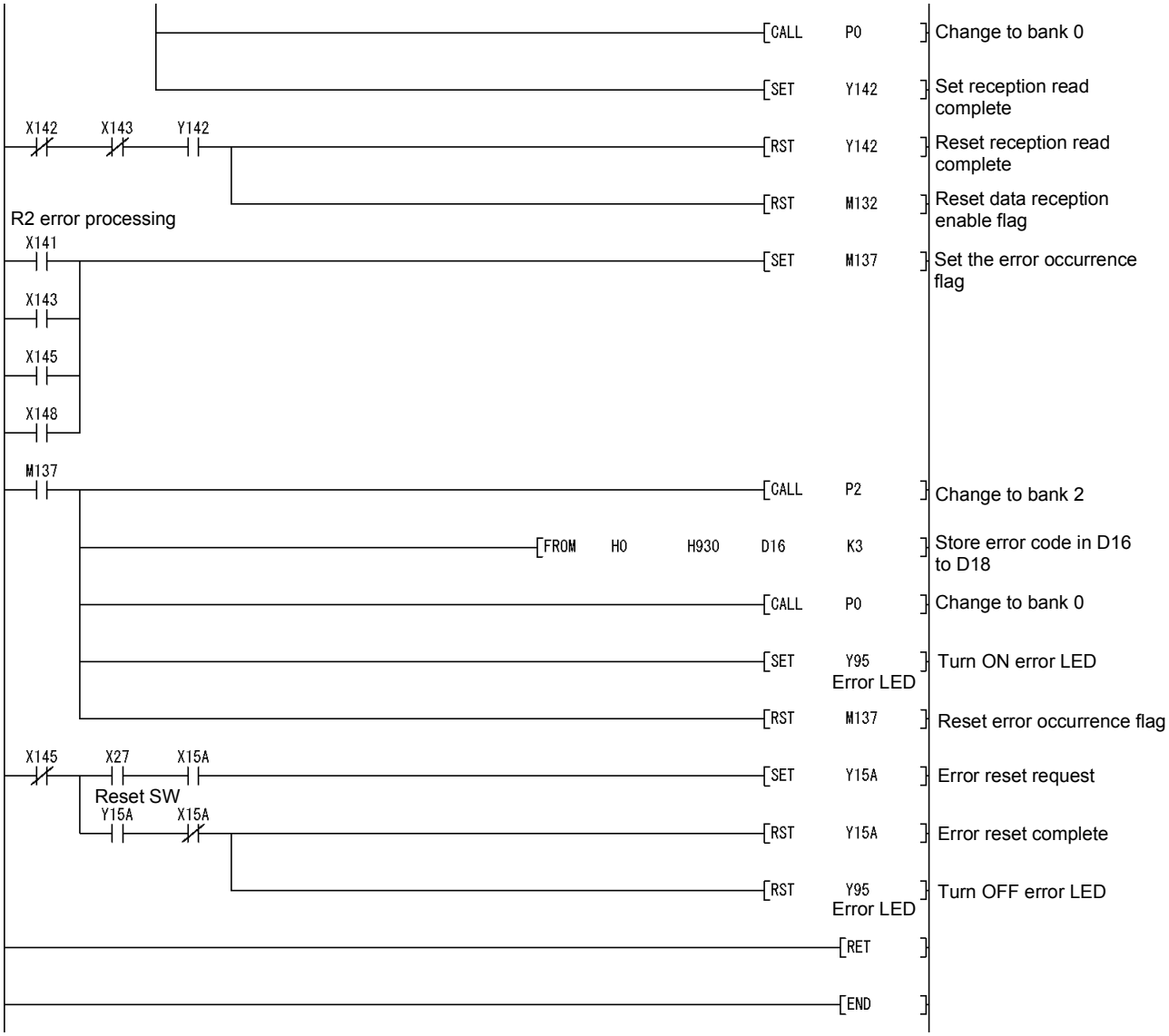

K0
SET Y124
Set initialization request
M117
X124
RST Y124
Reset initialization request
SET M116
X125
SET M136
Set the error occurrence flag
M116
X124
X125
SET M117
Complete initialization
Data transmission (Transmission data :ABCDEF)
X24
PLS M121
Pulsate data transmission switch
Transmission SW
M117
Y120
X120
X121
M121
SET M126
Set data transmission flag
M126
MOV K3 D105
Set transmission data size
MOV H4241 D106
Set transmission data (41H, 42H)
MOV H4443 D107
Set transmission data (43H, 44H)
MOV H4645 D108
Set transmission data (45H, 46H)
CALL P2
Change to bank 2
TO H0 H580 D105 K4
Store transmission data in automatic update buffer
CALL P0
Change to bank 0
SET Y120
Set transmission request
RST M126
Reset data transmission flag
X120
RST Y120
Reset transmission request
X121
Data reception
M117
X122
SET M131
Set data reception enable flag
X123
M131
Y122
CALL P2
Change to bank 2
FROM H0 H680 D250 K1
Read reception data size
<> K0 D250
MOV D250 Z
Store reception data size in Z
FROM H0 H681 D251 KOZ
Store data received from D251


CALL P0
Change to bank 0
SET Y122
Set reception read complete
X122 X123 Y122
RST Y122
Reset reception read complete
RST M131
Reset data reception enable flag
R2 error processing
X121
SET M136
Set the error occurrence flag
X123
X125
X128
M136
CALL P2
Change to bank 2
FROM H0 H570 D13 K3
Store error code in D13 to D15
CALL P0
Change to bank 0
SET Y93
Error LED
Turn ON error LED
RST M136
Reset error occurrence flag
Reset SW
X125 X25 X13A
SET Y13A
Error reset request
Y13A X13A
RST Y13A
Error reset complete
RST Y93
Error LED
Turn OFF error LED
RET

(f) Station No. 3 program




K0
SET Y144
Set initialization request
M119 X144
RST Y144
Reset initialization request
SET M118
X145
SET M137
Set the error occurrence flag
M118 X144 X145
SET M119
Complete initialization
Data transmission (Transmission data :ABCDEF)
X26
PLS M122
Pulsate data transmission switch
Transmission SW
M119 Y140 X140 X141 M122
SET M127
Set data transmission flag
M127
MOV K3 D110
Set transmission data size
MOV H4241 D111
Set transmission data (41H, 42H)
MOV H4443 D112
Set transmission data (43H, 44H)
MOV H4645 D113
Set transmission data (45H, 46H)
CALL P2
Change to bank 2
TO H0 H940 D110 K4
Store transmission data in automatic update buffer
CALL P0
Change to bank 0
SET Y140
Set transmission request
RST M127
Reset data transmission flag
X140
RST Y140
Reset transmission request
X141
Data reception
M119 X142
SET M132
Set data transmission enable flag
X143
M132 Y142
CALL P2
Change to bank 2
FROM H0 H0A40 D300 K1
Read reception data size
<> K0 D300
MOV D300 Z
Store reception data size in Z
FROM H0 H0A41 D301 K0Z
Store data received from D301


CALL P0
Change to bank 0
SET Y142
Set reception read complete
X142 X143 Y142
RST Y142
Reset reception read complete
RST M132
Reset data reception enable flag
R2 error processing
X141
SET M137
Set the error occurrence flag
X143
X145
X148
M137
CALL P2
Change to bank 2
FROM H0 H930 D16 K3
Store error code in D16 to D18
CALL P0
Change to bank 0
SET Y95
Error LED
Turn ON error LED
RST M137
Reset error occurrence flag
X145 X27 X15A
SET Y15A
Error reset request
Reset SW
Y15A X15A
RST Y15A
Error reset complete
RST Y95
Error LED
Turn OFF error LED
RET
END

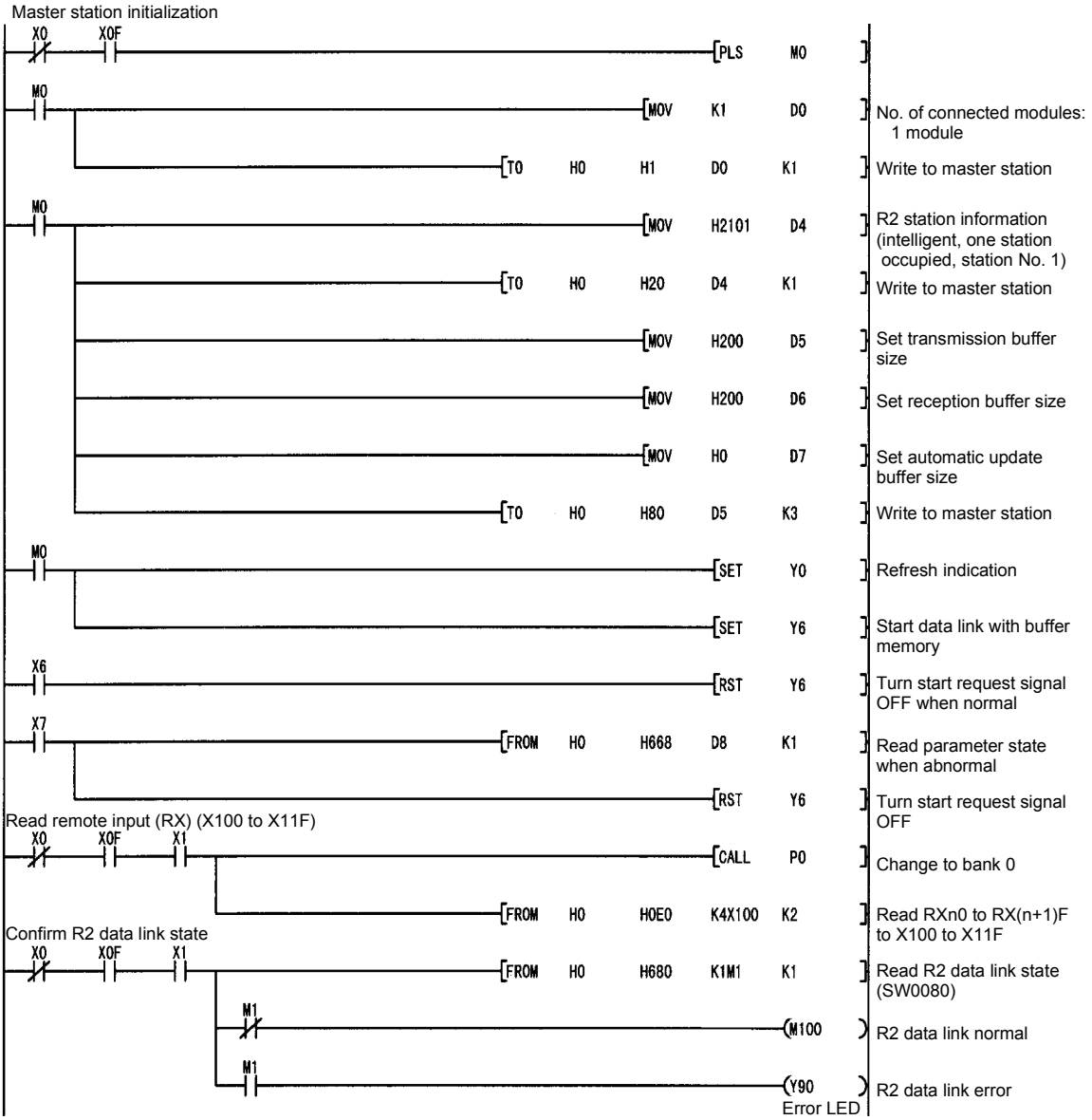
9.3 Example of program for using transmission/reception buffer

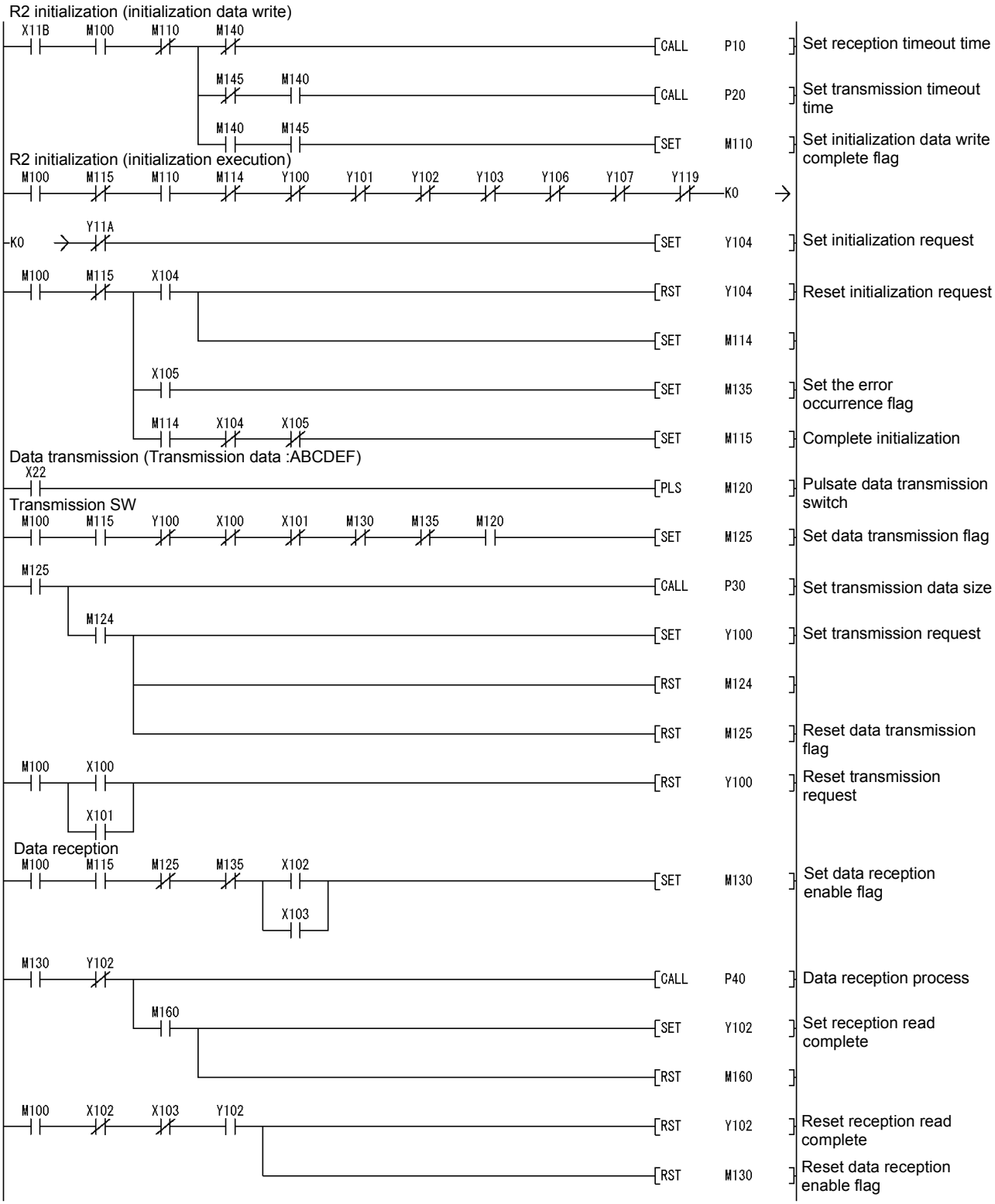
An example of the program for using the transmission/reception buffer is given below.

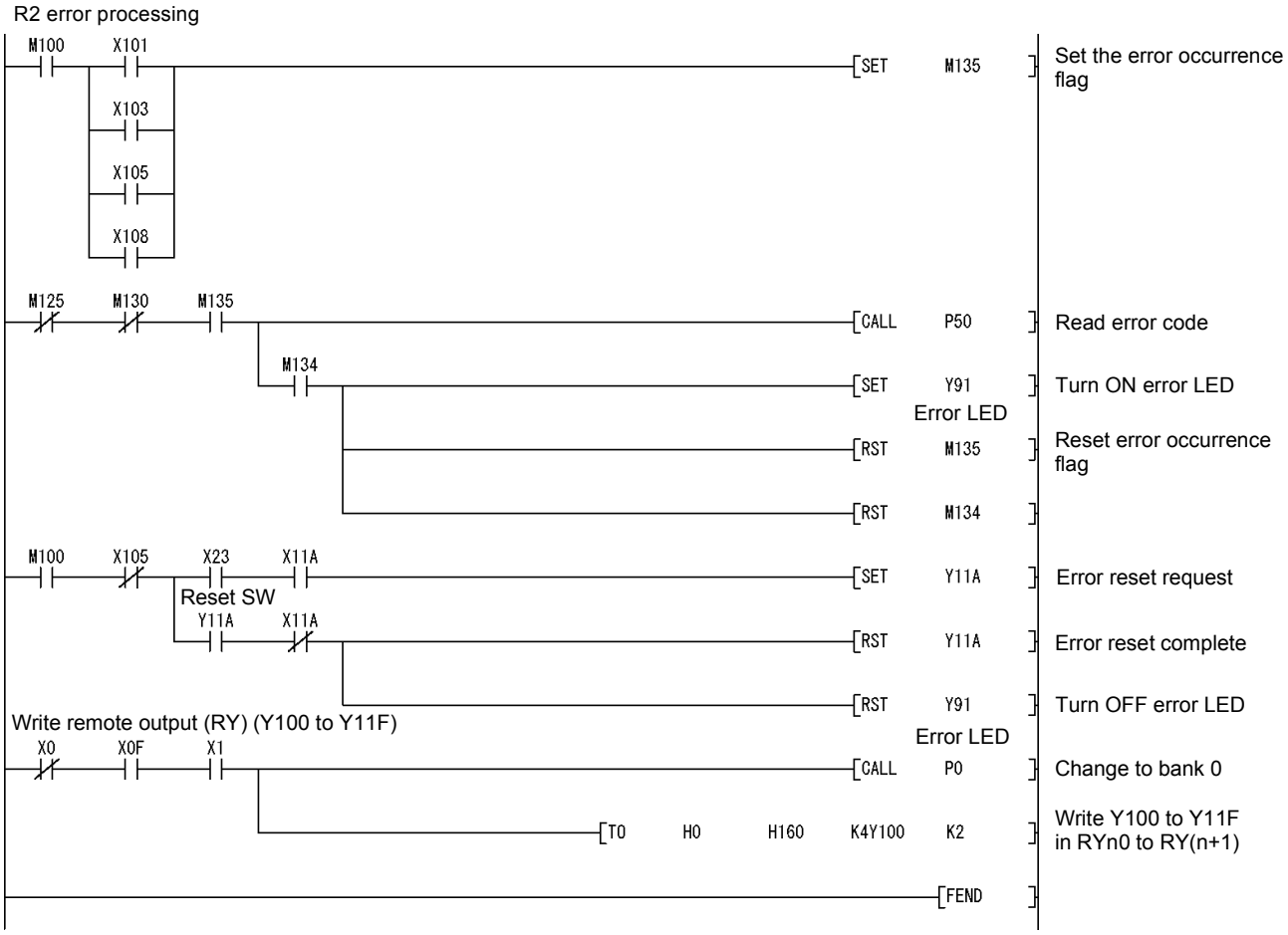
9.3.1 When using FROM/TO command with ACPU / QCPU-A (A mode)

An example of the program for using the FROM/TO command with the ACPU / QCPU-A (A mode) when using the transmission/reception buffer is shown below.

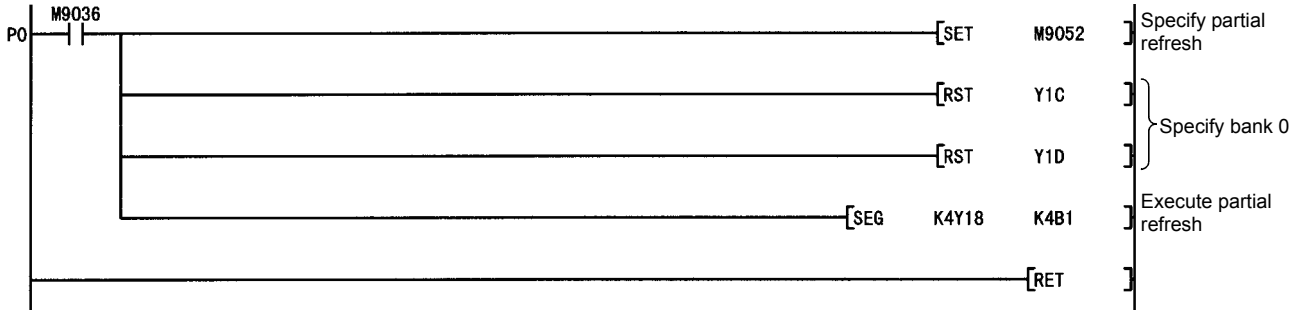
(1) Main program



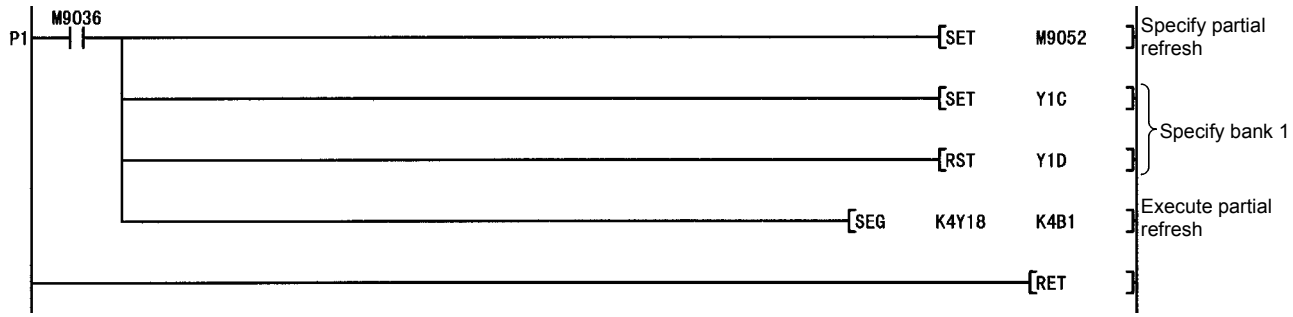

R2 initialization (initialization data write)
X11B M100 M110 M140 CALL P10 Set reception timeout time
M145 M140 CALL P20 Set transmission timeout time
M140 M145 SET M110 Set initialization data write complete flag
R2 initialization (initialization execution)
M100 M115 M110 M114 Y100 Y101 Y102 Y103 Y106 Y107 Y119 K0
K0 Y11A SET Y104 Set initialization request
M100 M115 X104 RST Y104 Reset initialization request
SET M114
X105 SET M135 Set the error occurrence flag
M114 X104 X105 SET M115 Complete initialization
Data transmission (Transmission data :ABCDEF)
X22 PLS M120 Pulsate data transmission switch
Transmission SW
M100 M115 Y100 X100 X101 M130 M135 M120 SET M125 Set data transmission flag
M125 CALL P30 Set transmission data size
M124 SET Y100 Set transmission request
RST M124
RST M125 Reset data transmission flag
M100 X100 RST Y100 Reset transmission request
X101
Data reception
M100 M115 M125 M135 X102 SET M130 Set data reception enable flag
X103
M130 Y102 CALL P40 Data reception process
M160 SET Y102 Set reception read complete
RST M160
M100 X102 X103 Y102 RST Y102 Reset reception read complete
RST M130 Reset data reception enable flag



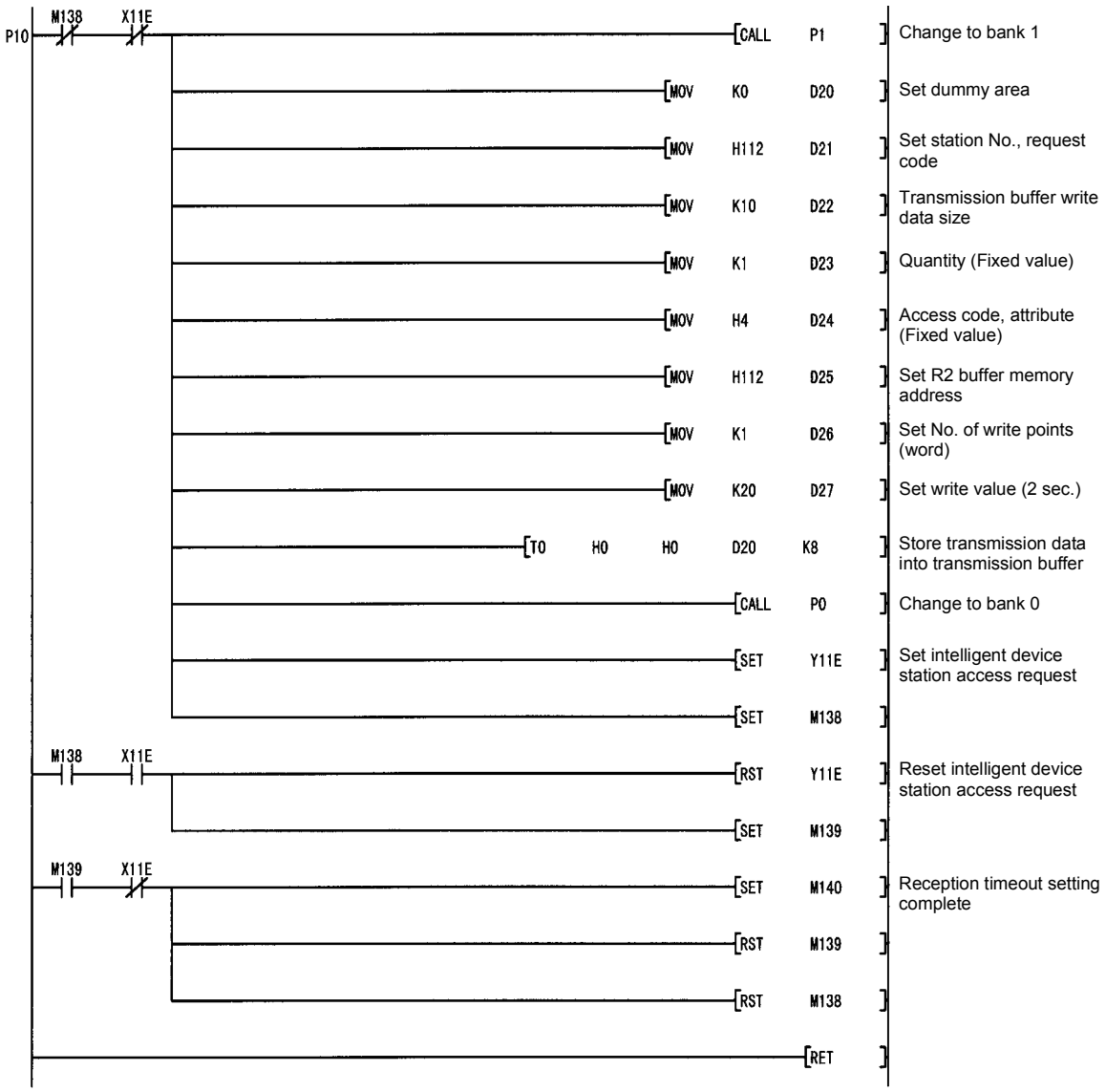
(2) Program to change to bank 0



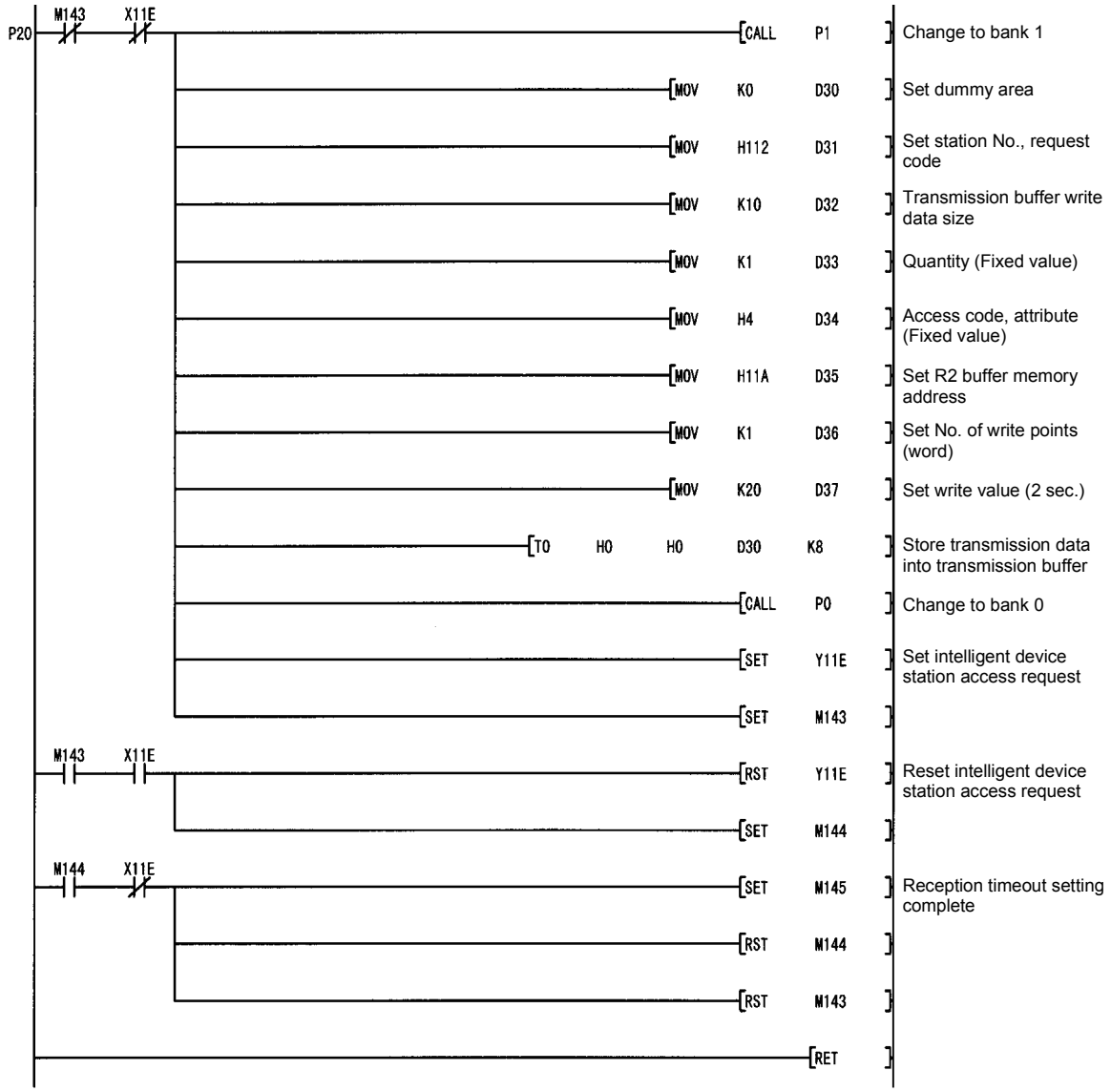
(3) Program to change to bank 1



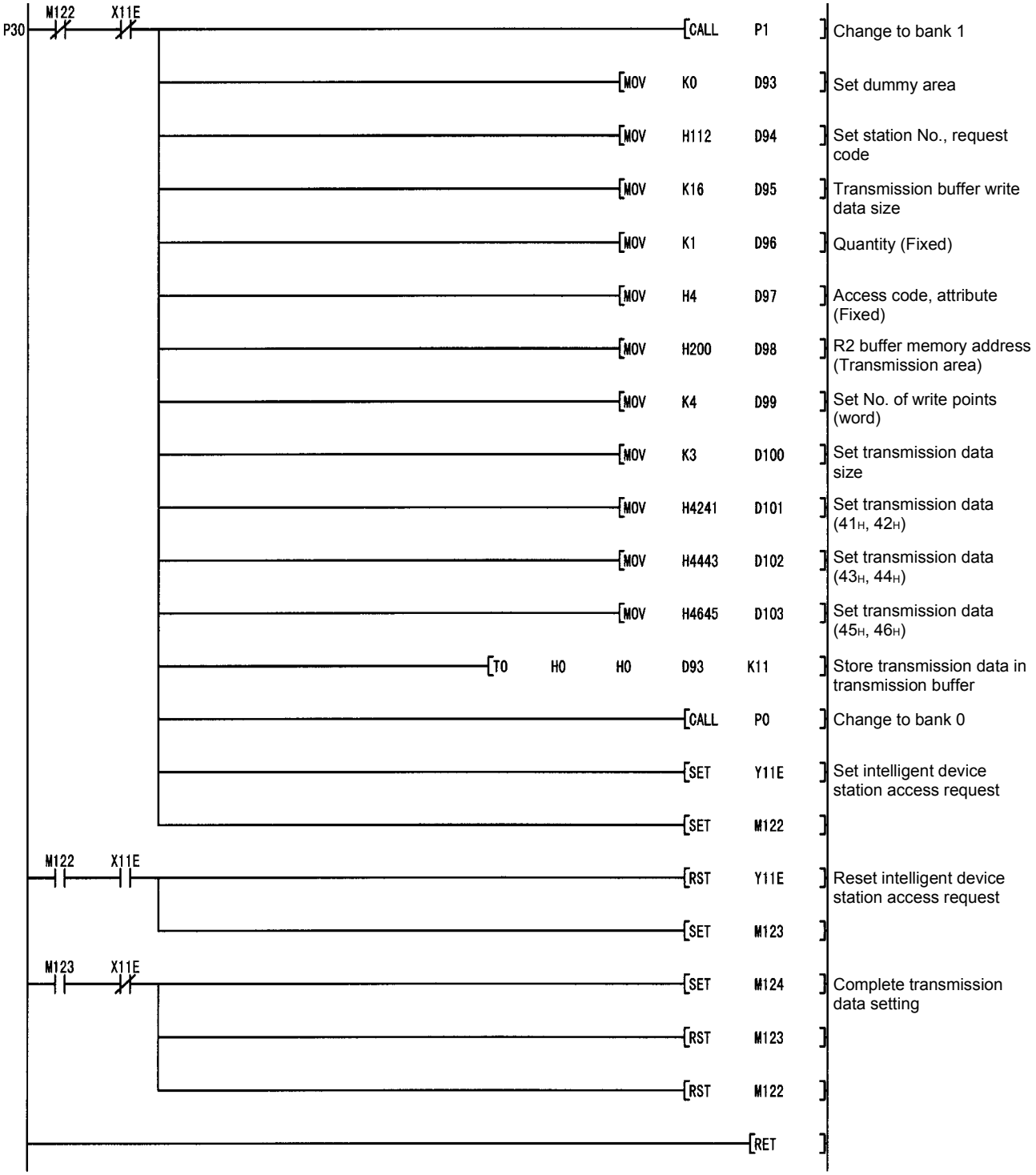
(4) Program for setting reception timeout time



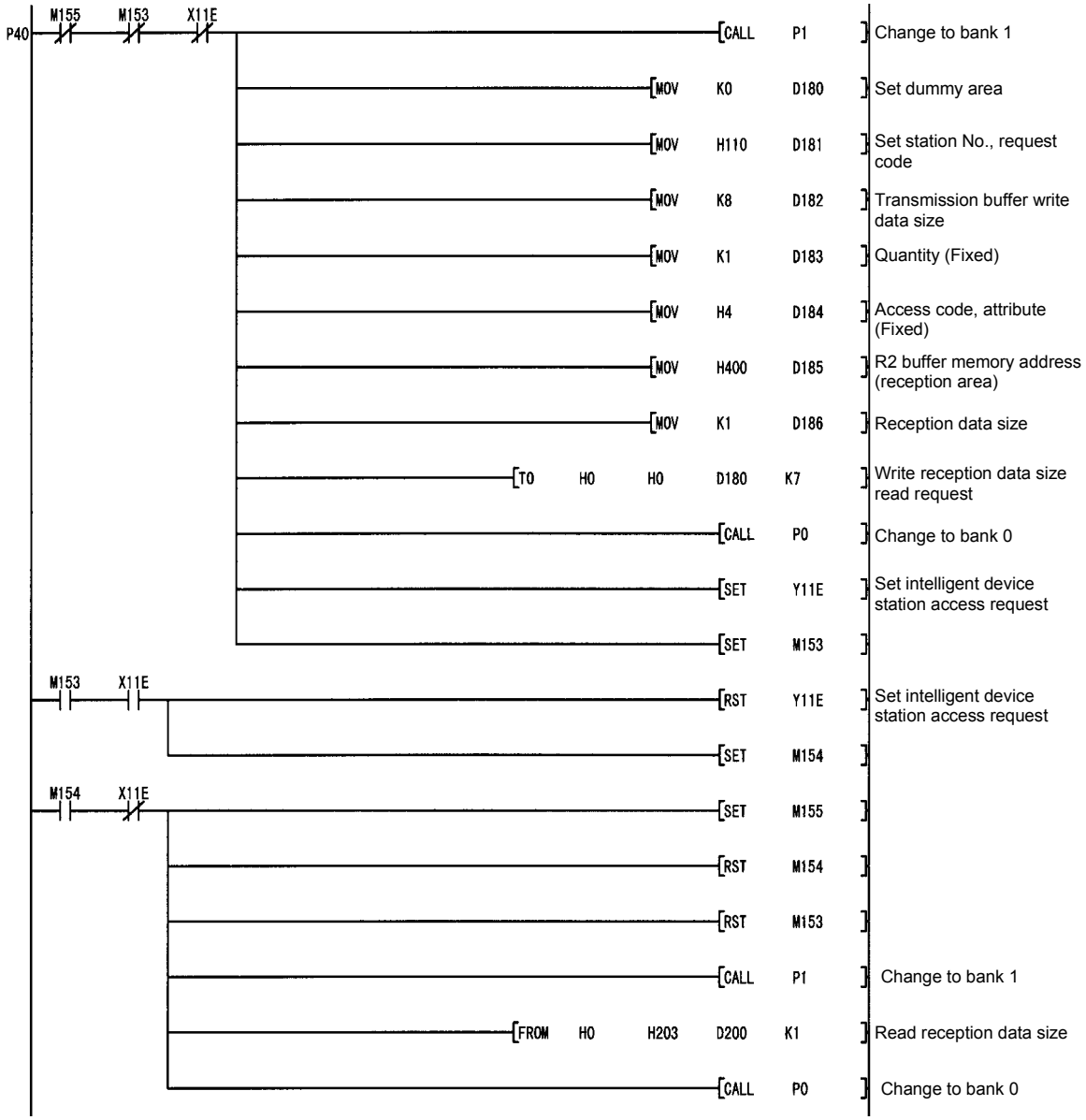
(5) Program for setting transmission timeout time

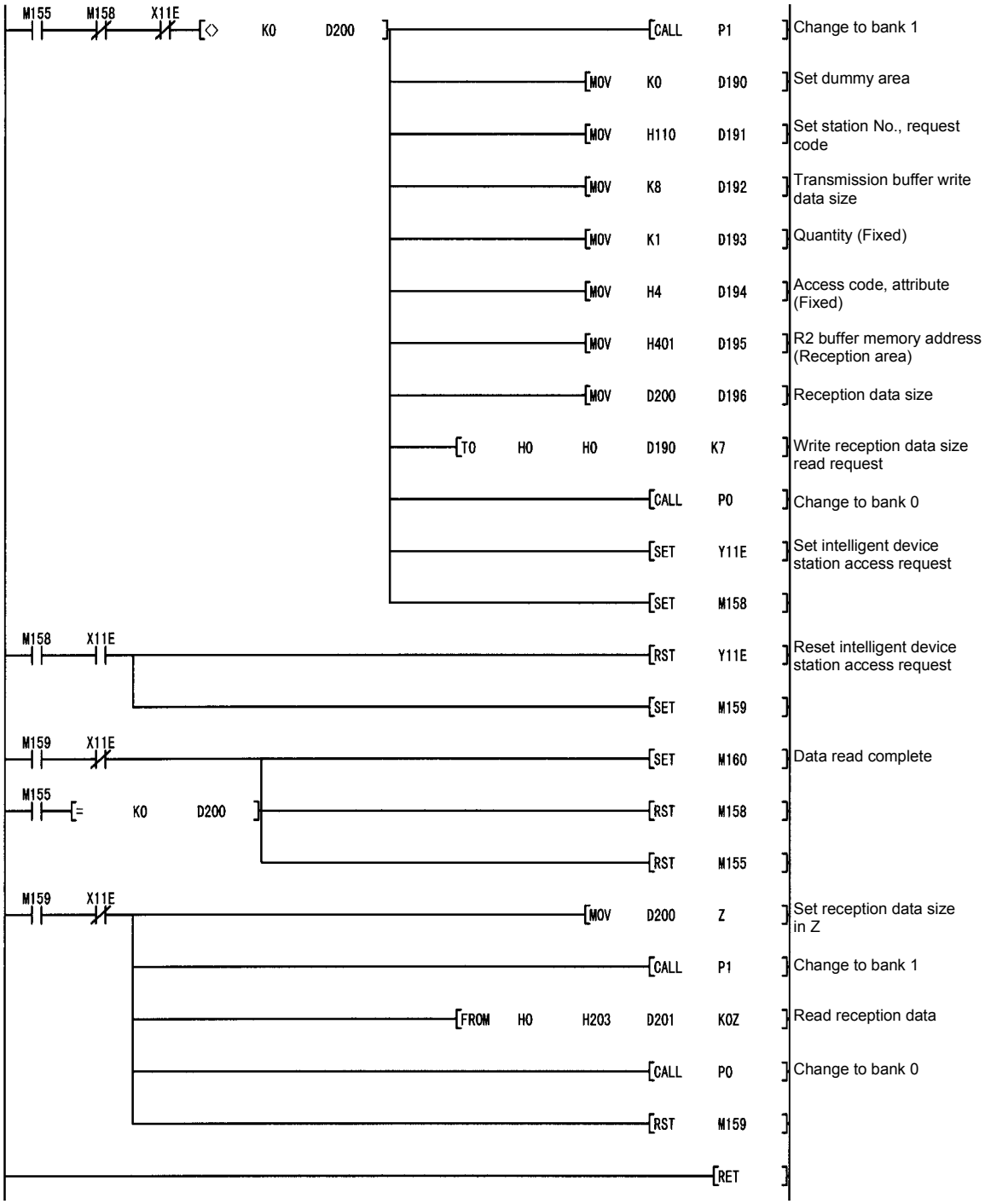


(6) Program for setting transmission data

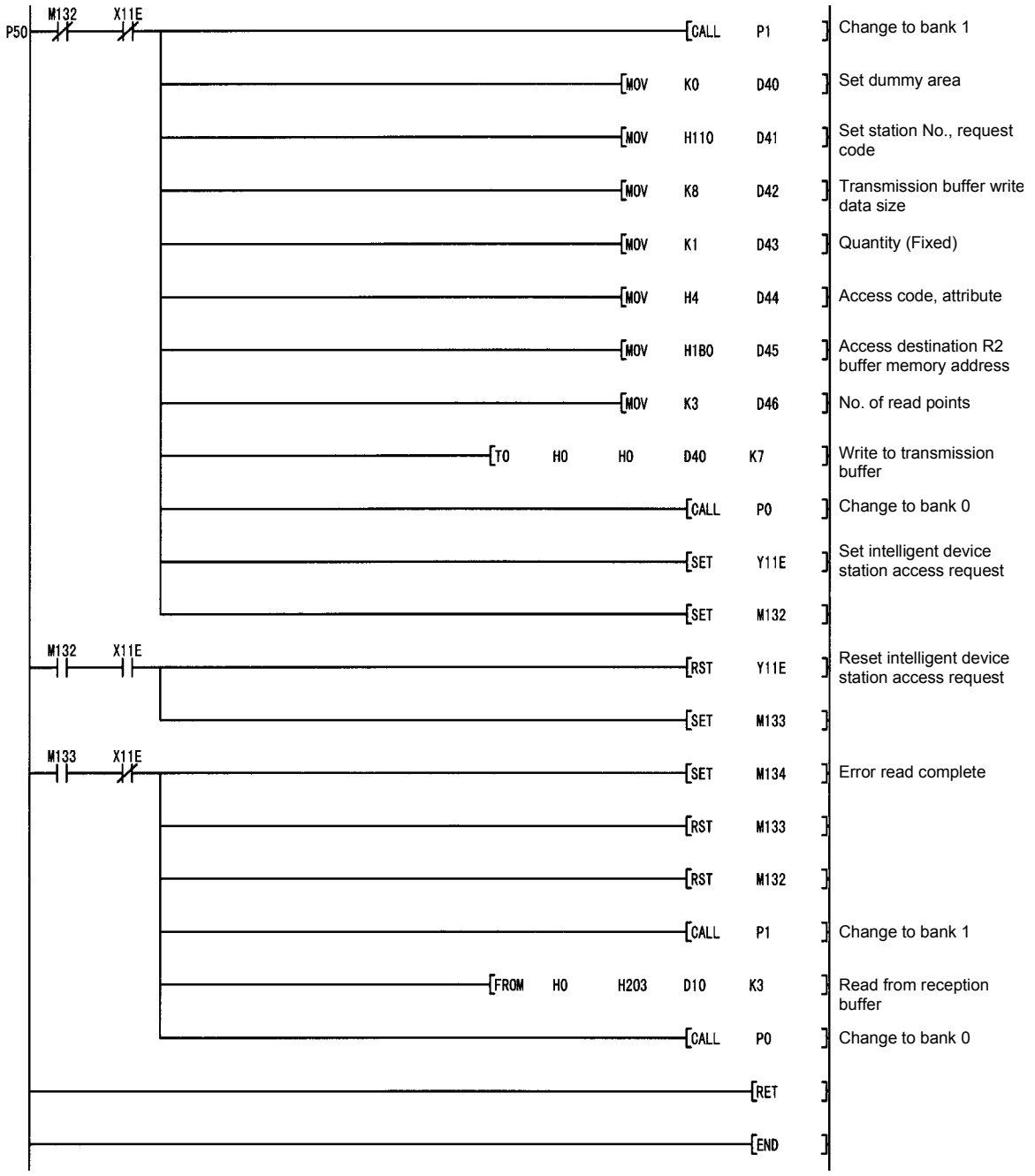


(7) Program for receiving data




M155 M158 X11E [<> K0 D200] [CALL P1] Change to bank 1
[MOV K0 D190] Set dummy area
[MOV H110 D191] Set station No., request code
[MOV K8 D192] Transmission buffer write data size
[MOV K1 D193] Quantity (Fixed)
[MOV H4 D194] Access code, attribute (Fixed)
[MOV H401 D195] R2 buffer memory address (Reception area)
[MOV D200 D196] Reception data size
[TO H0 H0 D190 K7] Write reception data size read request
[CALL P0] Change to bank 0
[SET Y11E] Set intelligent device station access request
[SET M158]
M158 X11E [RST Y11E] Reset intelligent device station access request
[SET M159]
M159 X11E [SET M160] Data read complete
M155 [= K0 D200] [RST M158]
[RST M155]
M159 X11E [MOV D200 Z] Set reception data size in Z
[CALL P1] Change to bank 1
[FROM H0 H203 D201 K0Z] Read reception data
[CALL P0] Change to bank 0
[RST M159]
[RET]

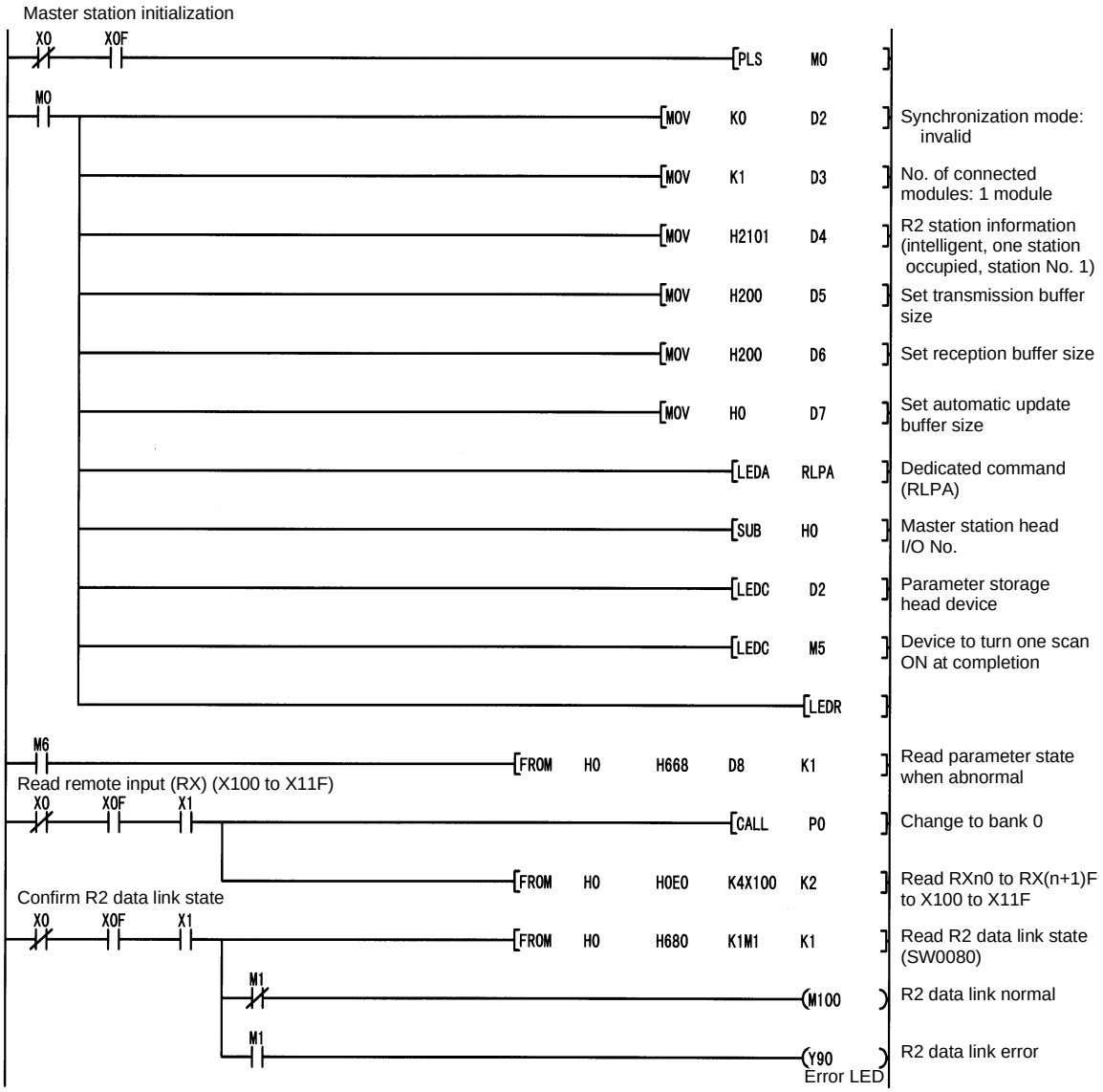
(8) Program for reading error codes

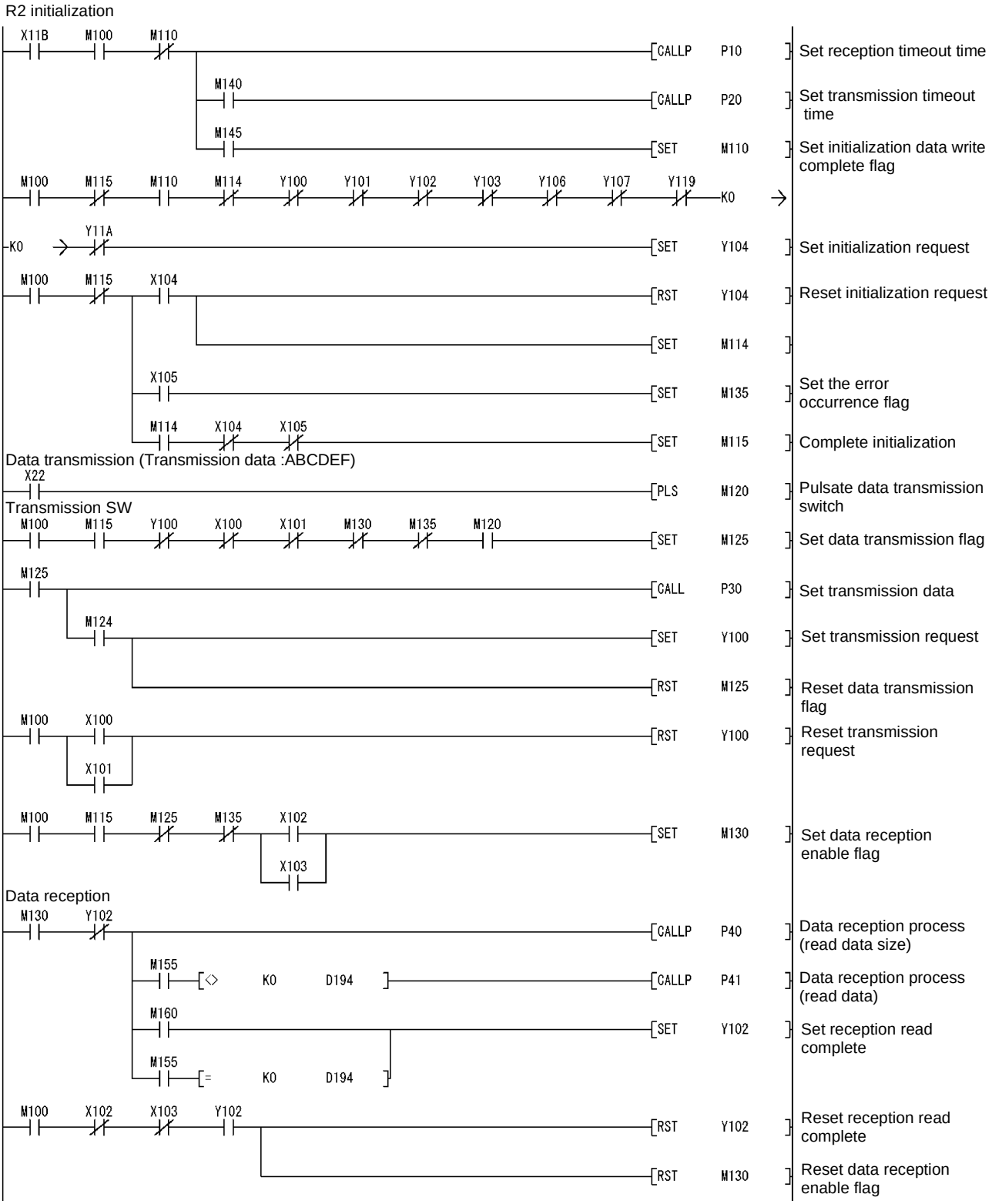


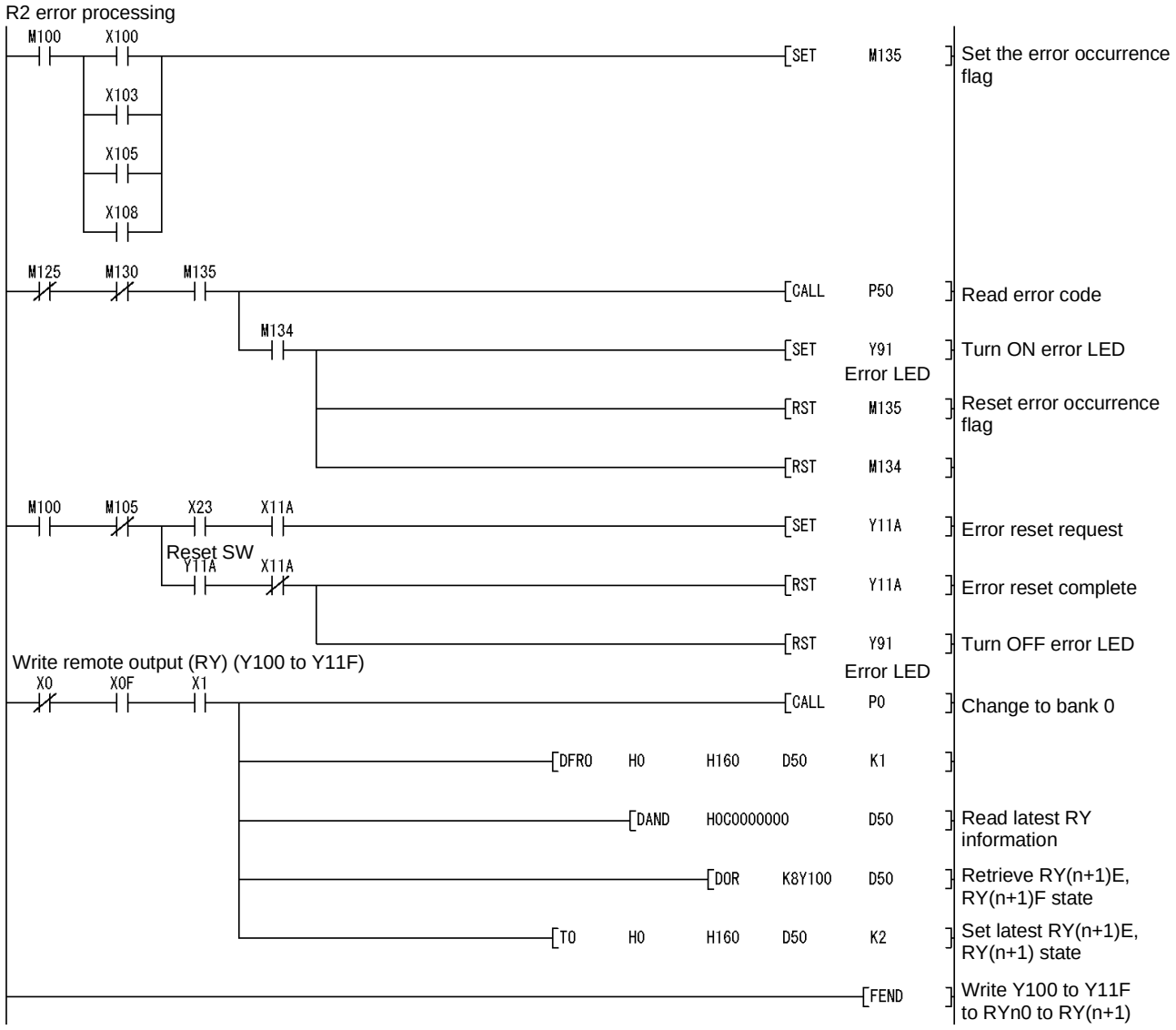
9.3.2 When using dedicated commands with ACPU / QCPU-A (A mode)

An example of the program for using the dedicated commands with the ACPU / QCPU-A (A mode) when using the transmission/reception buffer is shown below.

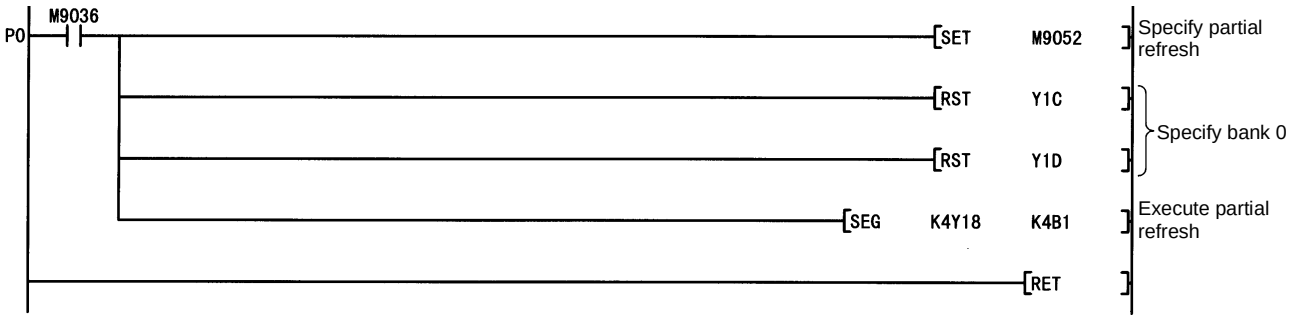
(1) Main program



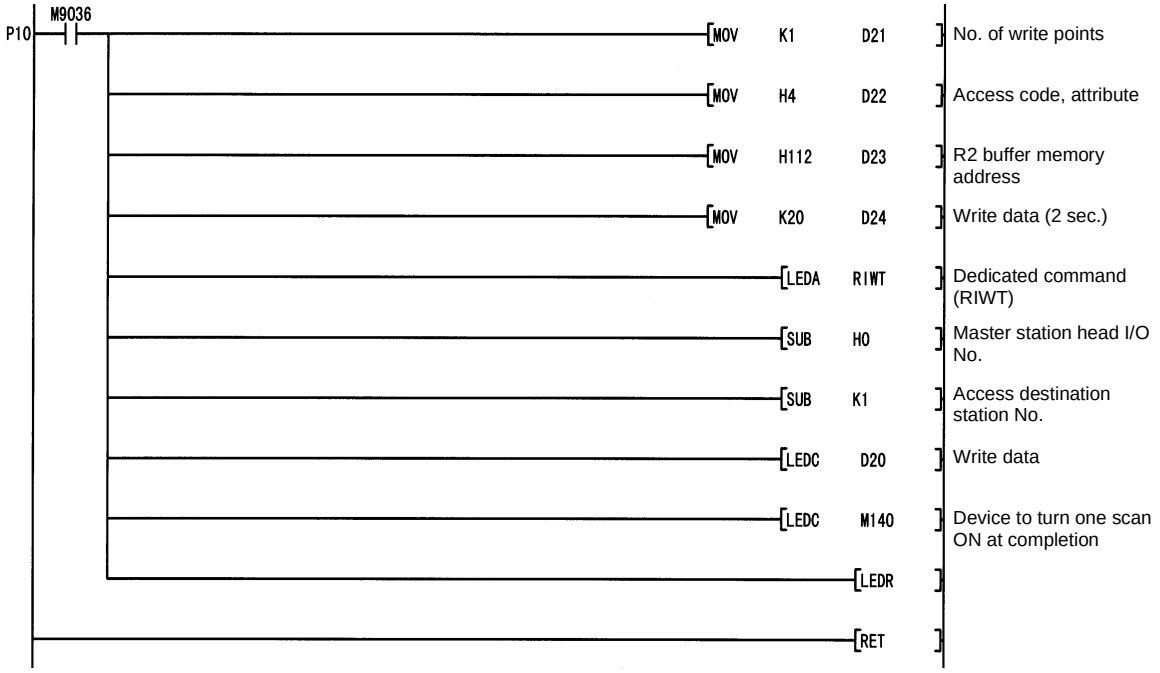

R2 initialization
X11B M100 M110 CALLP P10 Set reception timeout time
M140 CALLP P20 Set transmission timeout time
M145 SET M110 Set initialization data write complete flag
M100 M115 M110 M114 Y100 Y101 Y102 Y103 Y106 Y107 Y119 K0
K0 Y11A SET Y104 Set initialization request
M100 M115 X104 RST Y104 Reset initialization request
SET M114
X105 SET M135 Set the error occurrence flag
M114 X104 X105 SET M115 Complete initialization
Data transmission (Transmission data :ABCDEF)
X22 PLS M120 Pulsate data transmission switch
Transmission SW
M100 M115 Y100 X100 X101 M130 M135 M120 SET M125 Set data transmission flag
M125 CALL P30 Set transmission data
M124 SET Y100 Set transmission request
RST M125 Reset data transmission flag
M100 X100 RST Y100 Reset transmission request
X101
M100 M115 M125 M135 X102 SET M130 Set data reception enable flag
X103
Data reception
M130 Y102 CALLP P40 Data reception process (read data size)
M155 <> K0 D194 CALLP P41 Data reception process (read data)
M160 SET Y102 Set reception read complete
M155 = K0 D194
M100 X102 X103 Y102 RST Y102 Reset reception read complete
RST M130 Reset data reception enable flag



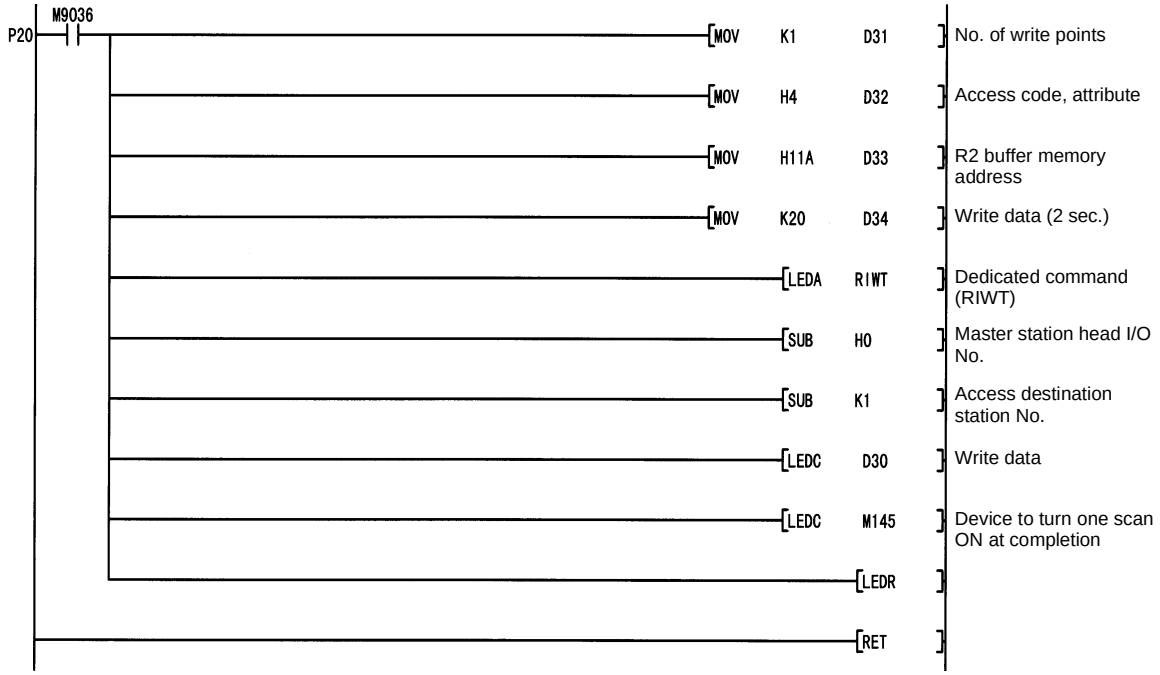
(2) Program for changing to bank 0



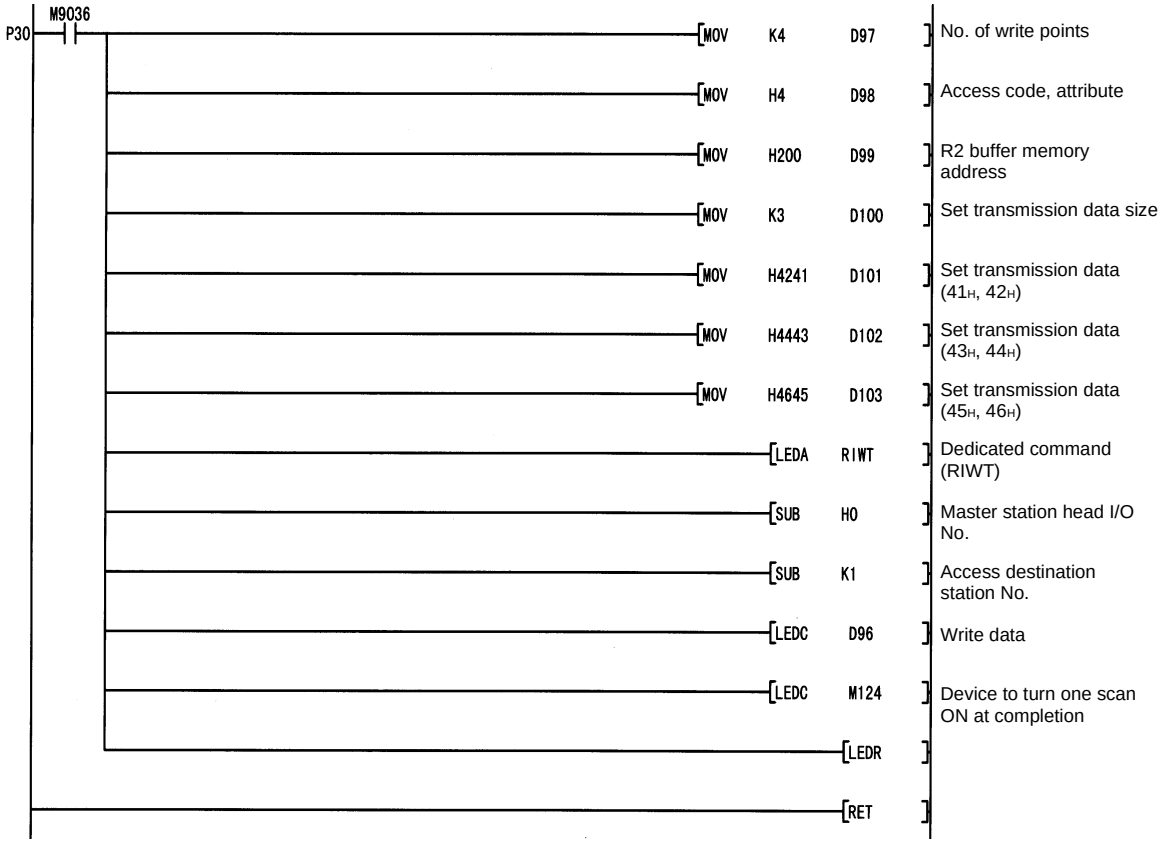
(3) Program for setting reception timeout time



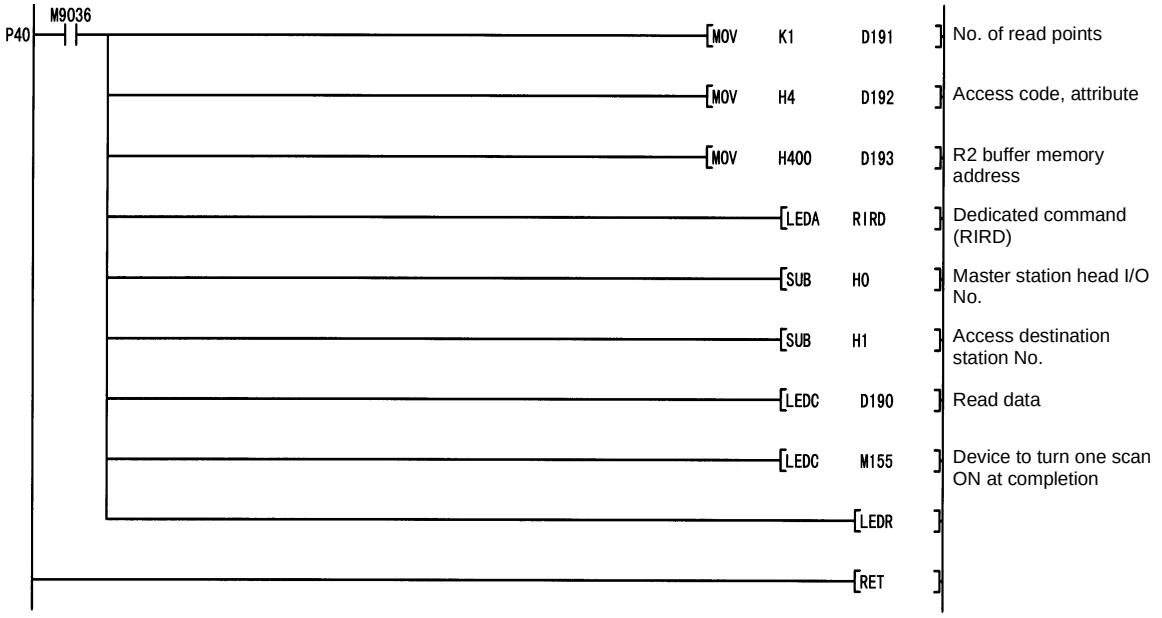
(4) Program for setting transmission timeout time



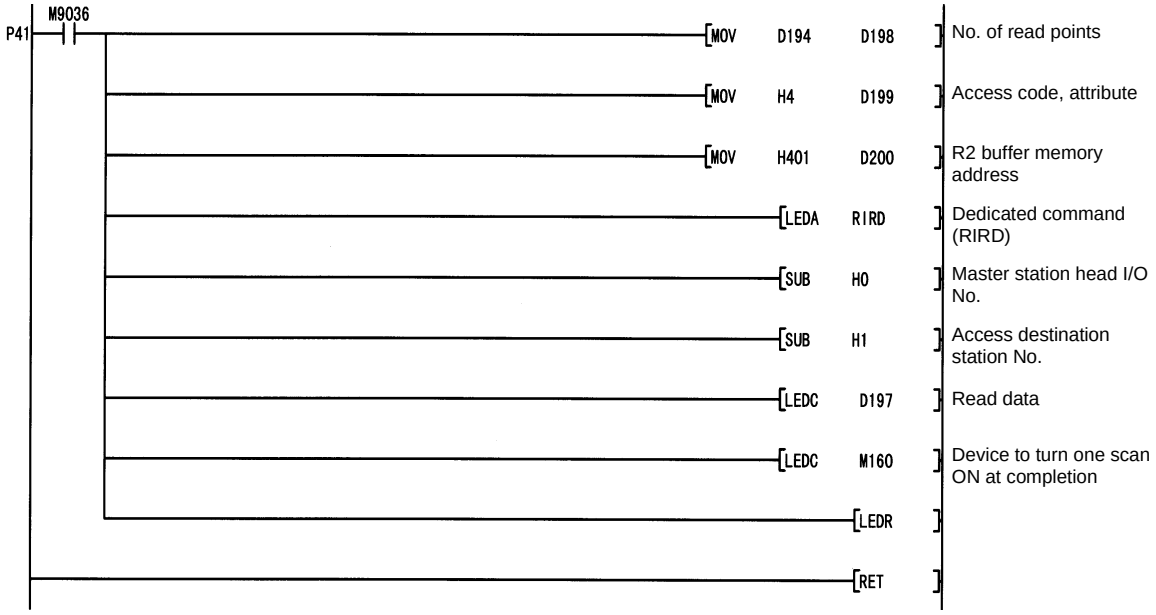
(5) Program for setting transmission data



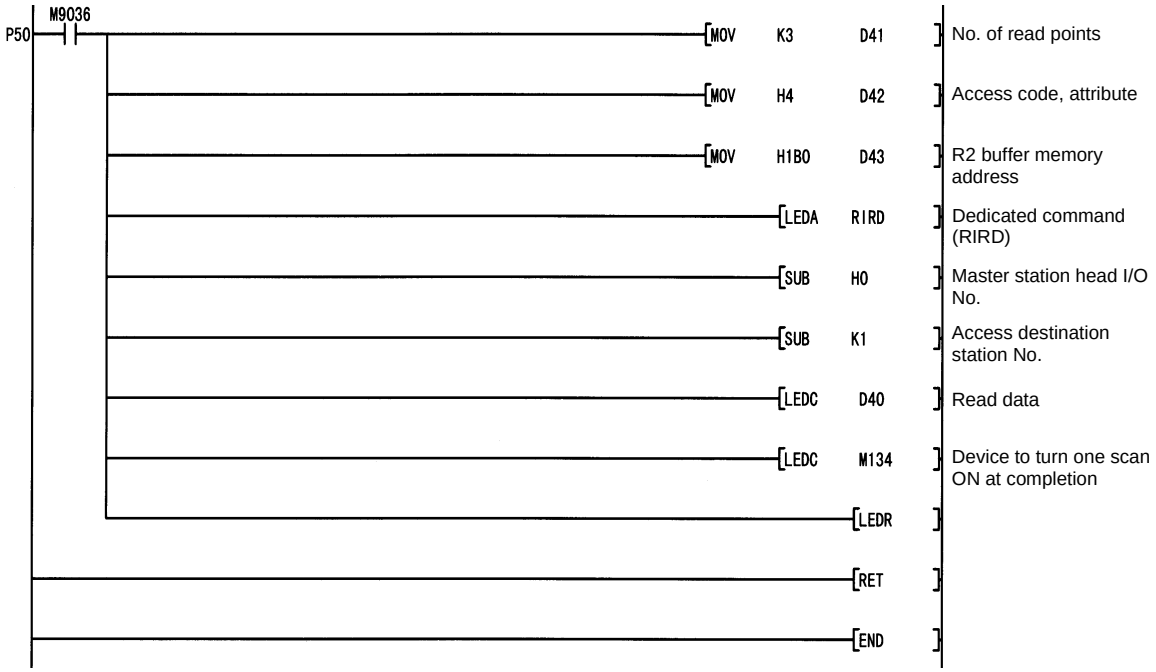
(6) Program for reading reception data size



(7) Program for reading reception data



(8) Program for reading error codes



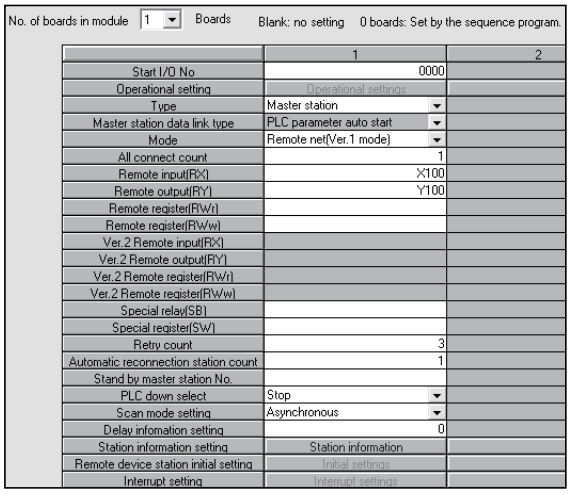
9.3.3 When using dedicated commands with QCPU (Q mode) / QnACPU

An example of the program for using the dedicated commands with the QCPU (Q mode) / QnACPU when using the transmission/reception buffer is shown below.
With this program, it is assumed that the CC-Link parameters are set as follows.

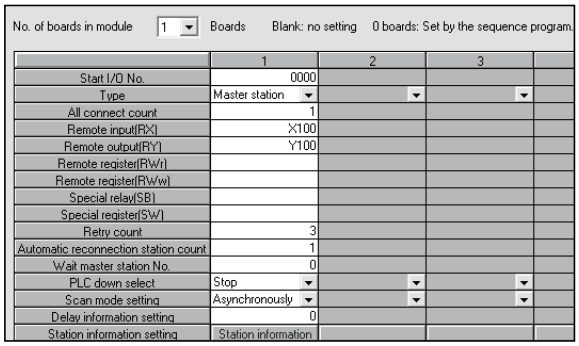
Parameter setting item		Setting value
No. of modules		1 module
Module head input/output No.		0
Module type		Master station
Total No. of connected modules		1
Batch refresh device	Remote input (RX)	X100
	Remote output (RY)	Y100
Station information	Station type	Intelligent device station
	No. of occupied stations	One station occupied
	Transmission buffer size	512
	Reception buffer size	512
	Automatic update buffer size	0

<GPPW parameter setting screen>

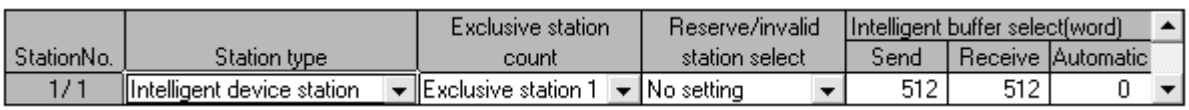
When the programmable controller series is QCPU (Q mode)



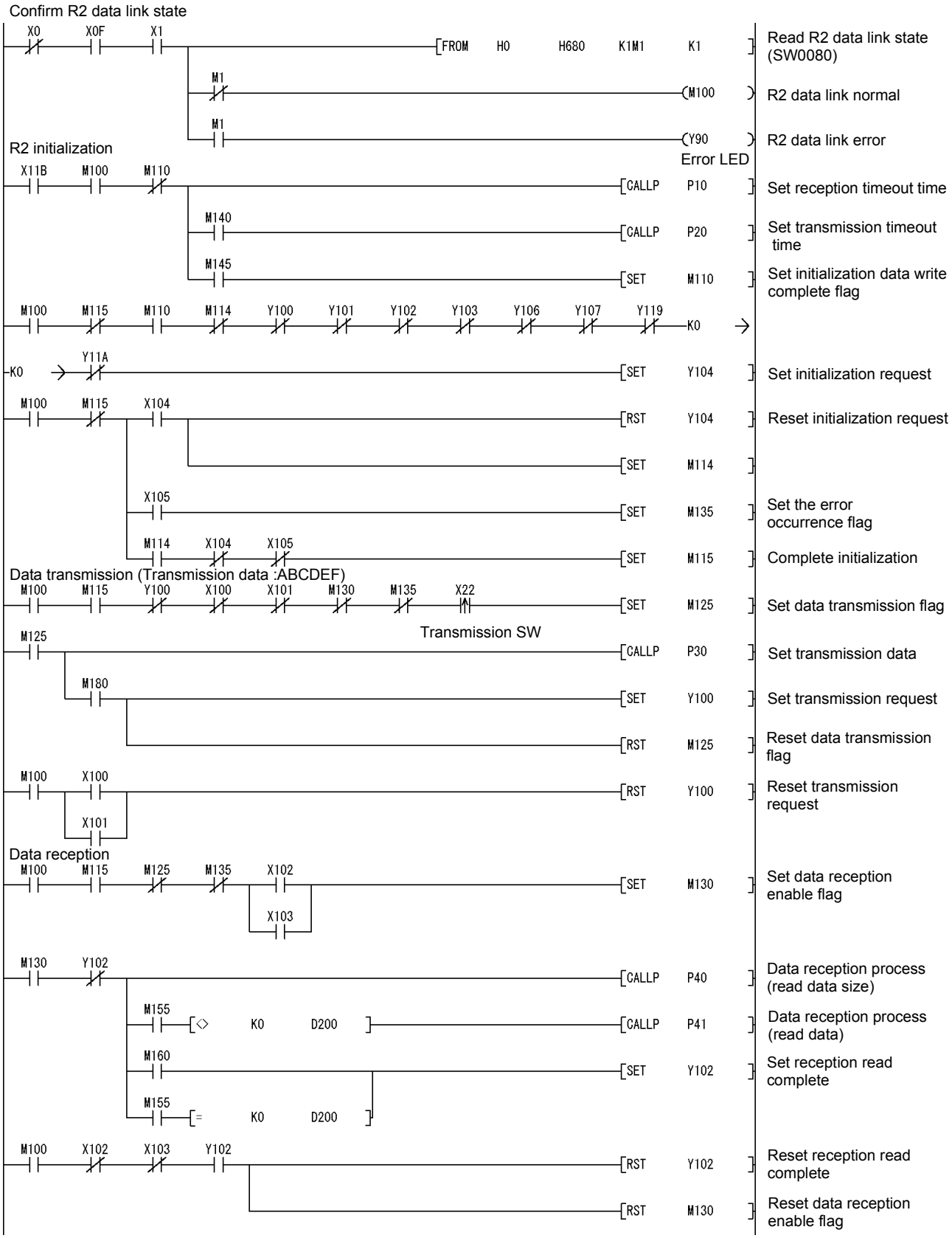
When the programmable controller series is QnACPU

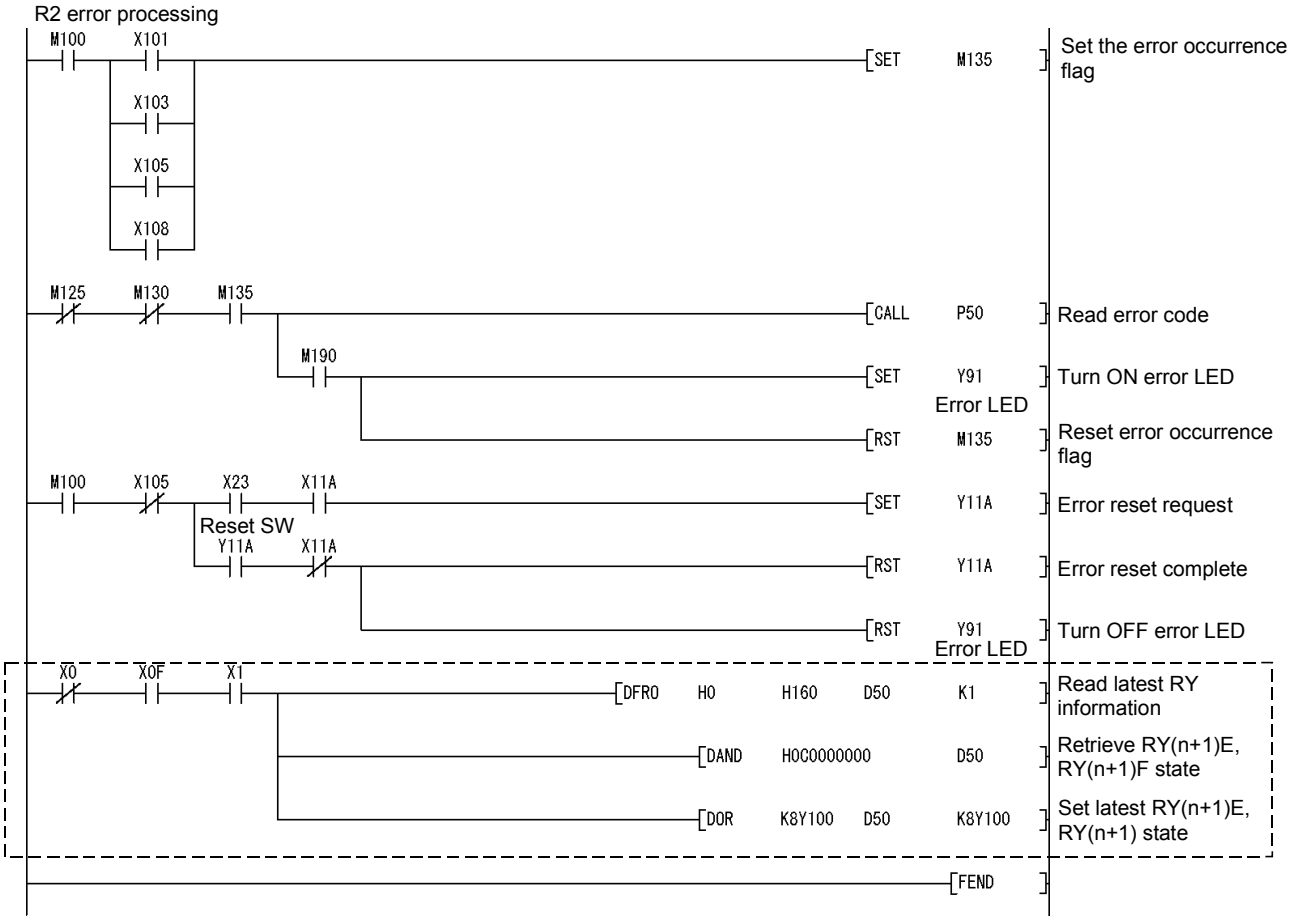


<GPPW station information setting screen>



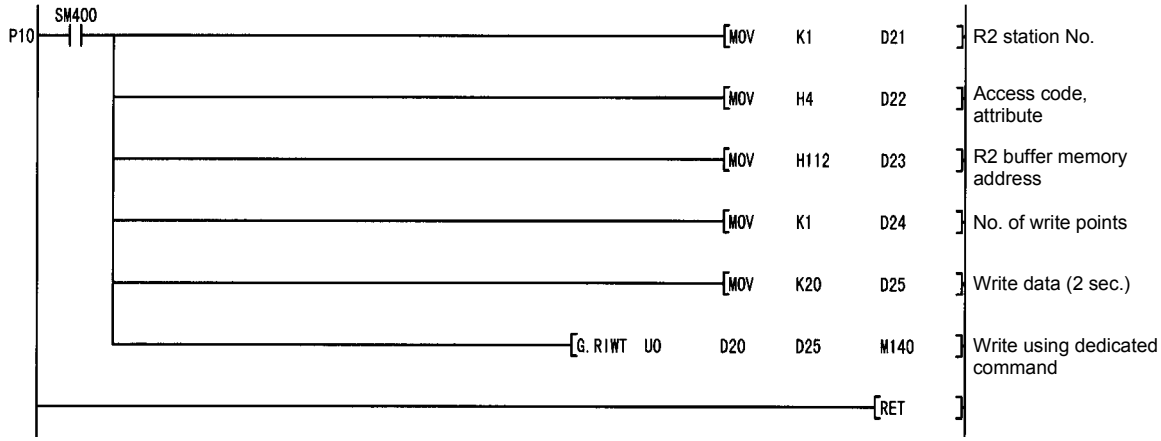
(1) Main program



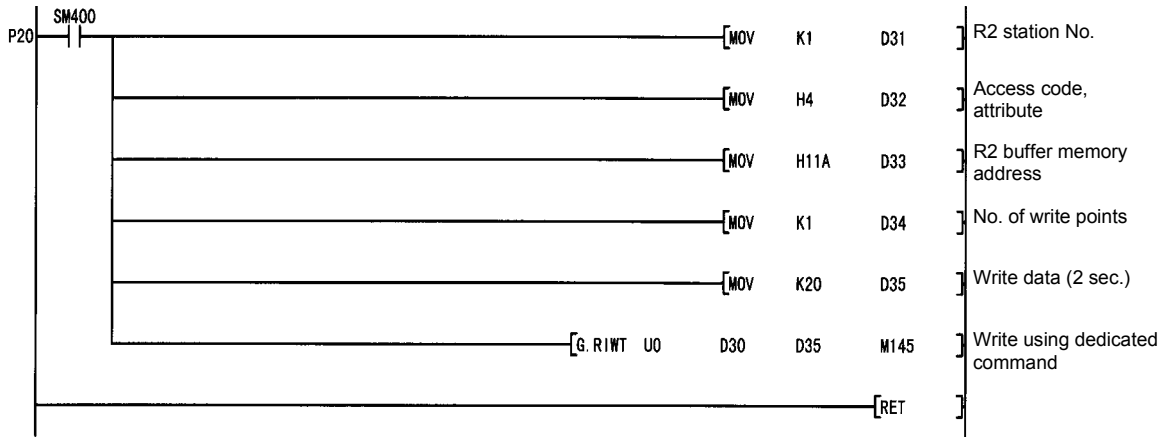


* The program area enclosed by the dotted line is not required when the QCPU (Q mode) is used.

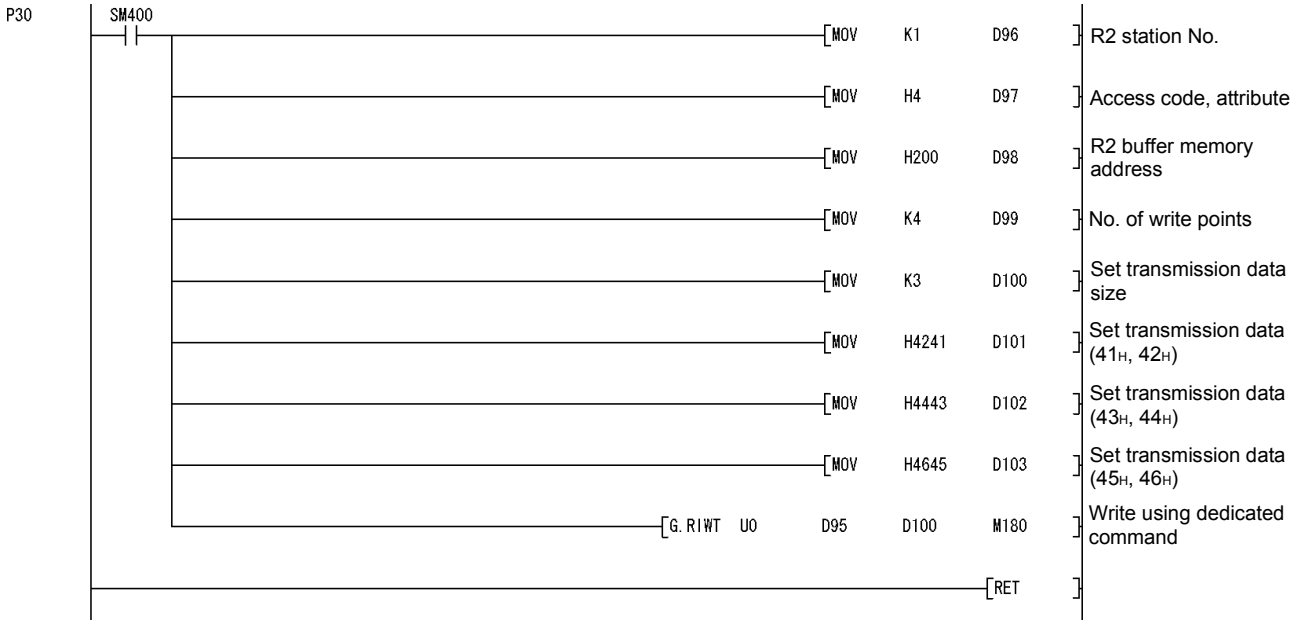
(2) Program for setting reception timeout time



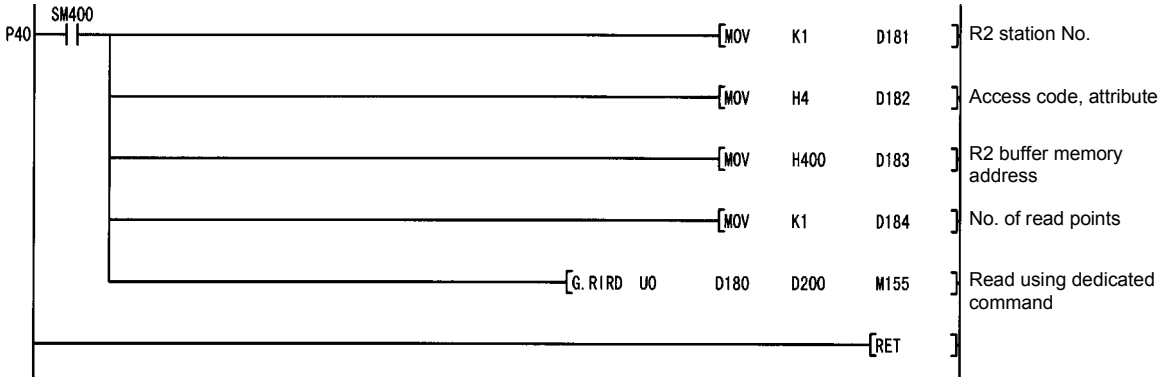
(3) Program for setting transmission timeout time



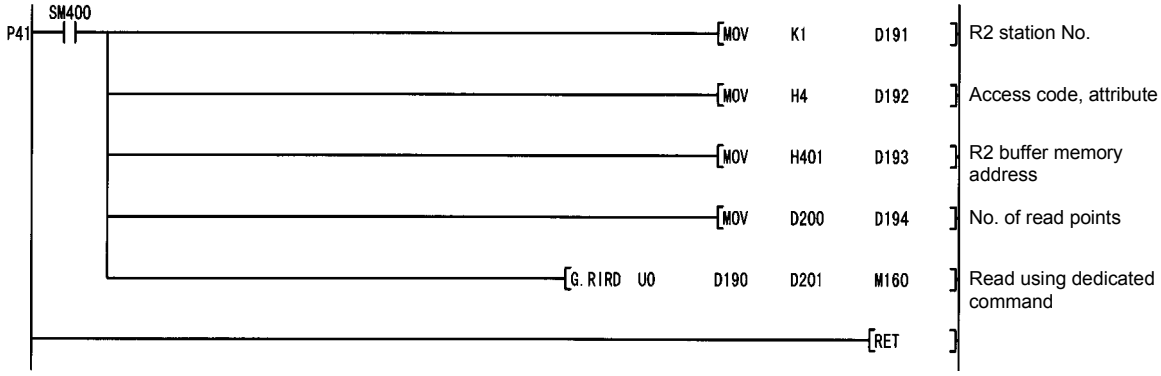
(4) Program for setting reception data



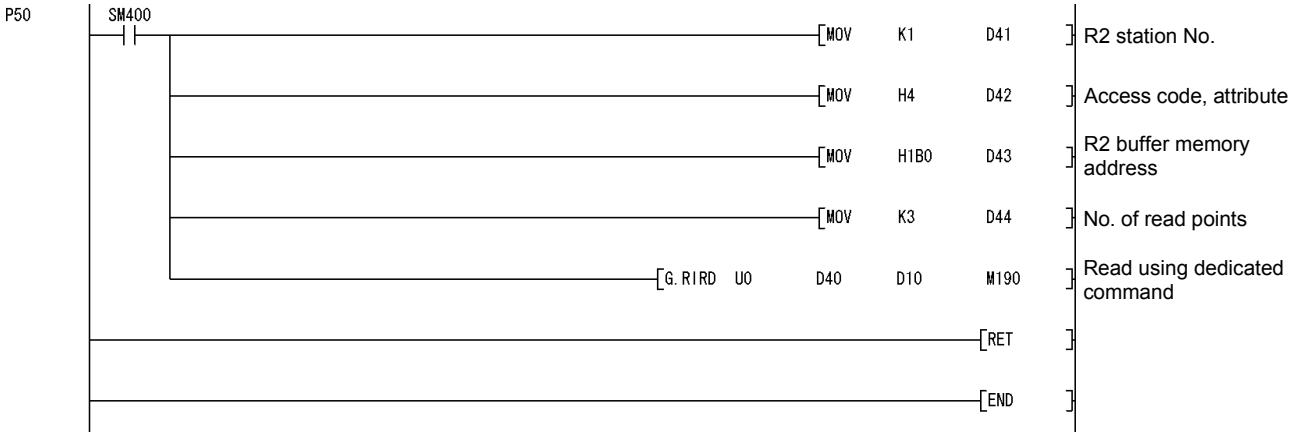
(5) Program for reading reception data size



(6) Program for reading reception data



(7) Program for reading error codes



MEMO

10. TROUBLESHOOTING

The details of the errors that occurs when using the R2, and the troubleshooting methods are explained in this chapter.

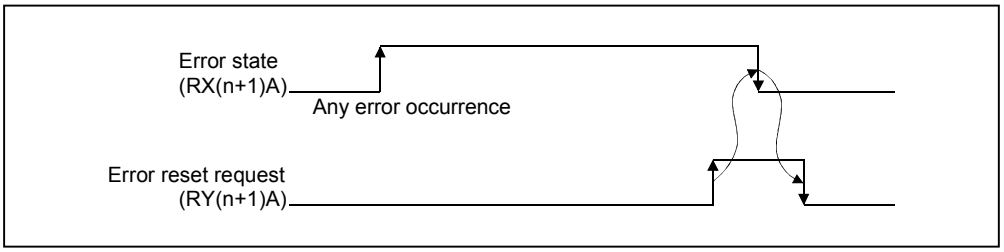
10.1 Error codes

The error codes stored in the R2 buffer memory are explained.

10.1.1 Error code storage area

When an error occurs in the R2, programmable controller CPU or master module, an error code is stored in the error code storage area of the R2, which is classified by function, and the ERR. LED turns ON.
Up to eight error codes that have occurred in the past are stored in order of occurrence in the error code history (R2 1A8H to 1AFH) (The ninth and following error codes are not stored.)
The ERR. LED is turned OFF, and the error code storage area is cleared by turning the error reset request signal (RY(n+1)A) ON.

Address	Name	Error code storage buffer memory
R2 1A8H to 1AFH	Error code history	Up to eight error codes that occurred in the past are stored in order of occurrence.
R2 1B0H	General error code	The error code that occurs when the initialization error complete signal (RXn5), EEPROM function error complete signal (RXn8) turns ON or at the transmission timeout is stored.
R2 1B1H	Error code at transmission	The error code that occurs when the transmission error complete (RXn1) turns ON is stored.
R2 1B2H	Error code at reception	The error code that occurs when the reception error read request (RXn3) turns ON is stored.



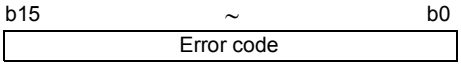
POINT

If an initial data read request signal (RY(n+1)9) error occurs, the error handling will not be carried out even if the error reset request signal (RY(n+1)A) turns ON.

10.1.2 List of error codes

The configuration of the error codes stored in the buffer memory, and a list of the error codes is given in this section.
Refer to the respective module User's Manual for details on the error codes that occur in the programmable controller CPU and master module.

(1) Error code configuration



(2) Error code list

Error code (hexadecimal)	Error name	Cause of error	Error remedy
0000	–	Normal	
0001 to 4FFF	–	Refer to programmable controller CPU User's Manual.	
B000 to BAFF	–	Refer to Master Module User's Manual.	
BB07	Automatic update timeout error	A timeout occurred when using the buffer memory automatic update function.	• Increase the transient timeout time designation (R2 105H).
BB11	Transmission timeout error	A transmission timeout occurred.	• Correct the flow control state, flow control designation (R2 100H) and external device flow control designation. • Check the RS-232-C cable wiring. • Increase the transmission timeout time designation (R2 11AH) value.
BB21	Reception timeout error	A reception timeout occurred.	• Correct the flow control state, flow control designation (R2 100H) and external device flow control designation. • Check the RS-232-C cable wiring. • Increase the reception timeout time designation (R2 112H) value. • Decrease the reception end data size designation (R2 111H) designated value.
BB23	RS-232-C reception overrun error	An overrun error occurred during RS-232-C reception.	• Decrease the transmission speed. • Noise may be the cause.
BB24	RS-232-C framing error	A framing error occurred during RS-232-C reception.	• Correct the specifications for the R2 and external device transmission. • Noise may be the cause.
BB25	RS-232-C reception parity error	A parity error occurred during RS-232-C reception.	• Correct the specifications for the R2 and external device transmission. • Noise may be the cause.
BB26	OS reception area overflow error	The OS reception area overflowed.	• Carry out flow control with the external device. • Correct the flow control designation (R2 100H) and external device flow control designation. • Check the RS-232-C wiring.

Error code (hexadecimal)	Error name	Cause of error	Error remedy
BB28	Sum check error	The received check sum is incorrect.	• Correct the registered frame's check sum designation. • Check the data received from the external device. • Noise may be the cause.
BB29	Special character usage area	A special character that cannot be used for the head or end frame during frame reception was designation.	• Correct the reception head/end frame No. designation.
BB2A	ASCII → binary conversion error	Data that cannot be converted from ASCII to binary was received.	• Check the data received from the external device. • Noise may be the cause.
BB41	Command error	A command (frame) that cannot be used with the R2 was used.	• Correct the command (frame).
BB42	Reception frame error	There is an error in the data received by the R2.	• Correct the access code, No. of processing points and attribute, etc.
BB81	Head address designation error	The value designated in the transmission/reception area head address designation area of the buffer memory is incorrect.	• Refer to the buffer memory list in section 3.7, and set the correct data.
BB82	Assignment designation error	The value designated in the various assignment designation area of the buffer memory is incorrect.	
BB83	Parameter error	The value designated in the parameter area of the buffer memory is incorrect.	
BB88	EEPROM function designation error	A value other than 0 to 4 was designated for the EEPROM function designation (R2 1C0H).	• Correct the value designated for the EEPROM function designation (R2 1C0H).
BB89	User registration frame No. designation error	A value other than 1000 to 1199 was designated for the user-registered frame No. designation (R2 1C1H).	• Correct the value designated for the user-registered frame No. designation (R2 1C1H).
BB8A	Registration frame byte size designation area	A value other than 1 to 80 was designated for the user-registered frame byte size designation (R2 1C7H).	• Correct the value designated for the user-registered frame byte size designation (R2 1C7H).
BB8B	Registration frame designated contents error	A special character that cannot be used in the user registration frame was used.	• Correct the contents of the user registration frame.
BB8C	EEPROM write error	An EEPROM write timeout error occurred.	• There may be a problem in the hardware, so contact your nearest dealer or branch office.
BB8D	User registration frame not registered error	The designated user registration frame No. has not been registered.	• Check whether the designated user registration frame No. has been registered.
BB92	Transmission data size over error	The transmission data has exceeded the maximum size of the transmission data.	• Make sure that the total of the transmission data size during frame transmission is within 2048 bytes after JIS conversion.

Error code (hexadecimal)	Error name	Cause of error	Error remedy
BB93	Transmission data size error	The transmission data size exceeds the transmission area size.	• Correct the transmission data size designation area (R2 200H at default) and the transmission area size (R2 1H).
BB94	Error during transmission cancel request signal ON	When the transmission was requested, the transmission cancel request signal (RYn1) was already ON.	• Request the transmission after turning the transmission cancel request (RYn1) OFF.
BB95	User registration frame transmission error	The designated user registration frame cannot be transmitted.	• Check that the designated user registration frame No. has been registered.
BB96	Special character usage error	A special character that cannot be used for the head frame during frame transmission was designated.	• Correctly designate the transmission head frame No.
BB97	Table transmission information error	Data that cannot be designated when transmitting a transmission table was designated.	• Correct the data designated in the transmission table (R2 122H to 185H) and the monitor designation 1 to 64 (R2 78H to F7H).
BB98	Registration frame contents transmission error	A special character that cannot be transmitted was used in the designated user registration frame No.	• Correct the contents of the registration data for the designated user registration frame No.
BBA2	Reception data size over error	The reception data exceeds the maximum size of the reception data.	• Make sure that the reception data size fits in the value designated with the reception area size designation (R2 3H).

10.2 Confirming the error with the LED

The method for confirming the error with the R2 LEDs is explained in this section. Refer to the programmable controller CPU and master module User's Manuals for errors related to the programmable controller CPU and master module.

(1) When the R2 RUN LED turns OFF

Cause	Remedy
Incorrect switch setting	Correct the switch setting. (Section 4.4)
A watch dog timer error has occurred.	Turn the R2 power ON again or reset it. If the RUN LED does not turn ON after the power is turned ON again, there may be a problem in the hardware. Contact your nearest dealer or sales office.

(2) When the R2 L RUN LED turns OFF

Cause	Remedy
A watch dog timer error has occurred.	Turn the R2 power ON again or reset it. If the RUN LED does not turn ON after the power is turned ON again, there may be a problem in the hardware. Contact your nearest dealer or sales office.
The cable is disconnected/short-circuited	Find the transmission cable that is disconnected or short-circuited, and repair.
The master station is in a link stop	Check whether an error has occurred in the master station.
The 24V power is not supplied to the R2, or the voltage is insufficient.	Check the 24V power supply voltage.
The station Nos. are duplicated.	Correctly set the station No. of the duplicate stations, and then turn the power ON again or reset it.
The setting switch is not set within the range (station No. 0 or 65 or more, transmission speed other than 0 to 4).	Correctly set the setting switch, and then turn the power ON again or reset it.

(3) The R2 L ERR. LED flickers

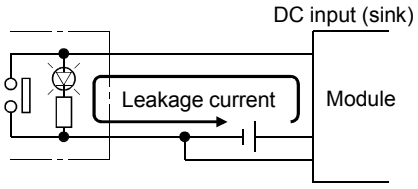
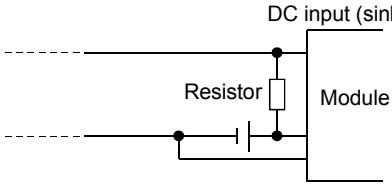
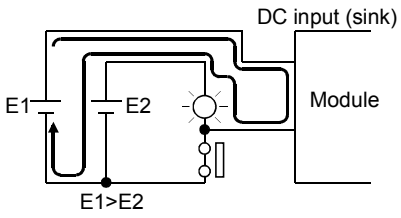
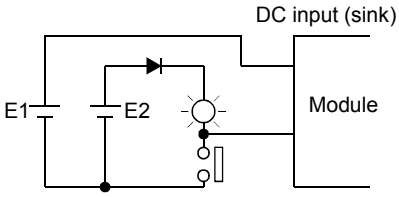
Cause	Remedy
The station No. or transmission speed switch setting was changed during normal operation	Return the setting to the previous station No. or transmission speed, and then turn the power ON again or reset it. If the L RUN LED does not turn ON after the power is turned ON again, there may be a problem in the hardware. Contact your nearest dealer or sales office.
The station No. or transmission speed switch is faulty.	If the L ERR. LED starts to flicker even when the switch setting has not been changed during operation, there may be a problem in the hardware. Contact your nearest dealer or sales office.

(4) The R2 L ERR. LED turns ON

Cause	Remedy
An error occurred in the communication between the master station and R2.	Check the error code stored in the R2 buffer memory, and set the correct data before turning the power ON again or resetting it.
The setting switch is not set within the range (station No. 0 or 65 or more, transmission speed other than 0 to 4).	Correctly set the setting switch, and then turn the power ON again or reset it.
The terminator is not connected.	Check that the terminator is connected. If not connected, connect one, and then turn the power ON again or reset it.
The module or transmission cable is being affected by noise.	• Ground (Class 3 grounding) both ends of the CC-Link dedicated cable's shield wire via the SLD and FG of each module. • Securely ground the module's FG terminal. • Securely ground the pipe when piping and wiring.

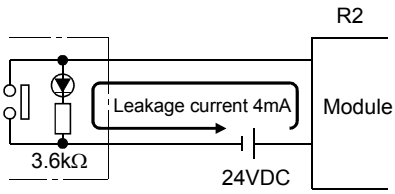
10.3 Examples of trouble in general-purpose input circuit

Examples of trouble that can occur in the general-purpose input circuit, and the remedies are explained below.

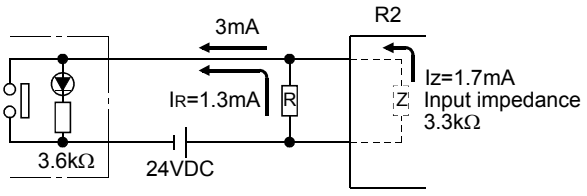
	State	Cause	Remedy
Example 1	The input signal does not turn OFF.	• Drive with LED display switch 	• Connect an appropriate resistor so that the voltage across the input terminal and COM1 exceeds the OFF voltage. 
Example 2	The input signal does not turn OFF.	• Lead-in from use of two power supplies 	• Change from two to one power supply. • Connect a lead-in prevention diode. (Refer to following drawing.) 

<Example of calculating example 1>

When the LED display switch is connected to the R2, and the leakage current is 4mA



(1) The R2 OFF current does not satisfy 1.7mA, so it does not turn OFF. In this case, connect a resistor as shown below.



(2) When calculating the terminator R value, connect a resistor R so that 1.3mA or more flows to the connected resistor in order to satisfy the R2 OFF current 1.7mA.
Therefore, a value for the resistor R can be calculated by the following formulas.

$I_R : I_Z = z$ (input impedance) : R (Resistance)

$$R \leq \frac{I_Z}{I_R} \times z = \frac{1.7}{1.3} \times 3.3 = 4.3\ (k\Omega)$$

$$R < 4.3k\Omega$$

When the resistance R is 3.9kΩ, power consumption W of the resistor R can be calculated by the following formula.

$W = (\text{input voltage})^2 \div R = 28.8^2\ (V) \div 3.9k(\Omega) = 0.2\ (W)$

(3) The resistor power capacity is selected to be three to fives times the actual power consumption, so connect a 3.9(kΩ)1.0(W) resistor to the problem terminal.

10.4 Troubleshooting per symptom

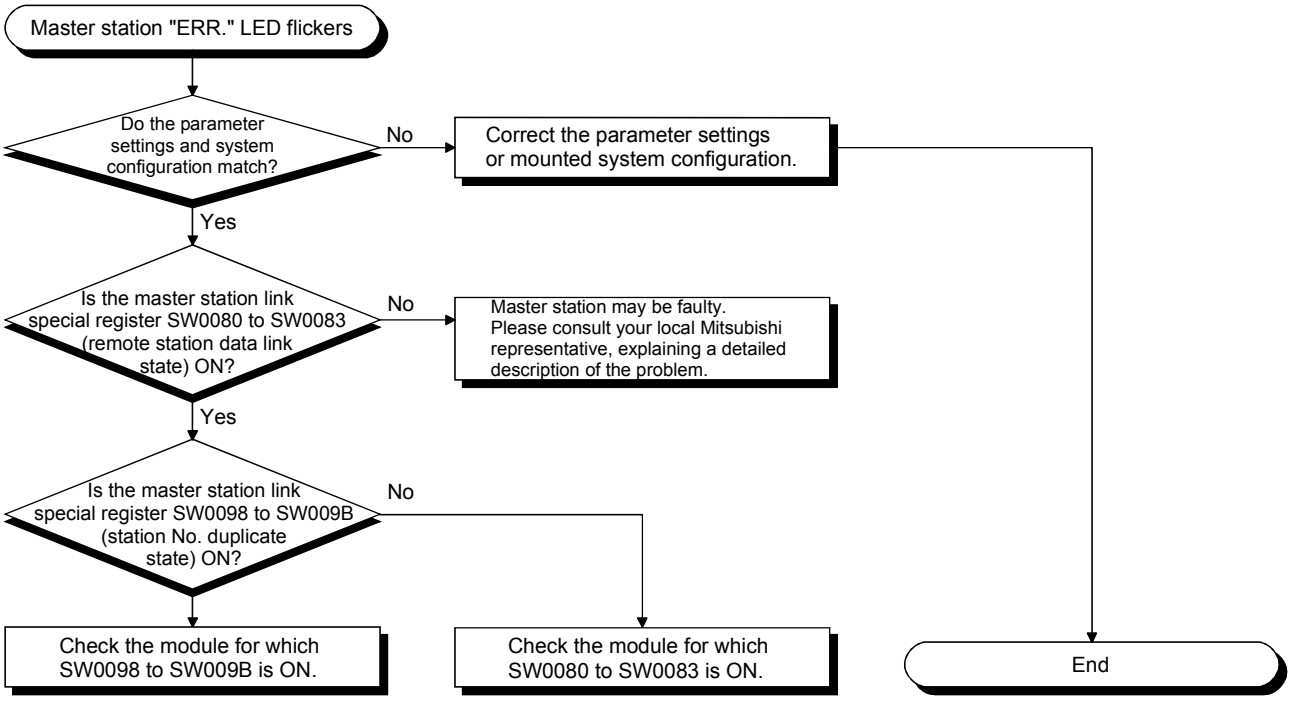
The troubleshooting for symptoms that occur during communication between the R2 and external device is shown below.
When a trouble occurs, check the R2 state, and check the items for the corresponding items below.

Symptom	Cause	Remedy
"RD" does not flicker even when a statement is transmitted from the external device.	The signal wire connection is incorrect.	Check whether the RD and SD are correctly connected to the R2 and external device.
	The external device side transmission control signal is not ON.	Wire so that the transmission control signal such as the R2 side "DSR" and "CS" are turned ON by the external device side.
	When carrying out flow control, the R2 OS reception area open space is less than 64 bytes.	Carry out the reception process so that the open space in the R2 OS reception area is 263 bytes or more.
	The transmission speed settings do not match.	Match the R2 and external device transmission speeds.
"RD" flickered when the statement was transmitted from the external device, but the read request did not turn ON	The transmission complete condition data has not been received.	• Check that the data with the fixed length set on the R2 side has been transmitted from the external device. • Check whether the end frame has been transmitted when communicating with registration frames.
	The transmission speed settings do not match.	Match the R2 and external device transmission speeds.
The statement was transmitted from the R2, but it was not received by the external device.	The external device reception complete condition data has not been transmitted.	Transmit data that satisfies the external device reception complete conditions.
	When carrying out flow control, the open space in the external device OS reception area is insufficient.	Carry out reception process with the external device to increase the open space in the external device OS reception area.
	The transmission speed settings do not match.	Match the R2 and external device transmission speeds.
The ERR.LED turns ON	The mode setting switch or transmission specifications setting switch setting is incorrect.	Read the error code from the buffer memory, check the error details, and correct the setting.
	The R2 detected an error during data transmission.	Read the error code from the buffer memory, and remedy according to the error details.
	The R2 detected and error during data reception.	Read the error code from the buffer memory, and remedy according to the error details.
Communication is possible in some cases, and not possible in other cases.	The signal cable wiring has a contact fault.	Replace the cable, or securely fix the connection.
Non-recognizable data is transmitted or received.	The parity bit settings do not match.	Match the R2 and external device parity check settings.
	The stop bit length settings do not match.	Match the R2 and external device stop bit size.
	The transmission speed settings do not match.	Match the R2 and external device transmission speeds.
It is not known whether the communication error cause is on the R2 side or external device side.	—	Carry out the following test on the R2 or master station side to check where the cause is. 1) Check the hardware. • The R2 must be securely mounted. • None of the module pins must be bent or abnormal. 2) Test the R2 hardware. (Refer to section 4.6.) • There must be no error in the hardware test. 3) Check the CPU state. • There must be no error to cause the CPU operation to stop

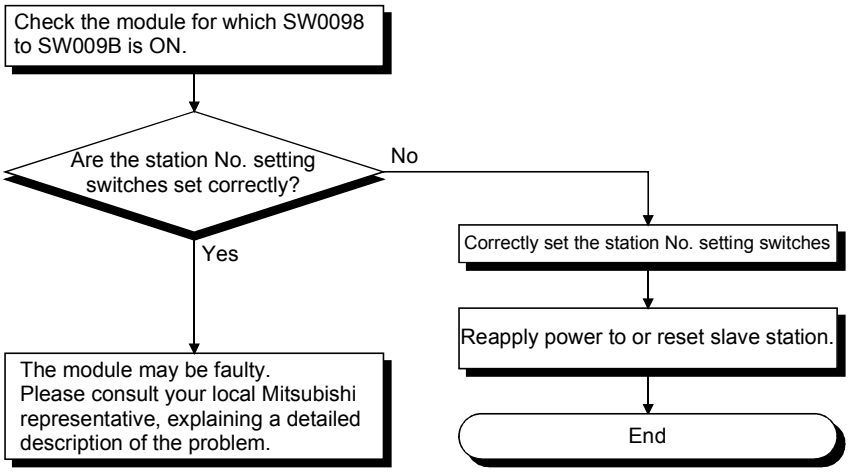
10.5 Troubleshooting when the master station's ERR. LED flashes

The following explains how to troubleshoot the system when the master station's ERR. LED flashes.

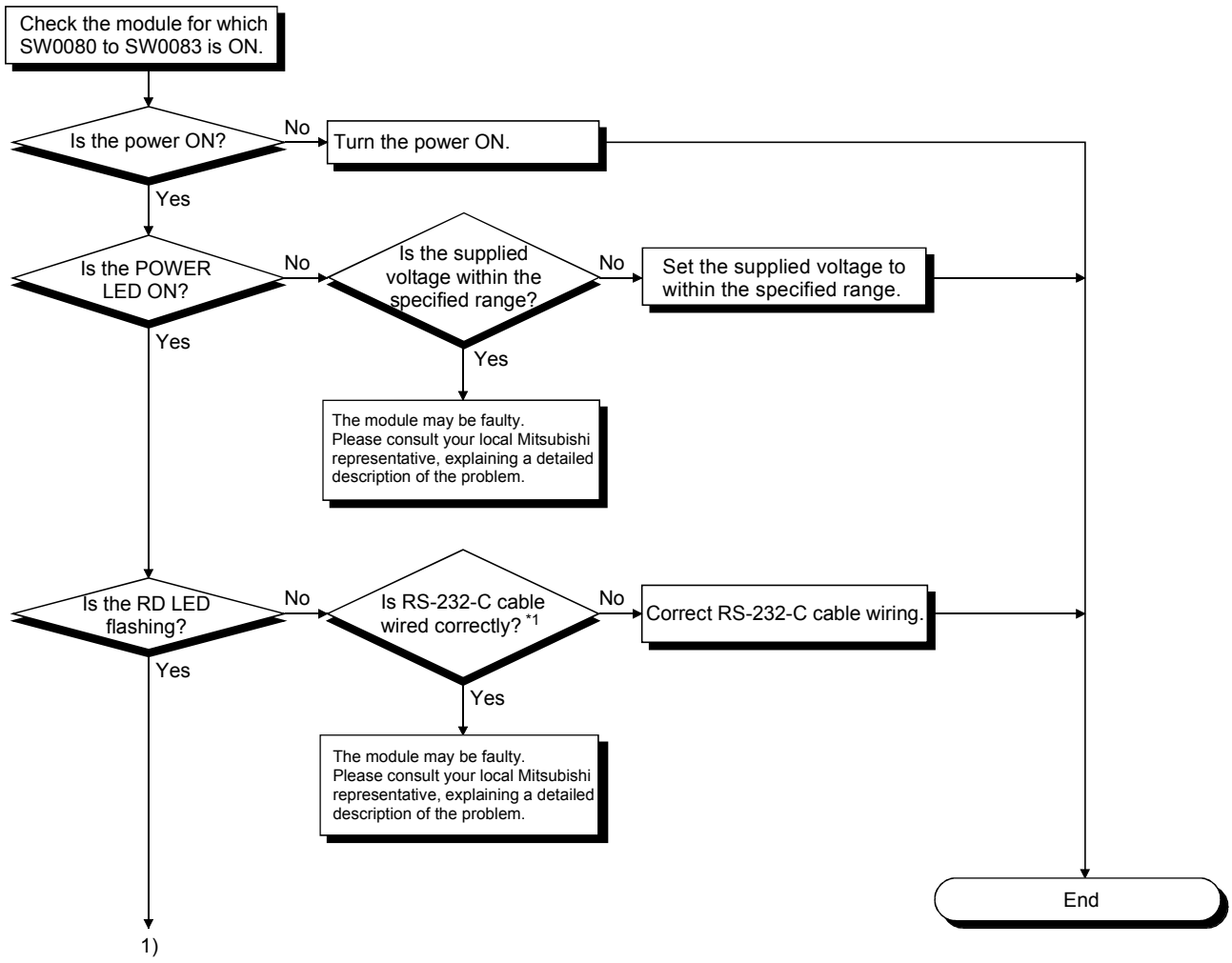
(1) Master station side troubleshooting



(2) Slave station side troubleshooting (When link special register (SW0098 to SW009B) turned ON)



(3) Slave station side troubleshooting (When link special register (SW0080 to SW0083) turned ON)



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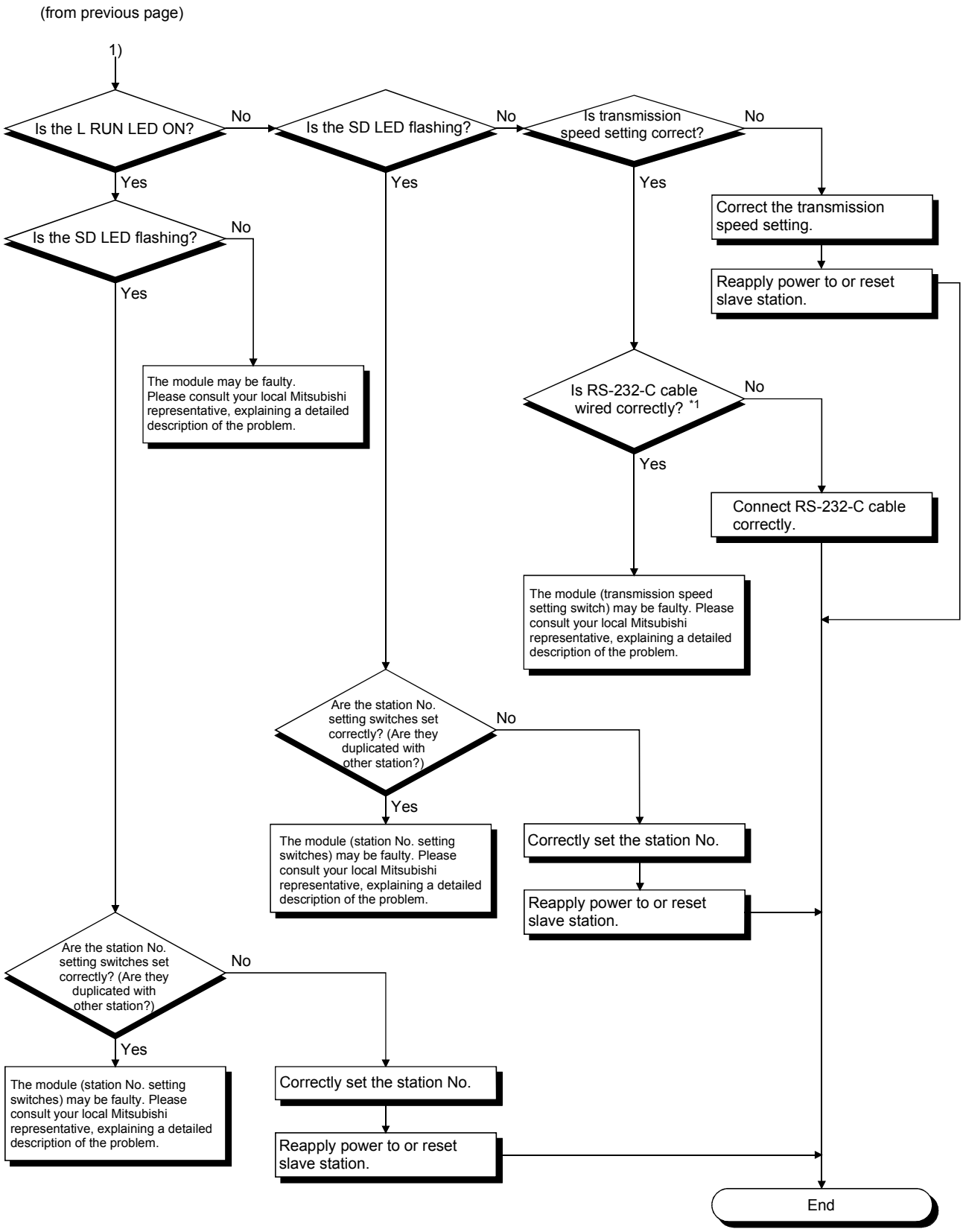
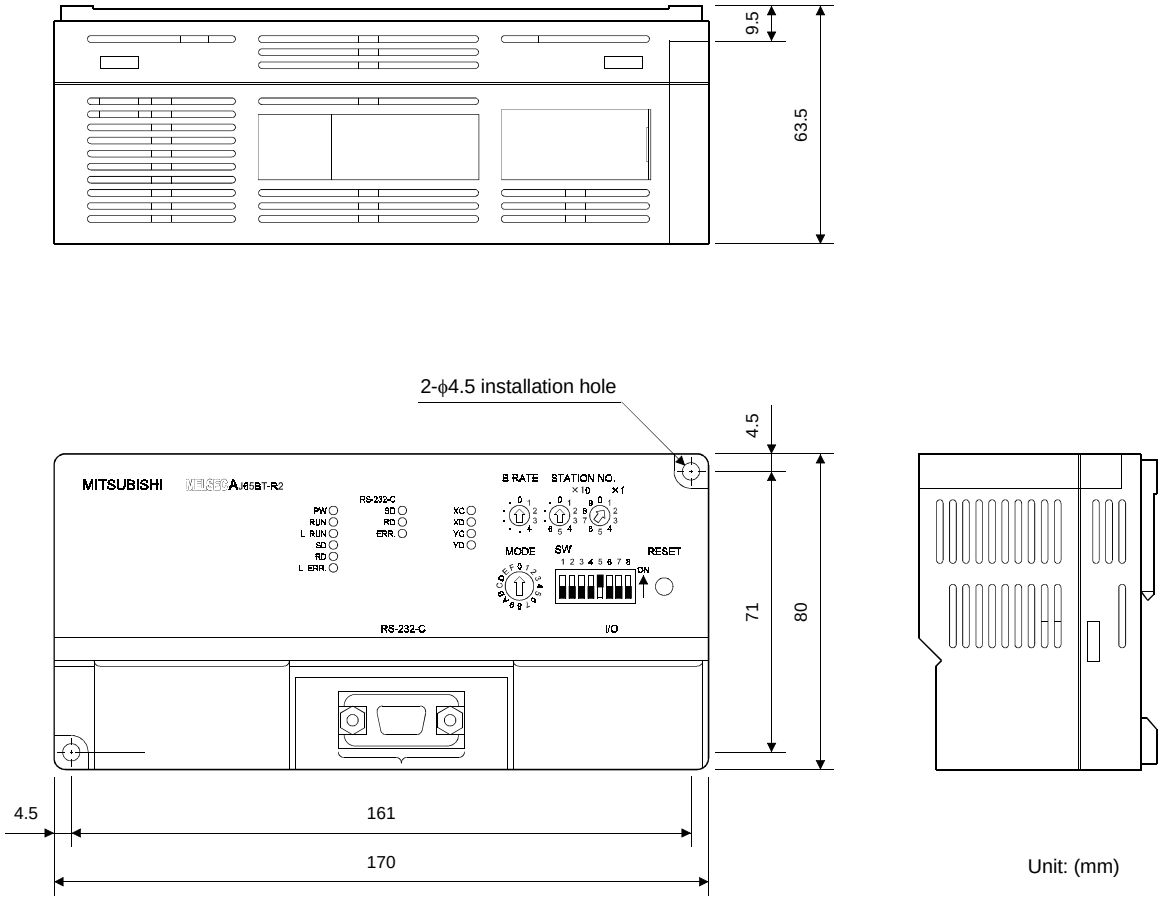


*1 Check for a short-circuit, reverse connection, disconnection, the terminator, FG connection, overall distance, and distance between stations.

APPENDIX

Appendix 1 Outline dimension drawing



Unit: (mm)

MEMO

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WARRANTY

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

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

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

[Gratis Warranty Range]

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

2. Onerous repair term after discontinuation of production

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

3. Overseas service

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

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

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

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
(2) The Mitsubishi programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable logic controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable logic controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

RS-232C Interface Module Type AJ65BT-R2

User's Manual

MODEL	AJ65BT-R2-U-E
MODEL CODE	13JL24
IB(NA)-66781-F(0711)MEE	

MITSUBISHI ELECTRIC CORPORATION

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