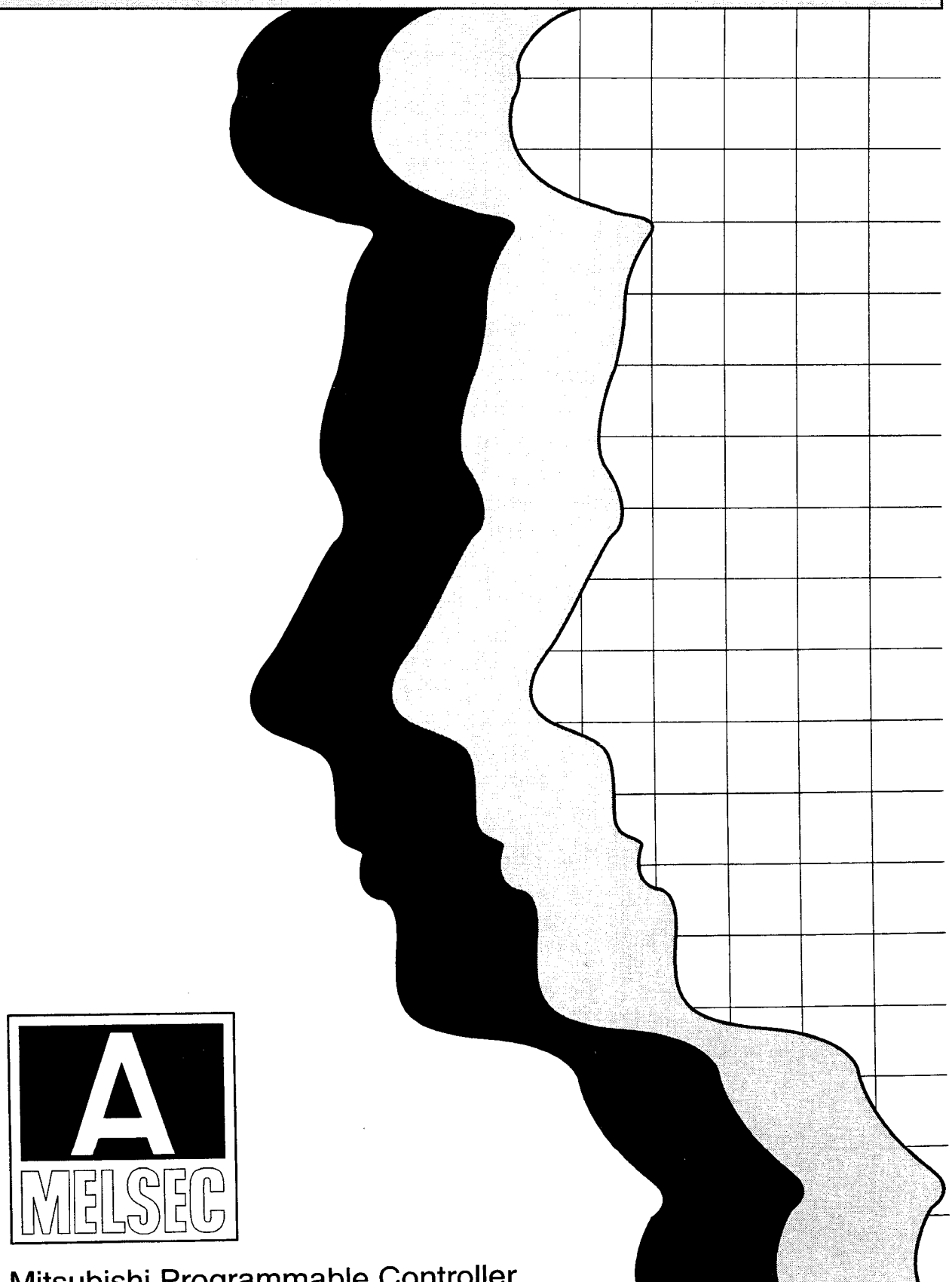
U

MITSUBISHI

RS-232C Interface Module type AJ65BT-R2

User's Manual

RS-232C Interface Module type AJ65BT-R2



A

MELSEC

Mitsubishi Programmable Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the PC system safety precautions.

These ●SAFETY PRECAUTIONS● classify the safety precautions into two categories: "DANGER" and "CAUTION".

⚠ DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.
⚠ CAUTION	Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by ⚠ **CAUTION** may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER

- When a data link communication error occurs, the status shown below will be established at the faulty station. In order to ensure that the system operates safely at such times, an interlock circuit should be provided in the sequence program (using the communication status information).
  Erroneous output and operation could result in an accident.
  (1) All general-purpose inputs from the AJ65BT-R2 will go OFF.
  (2) All general-purpose outputs from the AJ65BT-R2 will go OFF.
- Inputs and outputs may be turned ON or OFF as the result of failure of the AJ65BT-R2. Provide an external monitoring circuit for I/O signals whose incorrect operation could cause serious accidents.

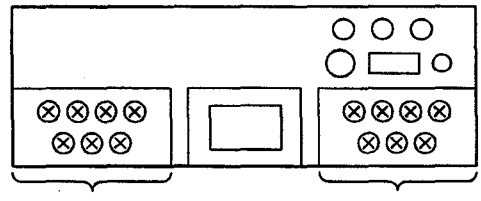
⚠ CAUTION

- Use the module in an environment that complies with the general specifications stated in this manual.
  Using it in an environment that does not comply with the general specifications could lead to electric shock, fire, malfunction, and product damage or deterioration.

[DESIGN PRECAUTIONS]

⚠ CAUTION

- Do not bundle the control and communication cables together with main circuit or power lines, or run them close to each other.
  As a guide, maintain a distance of 100 mm.
  If this distance is not maintained, malfunctions could occur due to noise.
- When making the connection to the master module with twisted cable, be sure to use the terminal block for data link use.
  Making the wrong connection at the terminal block for data link use or terminal block for general-purpose I/O use will cause the module to fail.



[INSTALLATION PRECAUTIONS]

⚠ DANGER

- Crimp, pressure-weld, or solder the connector wiring connections correctly using the tools stipulated by the makers, and fit the connector securely to the module.
  Imperfect connection could cause shorting or malfunction.

⚠ CAUTION

- Do not touch conductive parts of the module with your bare hands.
  This could cause module malfunctions or failure.
- Fix the module securely on a DIN rail or with the mounting screws. Tighten the mounting screws positively to within the stipulated torque range.
  If the screws are loose, the module may fall, or shorting or malfunctions may occur.
  If the screws are overtightened, they may break, leading to the module falling or to short circuits.
- Engage the connectors of connecting cables positively with the mating connectors.
  Imperfect connection could cause malfunctions due to contact faults.

[WIRING PRECAUTIONS]

DANGER

- Always switch all phases of the power supply off externally before starting mounting or wiring work.
  Failure to turn off the power could result in module failure or malfunctions.
- After completing mounting and wiring, fit the terminal covers supplied as accessories before turning on the module power and starting operation.
  If the covers are not fitted there will be a danger of electric shock.

CAUTION

- Be sure to ground the FG terminal to the protected grounding conductor.
  Otherwise there will be a danger of malfunctions.
- Carry out the module wiring correctly after checking its rated voltage and terminal arrangement.
  Connecting a power supply that does not match the rated voltage or wiring the module incorrectly could cause fire or module failure.
- Tighten the terminal screws to within the stipulated torque range.
  If the terminal screws are loose, shorting or malfunctions may occur.
  If the terminal screws are overtightened, they may break, leading to shorting or malfunctions.
- Make sure that no wire offcuts or other debris enters the top of the module.
  This could cause fire, failure, or malfunctions.
- Be sure to fix the communication and power cables that are connected to the module in place, either by running them through a duct or by using clamps.
  If the cables are not fixed in one of these ways, dispersion, movement, or careless pulling of the cables may cause damage to the module or cables, or malfunctions due to cable contact faults.
- When disconnecting a communication or power supply cable from the module, do not pull on the cable itself.
  Disconnect cables fitted with connectors by holding and pulling the cable connector.
  Disconnect cables not fitted with a connector by removing the screws from the part connected to the module.
  Pulling on a cable that is connected to the module can cause damage to the module or cable, or malfunction due to cable connection faults.

[STARTUP AND MAINTENANCE PRECAUTIONS]

DANGER

- Do not touch terminals and connectors while they are live.
  This could lead to electric shock or malfunctions.
- Always switch all phases of the power supply off externally before cleaning or retightening the terminal screws.
  Failure to turn off the power could result in module failure or malfunctions.
  If the screws are loose, the module may fall, or shorting or malfunctions may occur.
  If the screws are overtightened, they may break, leading to the module falling or to short circuits.
- Do not touch the connector inside the cover on the top of the module.
  This could cause module failure or malfunction.

CAUTION

- Do not disasseble or modify any module.
  This will cause failure, malfunction, injuries, or fire.
- The case of the module is made of plastic; do not drop it or subject it to strong impact.
  This could damage the module.
- Always switch all phases of the power supply off externally before mounting the module to, or removing it from, a panel.
  Failure to turn off the power could result in module failure or malfunctions.

[DISPOSAL PRECAUTIONS]

CAUTION

- Dispose of this product as industrial waste.

REVISIONS

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

Print Date	*Manual Number	Revision
Sep.,1997	IB (NA) 66781-A	First edition

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-QnA Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

CONTENTS

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)
AJ61BT11, A1SJ61BT11 CC-Link System Master Local Module User's Manual Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting for AJ61BT11 and A1SJ61BT11. (Purchased separately)	IB-66721 (13J872)
AJ61QBT11, A1SJ61QBT11 CC-Link System Master Local Module User's Manual Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting for AJ61QBT11 and A1SJ61QBT11. (Purchased separately)	IB-66722 (13J873)

1. OVERVIEW

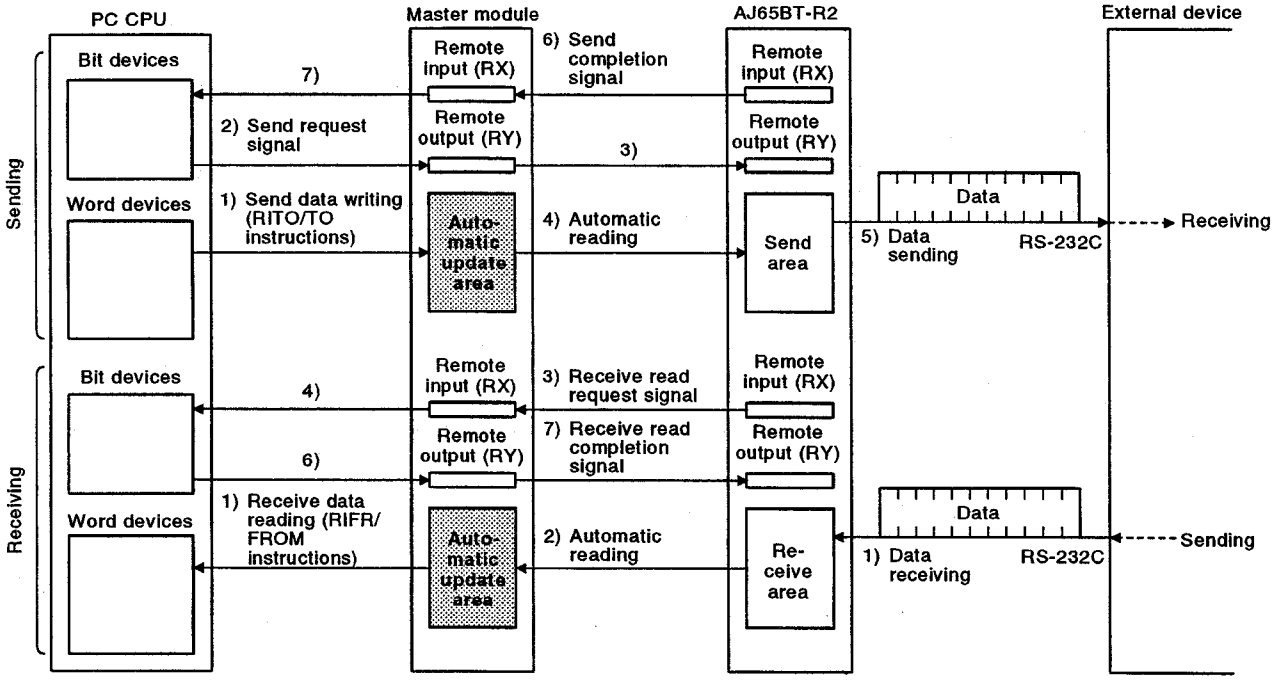
Note : The Mitsubishi term "MELSECNET/J" may also be used with the same meaning as "CC-Link".

This manual describes the features, specifications, communication with external devices, special functions, etc., of the type AJ65BT-R2 RS-232C interface module (hereafter "AJ65BT-R2") which is used as an intelligent device station in a Control & Communication Link (hereafter "CC-Link"). The AJ65BT-R2 can execute data communication with external devices such as RS-232C-connection bar code readers and ID controllers, general-purpose personal computers, etc.

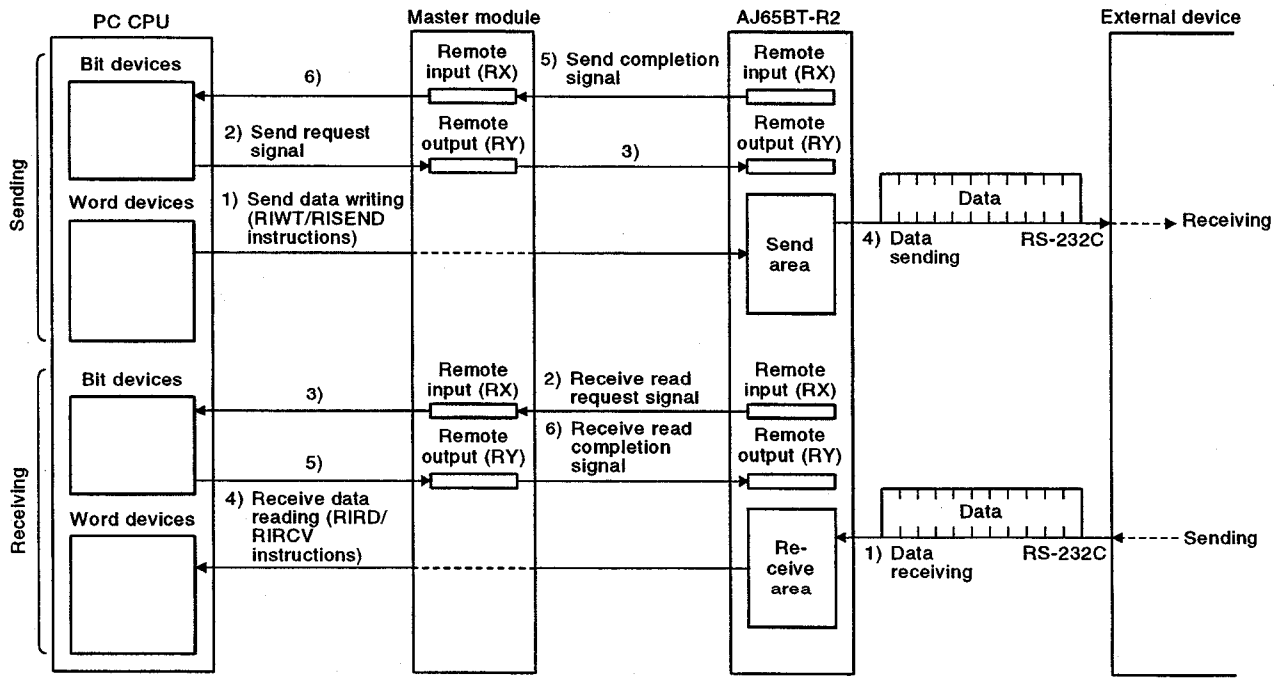
1.1 Features of the AJ65BT-R2

(1) Communication with external devices using the buffer memory automatic update function (detailed explanation: Section 5.5.1)
The AJ65BT-R2 can communicate data with external devices that accept RS-232C connections, by using sequence program control from a master station. Examples of external devices with which communication is possible include bar code readers, ID controllers, and general-purpose personal computers.
There are two methods for communicating with external devices: one in which the buffer memory automatic update function is used, and the other in which it is not used.
The buffer memory automatic update function is a function whereby data is automatically updated between the AJ65BT-R2 buffer memory area designated by automatic update area designation and the master module automatic update area.
When data is written from the PC CPU to the automatic update area of the master station, the values are automatically written into the designated AJ65BT-R2 area also.
In addition, since the data in the area designated by automatic update area designation is also automatically written to the automatic update area of the master station, the data in the AJ65BT-R2 area can be read into the PC CPU from the master station.
When the buffer memory automatic update function is used, data is read and written using FROM/TO instructions, which means that programming is easy. (This function can be used with all CPUs.)

(a) Flow of processing when the buffer memory automatic update function is used

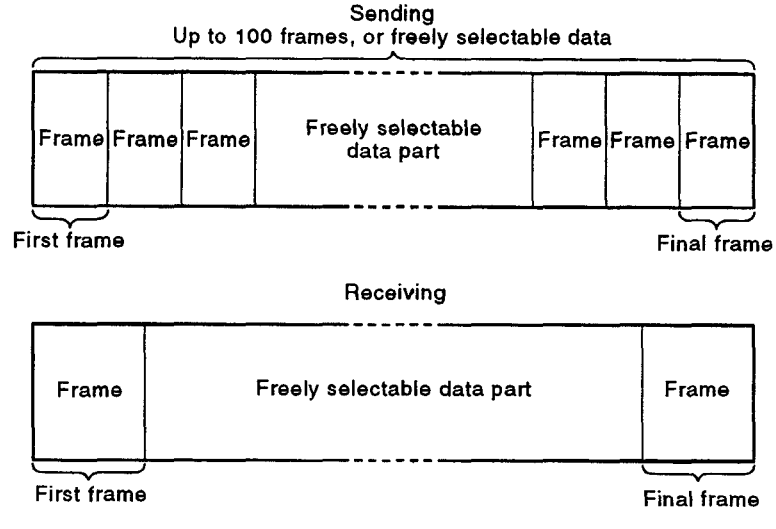


(b) Flow of processing when the buffer memory automatic update function is not used



(2) Registered frame function (detailed explanation: Chapter 8)
There are two methods for communication with external devices: no-protocol communication and frame communication.
In no-protocol communication, freely selectable data only is sent and received, whereas in frame communication a first frame and last frame are designated among the registered frames in order to send or receive data.
Two kinds of registered frame can be used in frame communication: a default registered frame, which is registered in advance, and user-registered frames, which are stored in the E^2PROM and can be registered, deleted, and changed as required by the user. Since the default registered frame has registered in it the main commands used for communication with RS-232C-connection type ID systems and bar code readers, it simplifies data communication.
User-registered frames allow the user to register any required data - in accordance with the specifications of the external device - in the frame. Up to 200 user-registered frames can be registered in the E^2PROM.

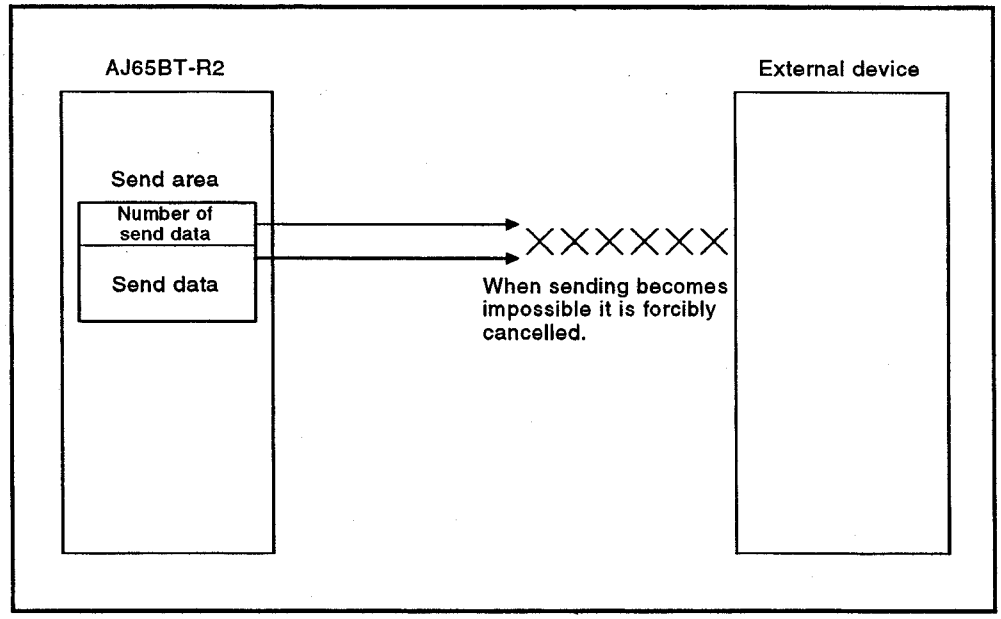
(3) Frame communication function (detailed explanation: Chapter 7)
Frame communication entails the registration in advance of a fixed data sequence (frame) in the AJ65BT-R2 in order to send and receive data in a message format that suits the specifications of the external device communicated with, and then sending/receiving messages containing freely selectable data between the AJ65BT-R2 and external device using this frame.
In frame sending, a message consisting of up to 100 frames alone, or freely selectable data with multiple frames (total maximum of 99 frames) appended at its start and end, can be sent from the AJ65BT-R2 to the external device.
In frame receiving, when a message containing data in the same sequence as the frame registered in the AJ65BT-R2 is sent from the external device to the AJ65BT-R2, the AJ65BT-R2 checks the frame of the received message and stores the receive data in the buffer memory.



(4) Monitor send function (detailed explanation: Section 7.4)
The monitor send function is a function whereby the AJ65BT-R2 monitors devices or statuses in accordance with settings made in advance by the user, and sends the contents of a send table designated by the user to the external device on detection of the data send command (data send timing).
The processing at the AJ65BT-R2 shown below, which takes place when data is sent using the monitor send function, can be designated as required by the user.

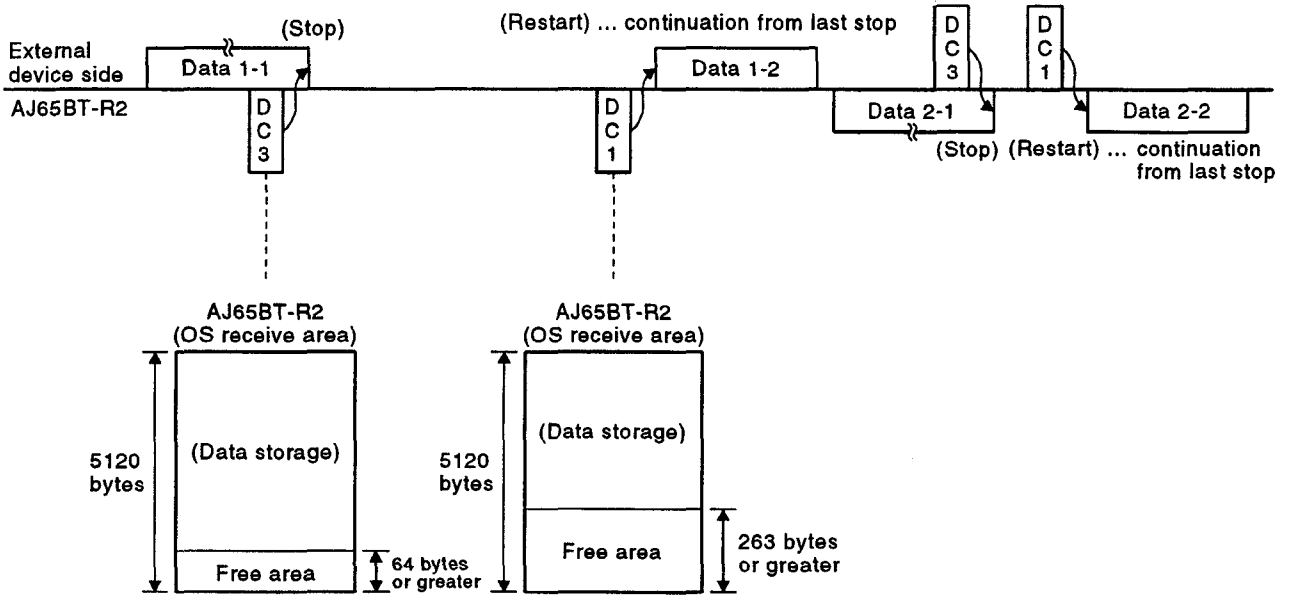
(5) Send cancel function/forced receive completion function (detailed explanation: Sections 9.2, 9.3)
It is possible to forcibly stop sending after a send request has been output from the PC CPU to the AJ65BT-R2 and before sending from the AJ65BT-R2 to the external device is completed.
The send cancel function can cancel the sending of data by the no-protocol send function and the frame send function. It is also possible to stop data reception when the receive read request signal does not come on. This makes it possible to forcibly stop data reception after a fixed time interval in cases where the number of data to be received before stopping, or the first frame and final frame, cannot be specified.

(Send cancel function)

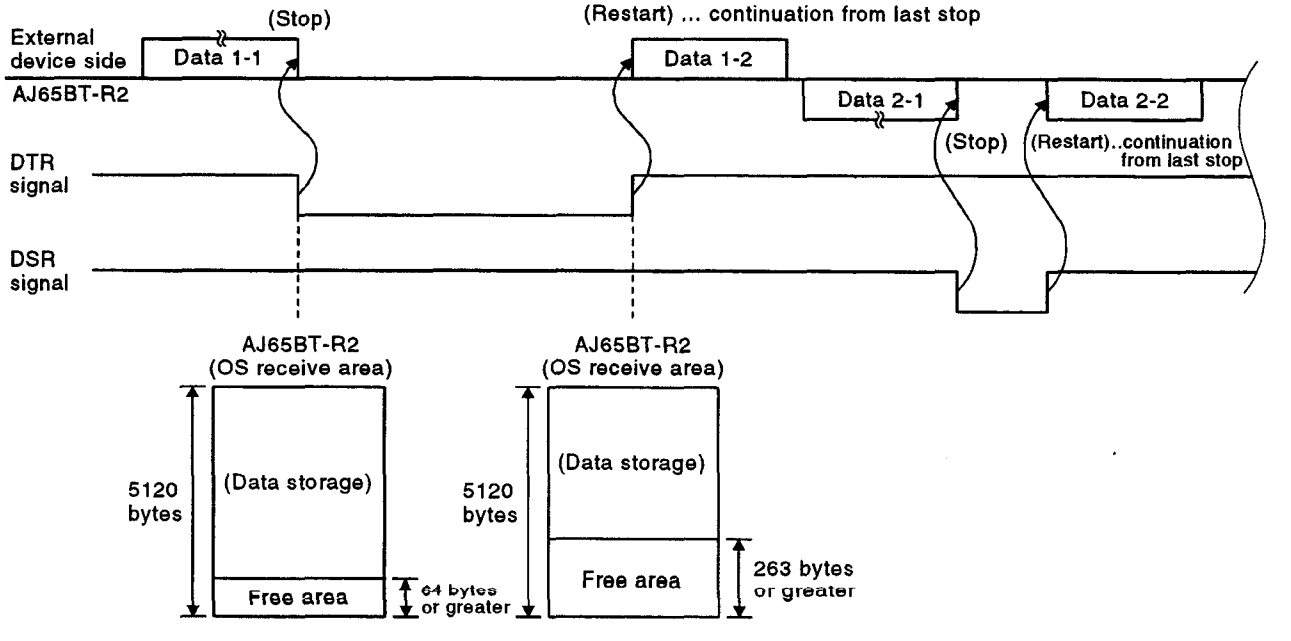


(6) Flow control function (detailed explanation: Section 9.4)
This is a function whereby, when the remaining capacity of the OS receive area of the AJ65BT-R2 is getting small (when the available capacity is 64 bytes or less), data sending from the external device can be temporarily stopped, and then restarted when there is excess capacity (when the available capacity is 263 bytes or more).
It is also possible to temporarily stop and then restart data sending from the AJ65BT-R2 in response to requests from the external device.
The methods used for temporary stop/restart are DC code control and DTR/DSR signal control.

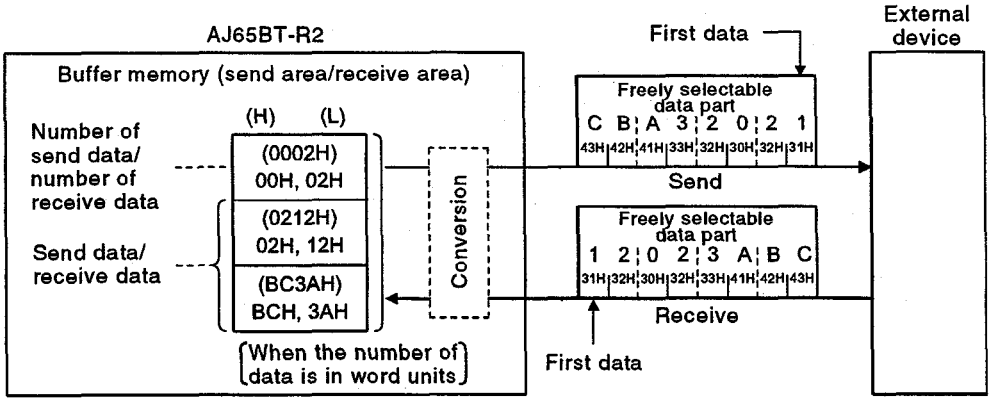
(a) DC Code Control



(b) DTR/DSR Control

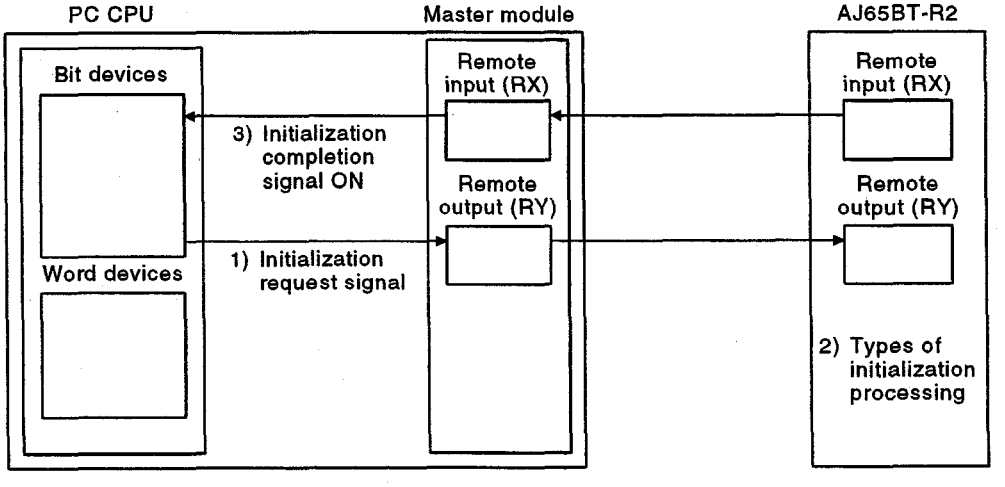


(7) ASCII-BIN conversion send function (detailed explanation: Section 9.5)
This is a function whereby data to be sent or received is converted from ASCII to binary. The AJ65BT-R2 uses binary data, but ASCII-BIN conversion allows it to communicate with external devices that handle ASCII data.



(8) RW update function (detailed explanation: Section 9.6)
The RW update function is a function that makes allocations in the buffer memory for the master station remote registers (RW) and automatic update area at the AJ65BT-R2 side.
When a cause for communication between the area designation area (43H to 4AH) and master module remote registers (RW) arises, the data in the corresponding area at the AJ65BT-R2 is automatically updated.

(9) Initialization function (detailed explanation: Section 9.7)
When the buffer memory settings have been changed, buffer memory initialization processing must be executed. The initialization function allows the AJ65BT-R2 to be initialized by a sequence program.



(10) Buffer memory setting value registration function (detailed explanation: Section 9.9)
This is a function for registering buffer memory setting values in the E^2PROM, or returning the setting values registered in the E^2PROM to the default values held by the AJ65BT-R2. The registered buffer memory setting values are used as the default values next time the power to the AJ65BT-R2 is turned on.

(11) Signal read/write function (detailed explanation: Section 9.10)
This function executes read/write control of the RS-232C interface signal statuses stored in the buffer memory. Reading/writing is performed using remote inputs/remote outputs (RX/RY).

(12) General-purpose I/O function
The AJ65BT-R2 has two general-purpose input points and two general-purpose output points.

1.2 Terms Used in this Manual

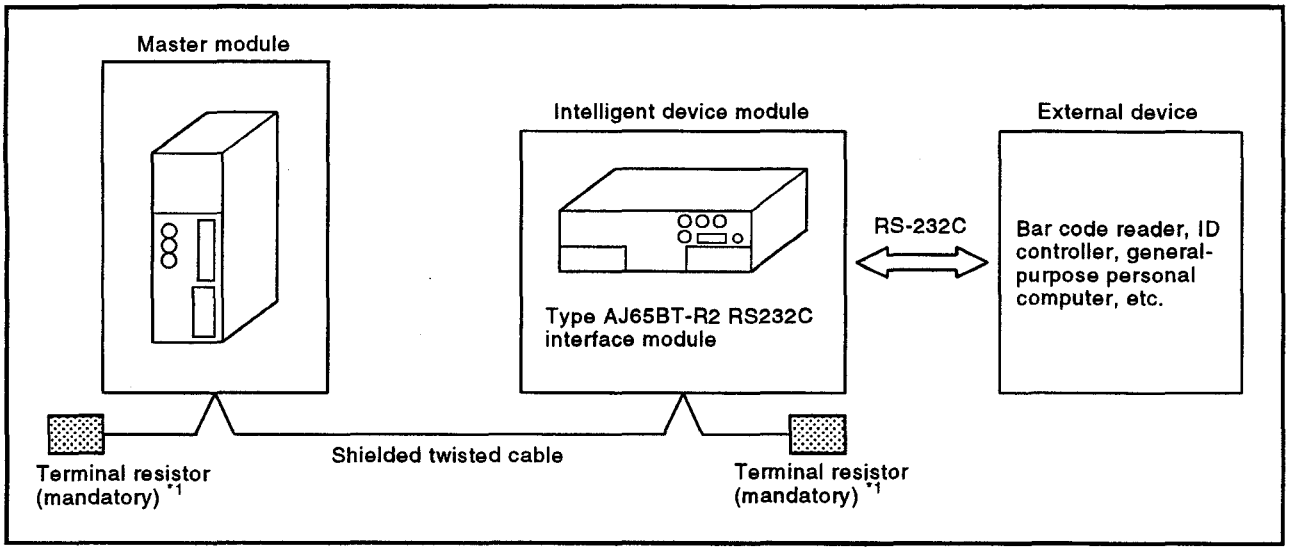
This section describes the abbreviations, generic terms, and other terms used in this manual.

Abbreviation or Term	Meaning
AJ65BT-R2	Abbreviation for RS-232C interface module type AJ65BT-R2
CC-Link	Abbreviation for Control & Communication Link system
Master station	Station that controls remote stations, local stations, and intelligent device stations.
Intelligent device station	Slave stations capable of transient transmission in a CC-Link system, such as AJ65BT-R2
Master module	Generic term used for AJ61QBT11, A1SJ61QBT11, AJ61BT11, or A1SJ61BT11 when used as a master station
Remote module	Generic term used for AJ65BTB□-□□, AJ65BTC□-□□, AJ65BT-64AD, AJ65BT-64DAV, and AJ65BT-64DAI
External device	A device such as an ID controller, bar code reader, or general-purpose personal computer connected to an AJ65BT-R2 for the purpose of data communication
RS-232C	Interface complying with the RS-232C standard
Transient transmission	Function whereby data is communicated with the designated station in response to an access request from a PC CPU or other device
Buffer memory automatic update function	Function whereby data is automatically updated between the automatic update area of the AJ65BT-R2 buffer memory and the automatic update area of the master station
Automatic update area	Buffer memory inside the master station, used for buffer memory automatic update with respect to an intelligent device station
Registered frame	Data sequence in the fixed-format portion of messages communicated between an external device and an AJ65BT-R2 There are two types of registered frame: the "default registered frame" which is already registered in the AJ65BT-R2, and "user-registered frames", which the user can register in the E^2PROM.
Send frame-1 area	Buffer memory addresses 118H to 119H When sending frame data using the send frame-1 area, freely selectable data can be sent by appending one frame each to the first and final data.
Send frame-2 area	Buffer memory addresses 120H to 185H When sending frame data using the send frame-2 area, up to 100 frames only, or freely selectable data with frames appended to the first and final data, giving a total of up to 99 frames, can be sent.
RX	Remote input
RY	Remote output
RWw	Remote register (write area)
RWr	Remote register (read area)

2. SYSTEM CONFIGURATION

2.1 AJ65BT-R2 System Configuration

The system configuration when using AJ65BT-R2 is shown below.
Up to twenty-six AJ65BT-R2 modules can be connected per master station.



*1 The terminal resistors are supplied as accessories with the master module.

2.2 Applicable Systems

This section describes the CC-Link system master modules with which AJ65BT-R2 can be used, and the PC CPUs that can use CC-Link dedicated instructions.

(1) Master modules with which AJ65BT-R2 can be used
The master modules that allow use of AJ65BT-R2 are those with the code indicated below (9707 B or later) inscribed as the DATE entry on the rating nameplate.
Modules that do not have "9707 B" or later inscribed as the DATE entry cannot be used.

(2) PC CPUs that can use CC-Link dedicated instructions
The PC CPUs that can use CC-Link dedicated instructions are those with the code indicated below (9707 B or later) inscribed as the DATE entry on the rating nameplate.
PC CPUs that do not have "9707 B" or later inscribed as the DATE entry cannot be used.

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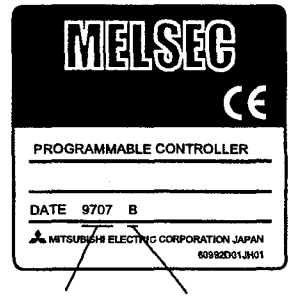

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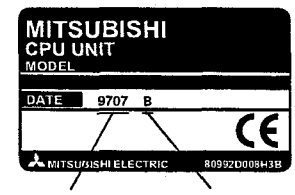


2.3 Connectable External Devices

The external devices that can be connected to the AJ65BT-R2 are indicated below (as of September 1997).

Connected device	Model Name	Remarks
Bar code reader	2600 series BCR-2530 Made by NIPPON ELECTRIC INDUSTRY CO., LTD.	• Communication method : no-protocol only • The AJ65BT-R2 interface must fall within the performance specification ranges in Section 3.3.
	TLMS-3500RV Made by TOHKEN CO., LTD.	
	DS50AF Made by Izumi Datalogic	
ID system	V620 Made by OMRON ELECTRONICS CO., LTD.	
	ID/R ID/X Made by SUNX TRADING CO., LTD.	
General purpose external devices	General purpose personal computers, general purpose printers, etc.	

For details on other devices for connection, please contact the relevant makers.

3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 General Specifications

<table>
<tr><th>Item</th><th colspan="6">Specifications</th></tr>
<tr><td>Operating 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>Operating ambient humidity</td><td colspan="6">10 to 90 % RH, No condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="6">10 to 90 % RH, No condensation</td></tr>
<tr><td rowspan="5">Vibration resistance</td><td rowspan="5">Conforming to *JIS B 3501, IEC 1132-2</td><td rowspan="2">When there is intermittent vibration</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 57 Hz</td><td>—</td><td>0.075 mm</td><td rowspan="3">10 times each in X, Y and Z axis (80 minutes)</td></tr>
<tr><td>57 to 150 Hz</td><td>9.8 m/s^2 {1G}</td><td>—</td></tr>
<tr><td rowspan="2">When there is continuous vibration</td><td>10 to 57 Hz</td><td>—</td><td>0.035 mm</td></tr>
<tr><td>57 to 150 Hz</td><td>4.9 m/s^2 {0.5G}</td><td>—</td></tr>
<tr><td>Shock resistance</td><td colspan="6">Conforming to JIS B 3501, IEC 1131-2 (147 m/s^2 {15G}, 3 times each in 3 directions)</td></tr>
<tr><td>Operating environment</td><td colspan="6">No corrosive gas present</td></tr>
<tr><td>Operating height</td><td colspan="6">2000 m (6562 ft.) or less</td></tr>
<tr><td>Installation area</td><td colspan="6">On the control board</td></tr>
<tr><td>Over-voltage category*1</td><td colspan="6">II or less</td></tr>
<tr><td>Pollution rate*2</td><td colspan="6">2 or less</td></tr>
</table>

*1 : Indicates the distribution area where the device is assumed to be connected, from the public power distribution network to the local machine device.
Category II is applied to the devices to which the power is supplied from a fixed equipment.
The surge resistance voltage of a rated 300 V device is 2500 V.

*2 : This is an index which indicates the occurrence rate of the conductive object in the environment where the device is used.
Pollution rate 2 indicates that only non-conductive pollution may occur with a possibility of generating temporary conductivity due to accidental condensation.

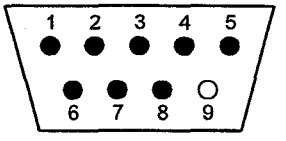
*3 : JIS : Japanese Indnstrial Standard

3.2 Performance Specifications of AJ65BT-R2

Table 3.2 Performance Specifications

Item			Performance Specification
RS-232C Specifications	Interface specification		Conforms to RS-232C, 1 channel (see Section 3.3)
	Transmission method		Full duplex
	Synchronization system		Start-stop synchronization
	Transmission speed		300, 600, 1200, 2400, 4800, 9600, 19200 BPS (selectable with RS-232C transmission specification setting switch)
	Data format	Start bit	1
		Data bit	7/8
		Parity bit	1 (YES)/0 (NO)
		Stop bit	1/2
	Error detection		Parity check performed (odd/even)/No parity check
	Transmission control (flow control)		DTR/DSR (ER/DR) control
			DC1/DC3 control
	Transmission distance		15 m (590.55 inch)
	OS receive area		5120 bytes
Data Link Specifications	General-purpose I/O specifications		Input side : 24 VDC (combined sink/source type), 2 points Output side : transistor output (sink type) 12/24 VDC, 2-point terminal block (see Section 3.4).
	Transmission channel type		Bus (RS-485)
	CC-Link station type		Intelligent device station
	Number of occupied stations		1 station (RX/RY 32 points each, RWw/RWr 4 points each)
	Power supply voltage		24 VDC
	Consumption current		TYP 110 mA (24 VDC) MAX 180 mA (16.8 V)
	Noise resistance		DC type noise voltage 500 Vp-p Noise width 1 μs, noise frequency 25 to 60 Hz, by noise simulator.
	Dielectric withstand voltage		500 VAC for 1 minute, between all DC external terminals and ground
	Insulation resistor		10 MΩ or greater, with 500 VDC insulation resistance tester, between all DC external terminals and ground
	Allowable momentary power interruption		1 ms
	E^2PROM service life for writing		100,000 times
	Module installation screws		M4 x 0.7 mm x 16 mm or greater (tightening torque range: 78 to 118 N·cm {8 to 12 kg·cm} [6.9 to 10.4 lb·inch]) Can also be mounted on a DIN rail
	Supported DIN rail		TH35-7.5Fe, TH35-7.5Al, TH35-15Fe (conforming to JIS-C2B12)
	Weight kg (lb)		0.395 (0.869)

3.3 RS-232C Interface Specifications



The connector at the AJ65BT-R2 has the model name indicated below. Use a mating connector that matches this model.
9-pin D-sub (female) screw type
DDK Electronics Ltd.
17JE-13090-37 (D23A)

Pin No.	Name	Signal Abbrev.	Signal Direction AJ65BT-R2 ↔ External Device
1	Receive carrier detection	CD	←
2	Receive data	RD (RXD)	←
3	Send data	SD (TXD)	→
4	Data terminal ready	ER (DTR)	→
5	Signal ground	SG	←
6	Data set ready	DR (DSR)	←
7	Request to send	RS (RTS)	→
8	Clear to send	CS (CTS)	←
9	Not used	—	—

Fig. 3.1 RS-232C Interface Specifications

Details on each signal are given below.

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

ER(DTR)..... When executing DTR/DSR control, this signal goes ON and OFF in accordance with the unused size of the OS receive area for receive data storage. (When the AJ65BT-R2 is able to receive data, the DTR signal goes ON.)
When not executing DTR/DSR control is not executed, the operation is determined by output signal RYnA.

DR(DSR)..... When DTR/DSR control is executed, data is not sent from the AJ65BT-R2 when this signal is OFF.
Make sure that this signal is always ON when the external device is in the status in which it can receive data.
When not executing DTR/DSR control the status of the DSR signal is ignored.

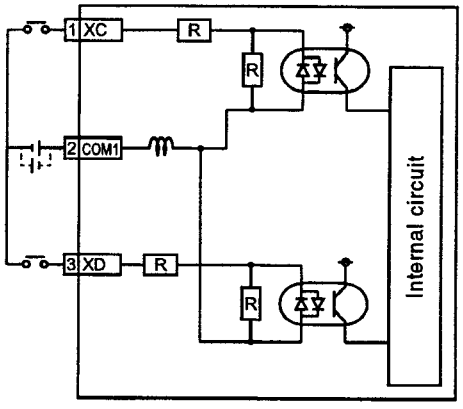
RS..... Complies with the setting of the AJ65BT-R2 buffer memory (address 101H) and the output signal RYn9.

CS..... When the CS signal is OFF, data is not sent from the AJ65BT-R2 to the external device. Make sure that this signal is always ON when the external device is in the status in which it can receive data.

For an example showing the standard connection of the RS-232C cable, see Section 4.5.2.

3.4 General-purpose I/O Specifications

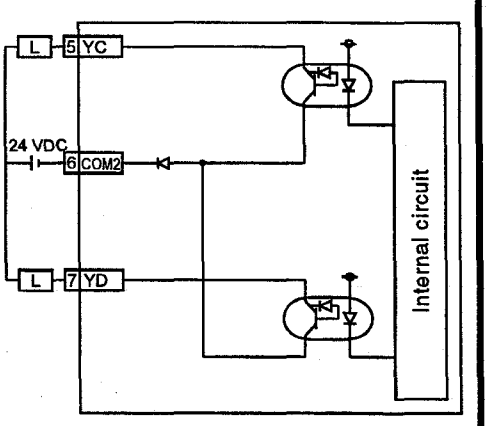
Table 3.3 General-purpose Input Specifications

		DC Input (Sink/Source Type)	
		AJ65BT-R2	External Connections
Number of input points		2 points	
Isolation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 28.8 VDC (ripple ratio : within 5 %)	
Number of max. simultaneously input points		100 %	
ON voltage/ON current		14 V or higher/3.5 mA or higher	
OFF voltage/OFF current		6 V or lower/1.7 mA or lower	
Input resistance		Approx. 3.3 kΩ	
Response time	OFF → ON	10 ms or less	
	ON → OFF	10 ms or less	
Common terminal arrangement		2 points/common (COM1) Sink/source type	
External wire connections		9-pin connector (I/O part) 7 terminal block connector (M3.5 screws) Includes transmission channel and module power supply terminals	
Applicable wire size		0.75 to 2 mm^2	
Applicable solderless terminals		RAV1.25-3.5, RAV2-3.5 (conforms to JIS C 2805)	

Terminal Number	Sig. Name	Terminal Number	Sig. Name
TB1	XC	TB3	XD
TB2	COM1	TB4	NC

Table 3.4 General-purpose Output Specifications

		Transistor Output (Sink Type)	
		AJ65BT-R2	External Connections
Number of output points		2	
Isolation method		Photocoupler	
Rated load voltage		12/24 VDC	
Operating load voltage range		10.2 to 28.8 VDC (ripple within 5 %)	
Max. load current		0.1 A/point 0.2 A/common	
Max. inrush current		0.4 A, max. 10 ms	
Leakage current at OFF		Max. 0.1 mA	
Max. voltage drop at ON		Max. 1.5 VDC, 0.1 A	
Output type		Sink type	
Response time	OFF → ON	2 ms or less	
	ON → OFF	2 ms or less (resistance load)	
Output part external power supply	Voltage	10.2 to 28.8 VDC (ripple ratio : within 5 %)	
	Current	50 mA or less (TYP 24 VDC per common) Not including external load current	
Surge suppression		Zener diode	
Common terminal arrangement		2 points/common (COM2)	
External wire connections		9-pin connector (I/O part) 7 terminal block connector (M3.5 screws) Includes transmission channel and module power supply terminals	
Applicable wire size		0.75 to 2 mm^2	
Applicable solderless terminals		RAV1.25-3.5, RAV2-3.5 (conforms to JIS C 2805)	



Terminal Number	Sig. Name	Terminal Number	Sig. Name
TB5	YC	TB7	YD
TB6	COM2		

3.5 I/O Signals Communicated with Master Module

3.5.1 I/O signal list

Table 3.5 List of I/O Signals

Signal Direction : PC CPU ← AJ65BT-R2			Signal Direction : PC CPU → AJ65BT-R2		
Input Number	Signal Name		Output Number	Signal Name	
RXn0	Send normal completion		RYn0	Send request	
RXn1	Send abnormal completion		RYn1	Send cancel request	
RXn2	Receive normal read request		RYn2	Receive read completion	
RXn3	Receive abnormal read request		RYn3	Forced receive completion request	
RXn4	Initialization normal completion		RYn4	Initialization request	
RXn5	Initialization abnormal completion		RYn5	Unusable	
RXn6	OS receive area clear completion		RYn6	OS receive area clear request	
RXn7	E^2PROM function normal completion		RYn7	E^2PROM function request	
RXn8	E^2PROM function abnormal completion		RYn8	Unusable	
RXn9	Signal status	CS (CTS) signal	RYn9	Signal setting	RS (RTS) signal*1
RXnA		DR (DSR) signal	RYnA		ER (DTR) signal*2
RXnB		CD signal	RYnB	Unusable	
RXnC to RXnD	General-purpose external input signals		RYnC to RYnD	General-purpose external output signals	
RXnE to RX (n+1) 8	Unusable		RYnE to RY (n+1) 8	Unusable	
RX (n+1) 9	Initial data setting completion		RY (n+1) 9	Initial data setting request	
RX (n+1) A	Error status		RY (n+1) A	Error reset request	
RX (n+1) B	Remote station ready		RY (n+1) B to RY (n+1) D	Unusable	
RX (n+1) C to RX (n+1) D	Unusable				
RX (n+1) E	Intelligent device station access completion		RY (n+1) E	Intelligent device station access request	
RX (n+1) F	Unusable		RY (n+1) F	Unusable	

n : Address allocated to the master module by station number setting

*1 The RS signal setting is only effective if compliance with RYn9 is set for the RS signal status designation (address 101H) in the buffer memory (see Section 9.10).

*2 The ER signal setting is invalidated if ER/DR control is set for the flow control designation in the buffer memory.

IMPORTANT

Do not designate the signals RXn0 to RXn8, RXnE to RX(n+1)F, RYn0 to RYn8, RYnB, RYnE to RY(n+1)F, for the following purposes.

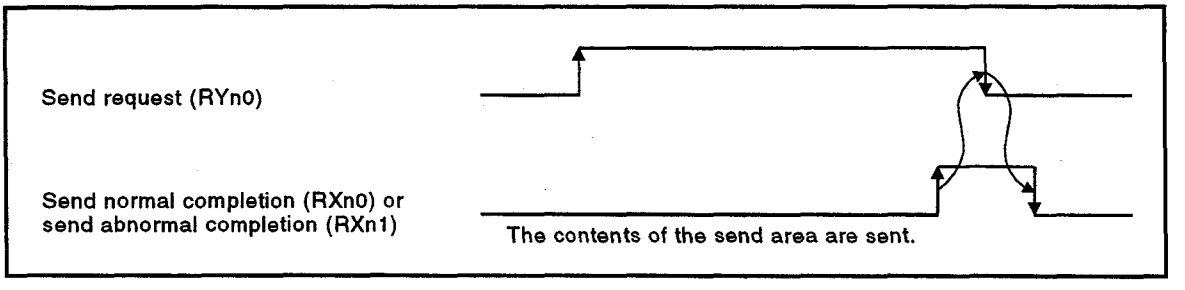
- Monitored RX/RY for the monitor send function
- Reference RX/RY of special characters in RX/RY/RW reference for the registered frame.

Note also that the output signals designated as "Unusable" in Table 3.5 are used by the system and cannot be used by the user.
If you do use any of these signals, normal operation of the AJ65BT-R2 cannot be guaranteed.

3.5.2 Details of I/O signals

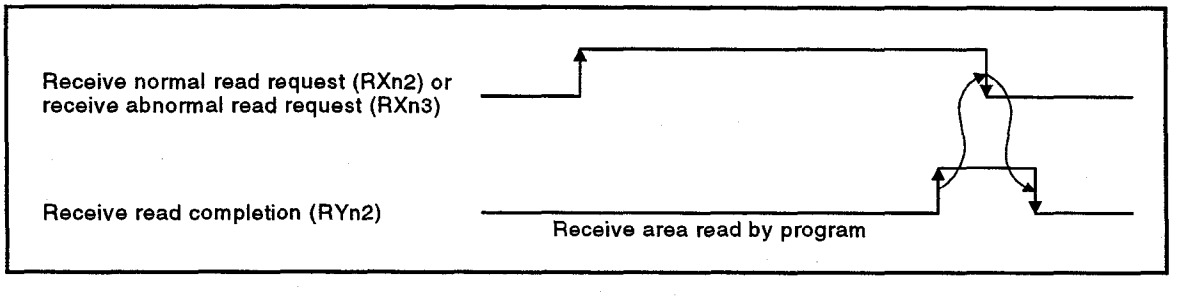
(1) Send normal completion : RXn0
This signal indicates the normal completion of the send request made by the send request signal (RYn0).
When data is sent to the external device connected to the AJ65BT-R2, if sending is completed normally the AJ65BT-R2 turns the send normal completion signal (RXn0) ON.
When the send normal completion signal (RXn0) is turned ON, the send request signal (RYn0) is turned OFF.

(2) Send abnormal completion : RXn1
This signal indicates the abnormal completion of the send request made by the send request signal (RYn0).
When data is sent to the external device connected to the AJ65BT-R2, if sending is completed abnormally the AJ65BT-R2 turns the send abnormal completion signal (RXn1) ON.
When the send abnormal completion signal (RXn1) is turned ON, the send request signal (RYn0) is turned OFF.



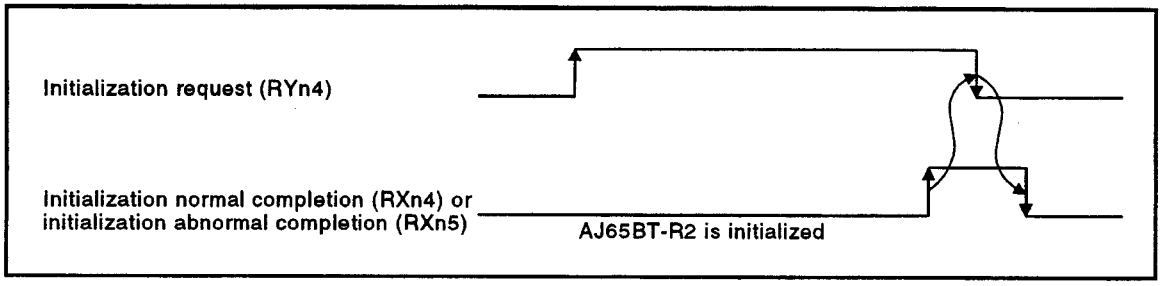
(3) Receive normal read request : RXn2
This signal comes ON when data is received from the external device connected to the AJ65BT-R2 and reception is completed normally.
When the receive normal read request signal (RXn2) comes ON, the master station starts reading the data in the receive area of the AJ65BT-R2.

(4) Receive abnormal read request : RXn3
This signal comes ON when data is received from the external device connected to the AJ65BT-R2 and reception is completed abnormally.
When the receive abnormal read request signal (RXn3) comes ON, the master station starts reading the data in the receive area of the AJ65BT-R2.

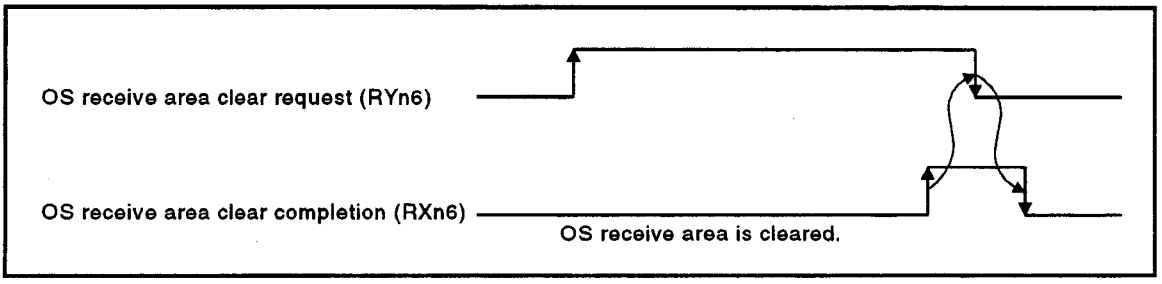


(5) Initialization normal completion : RXn4
This signal indicates the normal completion of the initialization request made by the initialization request signal (RYn4).
When initialization of the AJ65BT-R2 is completed normally, the AJ65BT-R2 turns the initialization normal completion signal (RXn4) ON.
When the initialization normal completion signal (RXn4) is turned ON, the initialization request signal (RYn4) is turned OFF.

(6) Initialization abnormal completion : RXn5
This signal indicates the abnormal completion of the initialization request made by the initialization request signal (RYn4).
When initialization of the AJ65BT-R2 is completed abnormally, the AJ65BT-R2 turns the initialization abnormal completion signal (RXn5) ON.
When the initialization abnormal completion signal (RXn5) is turned ON, the initialization request signal (RYn4) is turned OFF.

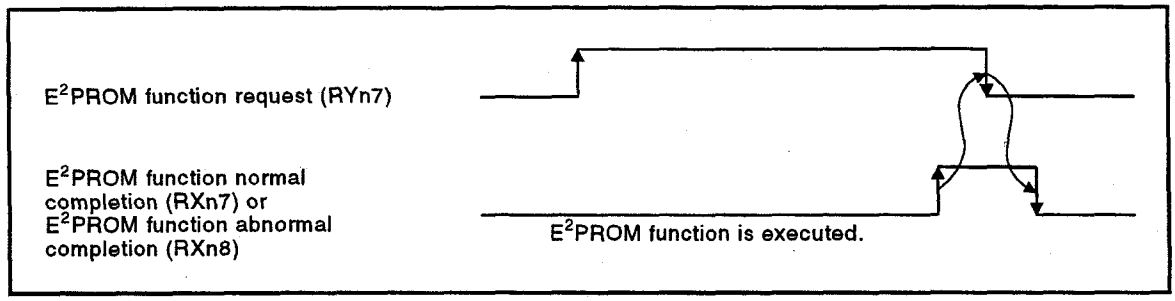


(7) OS receive area clear completion : RXn6
The OS receive area clear completion signal (RXn6) indicates the completion status of the OS receive area clear request.
When OS receive area clearance is completed, the AJ65BT-R2 turns the OS receive area clear completion signal (RXn6) ON.
When the OS receive area clear completion (RXn6) is turned ON, the OS receive area clear request signal (RYn6) is turned OFF.



(8) E^2PROM function normal completion : RXn7
This signal indicates the normal completion of the E^2PROM function request made by the E^2PROM function request signal (RYn7).
When the E^2PROM function is completed normally, the AJ65BT-R2 turns the E^2PROM function normal completion signal (RXn7) ON.
When the E^2PROM function normal completion signal (RXn7) is turned ON, the AJ65BT-R2 turns the E^2PROM function request signal (RYn7) OFF.

(9) E^2PROM function abnormal completion : RXn8
This signal indicates the abnormal completion of the E^2PROM function request made by the E^2PROM function request signal (RYn7).
When the E^2PROM function is completed abnormally, the AJ65BT-R2 turns the E^2PROM function abnormal completion signal (RXn8) ON.
When the E^2PROM function abnormal completion signal (RXn8) is turned ON, the E^2PROM function request signal (RYn7) is turned OFF.



(10) Signal status : RXn9 to RXnB
These signals indicate the status of the control signals (CS, DR, CD signals) during RS-232C communication by their ON or OFF status.

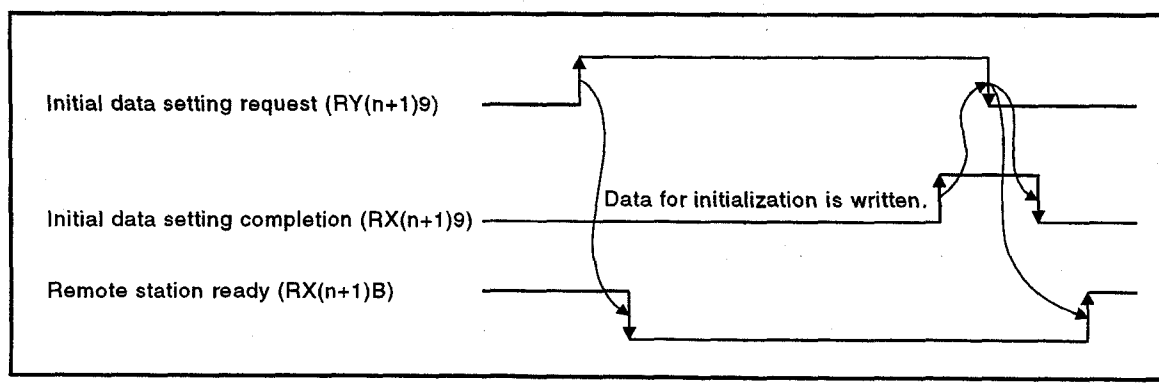
(11) General-purpose input signals : RXnC to RXnD
These signals indicate the status of the general-purpose inputs (XC, XD) of the AJ65BT-R2 by their ON or OFF status.
RXnC : Corresponds to XC
RXnD : Corresponds to XD

(12) Initial data setting completion : RX(n+1)9
This signal indicates the normal completion of the initial data setting request made by the initial data setting request signal (RY(n+1)9).

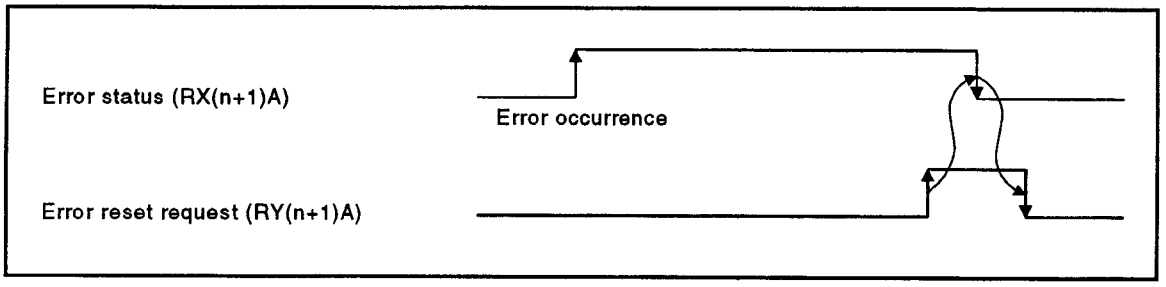
(a) When the initial data setting request signal (RY(n+1)9) is turned ON, the remote station ready signal (RXn1B) is turned OFF.

(b) When initial setting of the AJ65BT-R2 is completed normally, the initial data setting completion signal (RX(n+1)9) is turned ON.

(c) When the initial data setting completion signal (RX(n+1)9) is turned ON, the initial data setting request signal (RY(n+1)9) is turned OFF.
When the initial data setting request signal (RY(n+1)9) is turned OFF, the initial data setting completion signal (RX(n+1)9) goes OFF, and the remote station ready signal (RX(n+1)B) comes ON.



(13) Error status : RX(n+1)A
This signal indicates the error status of the AJ65BT-R2.
When the ERR LED of the AJ65BT-R2 is lit the error status signal (RX(n+1)A) is ON, and when the ERR LED is off it is OFF.
After eliminating the cause of the error, the error status signal (RX(n+1)A) can be turned OFF by turning on the error reset request (RY(n+1)A).

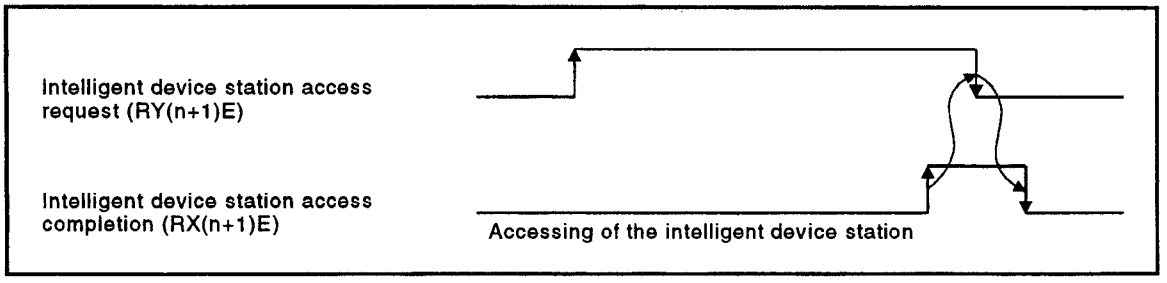


(14) Remote station ready : RX(n+1)B
This signal indicates whether or not the AJ65BT-R2 is able to operate.

(a) It comes ON under the following conditions:
1) When the AJ65BT-R2 enters the status in which it can operate
2) When the initial data setting request signal (RY(n+1)9) is turned OFF

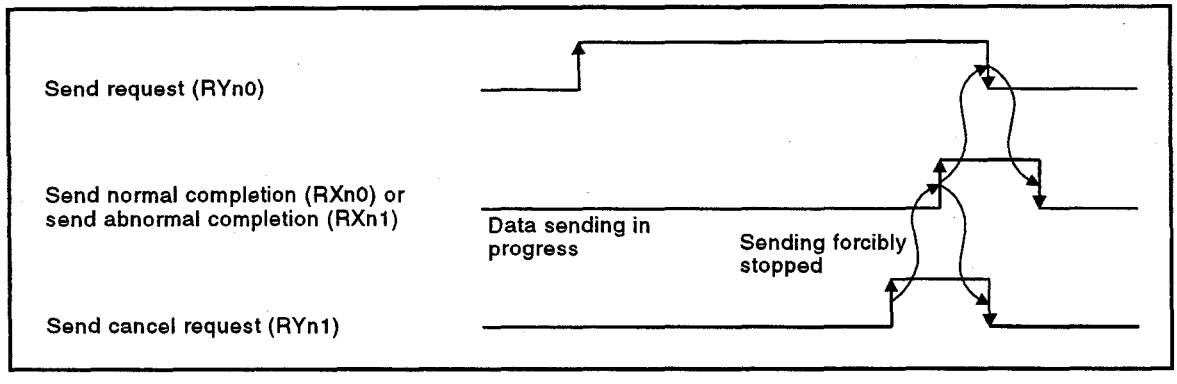
(b) It goes OFF under the following conditions.
1) When an AJ65BT-R2 error occurs (setting value error in buffer memory special purpose area)
2) When the initial data setting request signal (RY(n+1)9) is turned ON

(15) Intelligent device station access completion : RX(n+1)E
This signal indicates that accessing of the intelligent device station in response to the intelligent device station access request signal (RX(n+1)E) has been completed.
When using a master module for the A-series (AJ61BT11/A1SJ61BT11), on completion of accessing of the intelligent device station when reading from or writing to the buffer memory of the master module directly from the PC CPU, the AJ65BT-R2 turns ON the intelligent device station access completion signal (RX(n+1)E).
When the intelligent device station access completion signal (RX(n+1)E) is turned ON, the intelligent device station access request signal (RY(n+1)E) is turned OFF.



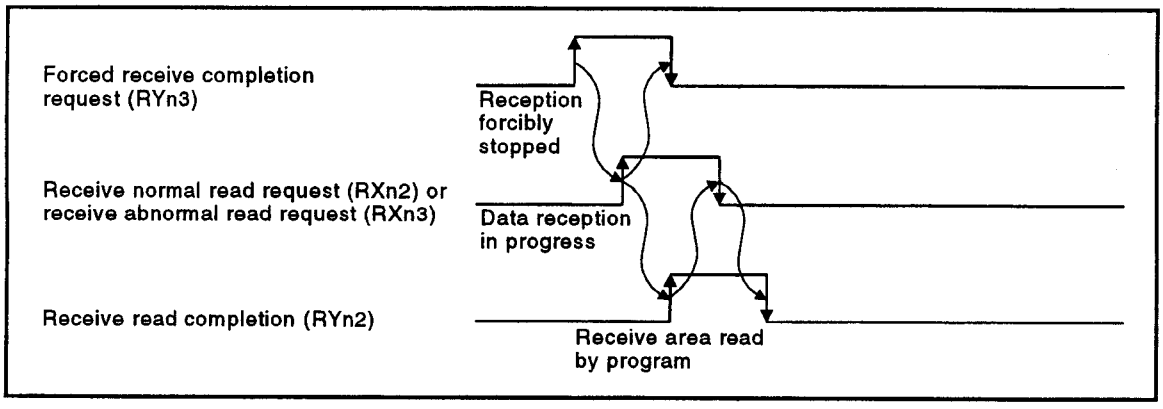
(16) Send request : RYn0
This signal serves to send data to the external device connected to the AJ65BT-R2.
Data sending is started when the send request signal (RYn0) is turned ON after the data to be sent has been written to the send area of the AJ65BT-R2.
For details on the signal timing during data sending, refer to (2).

(17) Send cancel request : RYn1
This signal serves to forcibly cancel sending of data to the AJ65BT-R2.
After a request to send data to the AJ65BT-R2 has been issued, sending can be forcibly cancelled part way through by turning the send cancel request signal (RYn1) ON.
When sending is forcibly cancelled, the send completion signal (RXn0) or send abnormal completion signal (RXn1) comes ON.
When the send completion signal (RXn0) or send abnormal completion signal (RXn1) comes ON, the send request signal (RYn0) and send cancel request signal (RYn1) go OFF.



(18) Receive read completion : RYn2
This signal indicates the completion of reading of receive data from the receive area of the AJ65BT-R2 in response to the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3).
When the receive read completion signal (RYn2) is turned ON on completion of receive reading, the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) is turned OFF.
When the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) goes OFF, the receive read completion signal (RYn2) is turned OFF.
For the timing of signals during reception, see (4).

(19) Forced receive completion request : RYn3
This signal forcibly ends reception from the external device.
When the forced receive completion request signal (RYn3) is turned ON, reception from the external device is forcibly stopped.
Upon forced stopping, the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) comes ON.
When the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) comes ON, the forced receive completion signal (RYn3) is turned OFF.
When the receive read completion signal (RYn2) is turned ON on completion of receive reading, the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) goes OFF.
When the receive normal read request signal (RXn2) or receive abnormal read request signal (RXn3) goes OFF, the receive read completion signal (RYn2) is turned OFF.



(20) Initialization request : RYn4
This signal serves to initialize the AJ65BT-R2.
When the contents of the AJ65BT-R2 buffer memory special purpose area are changed, the AJ65BT-R2 must be initialized.
Initialization of the AJ65BT-R2 is started by turning ON the initialization request signal (RYn4).
For the timing of signals during initialization, see (6).

(21) OS receive area clear request : RYn6
This signal serves to clear the OS receive area of the AJ65BT-R2.
To destroy the data received in the OS receive area of the AJ65BT-R2, the OS receive area clear request signal (RYn6) is turned ON, whereupon all the data received up to that point in the OS receive area is cleared.
For the timing of signals during OS receive area clearance, see (7).

(22) E^2PROM function request : RYn7
This signal serves to execute the E^2PROM function of the AJ65BT-R2.
The E^2PROM function of the AJ65BT-R2 is executed by turning the E^2PROM function request signal (RYn7) ON with a sequence program after writing data to the E^2PROM area of the AJ65BT-R2.
For the timing of signals when executing the E^2PROM function, see (9).

(23) Signal setting : RYn9 to RYnA
These signals turn the output signals in the RS-232C line (RS and ER signals) ON and OFF.
However, if the "RS signal status designation" of the buffer memory is set to "always ON", the signal status will remain ON even if the RS signal setting signal (RYn9) is turned ON/OFF. To control the RS signal with the RS signal setting signal (RYn9), "complies with RY" must be set for the "RS signal status designation.
When ER/DR flow control is in effect, the setting at the buffer memory side will be complied with even if the ER signal setting signal (RYnA) is turned ON/OFF. To control the ER signal with the ER signal setting signal (RYnA), a setting other than "execute ER/DR control" must be set for the "flow control setting" of the buffer memory.

(24) General-purpose I/O signals : RYnC to RYnD
These signals indicate the status of the general-purpose outputs (YC, YD) of the AJ65BT-R2.
RYnC : Corresponds to YC
RYnD : Corresponds to YD

(25) Initial data setting request : RY(n+1)9
This signal serves to write the data for initializing the AJ65BT-R2.
To write initialization data to the automatic update area of the master station allocated for the AJ65BT-R2 before executing the initialization function, the initial data setting request signal (RY(n+1)9) is turned ON.
When the buffer memory automatic update function is used, the initial setting request signal (RY(n+1)9) must be turned ON first.
For the timing of signals during initial data setting, see (12).

(26) Error reset request : RY(n+1)A
This signal serves to turn off the ERR LED of the AJ65BT-R2 and clear the error code storage area.
When an error occurs, the AJ65BT-R2 stores the error code in one of the three error code storage areas provided for different functions, and lights the ERR LED. Since the ERR LED does not go off automatically, it must be turned off by turning the error reset request signal (RY(n+1)A) ON after remedying the cause of the error.
For the timing of signals at error reset, see (13).

(27) Intelligent device station access request : RY(n+1)E
This signal serves to request access to the AJ65BT-R2 from the PC CPU when using an A-series master module (AJ61BT11/A1SJ61BT11).
To write directly to the designated buffer memory of the AJ65BT-R2 from the PC CPU, designate the data in the send buffer of the master module that is to be written to the AJ65BT-R2, and turn the intelligent device station access request signal (RY(n+1)E) ON.
To read data directly from the designated buffer memory of the AJ65BT-R2 to the PC CPU, designate the control data in the send buffer of the master module and turn the intelligent device station access request signal (RY(n+1)E) ON.
For the timing of signals during intelligent device station access, see (15).

3.6 Buffer Memory

List An outline of the buffer memory of the AJ65BT-R2 is presented in Table 3.6.
The contents of the buffer memory return to the default values when the AJ65BT-R2 power is turned OFF or the PC CPU is reset.
If the user registers default values in the E^2PROM, these default values will be written to the buffer memory when the power to the AJ65BT-R2 is turned ON or the PC CPU is reset.

The meanings of the symbols in the buffer memory table are explained below.

*1 Direction : Indicates whether it the master station or AJ65BT-R2 that updates the buffer memory values.
- → : Master station performs updating
- ← : AJ65BT-R2 performs updating
- ↔ : Both perform updating

*2 Initialization : Indicates whether or not initialization is necessary after changing a buffer memory value.
- o : Necessary
- x : Not necessary

*3 Registration : Indicates whether or not buffer memory setting value registration (see Section 9.9) is possible.
- o : Possible
- x : Not possible

Table 3.6 Buffer Memory List

Item	Address (Hex.)	Name			Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area
Areas for Allocation Designations	0H	Send/receive area first address designation area		Send area first address designation	Designates the first address of the send area.	200H	→	o	o	Section 5.2.1	Area "d"
	1H			Send area size designation	Designates the size of the send area. (Number of send data designation area + send data designation area)	200H					
	2H			Receive area first address designation	Designates the first address of the receive area.	400H					
	3H			Receive area size designation	Designates the size of the receive area. (Number of receive data storage area + receive data storage area)	200H					
	4H to FH	System area			Unusable						
	10H	Automatic update area designation	Area "a"	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately before the AJ65BT-R2 turns on the send/initialization/E²PROM function completion signal • Immediately before the AJ65BT-R2 turns on the receive read request signal • Immediately after the AJ65 BT-R2 detects OFF → ON of the error reset request signal • Immediately after detection of a send error when using the monitor send function • Immediately before turning on the initial data setting completion signal	20H	→	o	o	Section 5.2.1, Section 5.5	
	11H			First address at AJ65BT-R2 side		1A0H					
	12H			(Fixed value: 4004H)		4004H					
	13H			First offset address at master module side		1A0H					
	14H		Area "b" (1)	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately after the AJ65 BT-R2 detects OFF → ON of the send request signal	88H					
	15H			First address at AJ65BT-R2 side		118H					
	16H			(Fixed value: 4004H)		4004H					
	17H			First offset address at master station side		118H					
	18H		Area "b" (2)	Transmission size		200H					
	19H			First address at AJ65BT-R2 side		200H					
	1AH			(Fixed value: 4004H)		4004H					
	1BH			First offset address at master station side		200H					

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name			Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area
Areas for Allocation Designations	1CH	Automatic update area designation	Area "c"	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately after the AJ65 BT-R2 turns on the receive read request signal	200H	→	o	o	Section 5.2.1, Section 5.5	Area "d"
	1DH			First address at AJ65BT-R2 side		400H					
	1EH			(Fixed value: 4004H)		4004H					
	1FH			First offset address at master station side		400H					
	20H		Area "d"	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately after the AJ65 BT-R2 detects OFF → ON of the initialization request signal • Immediately after the AJ65 BT-R2 detects OFF → ON of the initial data setting request signal	1A0H					
	21H			First address at AJ65BT-R2 side		0H					
	22H			(Fixed value: 4004H)		4004H					
	23H			First offset address at master station side		0H					
	24H		Area "e"	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately after the AJ65 BT-R2 detects OFF → ON of the E²PROM function request signal	30H					
	25H			First address at AJ65BT-R2 side		1C0H					
	26H			(Fixed value: 4004H)		4004H					
	27H			First offset address at master station side		1C0H					
	28H		Area "f"	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately before the AJ65BT-R2 turns on the E²PROM function completion signal	29H					
	29H			First address at AJ65BT-R2 side		1C7H					
	2AH			(Fixed value: 4004H)		4004H					
	2BH			First offset address at master station side		1C7H					

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name			Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area
Areas for Allocation Designations	2CH	Automatic update area designation	Area "g" (1)	Transmission size	These data designate the first buffer memory address, and size, of the data transmitted at the following times when the buffer memory automatic update function is used. (For details, see Section 5.3) • Immediately after establishment of the condition for the monitor send function	88H	→	o	o	Section 5.2.1, Section 5.5	Area "d"
	2DH			First address at AJ65BT-R2 side		118H					
	2EH			(Fixed value: 4004H)		4004H					
	2FH			First offset address at master station side		118H					
	30H		Area "g" (2)	Transmission size		200H					
	31H			First address at AJ65BT-R2 side		200H					
	32H			(Fixed value: 4004H)		4004H					
	33H			First offset address at master station side		200H					
	34H to 3FH	System area			Unusable	—					
	40H	RW update interval designation			Designates the interval for updating between RW of the master station and the buffer memory of the AJ65BT-R2.	1	→	o	o	Section 5.2.1, Section 9.6	
	41H	RWw update effective/ineffective designation			Designate whether RWw or RWr updating is effective or ineffective.	0 (ineffective)					
	42H	RWr update effective/ineffective designation				1 (effective)					
	43H	RW refresh destination address designation		Master → AJ65BT-R2 RWw0	Designate RW at the master station side and the buffer memory address automatically updated at the AJ65BT-R2 side.	118H					
	44H			AJ65BT-R2 → Master RWr0		1B0H					
	45H			Master → AJ65BT-R2 RWw 1		119H					
	46H			AJ65BT-R2 → Master RWr 1		1B1H					
	47H			Master → AJ65BT-R2 RWw 2		120H					
	48H			AJ65BT-R2 → Master RWr 2		1B2H					
	49H			Master → AJ65BT-R2 RWw 3		121H					
	4AH			AJ65BT-R2 → Master RWr 3		1B6H					
	4BH to 6FH	System area			Unusable	—					
	70H	Monitor interval designation			Designates the interval at which the RX/RY/RW values in the CC-Link are monitored when monitor send is executed. (100 ms units)	0 (No monitoring)	→	o	o	Section 5.2.1, Section 7.4	
	71H	Monitored number			Designates the number of RX/RY/RW values in the CC-Link to be monitored.	0					

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name		Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area
Areas for Allocation Designations	72H to 77H	System area		Unusable	———					Area "d"
	78H	Monitor designation 1	Monitored object designation	Monitored object designation Designates the device and status to be used in send trigger detection by the AJ65BT-R2. Send data designation Designates the destination of the data sent on occurrence of the send trigger due to establishment of the send condition. (First number of the sent tables, and number of tables)	0	→	o	o	Section 5.2.1, Section 7.4	
	79H		Send data designation		0					
	7AH	Monitor designation 2	Monitored object designation		0					
	7BH		Send data designation							
	7CH to F5H	to			0					
	F6H	Monitor designation 64	Monitored object designation		0					
	F7H		Send data designation							
	F8H to FFH	System area		Unusable	———					
Parameter Area	100H	Flow control designation		Designates whether DC code control or DTR/DSR signal control is executed.	1 (DTR/DSR signal control)	→	o	o	Section 5.2.2, Section 9.4	
	101H	RS (RTS) signal status designation		Designates the RS(RTS) signal status.	0 (Always ON)				Section 5.2.2, Section 9.10	
	102H	Word/byte unit designation		Designates whether to make words or bytes the units for the number of send data and number of receive data when sending/receiving data.	0 (Word units)				Section 5.2.2	
	103H	ASCII-BIN conversion designation		Designates whether send/receive data is subjected to ASCII ↔ binary conversion or not.	0 (Not converted)				Section 5.2.2, Section 9.5	
	104H	System area		Unusable	———					
	105H	Transient time-out time designation		Designates the time-out time for completion of AJ65BT-R2 and master station buffer memory automatic updating.	0 (5 seconds)	→	o	o	Section 5.2.2	
	106H to 107H	System area		Unusable	———					
	108H to 10BH	Receive first frame number		Designates the first frame number in frame reception.	0, 0, 0, 0	→	o	o	Section 5.2.2, Section 7.3	
	10CH to 10FH	Receive final frame number		Designates the final frame number in frame reception.	AH, DH, 0, 0					
	110H	Receive first frame/receive final frame cancel designation		Designates whether or not to store the first frame and final frame parts of the data in the receive area in frame reception.	1 (Not stored)					
	111H	Receive end number of data designation		Designates the number of data at which reception ends when the reading of receive data ("freely selectable data part" in the case of frame reception) is restricted to a fixed length.	0				Section 5.2.2	
	112H	Receive time-out time designation		Designates the receive time-out time for data reception.	0					
	113H to 117H	System area		Unusable	———					

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name		Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area
Parameter Area	118H	Send frame 1 area	Send first frame number	Designates the first frame number for frame sending.	0	→	x	o	Section 5.2.2, Section 7.3	Area "b" (1) / Area "d" / Area "g" (1)
	119H		Send final frame number	Designates the final frame number for frame sending.	0					
	11AH	Send time-out time designation		Designates the send time-out time, for the time from the start of data transmission to the end of data transmission.	0				Section 5.2.2	
	11B to 11FH	System area		Unusable	——					
	120H	Send frame 2 area	First send table number designation	Writes the first position of the send table designated area to which table data is sent.	0	→	x	o	Section 5.2.2, Section 7.3	
	121H		Send table number	Writes the number of registered frames, starting from the designated position, that are to be sent to the first send table number designation area.	0					
	122H		Send table designation: Number 1	Designates the number of the frame to be sent. If data written in the send area is also to be sent, use "8000H" as the provisional registered frame number.	0	→	x	o		
	123H to 184H		Send table designation: to							
	185H		Send table designation: Number 100							
	186H to 18FH	System area		Unusable	——					
	190H to 19FH									
Setting Status Storage Area	1A0H	Station number setting switch		Stores the station number set with the station number setting switch.	Depends on switch settings	←	x	x	Section 5.3	Area "a"
	1A1H	Data link transmission speed setting switch		Stores the data transmission speed of the CC-Link set with the data link transmission speed setting switch.						
	1A2H	Mode setting switch		Stores the mode number set with the mode setting switch.						
	1A3H	RS-232C transmission speed		Stores the transmission speed set with the RS-232C transmission specification setting switch.						
	1A4H	RS-232C data bit length		Stores the data bit length set with the RS-232C transmission specification setting switch.						
	1A5H	RS-232C parity bit used/not used		Stores the parity bit status set with the RS-232C transmission specification setting switch.						
	1A6H	RS-232C stop bit length		Stores the stop bit length set with the RS-232C transmission specification setting switch.						
	1A7H	Buffer memory default value setting storage status		Stores whether the default value status of the buffer memory when the AJ65BT-R2 is started up is to be the default values held by the AJ65BT-R2 or the default values registered in the E²PROM.	0					

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name		Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area	
Communication Status Storage Area	1A8H to 1AFH	Error code storage area	Error code history	Stores the codes of up to 8 errors that have occurred up to the present in order of occurrence.	0	←	x	x	Section 5.3	Area "a"	
	1B0H		General error codes	Stores the error code when the initialization abnormal completion signal (RXn5) or E²PROM function abnormal completion signal (RXn8) is turned on, or a time-out error occurs.	0						
	1B1H		Send error code	Stores the error code when the send abnormal completion signal (RXn1) is turned on.	0						
	1B2H		Receive error code	Stores the error code when the receive abnormal read request signal (RXn3) is turned on.	0						
	1B3H	System area		Unusable	——						
	1B4H	Actual number of send data storage		Stores the number of data (words/bytes) sent when data transmission has ended normally or abnormally.	0	←	x	x	Section 5.3		
	1B5H	Receive frame index number storage		Stores what group (of 1 to 4) of the frame designated with the first receive frame number was received in frame reception.	0						
	1B6H	Number of data storage area in OS receive area		Stores the number of data (words/bytes) stored in the OS receive area.	0						
	1B7H to 1BEH	System area		Unusable	——						
	1BFH	Software version storage		Stores the software version of the AJ65BT-R2 in ASCII code.	Depends on version	←	x	x	Section 5.3		
Area for E²PROM	1C0H	E²PROM function designation		Designates the E²PROM function. (The E²PROM function is a function that registers/initializes the buffer memory setting values stored in the E²PROM, or registers/reads /deletes user-registered frames.)	0	→	x	x	Section 5.4, Chapter 8, Section 9.1	Area "e"	
	1C1H	User-registered frame number designation		Designates the registration number of the user-registered frame when a frame is registered in/read to the E²PROM. (3E8H to 4AFH)	0				Section 5.4, Chapter 8		
	1C2H to 1C6H	System area		Unusable	——					Area "e"	—
	1C7H	User-registered frame byte number designation		Designates the total number of bytes for the user-registered frame registered/read to the E²PROM.	0	↔	x	x	Section 5.4, Chapter 8		Area "f"
	1C8H to 1EFH	User-registered frame		Stores, at registration, the registration data for the user-registered frame to be registered. Stores the registration data of the registered user-registered frame when the frame is read.	0						
	1F0H to 1FFH	System area		Unusable	——					—	

Table 3.6 Buffer Memory List (Continued)

Item	Address (Hex.)	Name	Description	Default Value	Direction*1	Initialization*2	Registration*3	Reference Section	Default Automatic Update Area	
User Free Area	200H	Default number of send data designation area	Designates the number of words/bytes written to the send data designation area.	0	→	x	x	Chapter 6	Area "b" (2)	Area "g" (2)
	201H to 3FFH	Default send data designation area	Designates the data to be sent.	0						
	400H	Default number of receive data storage area	Designates the number of words/bytes of data stored in the receive data storage area.	0	←	x	x		Area "c"	
	401H to 5FFH	Default receive data storage area	Stores the data received.	0						
	600H to 7FFH	Default unused area	Can be used as send/receive area.	0	Depends on send/receive area setting.	x	x		—	
System Area	800H to F1FH	System area	Unusable	—					—	

3.7 Default Registered Frame List

Table 3.7 Default Registered Frame List

Default Registered Frame Number (Hex. (Dec.))	Registered Number of Bytes	Frame Contents when Sending/Receiving		Remarks
0 (0)	———	Vacant (cannot be used)		
001H (1) to to 0FEH (254)	1 to 1	The same data as the registered frame number. (1 to FEH) For example, if the registered number is 2, the data is STX(02).		
0FFH (255)	1	Cannot be used		
100H (256)	1	Annual (00H)		
101H (257)	2	FFH (1 byte)		The value actually registered is the special character FFH·FFH.
102H (258)	2	CR (0DH), LF (0AH)		
103H (259)	2	DLE, STX		
104H (260)	2	DLE, ETX		
105H (261)	2	00H, FEH		
106H (262)	3	00H, 00H, FEH		
107H (263)	3	ETX, sum check (FFF1H)		
108H (264)	5	ETX, sum check (FFF1H), CR, LF		
109H (265) to to 12BH (299)	———	Cannot be used		
12CH (300)	4	STX, '0', '0', 'G'	2600 series (NIPPON ELCTRIC INDUSTRY CO., LTD.)	First frame of in zone ON command
12DH (301)	5	STX, '0', '0', 'S', ETX		In zone OFF command
12EH (302)	4	STX, '0', '0', 'D'		First frame of bar code data
12FH (303)	4	STX, '0', '0', 'E'		First frame when bar code reader error occurs
130H (304)	4	STX, 'B', 'R', ETX	TLMS-3500RV (TOHKEN CO., LTD.)	No-read frame
131H (305)	3	STX, 'E', 'R'		First frame when error occurs
132H (306)	4	ESC, 'A', '0', CR		Synchronous ON command
133H (307)	4	ESC, 'A', '0', ','		First frame of synchronous ON command during edge input
134H (308)	4	ESC, 'A', '1', CR		TOHKEN CO., LTD.'s synchronous OFF command
135H (309)	4	STX, CAN, CR, LF	DS50AF (Izumi Datalogic)	No-read frame
136H (310)	4	STX, BEL, CR, LF		Frame when error occurs
137H (311)	2	'*', CR	V620 (OMRON ELECTRONICS CO., LTD.)	Final frame
138H (312)	2	'RD'		First frame of each command
139H (313)	2	'WT'		
13AH (314)	2	'AR'		
13BH (315)	2	'AW'		
13CH (316)	2	'PR'		
13DH (317)	2	'PW'		
13EH (318)	2	'TS'		
13FH (319)	4	'AA*', CR		Various command frames
140H (320)	4	'XZ*', CR		

Table 3.7 Default Registered Frame List (Continued)

Default Registered Frame Number (Hex. (Dec.))	Registered Number of Bytes	Frame Contents when Sending/Receiving	Remarks	
141H (321)	3	Check sum (FFFA), CR	Final frame of ID/R/X (SUNX TRADING CO., LTD.)	
142H (322)	—	Cannot be used	—	
143H (323)				
144H (324)				
145H (325)				
146H (326)				
147H (327)				
148H (328)				
149H (329)				
14AH (330)				
14BH (331)				
14CH (332)				
14DH (333)	2	'ST'	ID/R/X (SUNX TRADING CO., LTD.)	First frame of each command
14EH (334)		'WR'		
14FH (335)		'CT'		
150H (336)		'RD'		
151H (337)		'RA'		
152H (338)		'RP'		
153H (339)		'WA'	ID/R/X (SUNX TRADING CO., LTD.)	First frame of each command
154H (340)		'WP'		
155H (341)		'CL'		
156H (342)		'WI'		
157H (343)		'SP'		
158H (344)	5	'RD6A' ,CR		Various command frames
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 (354) to 3E7H (999)	—	Cannot be used	—	

3.8 Transmission Delay Time

The transmission delay time (time until data is transmitted) is described here.

(1) Master station(RX/RWr) ← AJ65BT-R2(RX/RWr)
[Calculation formula]

SM + Ls × 3 + RS [ms]

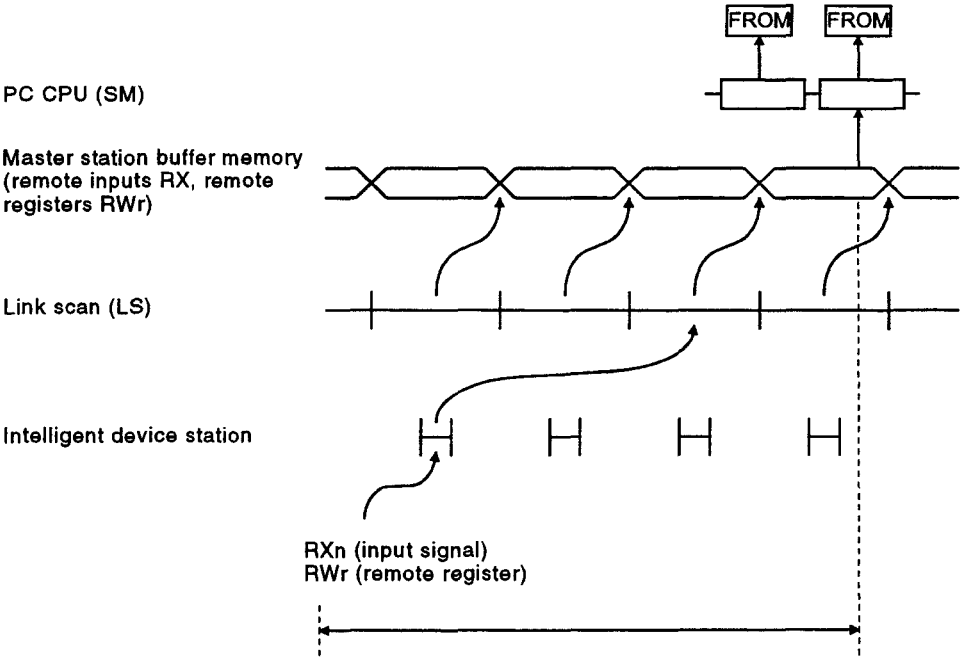
SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time *1

*1 AJ65BT-R2 internal processing time
The internal processing time of the AJ65BT-R2 is given by the following formula.

AJ65BT-R2 internal processing time (RS) = LS × K (constant)

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

[Flow of data]

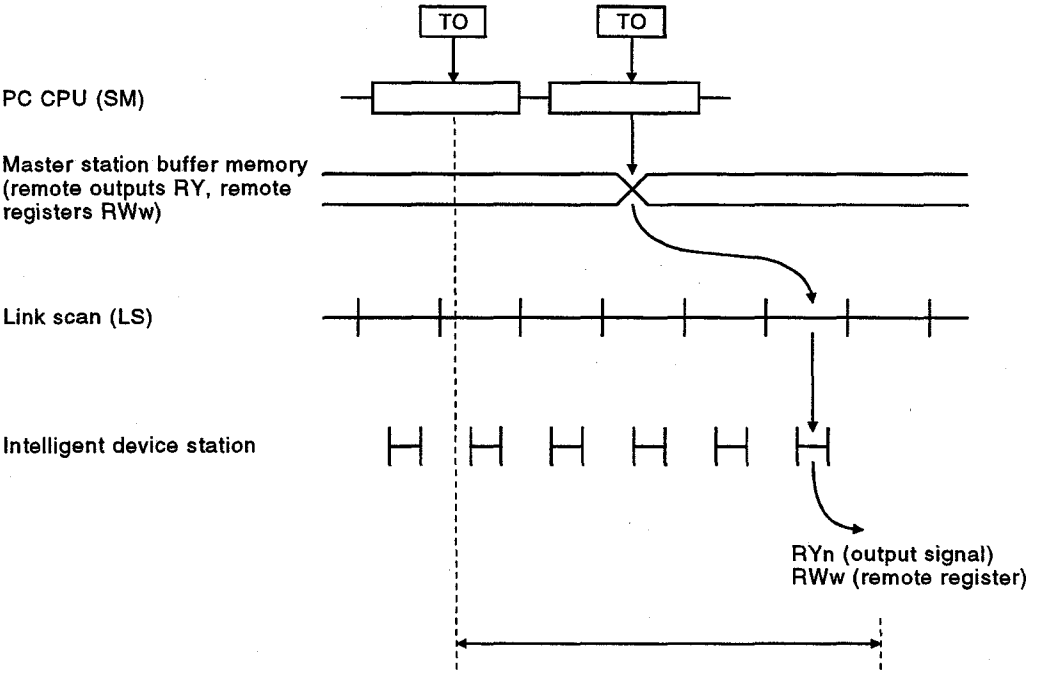


(2) Master station (RY/RWw) → AJ65BT-R2(RY/RWw)
[Calculation formula]

SM + Ls × 3 + RS [ms]

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time (see Section 3.8 (1))

[Flow of data]

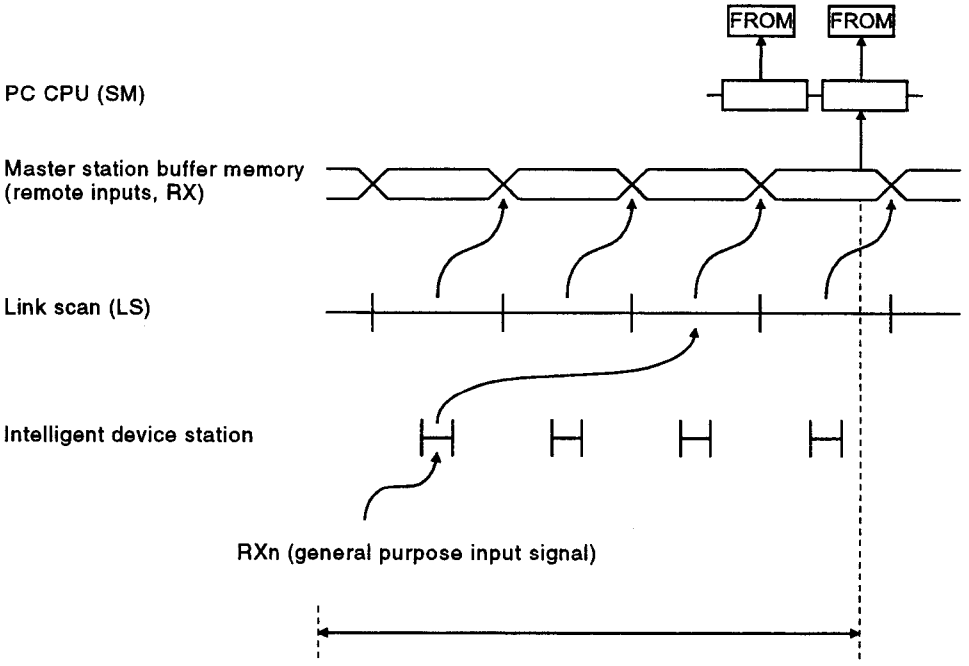


(3) Master station (RX) → general purpose inputs (RXnC, RXnD)
[Calculation formula]

SM + Ls × 3 +10 ms (general purpose input response time) [ms]

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)

[Flow of data]

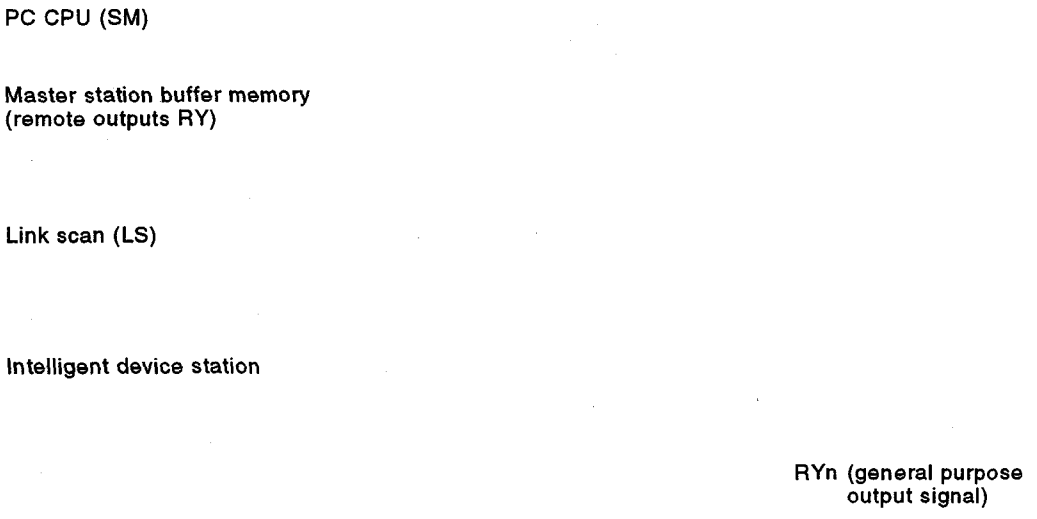


(4) Master station ← general purpose outputs (RYnC, RYnD)
[Calculation formula]

SM + Ls × 3 + 2 ms (general purpose output response time) [ms]

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)

[Flow of data]



3.9 Send/Receive Time

This is the time that elapses between the send request signal (RYn0) being turned ON by the master station and the send completion signal (RXn0) being turned ON by the AJ65BT-R2.

3.9.1 Send time

(1) When the buffer memory automatic update function is used
[Calculation formula]

SM × 2 + LS × 6 + RS + data send time*1
+ automatic update b area request/response scan*2
+ automatic update a area request/response scan*3

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time (see Section 3.8 (1))

(2) When the buffer memory automatic update function is not used
[Calculation formula]

SM × 2 + LS × 6 + RS + data send time*1

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time (see Section 3.8 (1))

*1 Data send time
This is determined by the number of data and the RS-232C transmission speed.
Example : With a number of data of 200 bytes and a transmission speed of 9600 bps (data bit length: 8, stop bit length: 1, parity bit: even)

$200 \times 10/9600 \approx 0.208$ s

*2 The automatic update b area request/response scan is the scan that executes reading of data equivalent to the size designated in the automatic update b area from the master station. For the calculation formula for the transient transmission request/response scan, see Section 5.4 of the master module User's Manual.

*3 The automatic update a area request/response scan is the scan that executes writing of data equivalent to the size designated in the automatic update a area to the master station. For the calculation formula, see Section 5.4 of the master/local module User's Manual.

3.9.2 Receive time

This is the time that elapses between the AJ65BT-R2 starting data reception and the AJ65BT-R2 turning the receive normal/abnormal read request signal (RXn2/RXn3) ON.

(1) When the buffer memory automatic update function is used
[Calculation formula]

SM + LS × 3 + RS + data receive time*1
+ automatic update b area request/response scan*2
+ automatic update a area request/response scan*3

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time (see Section 3.8 (1))

(2) When the buffer memory automatic update function is not used
[Calculation formula]

SM + LS × 6 + RS + data receive time*1

SM : Scan time of master station sequence program
LS : Link scan time (see Section 5.2 of the master station User's Manual)
RS : AJ65BT-R2 internal processing time (see Section 3.8 (1))

*1 The data receive time is determined by the number of data and the RS-232C transmission speed.
Example : With a number of data of 200 bytes and a transmission speed of 9600 bps (data bit length: 8, stop bit length: 1, parity bit: even)

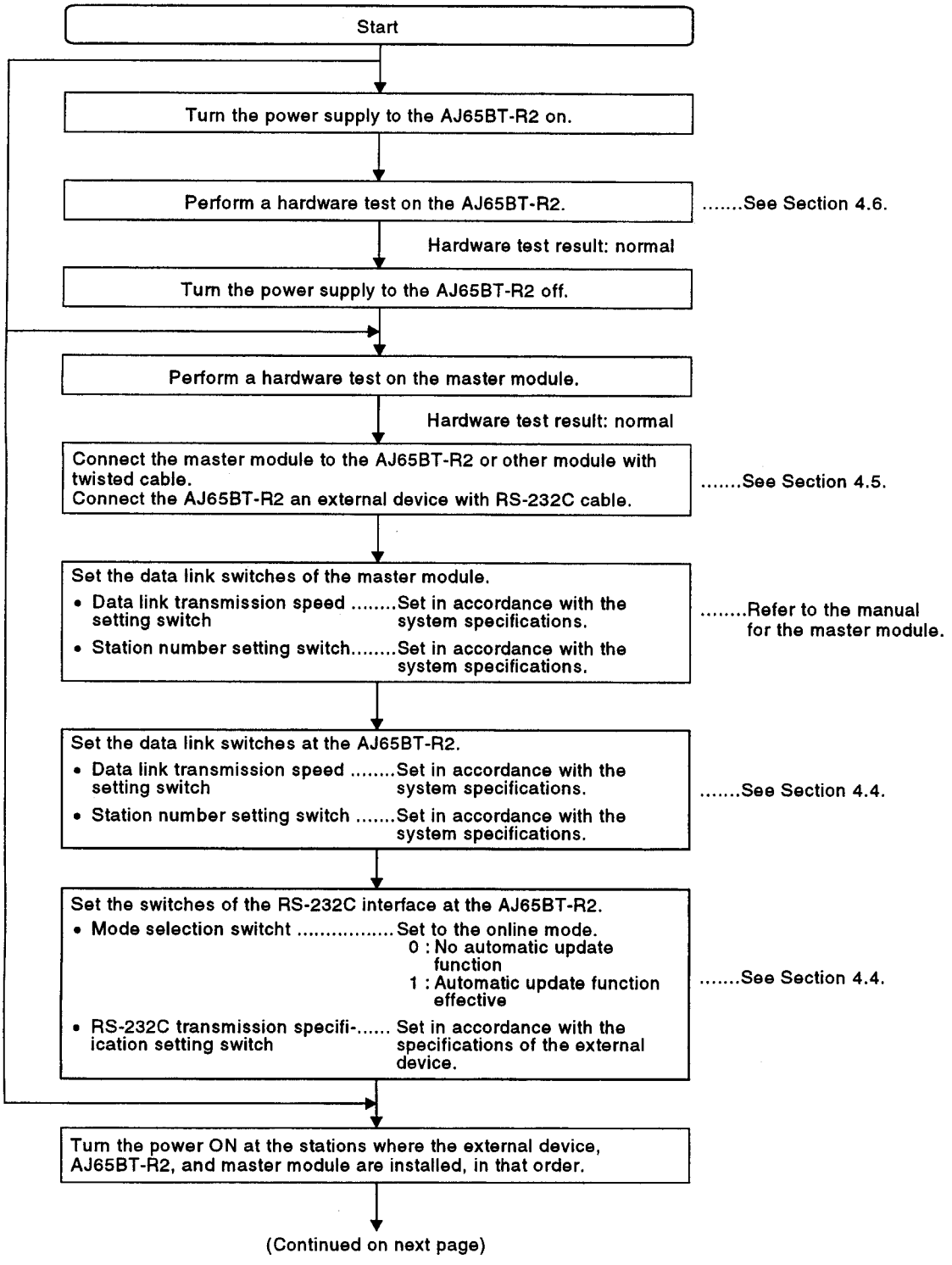
$$200 \times 10/9600 \approx 0.208 \text{ s}$$

*2 The automatic update b area request/response scan is the scan that executes reading of data equivalent to the size designated in the automatic update b area from the master station. For the calculation formula, see Section 5.4 of the master module User's Manual.

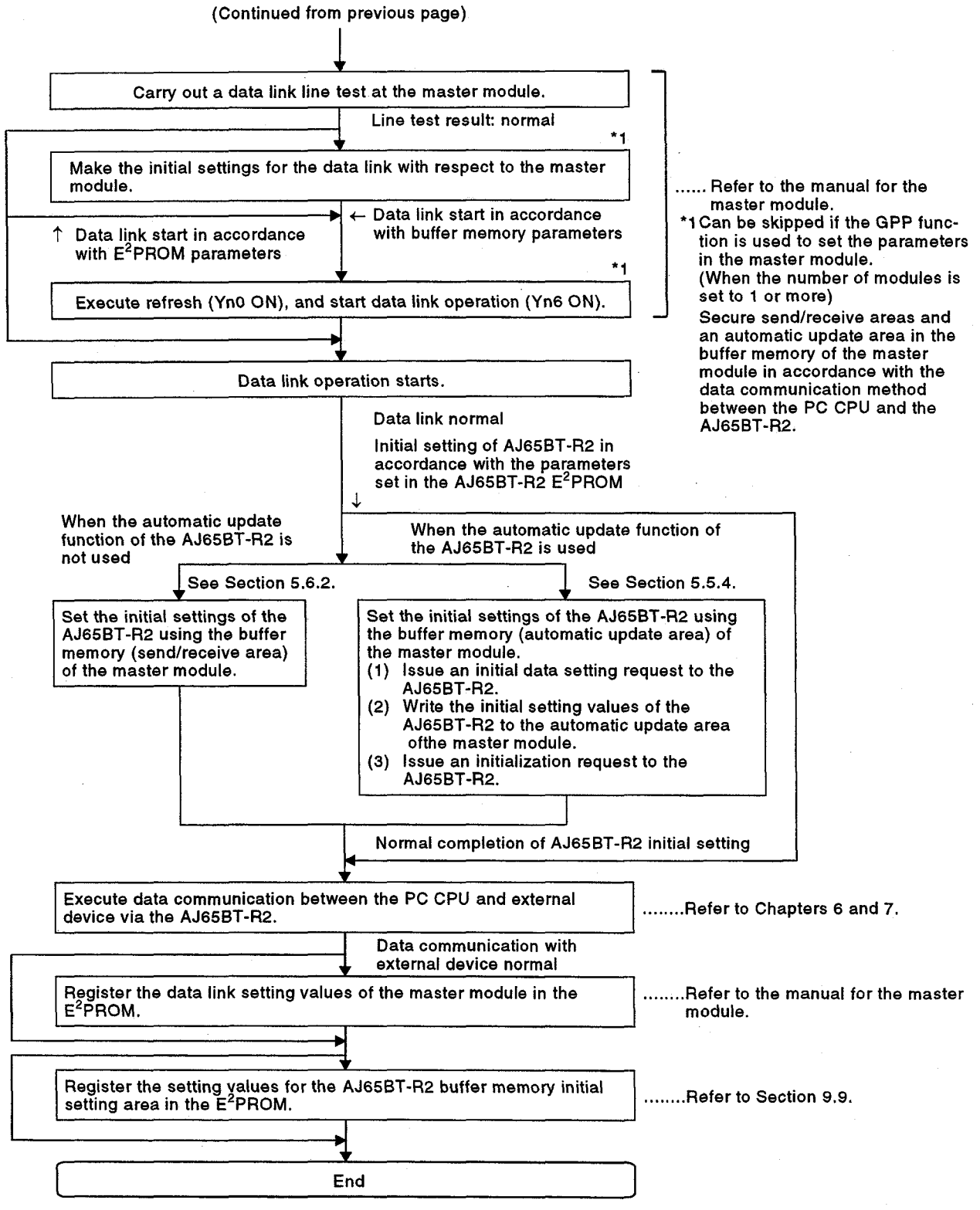
*3 The automatic update a area request/response scan is the scan that executes writing of data equivalent to the size designated in the automatic update a area to the master station. For the calculation formula, see Section 5.4 of the master module User's Manual.

4. PRE-OPERATION SETTINGS AND PROCEDURES

4.1 Procedure Before Starting Operation



(Continued on next page)


(Continued from previous page)
Carry out a data link line test at the master module.
Line test result: normal
*1
Make the initial settings for the data link with respect to the master module.
↑ Data link start in accordance with E²PROM parameters
← Data link start in accordance with buffer memory parameters
*1
Execute refresh (Yn0 ON), and start data link operation (Yn6 ON).
..... Refer to the manual for the master module.
*1 Can be skipped if the GPP function is used to set the parameters in the master module. (When the number of modules is set to 1 or more)
Secure send/receive areas and an automatic update area in the buffer memory of the master module in accordance with the data communication method between the PC CPU and the AJ65BT-R2.
Data link operation starts.
Data link normal
Initial setting of AJ65BT-R2 in accordance with the parameters set in the AJ65BT-R2 E²PROM
When the automatic update function of the AJ65BT-R2 is not used
When the automatic update function of the AJ65BT-R2 is used
See Section 5.6.2.
See Section 5.5.4.
Set the initial settings of the AJ65BT-R2 using the buffer memory (send/receive area) of the master module.
Set the initial settings of the AJ65BT-R2 using the buffer memory (automatic update area) of the master module.
(1) Issue an initial data setting request to the AJ65BT-R2.
(2) Write the initial setting values of the AJ65BT-R2 to the automatic update area ofthe master module.
(3) Issue an initialization request to the AJ65BT-R2.
Normal completion of AJ65BT-R2 initial setting
Execute data communication between the PC CPU and external device via the AJ65BT-R2.
.....Refer to Chapters 6 and 7.
Data communication with external device normal
Register the data link setting values of the master module in the E²PROM.
.....Refer to the manual for the master module.
Register the setting values for the AJ65BT-R2 buffer memory initial setting area in the E²PROM.
.....Refer to Section 9.9.
End

4.2 Handling Precautions

DANGER

- Do not touch terminals and connectors while they are live.
  This could lead to electric shock or malfunctions.
- Do not touch the connector inside the cover on the top of the module.
  This could cause module failure or malfunction.

CAUTION

- Make sure that no wire offcuts or other debris enters the top of the module.
  This could cause fire, failure, or malfunctions.
- Do not disassemble or modify the module.
  This could cause failure, malfunctions, injuries, or fire.
- Do not touch conductive parts of the module with your bare hands.
  This could cause module malfunctions or failure.
- The case of the AJ65BT-R2 is made of plastic: do not drop it or subject it to strong impact.
  This could damage the module.
- Tighten the terminal screws to within the stipulated torque range.
  If the terminal screws are loose, shorting or malfunctions may occur.
  If the terminal screws are overtightened, they may break, leading to shorting or malfunctions.
- Dispose of this product as industrial waste.
- Use the AJ65BT-R2 in an environment that complies with the general specifications stated in this manual.
  Using it in an environment that does not comply with the general specifications could lead to electric shock, fire, malfunction, and product damage or deterioration.
- Fix the module securely on a DIN rail or with the mounting screws.
  Tighten the mounting screws positively to within the stipulated torque range.
  If the screws are loose, the module may fall, or shorting or malfunctions may occur.
  If the screws are overtightened, they may break, leading to the module falling or to short circuits.
- Always switch all phases of the power supply off externally before mounting the module to, or removing it from, a panel.
  Failure to turn off the power could result in module failure or malfunctions.

(1) Tighten the module mounting and terminal screws as specified below.

Screw	Tightening Torque Range N·cm (kg·cm) [lb·inch]
Module mounting screw (M4 screw)	78 to 118 (8 to 12) [6.9 to 10.4]
Terminal block terminal screw (M3.5 screw)	59 to 88 (6 to 9) [5.2 to 7.8]
Terminal block mounting screw (M4 screw)	98 to 137 (10 to 14) [8.1 to 12.1]

(2) If using a DIN rail adapter, pay attention to the following points when installing the DIN rail.

(a) Applicable DIN rail models (35 mm (1.4 inch) - wide top-hat rail which conforms to DIN, EN, and IEC standards)
TH35-7.5Fe
TH35-7.5Al
TH35-15Fe

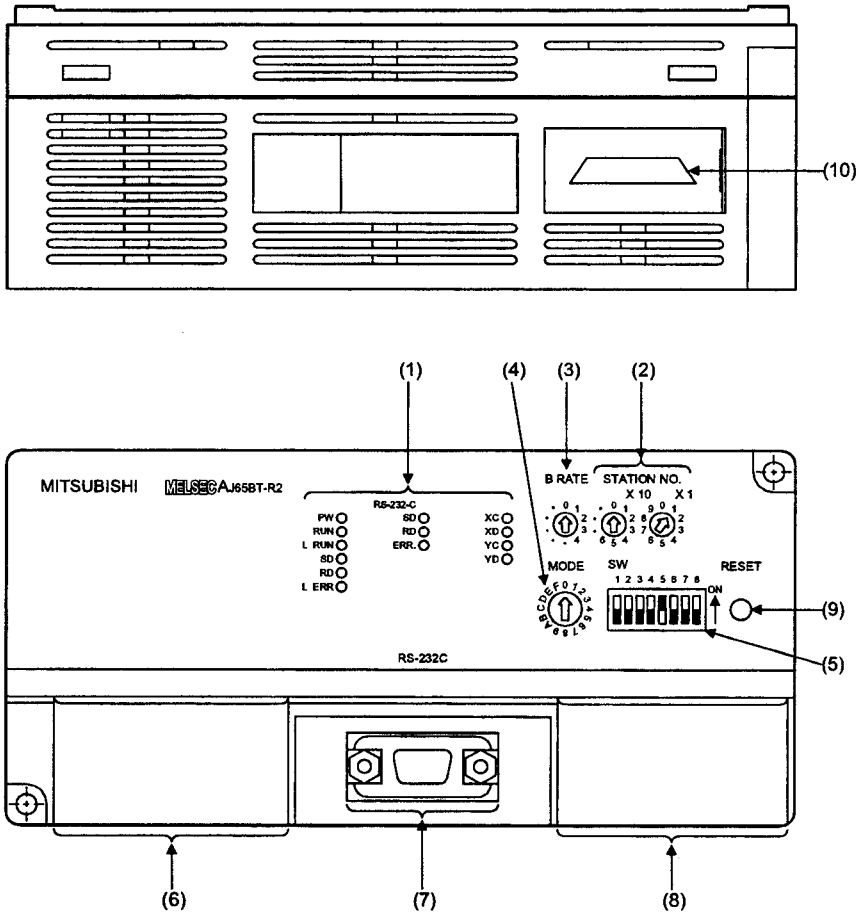
(b) Spacing of DIN rail mounting screws

When installing the DIN rail, space the screws at intervals no greater than 200 mm (7.87 inch).

4.3 Installation Environment

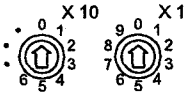
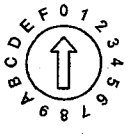
For details on installation of the PC, refer to the User's Manual for the CC-Link system master module.

4.4 Name and Setting of each Component



No.	Name	Functions and Settings
(1)	Indicator LEDs RS-232C PW ○ SD ○ XC ○ RUN ○ RD ○ XD ○ L.RUN ○ ERR ○ YC ○ SD ○ YD ○ RD ○ L.ERR ○	

LED Name		Details	ON When...	OFF When...
Initial status	PW	Lit when power is being supplied normally.	Power normal	Power abnormal
	RUN	Lit when the module is normal, off when WDT error occurs.	Module normal	WDT error
	L.RUN	Lit when network communication is normal.	Data link communication normal	Data link communication stopped (time over)
Status	L.ERR	Lit when network communication is abnormal. (e.g. CRC error)	Data link communication abnormal	Data link communication normal
Other	SD	Flashes during data sending in data link operation.	Flashes during data link sending	
	RD	Flashes during data reception in data link operation.	Flashes during data link reception	
XC, XD		Status of general-purpose inputs	Input ON	Input OFF
YC, YD		Status of general-purpose outputs	Output ON	Output OFF
RS-232C SD		Lit during RS-232C data sending.	Lit during RS-232C data sending.	
RS-232C RD		Lit during RS-232C data reception.	Lit during RS-232C data reception.	
RS-232C ERR		Lit e.g. when RS-232C transmission error occurs.	Error exists	No error

<table>
<tr><th>No.</th><th>Name</th><th>Functions and Settings</th></tr>
<tr><td>(2)</td><td>Station number setting switch
STATION NO.
X 10 X 1
  </td><td>Sets the station number of the module. (Factory setting: 0)
Setting range: 1 to 64 (0: master module)
"X10" sets the tens digit of the station number.
"X1" sets the units digit of the station number.</td></tr>
<tr><td>(3)</td><td>Data link transmission speed setting switch
B RATE
 
<table><tr><th>Setting</th><th>Transmission Speed</th></tr><tr><td>0</td><td>156 kbps</td></tr><tr><td>1</td><td>625 kbps</td></tr><tr><td>2</td><td>2.5 Mkbps</td></tr><tr><td>3</td><td>5 Mkbps</td></tr><tr><td>4</td><td>10 Mkbps</td></tr><tr><td>5 to 9</td><td>Setting error</td></tr></table></td><td>Sets the transmission speed of the module.
(For data link)
(Factory setting: 0)</td></tr>
<tr><td>(4)</td><td>Mode setting switch
  </td><td>Sets the operation status of the module (factory setting: 0)
<table><tr><th>No.</th><th>Name</th><th>Setting Details</th></tr><tr><td>0</td><td>Online mode
(Buffer memory automatic update function not effective)</td><td>Mode in which online communication takes place.
The buffer memory automatic update function is not effective.</td></tr><tr><td>1</td><td>Online mode
(Buffer memory automatic update function effective)</td><td>Mode in which online communication takes place.
The buffer memory automatic update function is effective.</td></tr><tr><td>2</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>3</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>4</td><td>Unusable</td><td>—</td></tr><tr><td>5</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>6</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>7</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>8</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>9</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>A</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>B</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>C</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>D</td><td>Hardware test mode</td><td>Mode in which operation of the module in isolation is checked.</td></tr><tr><td>E</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr><tr><td>F</td><td>Not used</td><td>Setting error ("RUN" LED off)</td></tr></table></td></tr>
<tr><td>(5)</td><td>RS-232C transmission specification setting switch
SW
1 2 3 4 5 6 7 8 ON
  </td><td>Sets the RS-232C transmission specifications.
<table><tr><th rowspan="2">No.</th><th rowspan="2">Setting Item</th><th colspan="2">Switch Setting</th><th>Factory Setting</th></tr><tr><th>ON</th><th>OFF</th><th></th></tr><tr><td>SW1 to 8</td><td>Transmission speed</td><td>SW 3 2 1
0 0 0 300 bps
0 0 1 600 bps
0 1 0 1200 bps
0 1 1 2400 bps
1 0 0 4800 bps
1 0 1 9600 bps
1 1 0 19200 bps
0:OFF 1:ON</td><td>OFF</td></tr><tr><td>SW4</td><td>Not used</td><td colspan="2"></td><td rowspan="4">OFF</td></tr><tr><td>SW5</td><td>Data bit length</td><td>8</td><td>7</td></tr><tr><td>SW6</td><td rowspan="2">Parity bit used/ not used</td><td>Used</td><td>Not used</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><td>ON</td></tr></table></td></tr>
<tr><td>(6)</td><td>Terminal block for data link</td><td>Connects the twisted cable for the power supply and for data link.
(Two-piece terminal block)</td></tr>
<tr><td>(7)</td><td>RS-232C interface</td><td>Connects the RS-232C cable for connection to external devices.</td></tr>
<tr><td>(8)</td><td>Terminal block for general-purpose I/O</td><td>Connects the I/O line.</td></tr>
<tr><td>(9)</td><td>Reset switch</td><td>Resets to the status when the power was turned ON.</td></tr>
<tr><td>(10)</td><td>Connector</td><td>Use prohibited</td></tr>
</table>

4.5 Wiring

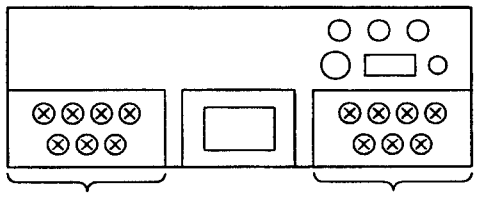
4.5.1 Data link

DANGER

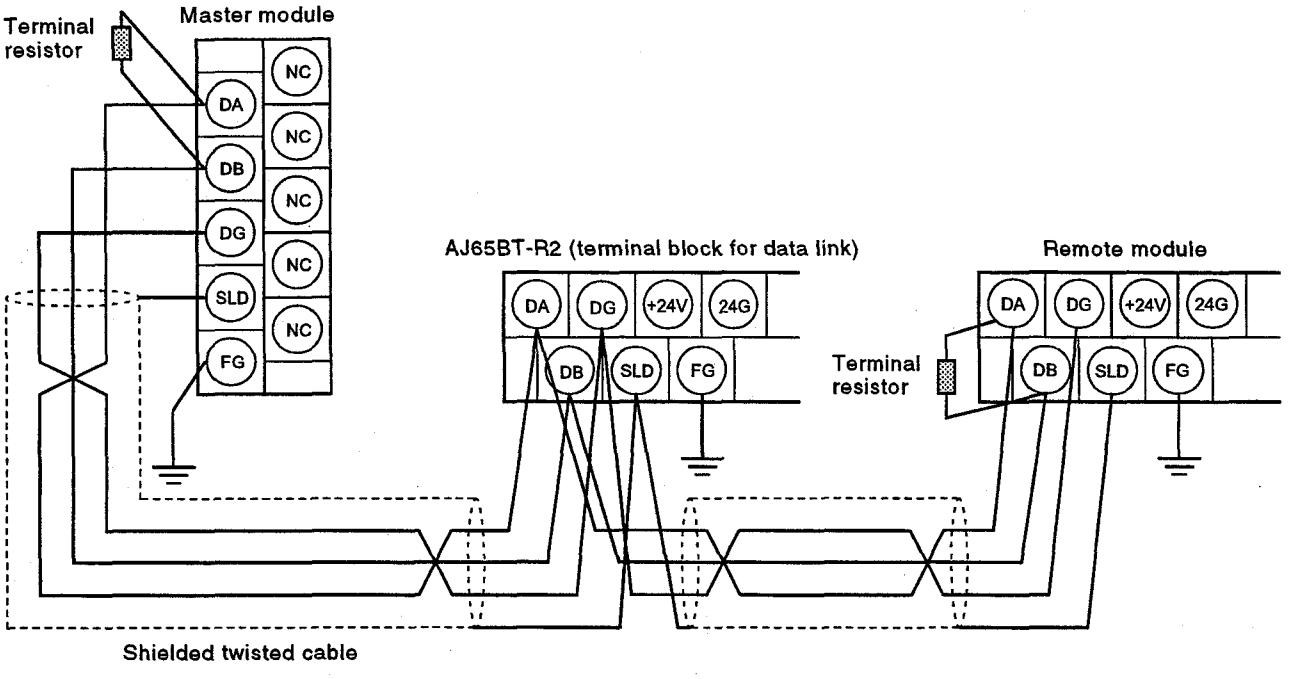
- Always switch all phases of the power supply off externally before starting mounting or wiring work. Failure to turn off the power could result in module failure or malfunctions.
- After completing mounting and wiring, fit the terminal covers supplied as accessories before turning on the module power and starting operation.
  If the covers are not fitted there will be a danger of electric shock.
- Always switch all phases of the power supply off externally before cleaning or retightening the terminal screws.
  Failure to turn off the power could result in module failure or malfunctions. If the screws are loose, the module may fall, or shorting or malfunctions may occur. If the screws are overtightened, they may break, leading to the module falling or to short circuits.

CAUTION

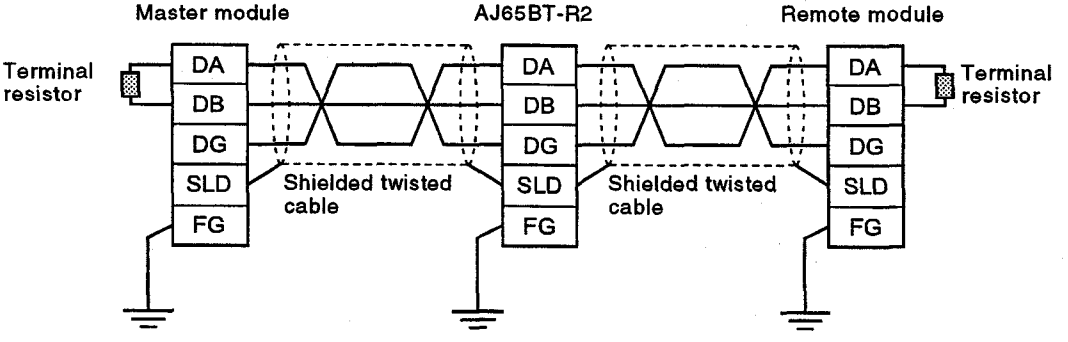
- Do not bundle the control and communication cables together with main circuit or power lines, or run them close to each other.
  As a guide, maintain a distance of 100 mm.
  If this distance is not maintained, malfunctions could occur due to noise.
- Be sure to ground the FG terminal to the protected grounding conductor.
  Otherwise there will be a danger of malfunctions.
- Carry out the module wiring correctly after checking its rated voltage and terminal arrangement.
  Connecting a power supply that does not match the rated voltage or wiring the module incorrectly could cause fire or module failure.
- Engage the connectors of connecting cables positively with the mating connectors.
  Imperfect connection could cause malfunctions due to contact faults.
- When making the connection to the master module with twisted cable, be sure to use the terminal block for data link use.
  Making the wrong connection at the terminal block for data link use or terminal block for general-purpose I/O use will cause the module to fail.



This section describes how to connect the master module, remote module, and AJ65BT-R2 using twisted cables.



[Schematic Diagram]



POINT

The "terminal resistors" supplied with the master module must be fitted at the modules at either end of the data link system. (Connected between DA-DB)

4.5.2 Connection with the external device

(1) Example connection in which DC code control and DTR/DSR signal control are possible

AJ65BT-R2 Side (DTE)		Cable Connections and Signal Directions	External Device (DTE)
Signal Code	Pin No.		Signal Code
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 connection in which only DC code control is possible

AJ65BT-R2 Side (DTE)		Cable Connections and Signal Directions	External Device (DTE)
Signal Code	Pin No.		Signal Code
SD	3		SD
RD	2		RD
RS	7		RS
CS	8		CS
DR	6		DR
SG	5		SG
CD	1		CD
ER	4		ER

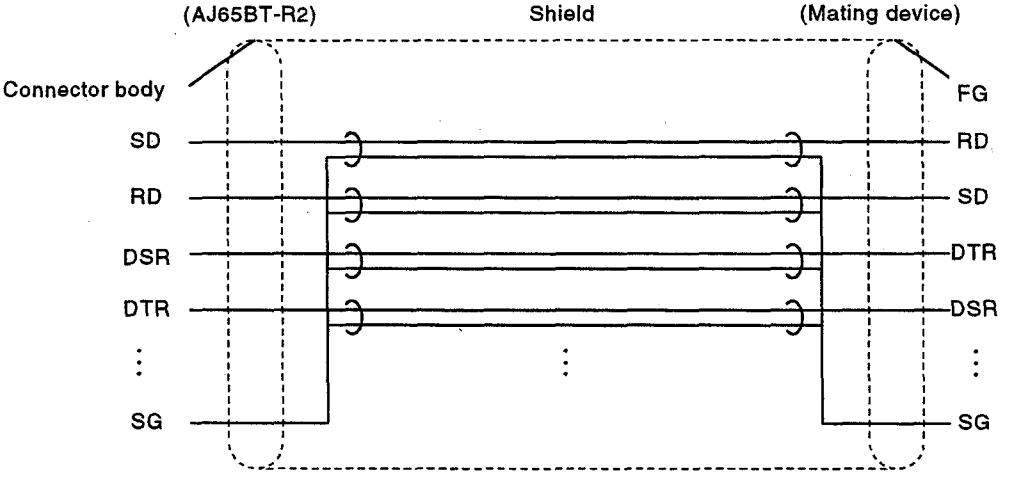
(3) Precautions relating to connection

(a) Handle the FG signal and shield of the connecting cable as follows.

	Connection Method	Remarks
FG signal	Connected to the body of the connector at the AJ65BT-R2 side.	• Do not short the FG and SG signals of the connecting cable. • If the FG and SG signals are connected inside the external device, do not connect the FG signal at the AJ65BT-R2 side to the external device.
Shield	Connected to the body of the connector at the AJ65BT-R2 side. (Not connected to the external device)	

(b) If, even when the connections are made as indicated above, normal data communication is not possible due to noise from an external source, connect the wiring as follows.

- Connect the FG terminals of both stations to the shielding of the connecting cable.
  Note that the connection at the external device side must be made in accordance with the directions in the instruction manual for the external device.
- Connect all signals other than SG and FG paired with the SG signal.

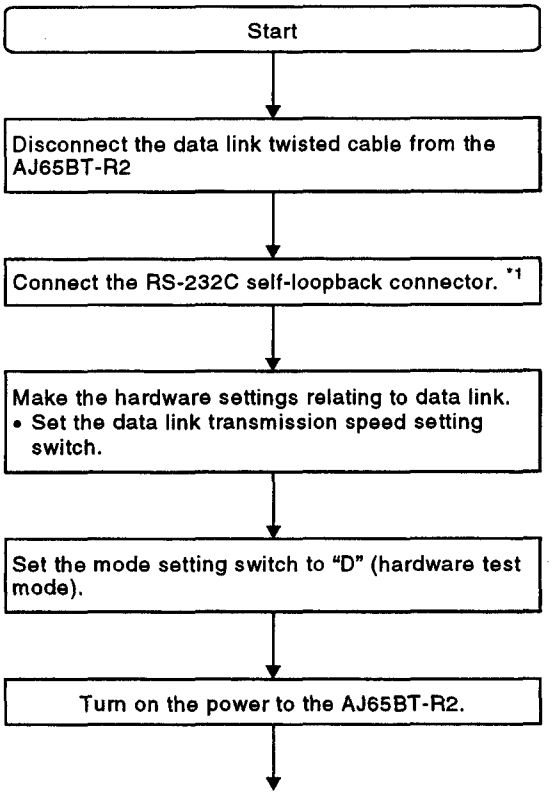


* The FG of the AJ65BT-R2 is connected to the screw-clamped part of the connector, and is the FG for the module body.

(c) Do not connect RS-422 devices to the RS-232C interface.
If you do, the hardware of the RS-422 interface of the connected device will be destroyed and communication will not be possible.

4.6 Module Status Check (Hardware Test)

This test determines whether the AJ65BT-R2 in isolation is operating normally.
It must be performed before configuring a system.
Perform the test by following the procedure below.



(Go to next page)

(Continued from previous page)

Check the RS-232C ERR LED.

[If normal: the RS-232C ERR LED flashes.]
The status is normal if flashing continues for 30 seconds or more.

[If abnormal: The RS-232C ERR LED is continuously lit.]
The cause of the error is indicated by the statuses of the YC and YD LEDs.

LED Status	Meaning	Action to Take
RS-232C SD ○ XC ○ RD ○ XD ○ ERR ● YC ○ YD ○	ROM check error	There could be a hardware fault: contact your nearest Mitsubishi representative.
RS-232C SD ○ XC ○ RD ○ XD ○ ERR ● YC ● YD ○	RAM check error	
RS-232C SD ○ XC ○ RD ○ XD ○ ERR ● YC ○ YD ●	Hardware fault, or twisted cable is still connected.	Disconnect the twisted cable if it is still connected. If the ERR LED does not flash when the cable is disconnected, there could be a hardware fault: contact your nearest Mitsubishi representative.
RS-232C SD ○ XC ○ RD ○ XD ○ ERR ● YC ● YD ●	Hardware fault, or the connector for RS-232C self-loopback is still connected.	Disconnect the connector for RS-232C self-loopback. If the ERR LED does not flash when the connector has been disconnected, there could be a hardware fault: contact your nearest Mitsubishi representative.

○: Off ●: Lit

*1 The specifications of the connector for RS-232C self-loopback are shown in Fig. 4.1.
Make the RS-232C self-loopback connector shown in Fig. 4.1.

AJ65BT-R2 Side (DTE)		Self-loopback Connector Wiring
Signal Code	Pin number	
CD	1	
RD(RXD)	2	
SD(TXD)	3	
DTR(ER)	4	
SG	5	
DSR(DR)	6	
RS(RTS)	7	
CS(CTS)	8	
—	9	

Fig.4.1 Specifications of RS-232C Self-Loopback Connector

IMPORTANT

Disconnect the data link wiring before performing the data link loopback test in the hardware test mode, since the data for the check is transmitted in the data link during the test.

5. BUFFER MEMORY READING/WRITING

(1) Special purpose area
This is the area in which the control information for data communication is set, and the information indicating the data communication status is stored.

(2) User free area
This is the area in which the data to be sent to the external device is designated, and received data is stored.

	Main Classification	Sub-Classification	Fine Classification	Addresses
Buffer memory	Special purpose area	Initial setting area	Areas for allocation designations	0H to FFH
			Parameter area	100H to 19FH
		Communication status, setting status storage areas	Setting status storage area	1A0H to 1A7H
			Communication status storage setting area	1A8H to 1BFH
		Area for E^2PROM		1C0H to 1FFH
	User free area			200H to 7FFH

5.1 Settings in the Special Purpose Area and Related Communication Functions

This section describes the special function area of the AJ65BT-R2's buffer memory.
The special function area stores the default values of the AJ65BT-R2. These values can be changed in accordance with the purpose and application of data communication, and the specifications of the external device.
The table on the following pages shows the special function area settings that relate to each type of communication.
(The position and sequence of each of the areas in the special function area as presented in the table are those that apply during allocation on the basis of the default values.)

POINTS

(1) The buffer memory addresses 0H to 1FFH include system areas - such as addresses 4H to FH - which are used by the system: do not write data to these areas. If data is written to these areas, the AJ65BT-R2 will not operate correctly.

(2) For buffer memory reading/writing, use pulse conversion (FROMP, TOP, etc.) to execute reading/writing only when necessary. Executing reading and writing continually will lead to a long data communication time.

Table 5.1 Special Purpose Area Settings Relating to Each Type of Communication

Address		Name			Default Value	No-Protocol Communication	Frame Communication		Monitor Send	Reference Section
							Send Frame Table 1	Send Frame Table 2		
Areas for Allocation Designations	0H	Send/receive area first address designation area		Send area first address designation	200H	O				Section 5.2.1
	1H			Send area size designation	200H	O				
	2H			Receive area first address designation	400H	O		—		
	3H			Receive area size designation	200H	O		—		
	4H to FH			System area	—	Unusable				—
	10H	Automatic update area designation	Area "a"	Transmission size	20H	O (Error code, send/receive data information storage area)				Section 5.2.1, Section 5.5
	11H			First address at AJ65BT-R2 side	1A0H					
	12H			(Fixed value)	4004H					
	13H			First offset address at master module side	1A0H					
	14H		Area "b" (1)	Transmission size	88H	O (Data send area)				
	15H			First address at AJ65BT-R2 side	118H					
	16H			(Fixed value)	4004H					
	17H			First offset address at master station side	118H					
	18H		Area "b" (2)	Transmission size	200H					
	19H			First address at AJ65BT-R2 side	200H					
	1AH			(Fixed value)	4004H					
	1BH			First offset address at master station side	200H					
	1CH		Area "c"	Transmission size	200H	O (Data receive area)		—		
	1DH			First address at AJ65BT-R2 side	400H					
	1EH			(Fixed value)	4004H					
	1FH			First offset address at master station side	400H					
	20H		Area "d"	Transmission size	1A0H	O (Initial setting area)				
	21H			First address at AJ65BT-R2 side	0H					
	22H			(Fixed value)	4004H					
	23H			First offset address at master station side	0H					
	24H		Area "e"	Transmission size	30H	—	O (Area for E²PROM function)			
	25H			First address at AJ65BT-R2 side	1C0H					
	26H			(Fixed value)	4004H					
	27H			First offset address at master station side	1C0H					
	28H		Area "f"	Transmission size	29H	—	O (User-registered frame area)			
	29H			First address at AJ65BT-R2 side	1C7H					
	2AH			(Fixed value)	4004H					
	2BH			First offset address at master station side	1C7H					

O.....Items relating to settings

Address		Name			Default Value	No-Protocol Communication	Frame Communication		Monitor Send	Reference Section
							Send Frame Table 1	Send Frame Table 2		
Areas for Allocation Designations	2CH	Automatic update area designations	Area "g" (1)	Transmission size	88H	—— (Monitor send area)			O	Section 5.2.1, Section 5.5
	2DH			First address at AJ65BT-R2 side	118H					
	2EH			(Fixed value)	4004H					
	2FH			First offset address at master station side	118H					
	30H		Area "g" (2)	Transmission size	200H					
	31H			First address at AJ65BT-R2 side	200H					
	32H			(Fixed value)	4004H					
	33H			First offset address at master station side	200H					
	34H to 3FH	System area			——	Unusable				——
	40H	RW update interval designation			1	O				Section 5.2.1, Section 9.6
	41H	RWw update effective/ineffective designation			0 (ineffective)	O				
	42H	RWr update effective/ineffective designation			1 (effective)	O				
	43H	RW refresh destination address designation		RWw0	118H	O				
	44H			RWr0	1B0H	O				
	45H			RWw1	119H	O				
	46H			RWr1	1B1H	O				
	47H			RWw2	120H	O				
	48H			RWr2	1B2H	O				
	49H			RWw3	121H	O				
	4AH			RWr3	1B6H	O				
	4BH to 6FH	System area			——	Unusable				——
	70H	Monitor interval designation			0 (No monitoring)	——			O	Section 5.2.1, Section 7.4
	71H	Monitored number			0	——			O	
	72H to 77H	System area			——	Unusable				——
	78H	Monitor designation 1		Monitored object designation	0	——			O	Section 5.2.1, Section 7.4
	79H			Send data designation	0	——			O	
	7AH to 7BH	Monitor designation 2		Monitored object designation	0	——			O	
				Send data designation	0	——			O	
	7CH to F5H	to			to	to			to	
	F6H to F7H	Monitor designation 64		Monitored object designation	0	——			O	
				Send data designation	0	——			O	
	F8H to FFH	System area			——	Unusable				——

Address		Name			Default Value	No-Protocol Communication	Frame Communication		Monitor Send	Reference Section
							Send Frame Table 1	Send Frame Table 2		
Parameter Area	100H	Flow control designation			1 (DTR/DSR signal control)	O				Section 5.2.2, Section 9.4
	101H	RS (RTS) signal status designation			0 (Always ON)	O				Section 5.2.2, Section 9.10
	102H	Word/byte unit designation			0 (Word units)	O				Section 5.2.2
	103H	ASCII-BIN conversion designation			0 (Not converted)	O				Section 5.2.2, Section 9.5
	104H	System area			—	Unusable				—
	105H	Transient time-out time designation			0 (5 seconds)	O				Section 5.2.2
	106H to 107H	System area			—	Unusable				—
	108H to 10BH	Receive first frame number			0, 0, 0, 0	—	O	—		Section 5.2.2, Section 7.3
	10CH to 10FH	Receive final frame number			AD, DH, 0, 0	—	O	—		
	110H	Receive first frame/receive final frame cancel designation			1 (Not stored)	—	O	—		
	111H	Receive end number of data designation			0	O		—		Section 5.2.2
	112H	Receive time-out time designation			0	O		—		
	113H to 117H	System area			—	Unusable				—
	118H	Send frame 1 area	Send first frame number		0	—	O	—		Section 5.2.2, Section 7.3
	119H		Send final frame number		0	—	O	—		
	11AH	Send time-out time designation			0	O				Section 5.2.2
	11BH to 11FH	System area			—	Unusable				—
	120H	Send frame-2 area	First send table number designation		0	—		O	—	Section 5.2.2, Section 7.3
	121H		Send table number		0	—		O	—	
	122H		Send table designation	Number 1	0	—		O	O	
	123H to 184H			to	0	to		to	to	
	185H			Number 100	0	—		O	O	
	186H to 19FH	System area			—	Unusable				—

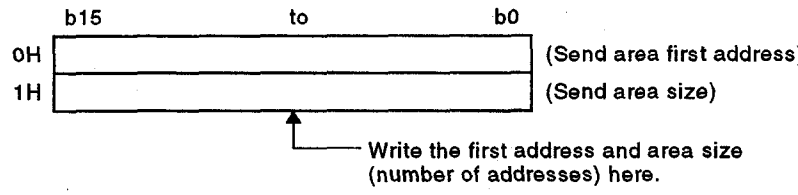
Address		Name		Default Value	No-Protocol Communication	Frame Communication		Monitor Send	Reference Section
						Send Frame Table 1	Send Frame Table 2		
Setting Status Storage Area	1A0H	Station number setting switch		Depends on switch settings	O				Section 5.3
	1A1H	Data link transmission speed setting switch			O				
	1A2H	Mode setting switch			O				
	1A3H	RS-232C transmission speed			O				
	1A4H	RS-232C data bit length			O				
	1A5H	RS-232C parity bit used/not used			O				
	1A6H	RS-232C stop bit length			O				
	1A7H	Buffer memory default value setting storage status		0	O				
Communication Status Storage Area	1A8H to 1AFH	Error code storage area	Error code history	0	O				
	1B0H		General error codes	0	O				
	1B1H		Send error code	0	O				
	1B2H		Receive error code	0	O				
	1B3H	System area		—	Unusable				—
	1B4H	Actual number of send data storage		0	O				Section 5.3
	1B5H	Receive frame index number storage		0	—	O			
	1B6H	Number of data in OS receive area storage area		0	O				
	1B7H to 1BEH	System area		—	Unusable				—
	1BFH	Software version storage		Depends on version	O				Section 5.3
Area for E^{2}PROM	1C0H	E^{2}PROM function designation		0	O				Section 5.4, Chapter 8, Section 9.9
	1C1H	User-registered frame number designation		0	—	O			Section 5.4, Chapter 8
	1C2H to 1C6H	System area		—	O				—
	1C7H	User-registered frame byte number designation		0	—	O			Section 5.4, Chapter 8
	1C8H to 1EFH	User-registered frame		0	—	O			
	1F0H to 1FFH	System area		—	Unusable				—
User Free Area	200H	Default number of send data designation area		0	O				Chapter 6
	201H to 3FFH	Default send data designation area		0	O				
	400H	Default number of receive data storage area		0	O			—	
	401H 5FFH	Default receive data storage area		0	O			—	
	600H to 7FFH	Default unused area		0	O				
System Area	800H to F1FH	System area		—	Unusable				—

5.2 Initial Setting Area (Special Purpose Area)

5.2.1 Areas for allocation designations

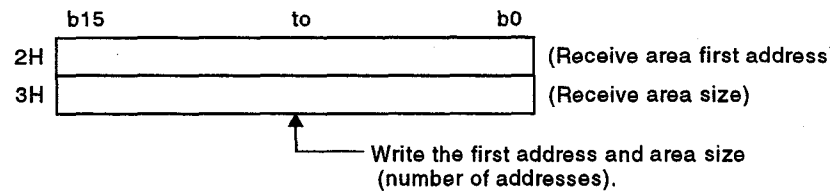
(1) Send area first address designation area (address: 0H)
Designate the first address of the buffer memory used as the send area.

(2) Send area size designation area (address: 1H)
Designate the size of the buffer memory used as the send area as a number of addresses.
(Size of the number of send data designation area + send data designation area)



(3) Receive area first address designation area (address: 2H)
Designate the first address of the buffer memory used as the receive area.

(4) Receive area size designation area (address: 3H)
Designate the size of the buffer memory used as the receive area as a number of addresses.
(Size of the number of receive data storage area + receive data storage area)

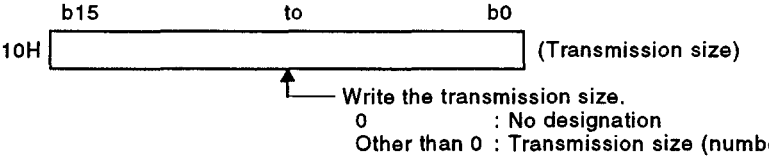


POINTS

- Since addresses 0H through 1FFH are used as the special purpose area, the first addresses for the send and receive areas must be set in the range from 200H upward.
- Make the settings so that the send area and receive area do not overlap.
  Also ensure that the send area and receive area do not overlap with areas used for other functions.
- Set the send and receive areas with a size of at least 2H.

(5) Automatic update area designation area (addresses: 10H to 33H)
The settings made here determine the correspondence between the automatically updated master station area and AJ65BT-R2 buffer memory when using the buffer memory automatic update function.
The data to be set are the transmission size for each area and the first addresses at the master station and the AJ65BT-R2.

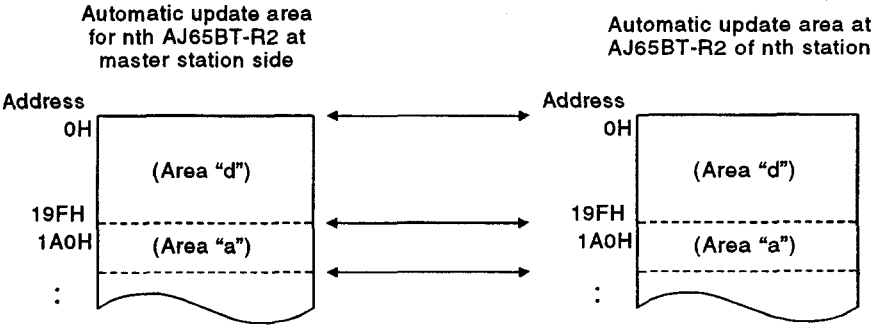
(a) Transmission size
(addresses 10H/14H/18H/1CH/20H/24H/28H/2CH/30H)
Designate the size (number of addresses) of the area (among "a" through "g") that is to be subject to automatic updating.



(b) First address at AJ65BT-R2 side
(addresses: 11H/15H/19H/1DH/21H/25H/29H/2DH/31H)
Designate the first address at the AJ65BT-R2 side for the area (among "a" through "g") that is to be subject to automatic updating.

(c) Fixed value (address 12H/16H/1AH/1EH/22H/26H/2AH/2EH/32H)
Set "4004H".

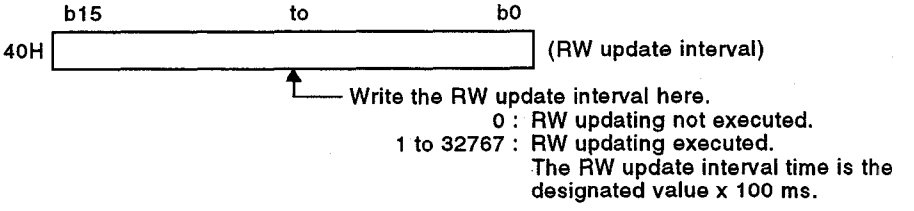
(d) First offset address at master module side
(addresses: 13H/17H/1BH/1FH/23H/27H/2BH/2FH/33H)
Set the first address at the master module side for the area (among "a" through "g") that is to be subject to automatic updating. Designate the first address for the relevant area, taking the address of the first area of the automatic update area allocated for use by this AJ65BT-R2 within the buffer memory for automatic updating at the master station to be "0H".
(Default allocation)



POINTS

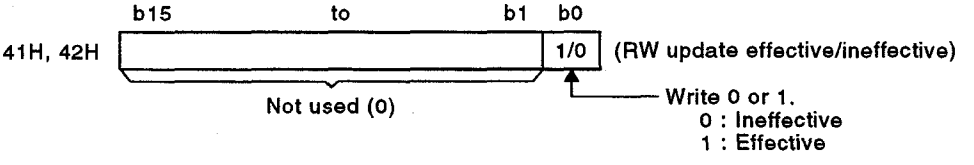
- Set the buffer memory values so that the following relationship holds:
  Transmission size + first address at AJ65BT-R2 side ≤ 800H
- The default automatic update area transmission size of the AJ65BT-R2 is 600H.
  The default size of the automatic update area at the master station is 80H per station.
  Either increase the size at the master station side, or decrease the combined size of areas "a" to "g" at the AJ65BT-R2 so that the size of the automatic update area at the master station side is greater than or equal to the size of the automatic update area at the AJ65BT-R2.

(6) RW update interval designation area (address : 40H)
Designate the update interval for automatic updating of the data in the AJ65BT-R2 with respect to RW of the master station when the RW update function is executed. (Units: 100 ms)



* The buffer memory that is automatically updated at the AJ65BT-R2 side is set as described in (7) and (8) below.

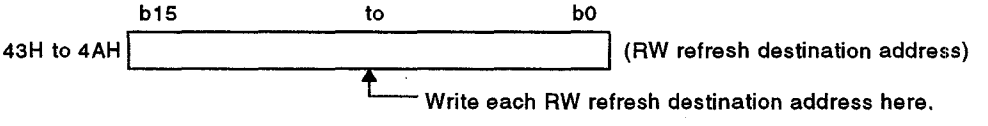
(7) RWw effective/ineffective designation area (address: 41H)
RWr effective/ineffective designation area (address: 42H)
Designate whether the RWw and RWr allocations made in (8) are to be made effective or not when the RW update function is used.



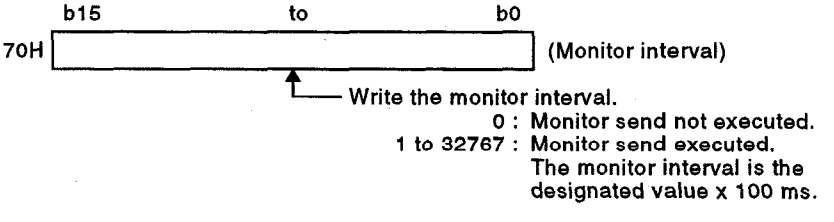
(8) RW refresh destination address designation area (addresses: 43H to 4AH)
Designate the AJ65BT-R2 buffer memory addresses that correspond to the master station RW devices when the RW allocation function is used.

(a) RWw (remote register write area) (addresses: 43H, 45H, 47H, 49H)

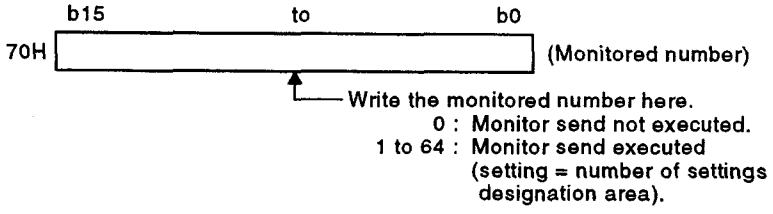
(b) RWr (remote register read area) (addresses: 44H, 46H, 48H, 4AH)



(9) Monitor interval designation area (address: 70H)
Designate the monitor interval for the AJ65BT-R2's monitoring of the devices for send trigger detection and statuses when the monitor send function is used. (Units: 100 ms)

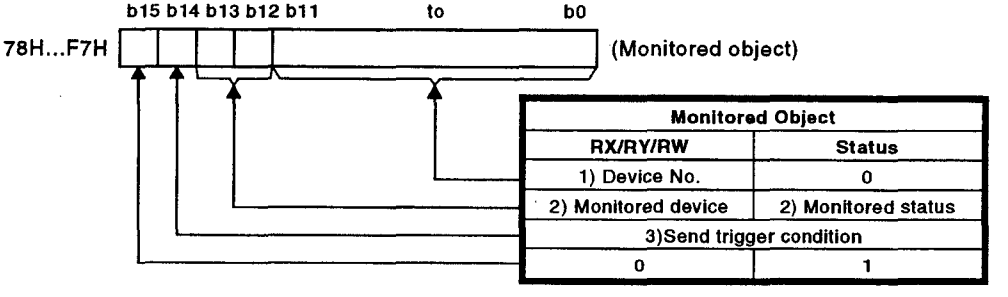


(10) Monitored number designation area (address: 71H)
Designate the number of data to be set by the user in the monitor designation areas described in (11) below in order to monitor the devices and statuses for send trigger detection by the AJ6BT-R2 when the monitor send function is used.



The number of settings equivalent to the number set in this area will be valid in the monitor designation areas described in (11) below.

(11) Monitor designation 1 to 64 (address : 78H to F7H)
(a) Monitored object designation area (address:78H, 7AH to F5H, F7H)
Set the devices and statuses for send trigger detection by the AJ65BT-R2 when the monitor send function is used.



Monitored Object	
RX/RY/RW	Status
1) Device No.	0
2) Monitored device	2) Monitored status
3)Send trigger condition	
0	1

1) Device number
Designate the RX/RY/RW number that the AJ65BT-R2 monitors in order to detect the send trigger, with the designation made within the RX/RY/RW range in the buffer memory of the master station.
Example: To designate RX5 of the remote module at the first station : H005
To designate RX5 of the remote module at the second station : H025

Master station addresses

		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) Monitored device/status
For the monitored device, designate the device type of the device number in 1) above that is to be the object of monitoring.
For the monitored status, designate the status information that the AJ65BT-R2 is to monitor in order to detect the send trigger, with the designation made among the information stored in the master station and PC CPU.

Bit Position		Monitored Device	Monitored Status
b13	b12		
0	0	RY	(Setting prohibited)
0	1	RX	CC-Link data link status
1	0	RWw	Operation status of the PC CPU
1	1	RWr	Status of the PC CPU

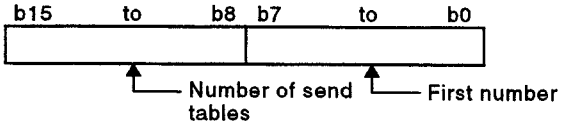
3) Send trigger condition
For the send trigger condition, designate the condition which the AJ65BT-R2 will regard as generating the send trigger when monitoring the monitored device and monitored status.

Monitored Object	Setting for Send Trigger Generation Condition		Send Trigger Generation Timing
	b14=OFF	b14=ON	
RX, RY	For detection at leading edge	For detection at trailing edge	The send trigger is generated when the AJ65BT-R2 detects a change to ON/OFF.
RWw, RWr	(Status of b14 is ineffective)		The send trigger is generated when the value of the designated RW becomes other than "0".
Link data link status	Stopped	Operating	The send trigger is generated when the AJ65BT-R2 detects a change to the relevant status.
PC CPU operation status *1	RUN	STOP	
PC CPU status	Error *2	Normal	

*1 When parameter setting is performed using the GPP function or the RLPA instruction, the RUN/STOP status of the CPU at the master station is the condition for trigger generation. If parameter setting is performed with a sequence program, the ON/OFF status of the master module's refresh signal Yn0 is the condition for trigger generation.
ON : CPU operation status : RUN
OFF : CPU operation status : STOP

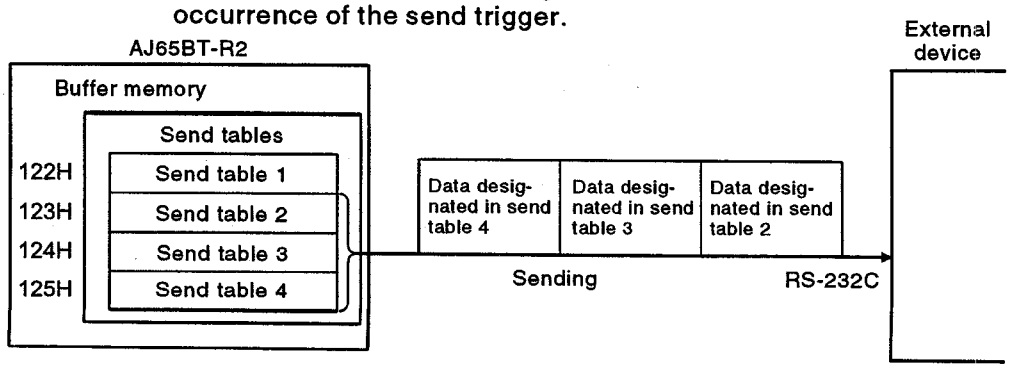
*2 An error that stops operation of the CPU will act as the condition for trigger generation. For details, see the User's Manual for the CPU module.

(b) Send data designation area (addresses: 79H, 7BH...F6H, F8H)
1) Designate the destination of the data sent when the AJ65BT-R2 detects generation of the send trigger during device/status monitoring in accordance with the monitored object designation.
2) Send data designation designates the first number and number of send tables to be set for the send data, with the designation made among the send tables of the AJ65BT-R2 (buffer memory addresses 122H to 185H).



- First number
Designate the first table number of the send tables designated for the data to be sent, within the range 1 to 100.
- Number of send tables
Designate the number of send tables set for the data to be sent, within the range 1 to 100.

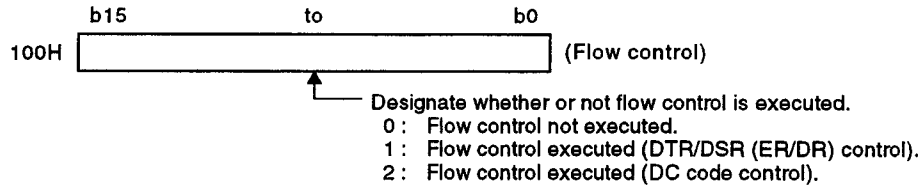
(Send data setting example)
In this example, the data designated in send tables 2 to 4 is sent on occurrence of the send trigger.



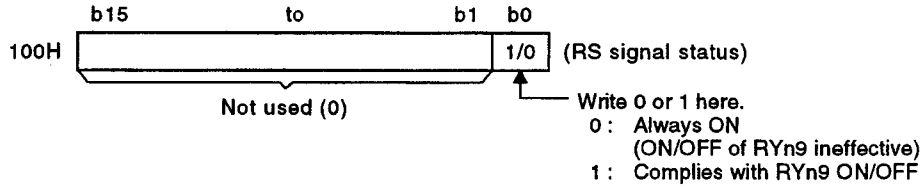
In this example, "0302H" would be set in the send data designation area.

5.2.2 Parameter area

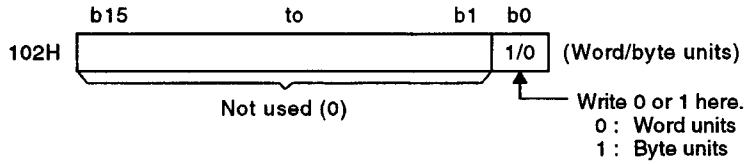
(1) Flow control designation area (address:100H)
Designate whether or not DTR/DSR control is executed in data communication between the AJ65BT-R2 and an external device.



(2) RS (RTS) signal status designation area (address: 101H)
Designate whether to make the RS signal status "always ON" or allow it to be determined by the ON/OFF status of RYn9.
When determination by the ON/OFF status of RYn9 is selected, the RS signal is output as follows.
RYn9 = ON → RS signal = ON, RYn9 = OFF → RS signal = OFF

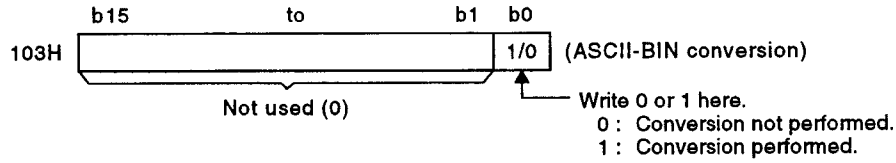


(3) Word/byte unit designation area (address: 102H)
Designates whether to make words or bytes the units for the number of send data designated in the send area and number of receive data designated in the receive area for data communication between the AJ65BT-R2 and external device.

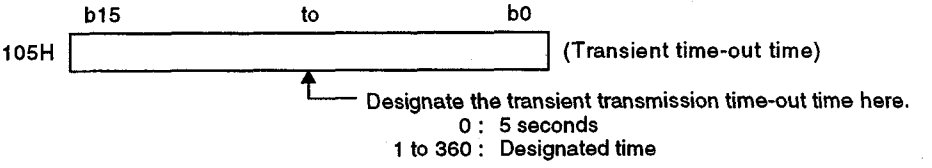


* The units set here are also used as the units for the numerical values handled in the actual number of send data storage area (address: 1B4H) and the number of data in the OS receive area storage area (address: 1B6H).

(4) ASCII-BIN conversion designation area (address: 103H)
Designate whether or not ASCII binary conversion is performed in order to send/receive ASCII code data in data communication with the external device.

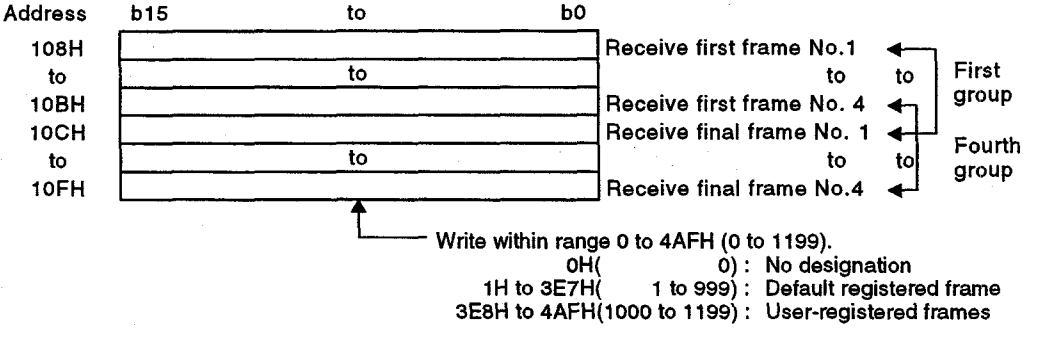


(5) Transient time-out time designation area (address: 105H)
Designate the time-out time for the communication of data between the AJ65BT-R2 and master station when the buffer memory automatic update function is used. (Units: seconds)



Note that since the RW update function uses cyclic transmission, it is not subject to this transient transmission time.

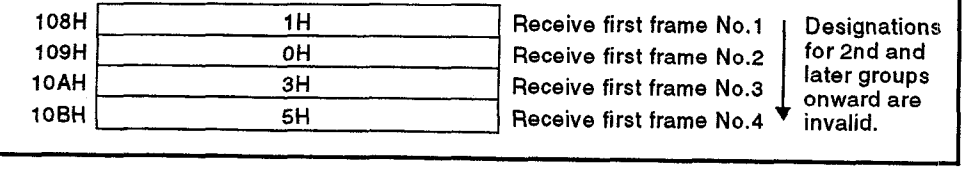
(6) Receive first frame number area (addresses: 108H to 10BH)
Set the first frame of the message when receiving data using the frame communication method.
Designate the number of the frame used as the first frame from among the default registered frame and user-registered frames registered in the E^2PROM of the AJ65BT-R2.
Up to four receive first frames can be designated in combination with the final frames described in (8) below.
(Set the correspondence with the final frames by following the procedure in Section 7.2.2.)



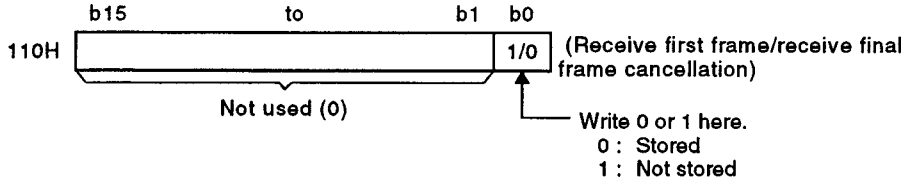
(7) Receive final frame number area (addresses: 10CH to 10FH)
Set the final frame of the message when receiving data using the frame communication method.
Designate the number of the frame used as the final frame from among the default registered frame and user-registered frames registered in the E^2PROM of the AJ65BT-R2.
Up to four receive final frames can be designated in combination with the first frames described in (7) above.
(Set the correspondence with the first frames by following the procedure in Section 7.2.2.)
Refer to (7) above for details on how to make designations in the receive final frame number area.

POINT

When "0" is designated as the number of the receive first frame, subsequent frame combination designations are invalid.

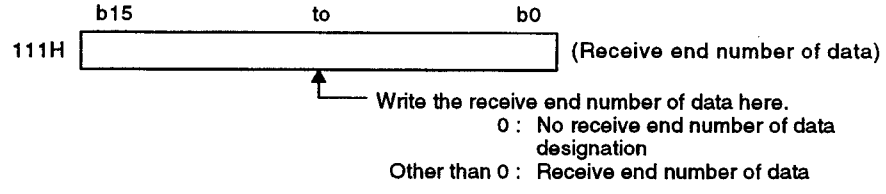


(8) Receive first frame/receive final frame cancel designation area (address: 110H)
Designate whether or not the data in the received first and final frames is to be stored, in the reception order, in the receive area of the AJ65BT-R2 together with the data in the freely-selectable data area.
If "not canceled" is set for the receive first frame and receive final frame, the data in the first and final frames is also stored in the receive area.
If "canceled" is set, the data in the first and final frames is not stored in the receive area.

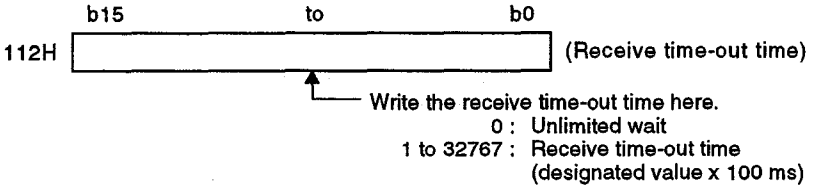


(9) Receive end number of data designation area (address:111H)
Designate the number of data at which reception ends when the reading of receive data ("freely selectable data part" in the case of frame reception) is restricted to a fixed length.
The units of the designated value (words/bytes) are determined by the setting in the word/byte unit designation area (address 102H).
Designate a value for the receive end number of data which does not exceed the size of the receive data storage area. (The receive data storage area is the receive area size (set at address 3H) minus 1).

- When word units are set
  Receive end number of data ≤ (receive area size -1)
- When byte units are set
  Receive end number of data ≤ (receive area size -1) x 2
  When receiving data in no-protocol communication, the receive end number of data (1 or greater) must be set.
  When receiving data using the frame communication function, the receive end number of data (0 or greater) can be set.
  When the receive end number of data is set as 0, reception is ended on receiving the receive first frame and receive final frame designated at addresses 108H to 10FH. (See Section 7.2.)



(10) Receive time-out time designation area (address: 112H)
Designates the receive time-out time - from the start of reception of the first valid receive data to reception end - for data reception.
(Units: 100 ms)

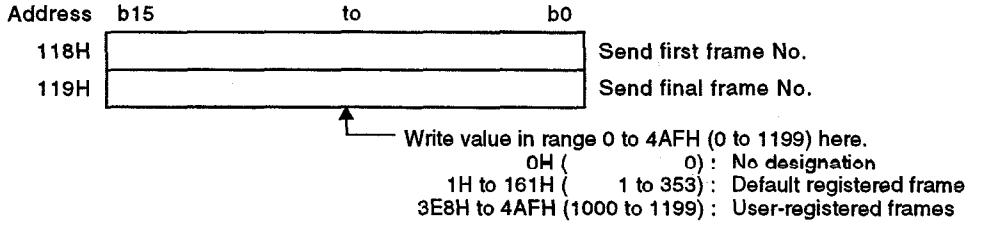


- For no-protocol reception
  From reception of the first data until data corresponding to the receive end number of data has been received.
- For frame reception
  (When receive first frame and receive final frame are set)
  From reception of the first data in the first frame to reception of the final data in the final frame.
  (When only the receive first frame is set)
  From reception of the first data in the first frame until data corresponding to the receive end number of data has been received.
  (When only the receive final frame is set)
  From reception of the first data in the freely-selectable data area to reception of the final data in the final frame.
  At receive time-out, the receive data received up to that point is stored in the receive area, and the receive abnormal read request signal (RXn3) comes ON.
  The error code is stored in the receive error code area (address 1B2H).

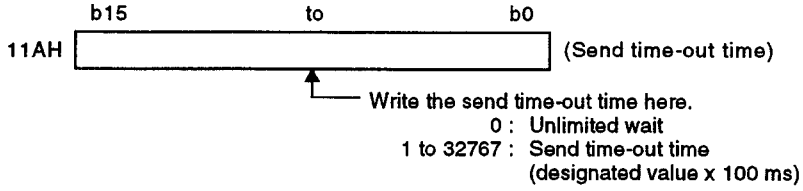
(11) Send frame -1 area

(a) Send first frame number area (address: 118H)
Designate the frame number of the data to be sent as the first frame when frame sending is executed using the send frame 1 area, making the designation from among the frames registered at the AJ65BT-R2.

(b) Send final frame number area (address: 119H)
Designate the frame number of the data to be sent as the final frame when frame sending is executed using the send frame 1 area, making the designation from among the frames registered at the AJ65BT-R2.



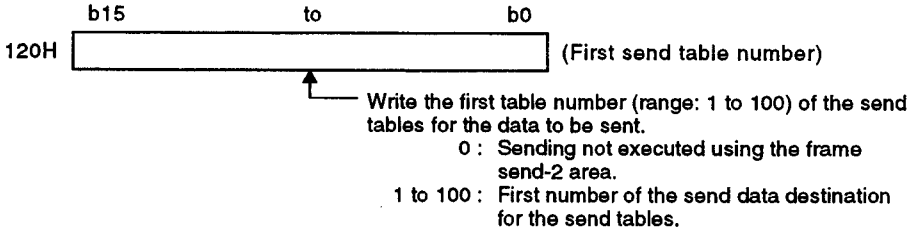
(12) Send time-out time designation area (address: 11AH)
Designate the time-out time from the start to the completion of sending after reception of the send request signal (RYn0) (or trigger generation when using the monitor send function) when sending data.
(Units: 100 ms)



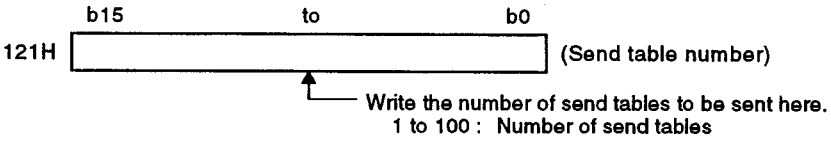
At send time-out, the send abnormal completion signal (RXn1) comes ON.
The error code is stored in the send error code area (address 1B1H).

(13) Send frame-2 area (addresses: 120H to 185H)

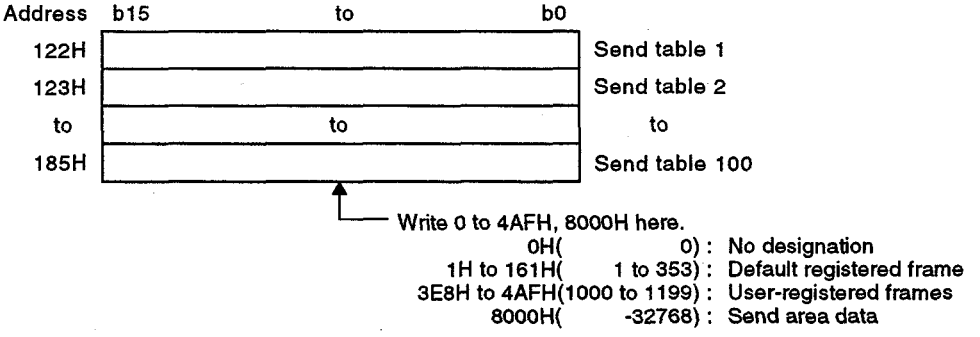
(a) First send table number designation area (address: 120H)
Designate - within the range 1 to 100 - the first number of the send tables in which the data to be sent is set, when frame sending is executed using the send frame-2 area.



(b) Send table number area (address: 121H)
When executing frame sending using the send frame-2 area, designate the number of send tables in which the data to be sent is set, starting from the table position designated by the first send table number in (a) above, within the range 1 to 100.



(c) Send table designation area (addresses: 122H to 185H)
When executing frame sending using the send frame-2 area, or monitor sending, designate the frame number of the data to be sent from among the frames registered in the AJ65BT-R2.
To send the data written in the send area, designate "8000H" as a provisional frame number.
Up to 100 registered frames and send area data can be designated in the send tables.



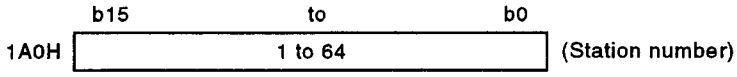
POINT

It is not possible to set a user-registered frame with the special character for the sum check code (see Section 8.1 (2)) appended, in the send table designation area (122H to 185H).

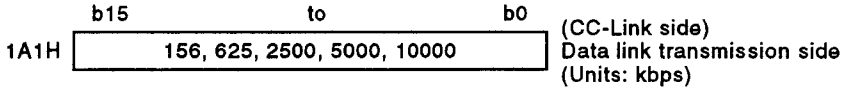
5.3 Communication Status/Setting Status Storage Area (Special Purpose Area)

(1) Switch setting status storage area (addresses: 1A0H to 1A6H)
The switch setting information of the AJ65BT-R2 is stored in the following buffer memory areas.

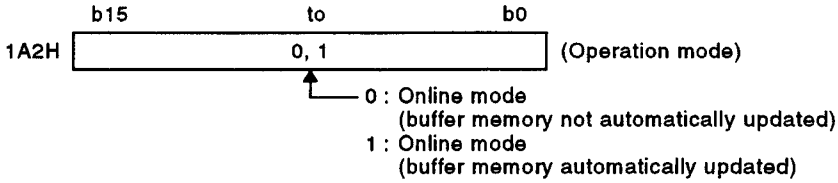
(a) Station number setting switch (address: 1A0H)



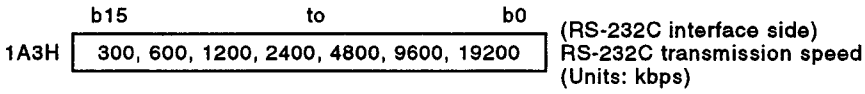
(b) Data link transmission speed setting switch (address: 1A1H)



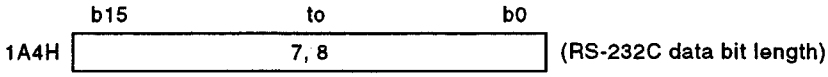
(c) Mode setting switch (address: 1A2H)



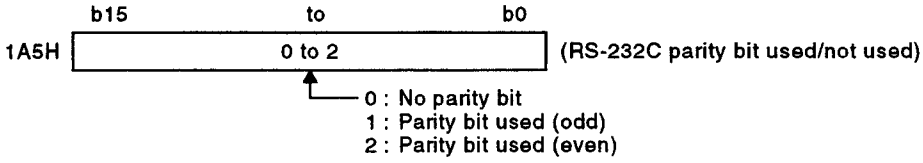
(d) RS-232C transmission speed (address: 1A3H)



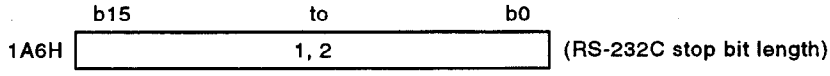
(e) RS-232C data bit length (address: 1A4H)



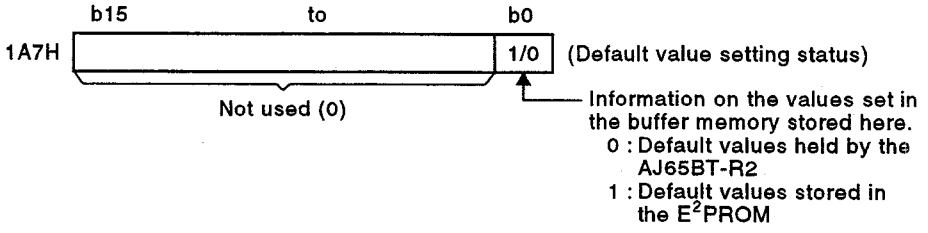
(f) RS-232C parity bit used/not used (address: 1A5H)



(g) RS-232C stop bit length (address: 1A6H)



(2) Buffer memory default value setting status storage area (address: 1A7H)
Stores information determining whether the default data set in the special purpose area of the buffer memory when the AJ65BT-R2 is started up is the default values held by the AJ65BT-R2 or the default values stored in the E^2PROM.



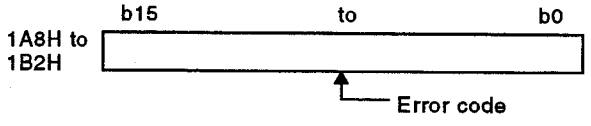
(3) Error code storage area (addresses: 1A8H to 1B2H)
These addresses store the error codes of errors that occur during communication between the AJ65BT-R2 and the external device.
Error codes can be cleared by turning ON the error reset request signal (RY(n+1)A).
For details on error codes, see Section 10.1.2.

(a) Error code history (addresses: 1A8H to 1AFH)
Stores error codes of up to 8 errors that have occurred, in order of their occurrence. The 9th and later error codes are not stored in the error code history.

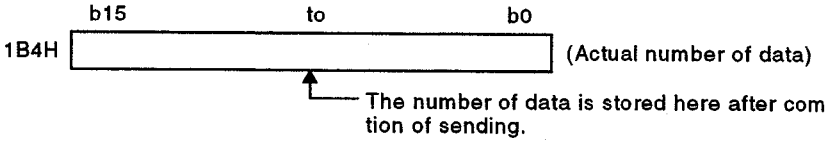
(b) General error codes (address: 1B0H)
Stores the error code when the initialization abnormal completion signal (RXn5) or E^2PROM function abnormal completion signal (RXn8) is turned ON.

(c) Send error code (address: 1B1H)
Stores the error code when the send abnormal completion signal (RXn1) is turned ON.

(d) Receive error code (address: 1B2H)
Stores the error code when the receive abnormal read request signal (RXn3) is turned ON.

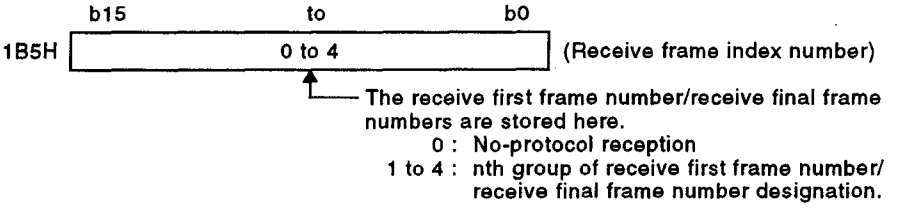


(4) Actual number of send data storage area (address: 1B4H)
The number of words/bytes of data actually sent on normal or abnormal completion of sending is stored in this area.
In frame sending, the first frame and final frame are included in the number of send data.
When ASCII-BIN conversion has been performed, the number of send data after the conversion is stored.

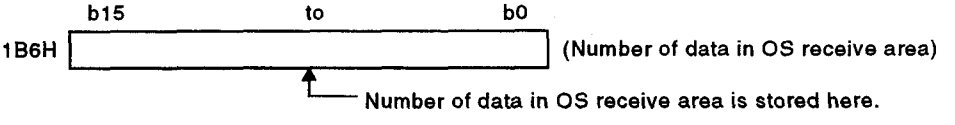


The units for the number of data are determined by the word/byte unit designation (address 102H).

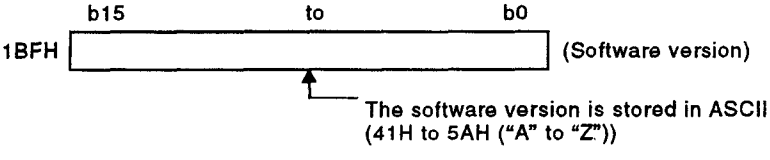
(5) Receive frame index number storage area (address: 1B5H)
Stores what group (of 1 to 4) of the registered frames designated in the receive first frame number/receive final frame number areas (buffer memory addresses 108H to 10BH/10CH to 10FH) was received and subject to a read request.
If the data was received not by frame reception but by no-protocol reception, "0" is stored.



(6) Number of data in OS receive area storage area (address: 1B6H)
Stores the number of words/bytes of data stored in the OS receive area of the AJ65BT-R2 (remaining receive data not subject to read request made to the PC CPU).
The units for the number of data are determined by the word/byte unit designation (address 102H).
The number of data in the OS receive data is continually updated at 100 ms intervals.



(7) Software version storage area (address: 1BFH)
Stores the software version of the AJ65BT-R2 in ASCII code.

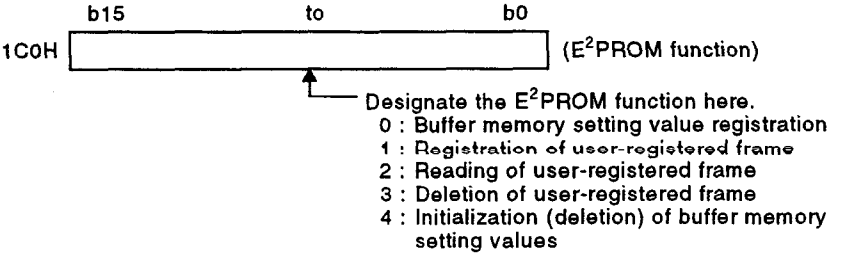


5.4 Area for E^2PROM (Special Purpose Area)

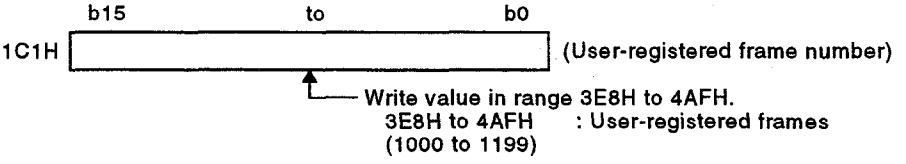
The E^2PROM function is a function that allows the following operations to be performed using the E^2PROM.

- Buffer memory setting value registration/initialization
  (detailed explanation: Section 9.9)
- User-registered frame registration/reading/deletion
  (detailed explanation: Chapter 8)

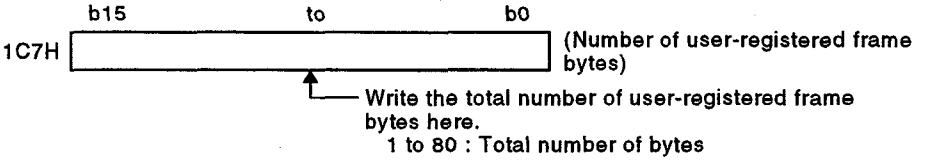
(1) E^2PROM function designation area (address: 1C0H)
Designate which function among the E^2PROM functions is to be used.



(2) User-registered frame number designation area (address: 1C1H)
Designate the relevant user-registered frame when executing user-registered frame registration/reading/deletion.
The data registered in the E^2PROM can be changed by designating the number of a user-registered frame that has already been registered when registering a user-registered frame.

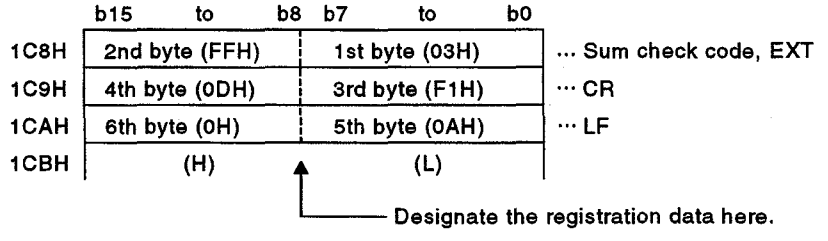


(3) User-registered frame byte number designation area (address: 1C7H)
When registering a user-registered frame, designates the total number of user-registered frame bytes.
When reading a user-registered frame, stores the total number of user-registered frame bytes.



(4) User-registered frame area (addresses: 1C8H to 1EFH)
When registering a user-registered frame, designate the data to be registered, from the first user-registered frame area, in (L) - (H) order.
When a user-registered frame is read, the registered data is stored with the same data contents, and in the same sequence, as at registration.

Example: Data designated in the user-registered frame area (addresses 1C8H to 1EFH) when registering a user-registered frame to communicate ETX, the sum check code, CR, and LF (registration codes: 03H, FFH, F1H, 0DH, 0AH) in the E^2PROM.



* In the case of the example above, "5" would be designated for the number of user-registered frame bytes (address 1C7H), assuming that byte units are set for the word/byte unit designation (address 102H).

5.5 Method for Buffer Memory Reading/Writing (When Using Buffer Memory Automatic Update Function)

AJ65BT-R2 buffer memory reading and writing can be executed in either of the following two ways.

1) By using the automatic update function and the master module buffer memory's automatic update area.
2) By using the send buffer and receive buffer of the master module's buffer memory.

This section describes the method for reading/writing using the buffer memory automatic update function.
For details on method 2) above, in which the automatic update function is not used and reading/writing is executed with respect to the AJ65BT-R2 buffer memory, see Section 5.6.

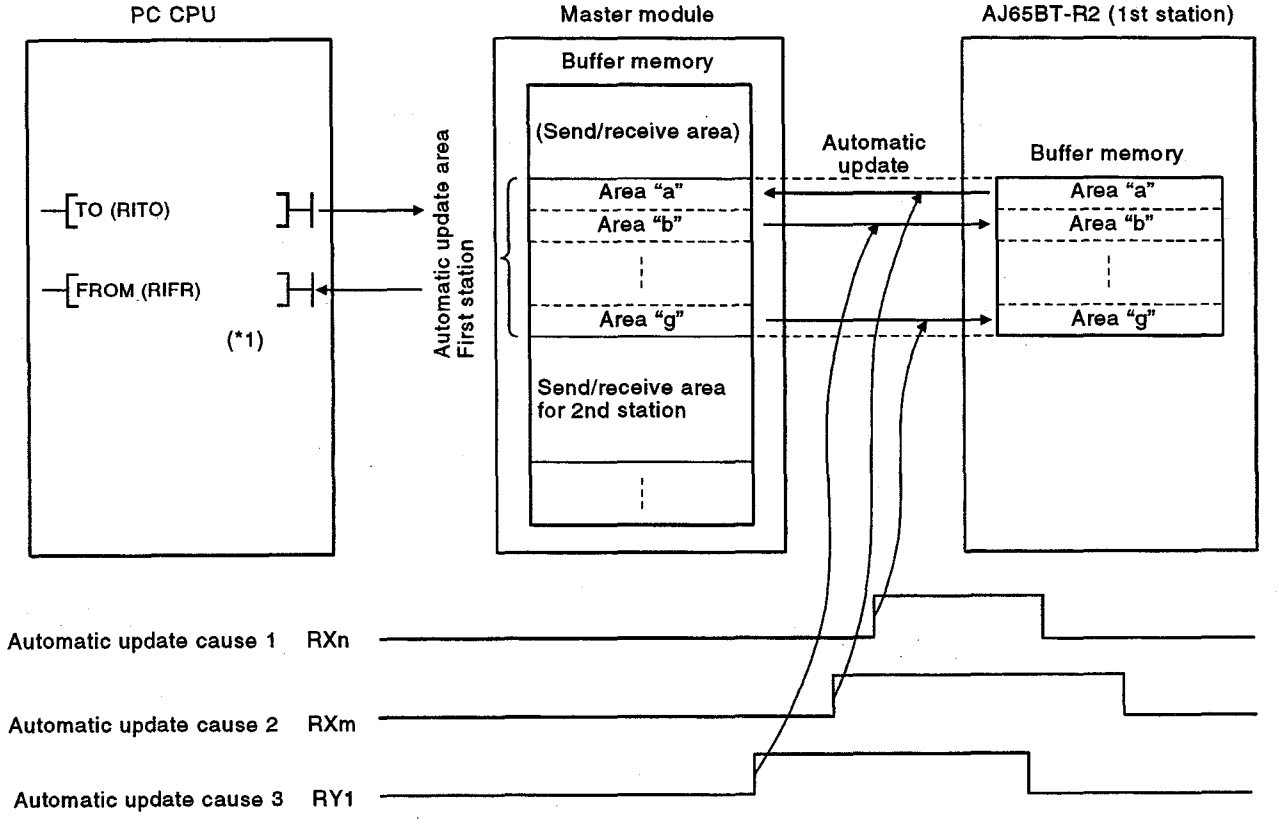
5.5.1 About the buffer memory automatic update function

The buffer memory automatic update function is a function whereby data is automatically communicated, and the relevant areas at each station are automatically updated, whenever a cause for data communication between the automatic update area of the AJ65BT-R2 (area "a" through area "g") and the automatic update area of the master module arises.

(Causes for automatic update) ... (for details see Section 5.5.2.)

- RX/RY signal for the automatic update function between the AJ65BT-R2 and the master module going from OFF to ON.
- Establishment of the send condition when using the monitor send function.
- Occurrence of an error during sending when using the monitor send function.

Etc.



*1 When using a master module for the A-series (AJ61BT11/A1SJ61BT11), the buffer memory bank of the master module must be changed (to bank 2) before reading/writing from the PC CPU to the buffer memory of the master module. Note however that when the RITO/RIFR dedicated instructions of AnSHCPU are used, the bank is automatically changed by the instruction.

The user can execute AJ65BT-R2 buffer memory reading/writing with the buffer memory automatic update function by making the following settings before starting data link operation.

(1) Master module side
Allocate the automatic update areas for each intelligent device station to the automatic update area of the buffer memory by using the GPP function or the RITO dedicated instruction. (Default = 128 words per station).

(2) AJ65BT-R2 side
Allocate each of the buffer memory areas used for automatic update (area "a" to area "g") by using the method described in this Section or in Section 5.2.1. (For the default allocation, see Section 5.5.3.)

When the buffer memory automatic update function is used, data is written in the following way.

- Data written from the PC CPU to the automatic update area of the master module is automatically written to the corresponding buffer memory of the relevant intelligent device station upon occurrence of the corresponding automatic update cause.
- The data of the corresponding buffer memory of the intelligent device station is automatically written to the master module's automatic update area for the relevant station upon occurrence of the corresponding automatic update cause, and can be written to the PC CPU.

Table 5.2 Outline of the Buffer Memory Automatic Update Function

	Outline	Instruction Used	
		Read/Write	
		Dedicated Instruction	Application Instruction
When using the buffer memory automatic update function	• When data is written from the PC CPU to the automatic update area of the master module, data is also automatically written to the corresponding area of the AJ65BT-R2. • The data of the AJ65BT-R2 is automatically written to the automatic update area of the master module. • A quantity of data that does not exceed the allocated size of the automatic update area of the master module can be automatically updated. • Since data reading/writing is executed using FROM/TO instructions, the sequence program is simple.	RITO/RIFR	TO/FROM

* The above dedicated instructions (RITO/RIFR) and application instructions (TO/FROM) are both used on the assumption of reading from/writing to the buffer memory of the master module.

5.5.2 Update timing of buffer memory automatic update function

Table 5.3 Update Timing for Buffer Memory Automatic Update Function

Area	Update Timing	Data Communication Direction Master Module ↔ AJ65BT-R2
a	• Immediately before the AJ65BT-R2 turns ON the send normal completion signal (RXn0)/send abnormal completion signal (RXn1). • Immediately before the AJ65BT-R2 turns ON the receive normal read request signal (RXn2)/receive abnormal read request signal (RXn3). • Immediately before the AJ65BT-R2 turns ON the initialization normal completion signal (RXn4)/initialization abnormal completion signal (RXn5). • Immediately before the AJ65BT-R2 turns ON the E^2PROM normal completion signal (RXn7)/E^2PROM function abnormal completion signal (RXn8). • Immediately after the AJ65BT-R2 detects the status change of the error reset request signal (RY(1+n)A) from OFF to ON. • Immediately after the AJ65BT-R2 detects an error during data sending using the monitor send function. • Immediately before the AJ65BT-R2 turns ON the initial data setting completion signal (RX(1+n)9).	←
b 1) 2)	Immediately after the AJ65BT-R2 detects the status change of the send request signal (RYn0) from OFF to ON.	→
c	Immediately before the AJ65BT-R2 turns ON the receive normal read request signal (RXn2)/receive abnormal read request signal (RXn3).	←
d	Immediately after the AJ65BT-R2 detects the change in status of the initialization request signal (RYn4) from OFF to ON. Immediately after the AJ65BT-R2 detects the change in status of the initial setting request signal (RY(1+n)9) from OFF to ON.	→ ←
e	Immediately after the AJ65BT-R2 detects the change in status of the E^2PROM function request signal (RYn7) from OFF to ON.	→
f	Immediately before the AJ65BT-R2 turns ON the E^2PROM function normal completion signal (RXn7)/E^2PROM function abnormal completion signal (RXn8).	←
g 1) 2)	Immediately after establishment of the condition when executing the monitor send function.	→

5.5.3 Default automatic update area allocations

Address		Name			Area Name / Size of Area	Area "a"	Area "b" 1)	Area "b" 2)	Area "c"	Area "d"	Area "e"	Area "f"	Area "g" 1)	Area "g" 2)
						20H	88H	200H	200H	1A0H	30H	29H	88H	200H
Send/Receive Area First Address Designation Area	0H	Send area first address designation												
	1H	Send area size designation												
	2H	Receive area first address designation												
	3H	Receive area size designation												
	4H to FH	System area												
Areas for Allocation Designations	10H	Automatic update area designation	Area "a"	Transmission size										
	11H			First address at AJ65BT-R2 side										
	12H			(Fixed value)										
	13H			First offset address at master module side										
	14H		Area "b" 1)	Transmission size										
	15H			First address at AJ65BT-R2 side										
	16H			(Fixed value)										
	17H			First offset address at master station side										
	18H		Area "b" 2)	Transmission size										
	19H			First address at AJ65BT-R2 side										
	1AH			(Fixed value)										
	1BH			First offset address at master station side										
	1CH		Area "c"	Transmission size										
	1DH			First address at AJ65BT-R2 side										
	1EH			(Fixed value)										
	1FH			First offset address at master station side										
	20H		Area "d"	Transmission size										
	21H			First address at AJ65BT-R2 side										
	22H			(Fixed value)										
	23H			First offset address at master station side										

Address		Name		Area Name	Area "a"	Area "b" 1)	Area "b" 2)	Area "c"	Area "d"	Area "e"	Area "f"	Area "g" 1)	Area "g" 2)
Areas for Allocation Designations	24H	Automatic update area designation	Area "e"	Transmission size									
	25H			First address at AJ65BT-R2 side									
	26H			(Fixed value)									
	27H			First offset address at master station side									
	28H		Area "f"	Transmission size									
	29H			First address at AJ65BT-R2 side									
	2AH			(Fixed value)									
	2BH			First offset address at master station side									
	2CH		Area "g" 1)	Transmission size									
	2DH			First address at AJ65BT-R2 side									
	2EH			(Fixed value)									
	2FH			First offset address at master station side									
	30H		Area "g" 2)	Transmission size									
	31H			First address at AJ65BT-R2 side									
	32H			(Fixed value)									
	33H			First offset address at master station side									
	34H to 3FH	System area											
	40H	RW update interval designation											
	41H	RWw update effective/ineffective designation											
	42H	RWr update effective/ineffective designation											
	43H	RW refresh destination address designation		RWw0									
	44H			RWr0									
	45H			RWw1									
	46H			RWr1									
	47H			RWw2									
	48H			RWr2									
	49H			RWw3									
	4AH			RWr3									
	4BH to 6FH	System area											
	70H	Monitor interval designation											
	71H	Monitored number											
	72H to 77H	System area											
	78H	Monitor designation 1		Monitored object designation									
	79H			Send data designation									

Address \ Name \ Area Name				Area "a"	Area "b" 1)	Area "b" 2)	Area "c"	Area "d"	Area "e"	Area "f"	Area "g" 1)	Area "g" 2)
Areas for Allocation Designations	7AH to 7BH	Monitor designation 2	Monitored object designation									
			Send data designation									
	7CH to F5H	to										
	F6H to F7H	Monitor designation 64	Monitored object designation									
			Send data designation									
	F8H to FFH	System area										
Parameter Area	100H	Flow control designation										
	101H	RS (RTS) signal status designation										
	102H	Word/byte unit designation										
	103H	ASCII-BIN conversion designation										
	104H	System area										
	105H	Transient time-out time designation										
	106H to 107H	System area										
	108H to 10BH	Receive first frame number										
	10CH to 10FH	Receive final frame number										
	110H	Receive first frame/receive final frame cancel designation										
	111H	Receive end number of data designation										
	112H	Receive time-out time designation										
	113H to 117H	System area										
	118H	Send frame 1 area	Send first frame number									
	119H		Send final frame number									
	11AH	Send time-out time designation										
	11BH to 11FH	System area										
	120H	Send frame-2 area	First send table number designation									
	121H		Send table number									
	122H		Send table designation: Number 1									
	123H to 184H		to									
	185H		Send table designation: Number 100									
	186H to 19FH	System area										

Address		Name		Area "a"	Area "b" 1)	Area "b" 2)	Area "c"	Area "d"	Area "e"	Area "f"	Area "g" 1)	Area "g" 2)
Parameter Area	1A0H	Station number setting switch		↕								
	1A1H	Data link transmission speed setting switch										
	1A2H	Mode setting switch										
	1A3H	RS-232C transmission speed										
	1A4H	RS-232C data bit length										
	1A5H	RS-232C parity bit used/not used										
	1A6H	RS-232C stop bit length										
	1A7H	Buffer memory default value setting storage status										
	1A8H to 1AFH	Error code storage area	Error code history									
	1B0H		General error codes									
	1B1H		Send error code									
	1B2H		Receive error code									
	1B3H	System area										
	1B4H	Actual number of send data storage										
	1B5H	Receive frame index number storage										
	1B6H	Number of data in OS receive area storage										
	1B7H to 1BEH	System area										
	1BFH	Software version storage		↕								
Area for E^2PROM	1C0H	E^2PROM function designation							↕			
	1C1H	User-registered frame number designation										
	1C2H to 1C6H	System area										
	1C7H	User-registered frame byte number designation								↕		
	1C8H to 1EFH	User-registered frame										
	1F0H to 1FFH	System area										
User Free Area	200H	Default number of send data designation area				↕						↕
	201H to 3FFH	Default send data designation area										
	400H	Default number of receive data storage area					↕					
	401H to 5FFH	Default receive data storage area										
	600H to 7FFH	Default unused area										
System Area	800H to F1FH	System area										

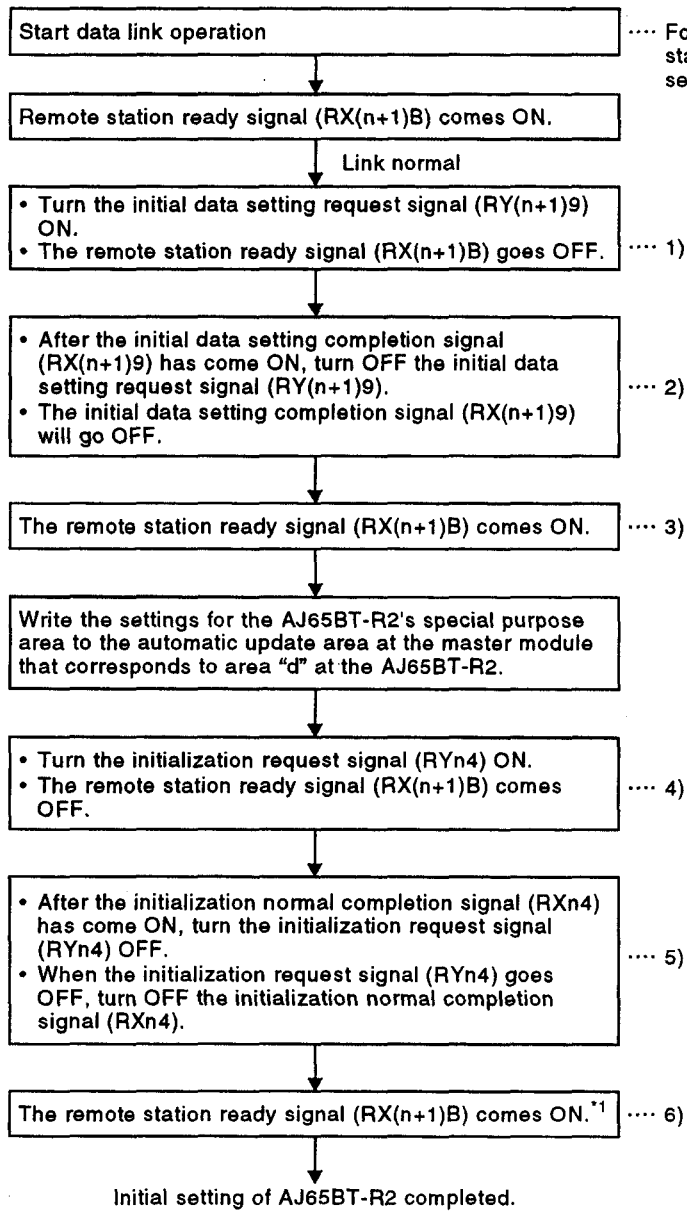
5.5.4 Initial setting for buffer memory automatic update function

When using the buffer memory automatic update function, the following settings must be made before starting data link operation.

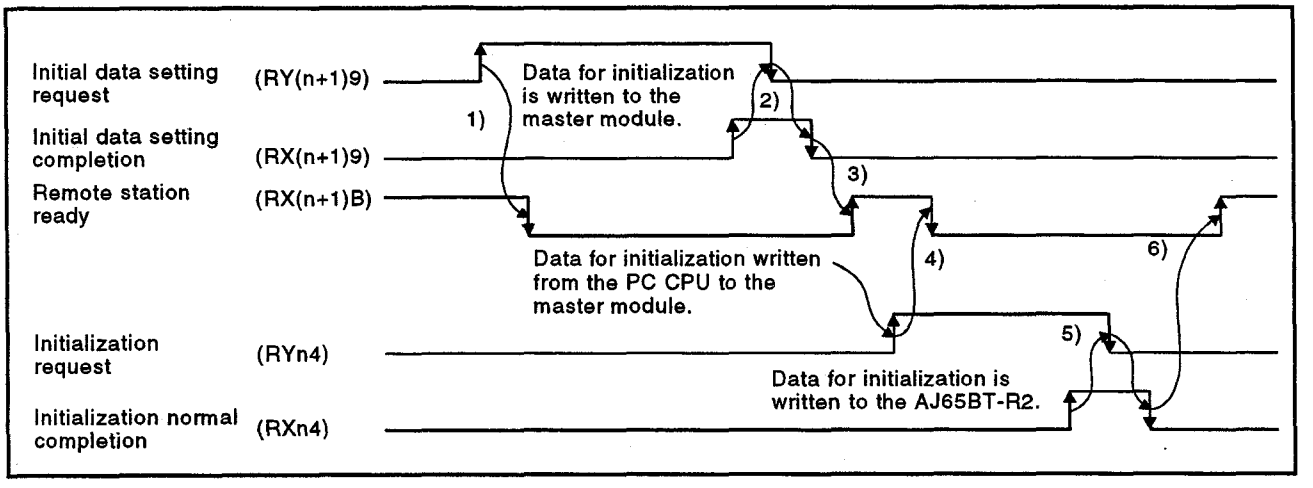
(1) Master module side
Secure an automatic update area in the buffer memory of the master module which is equivalent to the buffer memory area for initial setting at the AJ65BT-R2 side.

(2) AJ65BT-R2 side
Set the mode setting switch to "1" (automatic update function effective).

(Procedure)



*1 If the remote station ready signal (RX(n+1)B) fails to come ON, check the setting values set in the special purpose area of the AJ65BT-R2 buffer memory, then re-issue the initial data setting request and initialization request.



POINTS

(1) When using the buffer memory automatic update function, execute reading/writing with respect to the buffer memory of the AJ65BT-R2 after transition to the state indicated by 3) in the figure above.

(2) When the initial data setting request signal (RY(n+1)9) goes ON at 1) in the figure above, the data of the relevant buffer memory at the AJ65BT-R2 is written to the automatic update area at the master station.

5.5.5 Example sequence program for buffer memory reading/writing

For details on the instructions, refer to the Programming Manual.

POINTS

(1) The example programs described here read part of the special purpose area of the AJ65BT-R2, and write data for initial setting to it, from a QnACPU.
In these programs, only the minimum processing required for reading and writing is executed. If processing in the event of errors or other processing is required, it must be added.

(2) When reading from/writing to buffer memory areas other than that dealt with in this section, change the addresses.

(3) The buffer memories of master modules for use with the A-series (e.g. AJ61BT11) are divided into three banks, each of which has addresses starting from 0.
- Bank 0 : From parameter information area to link special registers (SW)
- Bank 1 : Send buffer and receive buffer used for reading from/writing to the buffer memory of the intelligent device station when not using the automatic update function.
- Bank 2 : Automatic update area used when reading from/writing to the buffer memory of the intelligent device station when using the automatic update function.

When using a master module for use with A-series, switch to the appropriate bank using an output signal (Y1C, Y1D) before executing buffer memory reading/writing. (Refer to the User's Manual)

The following conditions apply for these examples:
- The master module I/O signals are X/Y0 to X/Y1F.
- The station number of the AJ65BT-R2 at the data link side is No.1.
- The range of the automatic update area at the master module for reading to/writing from the buffer memory of the AJ65BT-R2 whose station number is 1 is as follows.
  When using a QnA series master module (e.g. AJ61QBT11)
  Automatic update area addresses : 2000H to 2FFFH (equivalent to 4096 words (1000H))
  When using an A-series master module (e.g. AJ61BT11)
  Automatic update area addresses : 000H to FFFH of bank 2 (4096 words (1000H))
- Automatic update area allocation : 600H per station.
- Batch refresh devices
  Remote inputs (RX) : XE0 to XFF
  Remote outputs (RY) : YE0 to YFF
- The allocation range for the automatic update area at the master module that corresponds to area "d" of the special purpose area of the AJ65BT-R2 whose station number is 1 complies with the default values.

(1) Writing to the buffer memory
Data is written by a dedicated instruction (RITO) or an application instruction (TO).
Example: Writing the AJ65BT-R2 initial setting data, as described in the program examples in (3)

Address		Master module (Automatic update area)	Address	AJ65BT-R2
QnA series	A series			
2111H	Bank 2+111H	Receive end number of data designation area	111H	Receive end number of data designation area
2112H	Bank 2+112H	Receive end time-out time designation area	112H	Receive end time-out time designation area

Example: Writing send data, as described in the program examples in (3)

Address		Master module (Automatic update area)	Address	AJ65BT-R2
QnA series	A series			
2200H	Bank 2+200H	Number of send data designation area	200H	Number of send data designation area
2201H	Bank 2+201H	Send data designation area	201H	Send data designation area
⋮	⋮		⋮	
23FFH	Bank 2+3FFH		3FFH	

(2) Reading from the buffer memory
Data is read by a dedicated instruction (RIFR) or an applied instruction (FROM).
Example: Reading a send error code, as described in the program examples in (3)

Address		Master station (automatic update area)	Address	AJ65BT-R2
QnA series	A series			
21B1H	Bank 2+1B1H	Send error code storage area	1B1H	Send error code storage area

Example: Reading receive data, as described in the program examples in (3)

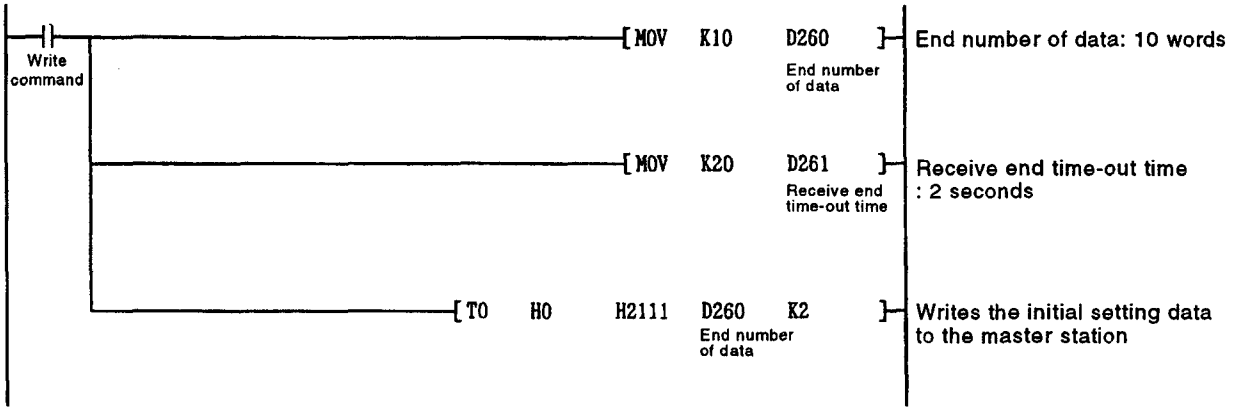
Address		Master module (Automatic update area)	Address	AJ65BT-R2
QnA series	A series			
2400H	Bank 2+400H	Number of receive data designation area	400H	Number of receive data designation area
2401H	Bank 2+401H	Receive data designation area	401H	Receive data designation area
⋮	⋮		⋮	
25FFH	Bank 2+5FFH		5FFH	

POINT

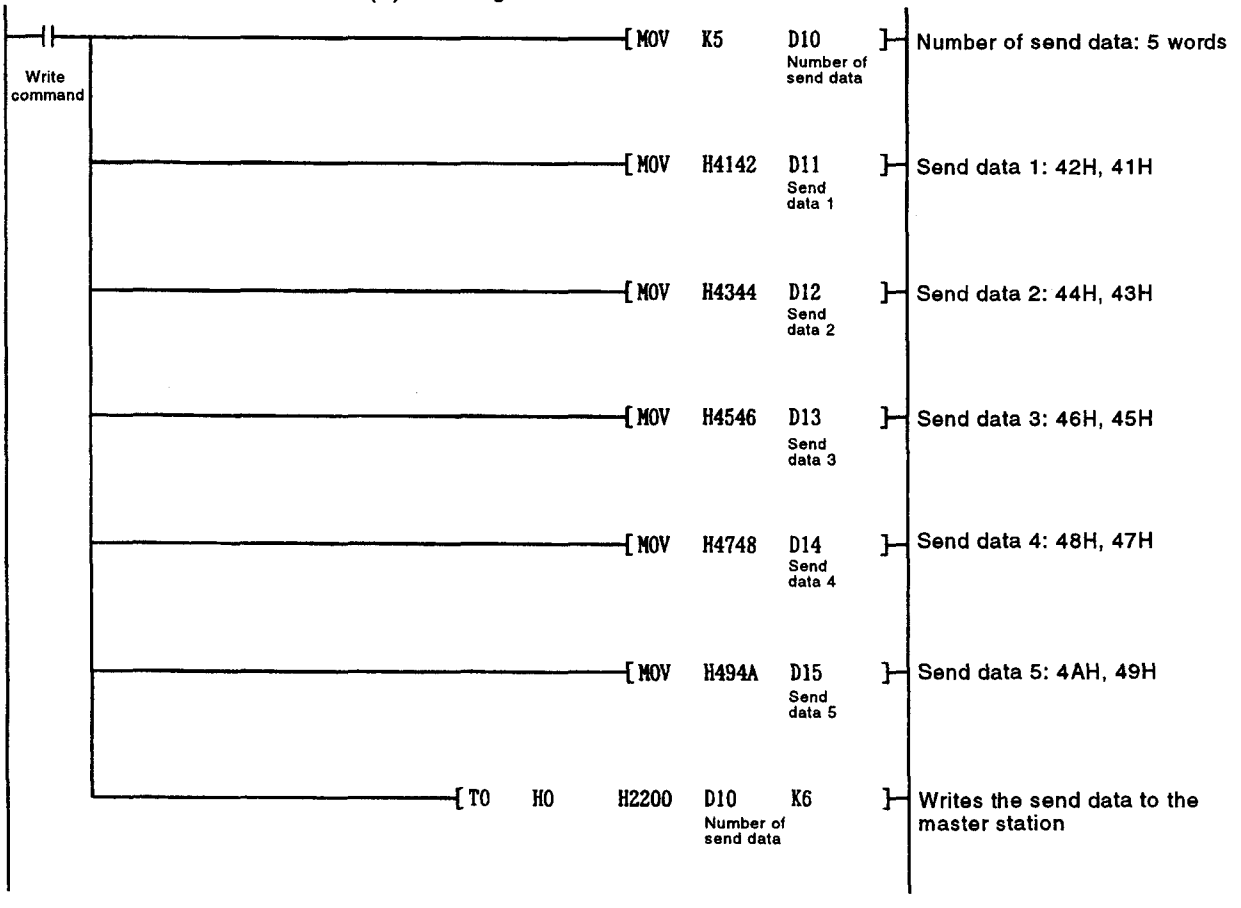
For information on the PC CPUs that can use dedicated instructions, see Section 2.2.

(3) Program examples ... for QnACPU

(a) Writing the AJ65BT-R2 initial setting data

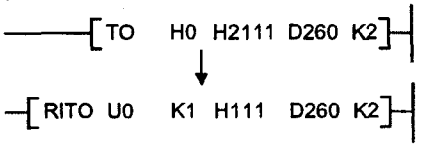


(b) Writing send data

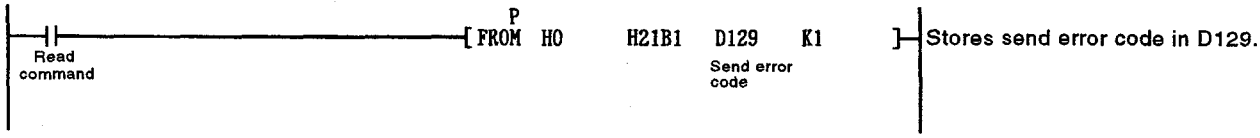


* When the RITO instruction (dedicated instruction) is used, program as indicated below.
For details on the dedicated instructions, refer to the Programming Manual.

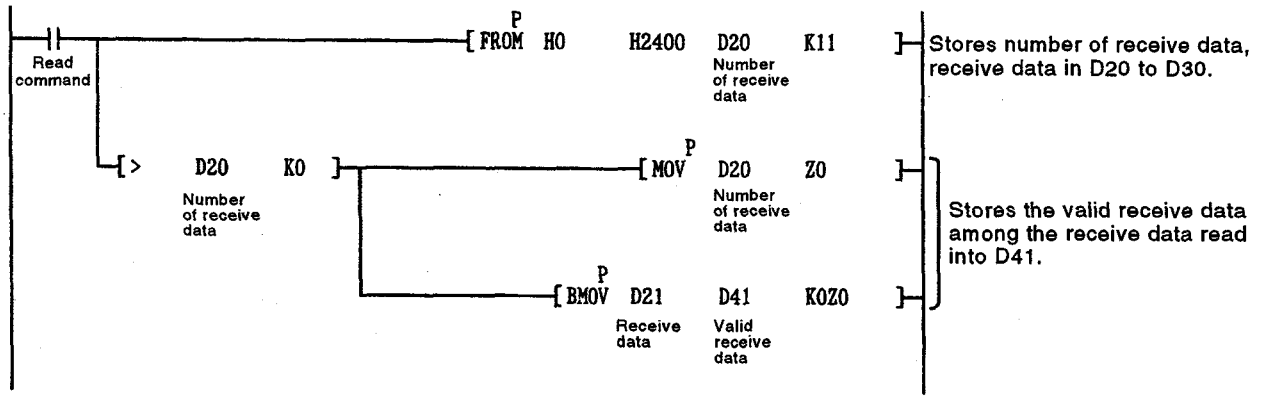
Example:



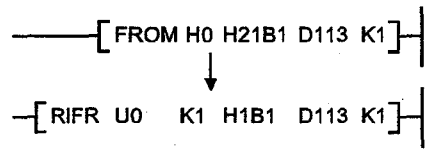
(c) Reading a send error code



(d) Reading receive data

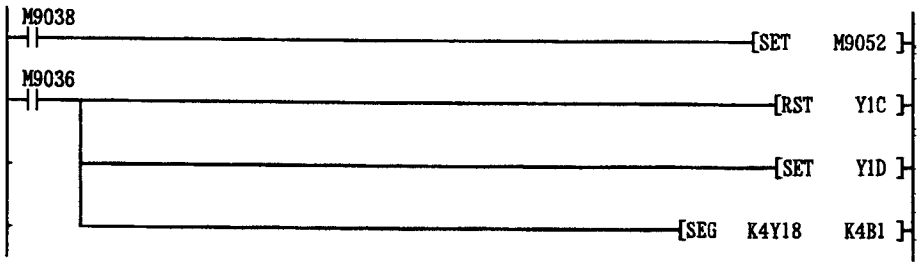


* When the RIFR instruction (dedicated instruction) is used, program as indicated below.
For details on the dedicated instructions, refer to the Programming Manual.



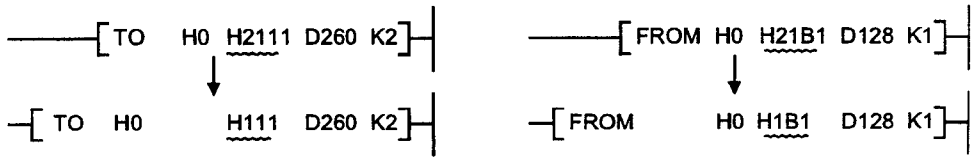
(4) Program examples ... for ACPU
When using a master module for the A-series (AJ61BT11/A1SJ61BT11), the buffer memory bank of the master module must be changed (to bank 2) before reading/writing from the PC CPU to the buffer memory of the master module. (Does not apply to AnSHCPU.)
Insert the instruction indicated below to switch the bank before the part of the program for AJ65BT-R2 reading/writing.

Program added to switch to bank 2



Also change the address designation in the part that executes reading from/writing to the AJ65BT-R2 buffer memory as follows.

Example:



POINT

When executing parameter setting at the master module, switch to bank 0.

5.6 Method for Buffer Memory Reading/Writing (When Not Using Buffer Memory Automatic Update Function)

AJ65BT-R2 buffer memory reading and writing can be executed in either of the following two ways.

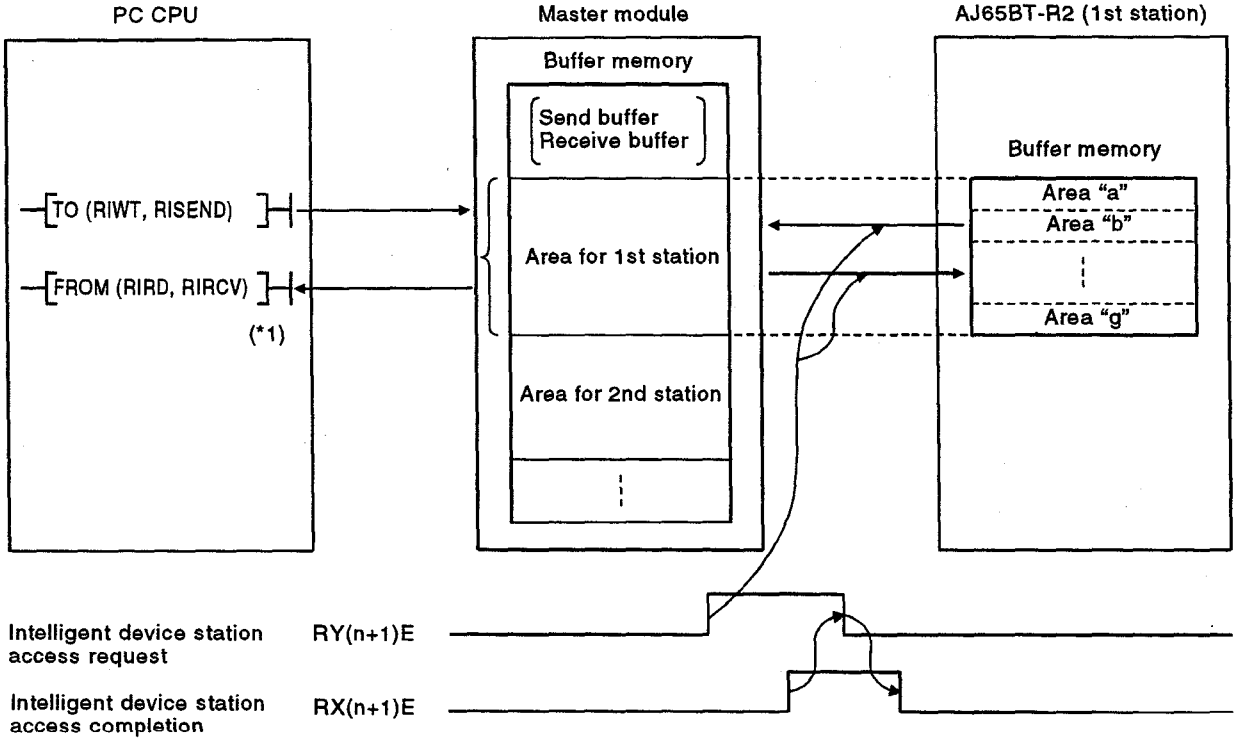
1) By using the automatic update function and the master module buffer memory's automatic update area.
2) By using the send buffer and receive buffer of the master module's buffer memory.

This section describes the method for reading/writing without using the buffer memory automatic update function, which is 2) above.
For details on method 1) above, in which the automatic update function is used for reading from/writing to the AJ65BT-R2 buffer memory, see Section 5.5.

5.6.1 About buffer memory reading/writing

When the buffer memory automatic update function is not used, AJ65BT-R2 buffer memory reading/writing is executed from the PC CPU by using the following buffer memories and RX and RY signals.

- Send buffer and receive buffer in the buffer memory of the master module
- RX and RY signals between the AJ65BT-R2 and master module (RX(n+1)E/RY(n+1)E).



*1 When using a master module for the A-series (AJ61BT11/A1SJ61BT11), the buffer memory bank of the master module must be changed (to bank 1) before reading/writing from the PC CPU to the send buffer /receive buffer.
Note however that when the RIWT/RIRD/RISEND/RIRCV dedicated instructions of AnSH are used, the bank is automatically changed by the instruction.

By allocating a send buffer and receive buffer to the buffer memory of the master module before starting data link operation, the user makes it possible to read from and write to the buffer memory of the AJ65BT-R2 without using the buffer memory automatic update function.
There are no allocations at the AJ65BT-R2 side.

When the buffer memory automatic update function is not used, read and write data in the following way by using the RIWT/RIRD/RISEND/RIRCV dedicated instructions.
For details, refer to the User Manuals for the master and local modules.

- Writing data to the AJ65BT-R2 buffer memory
  Designate the control data for the write request, and the data to be written to the buffer memory of the AJ65BT-R2, in the send/receive area of the master module from the PC CPU.
  By turning ON the intelligent device station access request signal (RY(n+1)E), the data is written into the designated buffer of the relevant intelligent device station.
  When writing is completed, the intelligent device station access completion signal (RX(n+1)E) comes ON.
- Reading data from the AJ65BT-R2 buffer memory
  Designate the control data for the read request in the send/receive area of the master module from the PC CPU.
  By turning ON the intelligent device station access request signal (RY(n+1)E), data is read from the designated buffer memory of the relevant intelligent device station to the send/receive area of the master module's buffer memory.

When reading is completed, the intelligent device station access completion signal (RX(n+1)E) comes ON.

Table 5.4 Outline of Reading/Writing Without the Buffer Memory Automatic Update Function

	Outline	Instruction Used	
		Read/Write	
		Dedicated Instruction	Application Instruction
When not using the buffer memory automatic update function	• Since data is read and written directly between the send area of the AJ65BT-R2 and the CPU, no restriction is imposed by the size of the automatic update area of the master module. • Since only the required size of data is transmitted, no superfluous data is sent, which improves the efficiency of the transmission route.	RIWT/RIRD	TO/FROM
		RISEND/RIRCV	(None)

* All of the dedicated instructions and application instructions in the table above are used for reading from/writing to the buffer memory of the AJ65BT-R2 via the send buffer/receive buffer of the master module.
There are no application instructions corresponding to the RISEND and RIRCV dedicated instructions.

- Functional outline of RIWT/RIRD dedicated instructions and application instructions (TO/FROM)
  These instructions read from/write to the designated buffer memory of the AJ65BT-R2.
- Functional outline of the RISEND/RIRCV dedicated instructions
  These instructions are used to make use of AJ65BT-R2 functions associated with the remote I/O signals (RX/RY) communicated between the master module and AJ65BT-R2: the RX and RY signals are automatically turned ON and OFF on reading from or writing to the designated buffer memory of the AJ65BT-R2.
  For example, when sending data, the send request signal (RY) and send completion signal (RX) are automatically turned ON/OFF when the data is written to the designated buffer memory.

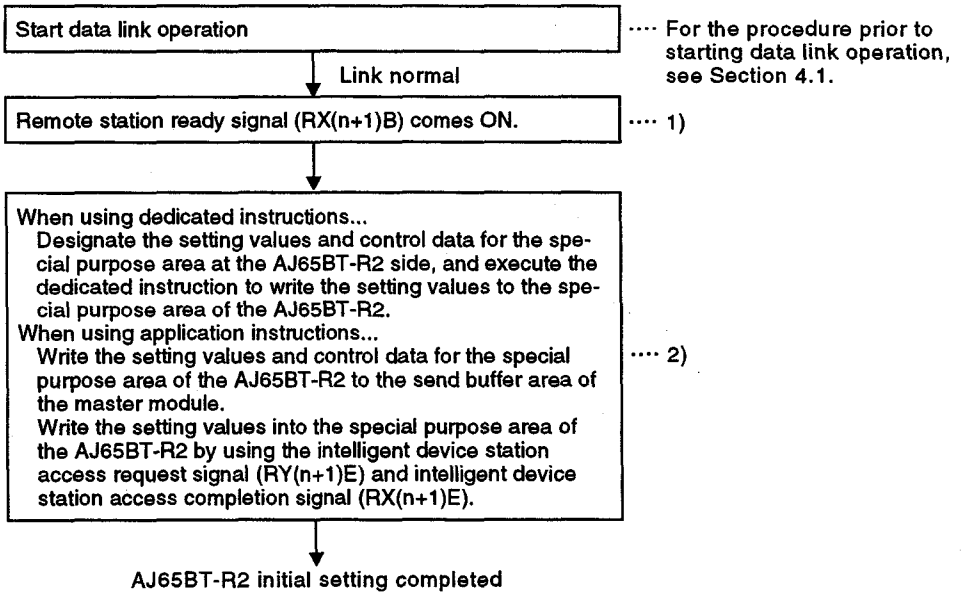
5.6.2 Initial setting when not using the buffer memory automatic update function

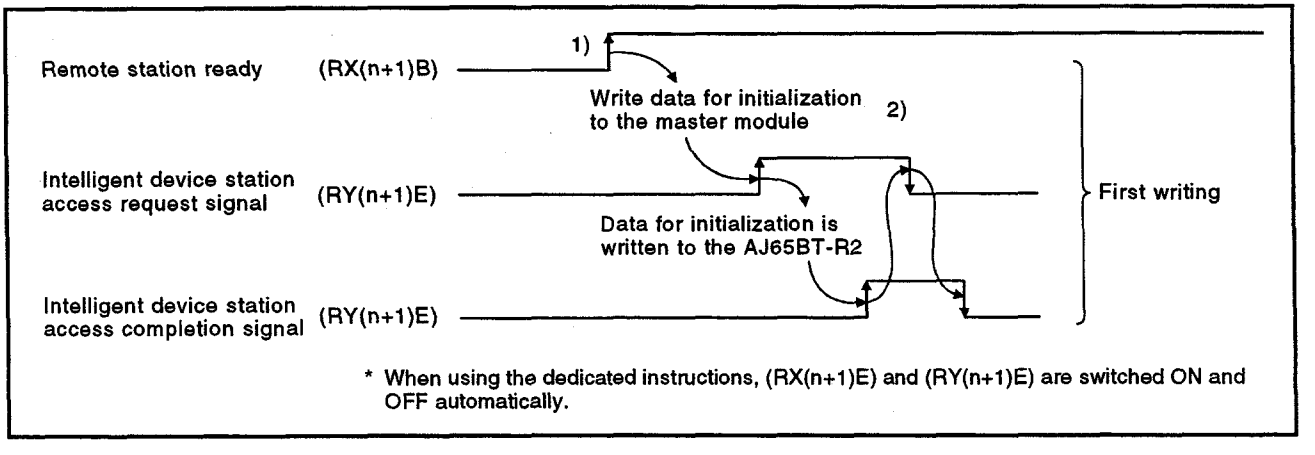
When not using the buffer memory automatic update function, make the following settings before starting data link operation.

(1) Master module side
Secure a send buffer area and receive buffer area large enough to accommodate the data handled by the read/write instructions issued with respect to the AJ65BT-R2 buffer memory (control data, send data, etc.), in the buffer memory of the master module.

(2) AJ65BT-R2 side
Set the mode setting switch to "0" (automatic update function ineffective).

(Procedure)





5.6.3 Example sequence programs for buffer memory reading/writing

For details on the instructions, refer to the Programming Manual.

POINTS

(1) These examples are programs for reading from and writing to a part of the AJ65BT-R2 special function area - the send area/receive area of the user free area - from a QnACPU.
In these programs, only the minimum processing required for reading and writing is executed. If processing in the event of errors or other processing is required, it must be added.

(2) When reading from/writing to buffer memory areas other than that dealt with in this section, change the addresses.

(3) The buffer memories of master modules for use with the A-series (e.g. AJ61BT11) are divided into three banks, each of which has addresses starting from 0.
- Bank 0 : From parameter information area to link special registers (SW)
- Bank 1 : Send buffer and receive buffer used for reading from/writing to the buffer memory of the intelligent device station when not using the automatic update function.
- Bank 2 : Automatic update area used when reading from/writing to the buffer memory of the intelligent device station when using the automatic update function.

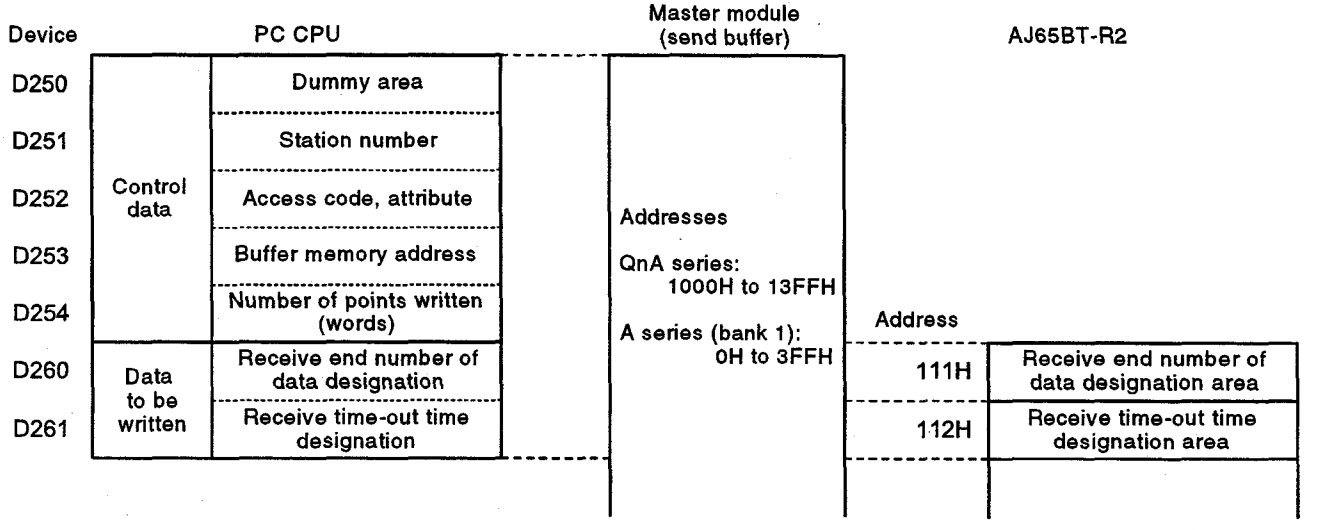
When using a master module for use with A-series, switch to the appropriate bank using an output signal (Y1C, Y1D) before executing buffer memory reading/writing. (Refer to the User's Manual.)

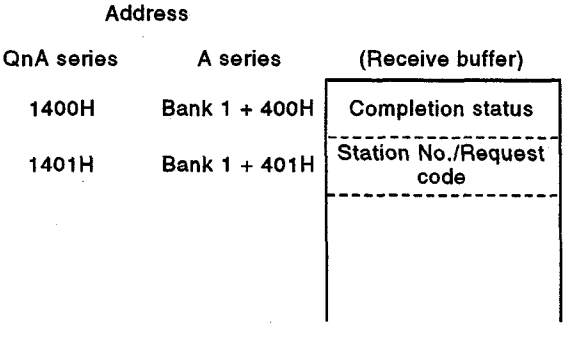
The following conditions apply for these examples:
- The master module I/O signals are X/Y0 to X/Y1F.
- The station number of the AJ65BT-R2 at the data link side is No.1.
- The allocation for the send buffer and receive buffer is 1024 words (400H).
- The range of the automatic update area at the master module for reading to/writing from the buffer memory of the AJ65BT-R2 whose station number is 1 is as follows.
  When using a QnA series master module (e.g. AJ61QBT11)
  Send buffer addresses : 1000H to 13FFH (equivalent to 1024 words (400H))
  Receive buffer addresses : 1400H to 17FFH (equivalent to 1024 words (500H))
  When using an A-series master module (e.g. AJ61BT11)
  Send buffer addresses : 000H to 3FFH (equivalent to 1024 words (400H)) of bank 1
  Receive buffer addresses: 400H to 7FFH (equivalent to 1024 words (400H)) of bank 1
- Batch refresh devices
  Remote inputs (RX) : XE0 to XFF
  Remote outputs (RY) : YE0 to YFF

(1) Writing to the buffer memory
Writing can be done with dedicated instructions (RIWT, RISEND) or an application instruction (TO).
For details on PC CPUs that can use dedicated instructions, see Section 2.2.

(a) When using the RIWT instruction (dedicated instruction)
This instruction is used only to write to the designated buffer memory of the AJ65BT-R2.
When the RIWT instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and data written to the AJ65BT-R2 buffer memory is used.
The receive buffer stores the completion status.

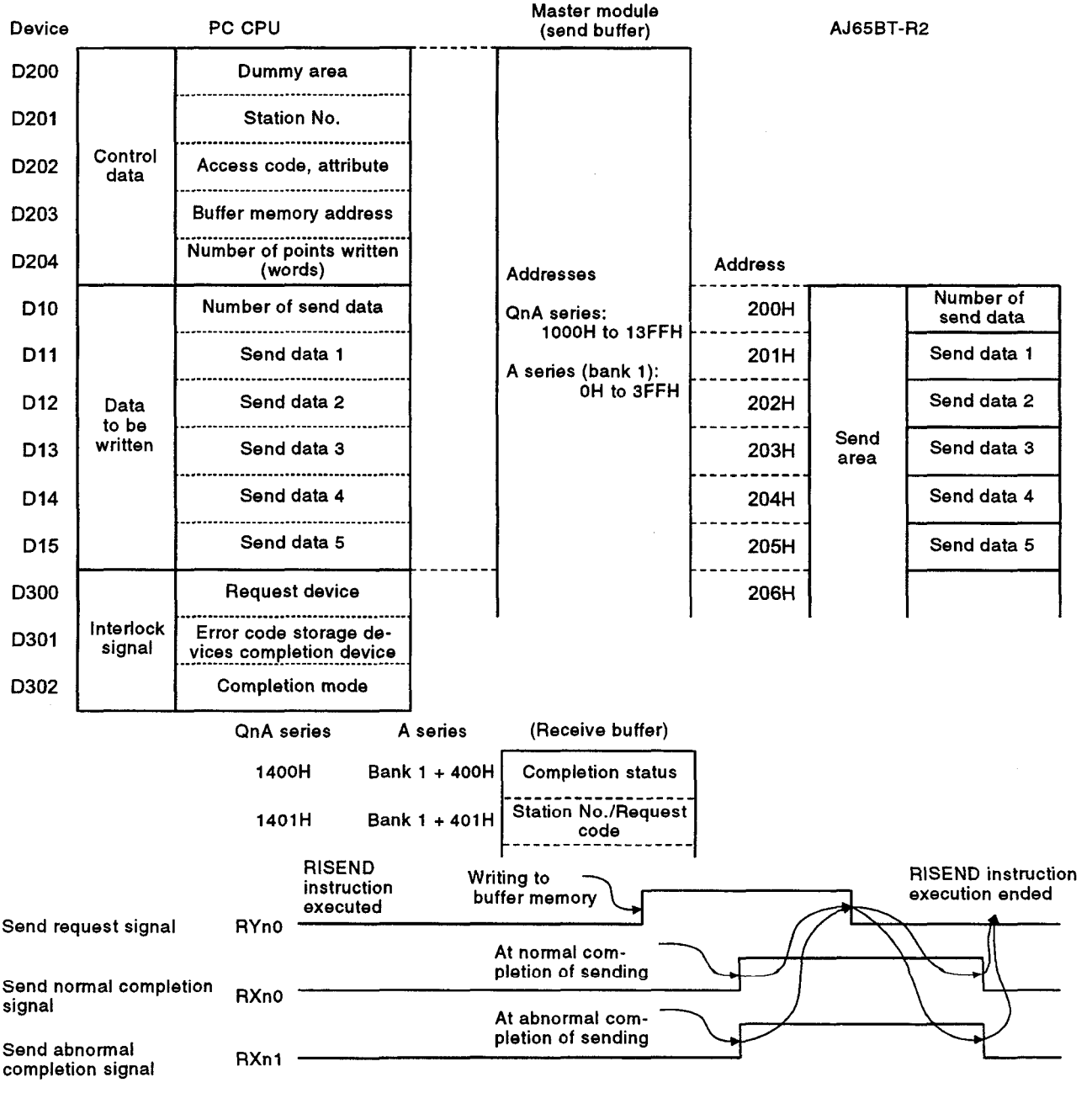
Example: Writing of AJ65BT-R2 initial setting data, as described in program examples in (3):





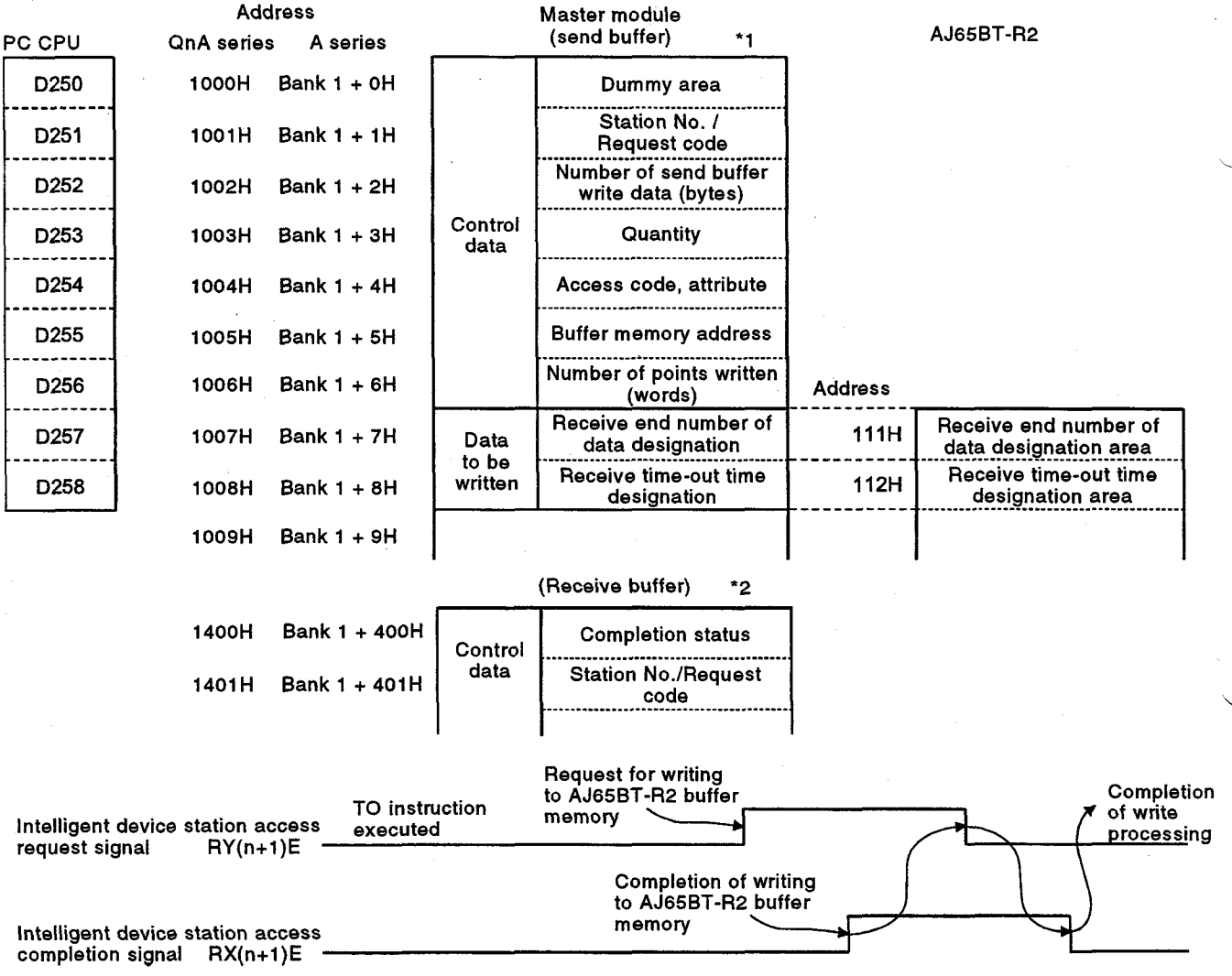
(b) When using the RISEND instruction (dedicated instruction)
This command is used to write to the designated buffer memory of the AJ65BT-R2 associated with the remote I/O signals (RX/RY) between the master module and the AJ65BT-R2.
When data is written to the designated AJ65BT-R2 buffer memory, the designated RY signal automatically comes ON.
When the RX signal comes ON on completion of processing for the relevant function, execution of the RISEND instruction is stopped.
When the RISEND instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and data written to the AJ65BT-R2 buffer memory is used. The receive buffer stores the completion status.

Example: Writing of send data and ON/OFF of send request signal (RY) and send completion signal (RX), as described in program examples in (3).



(c) When using the TO instruction (application instruction)
This instruction is used only to write to the designate buffer memory of the AJ65BT-R2.
When the TO instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and data written to the AJ65BT-R2 buffer memory is used. The receive buffer stores the completion status.
The designated data in the send buffer is written to the AJ65BT-R2 buffer memory using the intelligent device station access request signal and completion signal (RY(n+1)E and RX(n+1)E).

Example : Writing AJ65BT-R2 initial setting data, as described in the program examples in (3).



*1 When data is written to the buffer memory of the AJ65BT-R2 with the TO instruction, the following control data and data to be written is designated in the send buffer for the relevant AJ65BT-R2 in the master module.

Data Type	Name	Description	Setting Range	Set By
Control data	Dummy area	—	—	System
	Station No./ Request code	Station number (designated with the upper byte: bits 8 to 15) Designates the station number of the intelligent device station to be accessed.	0 to 64	User
		Request code (designated with the lower byte: bits 0 to 7) Designates the code for the write request.	12H	User
	Number of send buffer write data (bytes)	Designates the total number of bytes of designated data following the "quantity" designation (next item). • Control data : Quantity" to "number of points written" • Data to be written : Data to be written to the AJ65BT-R2 buffer memory	8 + Number of points written × 2	User
	Quantity	(Fixed value)	1	User
	Access code, attribute	(Fixed value)	0004H	User
	Buffer memory address	Designates the first buffer memory address (0H or greater)	0H to 5FFH	User
	Number of points written (words)	Write the number of data to be written next (number of words), making sure that it does not go beyond AJ65BT-R2 buffer memory address 5FFH. 5FFH ≥ (buffer memory address -1) + number of points written	1 to 480	User
Data to be written	Designates the data to be written to the corresponding buffer memory of the AJ65BT-R2, which is determined by the "buffer memory address" and "number of points written" items in the control data. When writing to the special purpose area, make the designation within the permissible ranges indicated in Sections 5.2 to 5.4..			User

* Among the data above, the following are the same as when using the RIWT instruction (dedicated instruction).
  1) Control data
     - Completion status
     - Station number
     - Access code, attribute
     - Buffer memory address
     - Number of points written (words)
  2) Data to be written

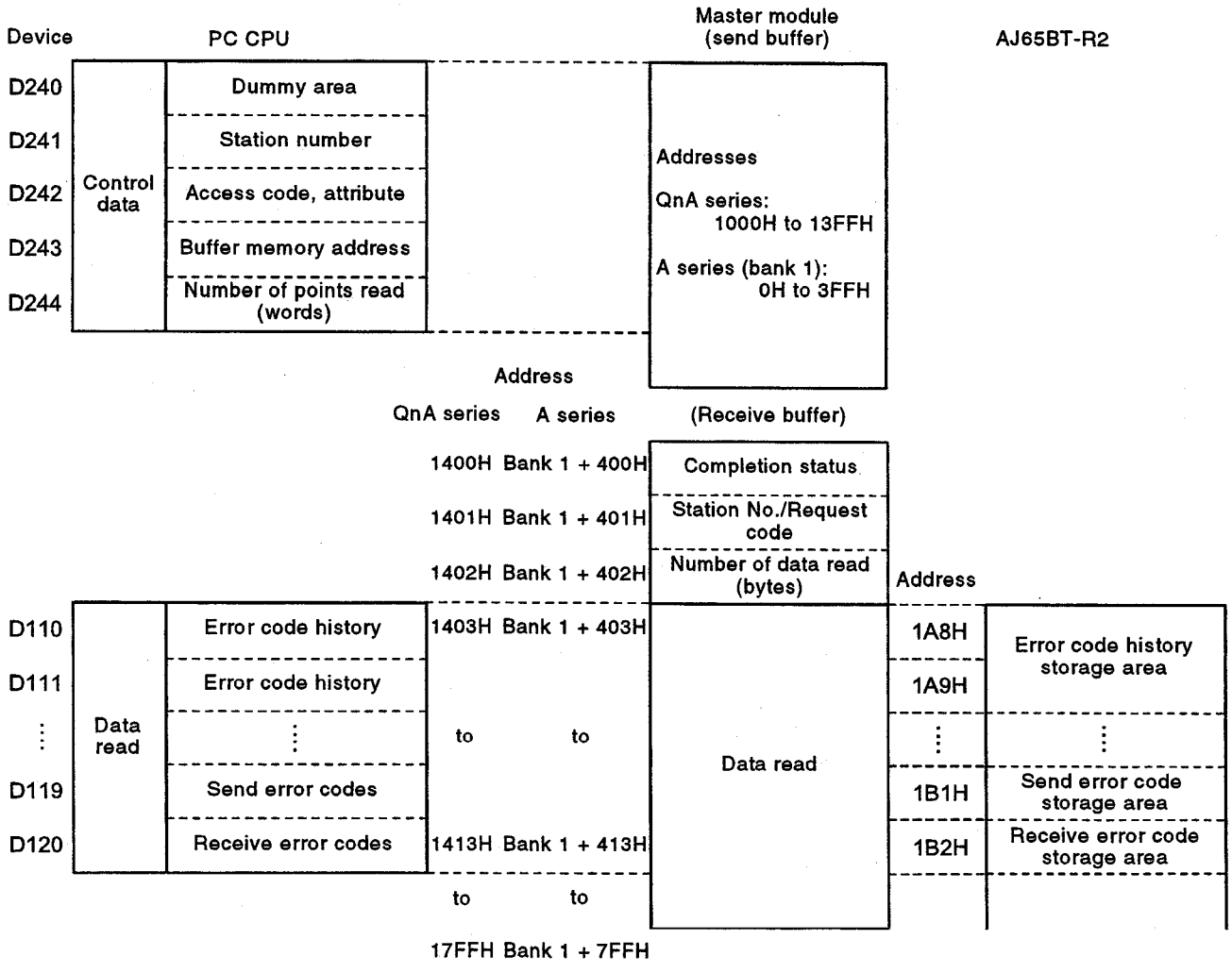
*2 The control data indicated below is stored in the master module receive buffer.

Designated Data	Description	Set By
Completion status	Stores the status on completion of an instruction. 0 : Normal completion Other than 0 : Abnormal completion (error code) Refer to the master module User's Manual.	System
Station No. / request code	Station number (designated with the upper byte (bits 8 to 15)) The station number of the access destination intelligent device station is stored.	System
	Request code (designated with the lower byte (bits 0 to 7)) The read request code (12H) is stored.	System

(2) Reading from the buffer memory
Data is read from the buffer memory using a dedicated instruction (RIRD, RIRCV) or an application instruction (FROM).
For details on PC CPUs that can use dedicated instructions, see Section 2.2.

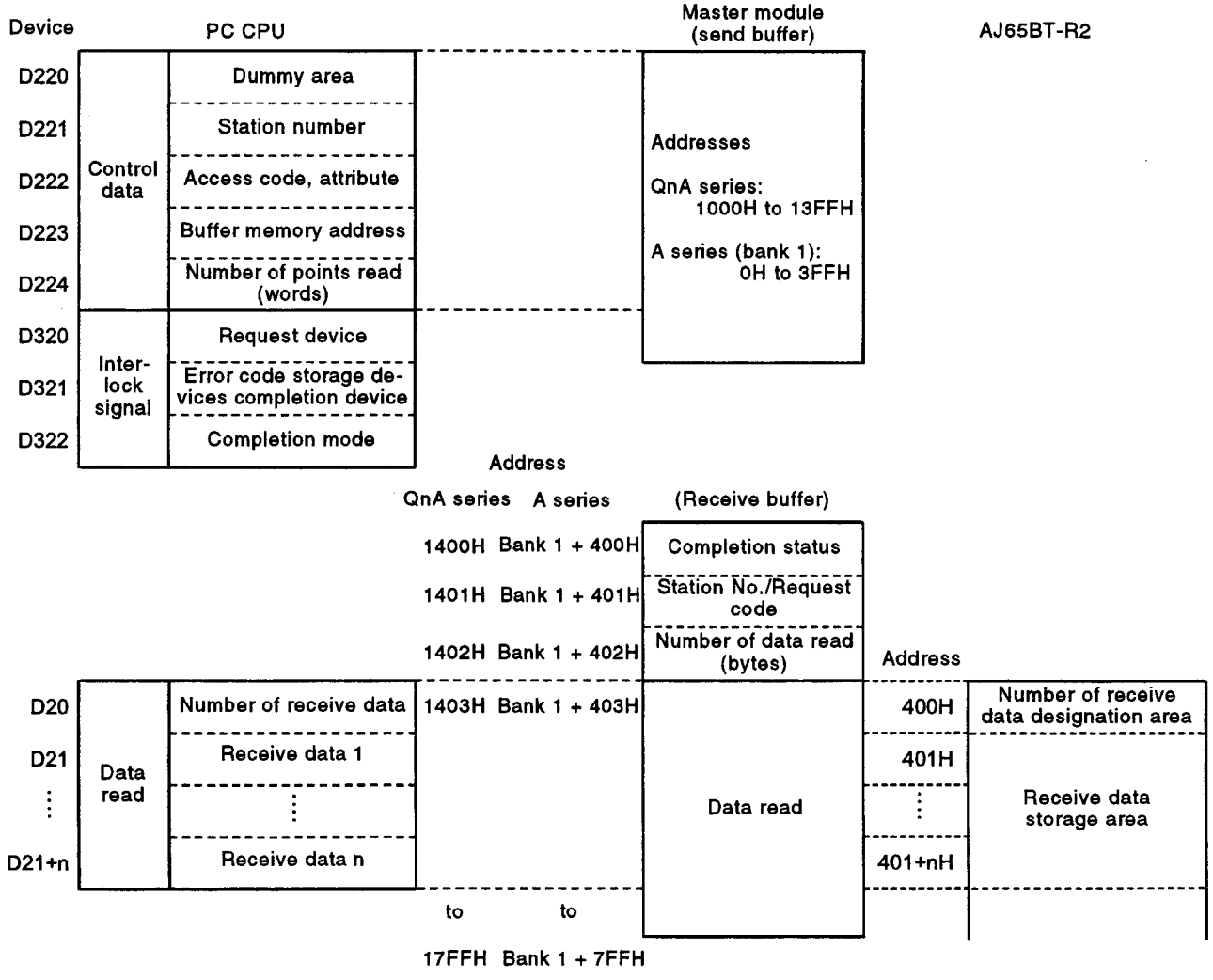
(a) When using the RIRD instruction (dedicated instruction)
This instruction is used only to read from the designated buffer memory of the AJ65BT-R2.
When the RIRD instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and a receive buffer (buffer memory of the master module) large enough to accommodate the data read, are used.

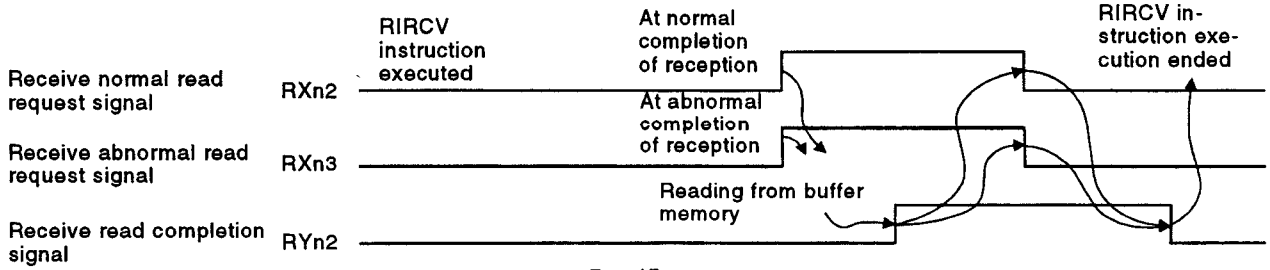
Example : Reading error information, as described in the program examples in (3).



(b) When using the RIRCV instruction (dedicated instruction)
This command is used to read from the designated buffer memory of the AJ65BT-R2 associated with the remote I/O signals (RX/RY) communicated between the master module and the AJ65BT-R2.
When the designated RX signal comes ON, data is read from the designated buffer memory of the AJ65BT-R2, and the designated RY signal is automatically turned ON.
When the designated RX signal goes OFF, the RY signal goes OFF and execution of the RIRCV instruction is ended.
When the RIRCV instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and a receive buffer (buffer memory of the master module) large enough to accommodate the data read, are used.

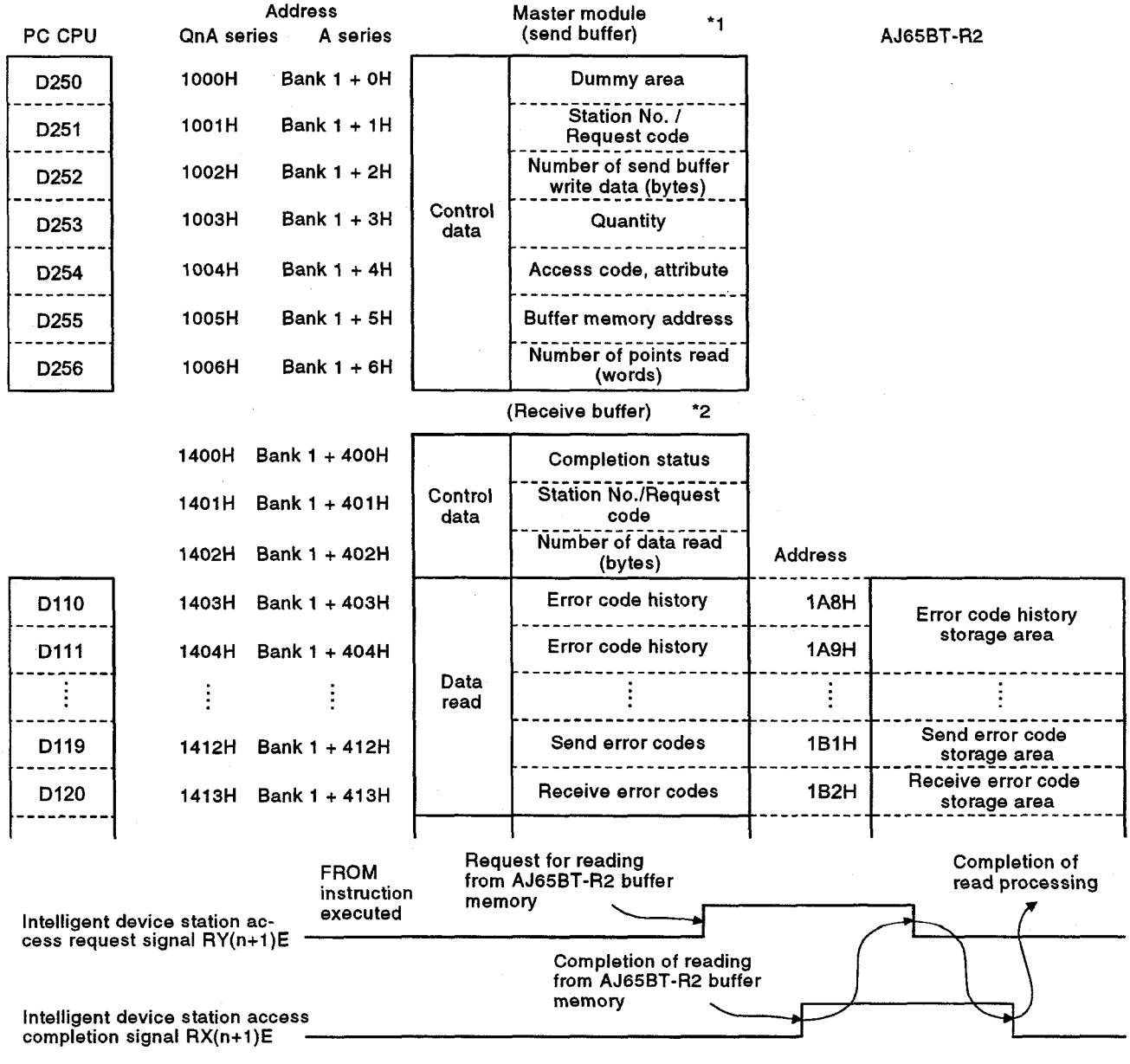
Example : Reading of receive data, and ON/OFF of read request signal (RX) and read completion signal (RY), as described in program examples in (3).





(c) When using the FROM instruction (application instruction)
This instruction is used only to read from the designated buffer memory of the AJ65BT-R2.
When the FROM instruction is used, a send buffer (buffer memory of the master module) large enough to accommodate the control data and a receive buffer (buffer memory of the master module) large enough to accommodate the data read, are used.
The data designated in the send buffer is read from the AJ65BT-R2 buffer memory using the intelligent device station access request signal and completion signal (RY(n+1)E and RX(n+1)E).

Example : Reading error information, as described in the program examples in (3).



*1 When data is read from the buffer memory of the AJ65BT-R2 with the FROM instruction, the following control data and data to be written is designated in the send buffer for the relevant AJ65BT-R2 in the master module.

Data Type	Name	Description	Setting Range	Set By
Control data	Dummy area	—	—	System
	Station No./Request code	Station number (designated with the upper byte: bits 8 to 15) Designates the station number of the intelligent device station to be accessed.	0 to 64	User
		Request code (designated with the lower byte: bits 0 to 7) Designates the code for the read request.	10H	User
	Number of send buffer write data (bytes)	(Fixed value)	8	User
	Quantity	(Fixed value)	1	User
	Access code, attribute	(Fixed value)	0004H	User
	Buffer memory address	Designates the first buffer memory address (0H or greater)	0H to 5FFH	User
	Number of points read (words)	Write the number of data to be read (number of words) so that it does not go beyond AJ65BT-R2 buffer memory address 5FFH. 5FFH ≥ (buffer memory address -1) + number of points read	1 to 480	User

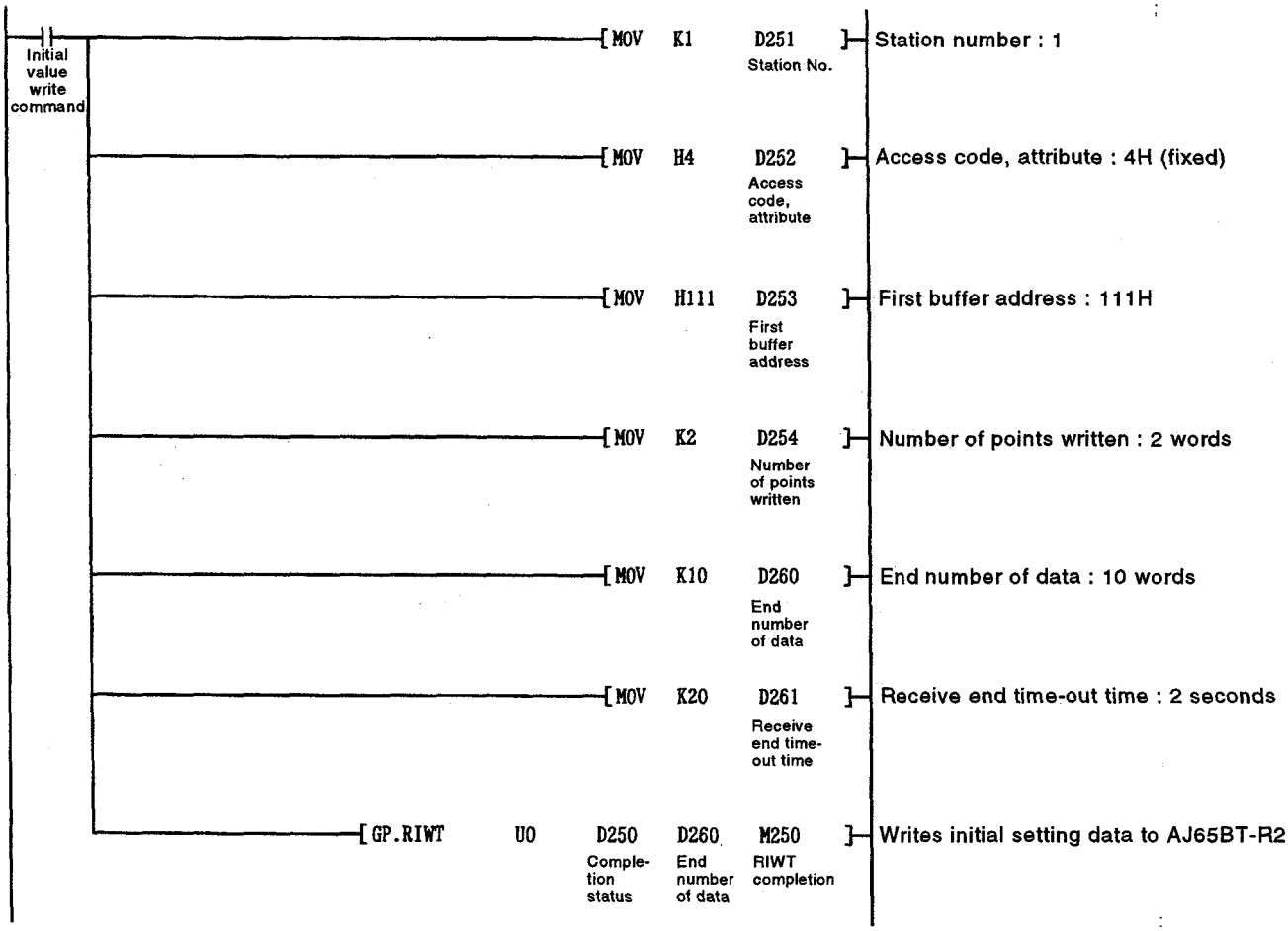
* Among the data above, the following are the same as when using the RIRD instruction (dedicated instruction).
  - Completion status
  - Station number
  - Access code, attribute
  - Buffer memory address
  - Number of points read (words)

*2 The data read from the buffer memory of the AJ65BT-R2 with the FROM instruction is stored unaltered in the master module's receive buffer for the relevant AJ65BT-R2.

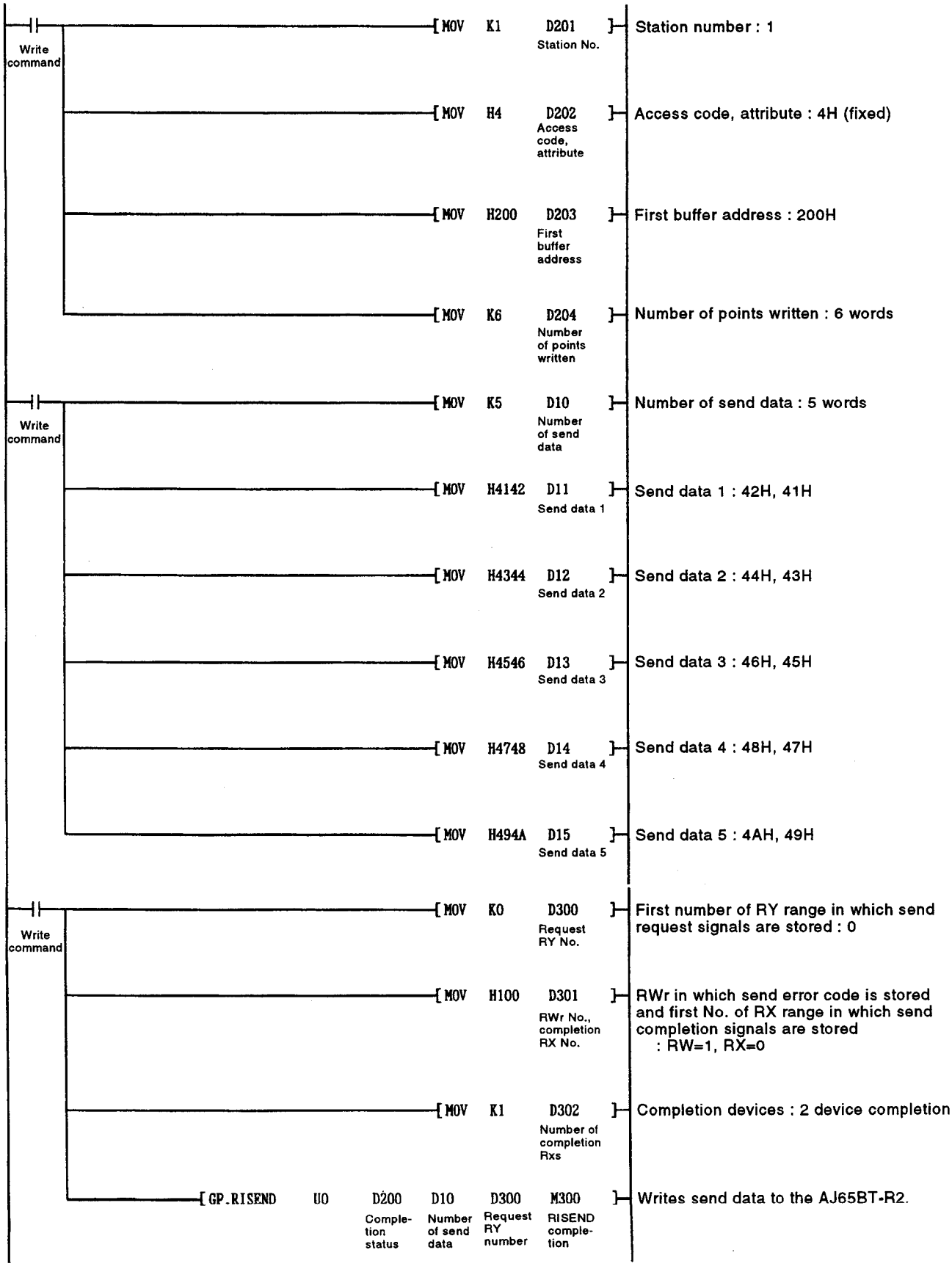
Data Type	Description	Set By
Completion status	Stores the status on completion of an instruction. 0 : Normal completion Other than 0 : Abnormal completion (error code) Refer to the master module User's Manual.	System
Station No. /request code	Station number (designated with the upper byte (bits 8 to 15)) The station number of the access destination intelligent device station is stored.	System
	Request code (designated with the lower byte (bits 0 to 7)) The read request code (10H) is stored.	System
Number of data read (bytes)	The total number of bytes of read data is stored.	System
Data Read	Stores the data from the corresponding buffer memory of the AJ65BT-R2, which is determined by the "buffer memory address" and "number of points written" items in the control data.	System

(3) Example programs using the RIWT, RIRD, RISEND, and RIRCV instructions (dedicated instructions)

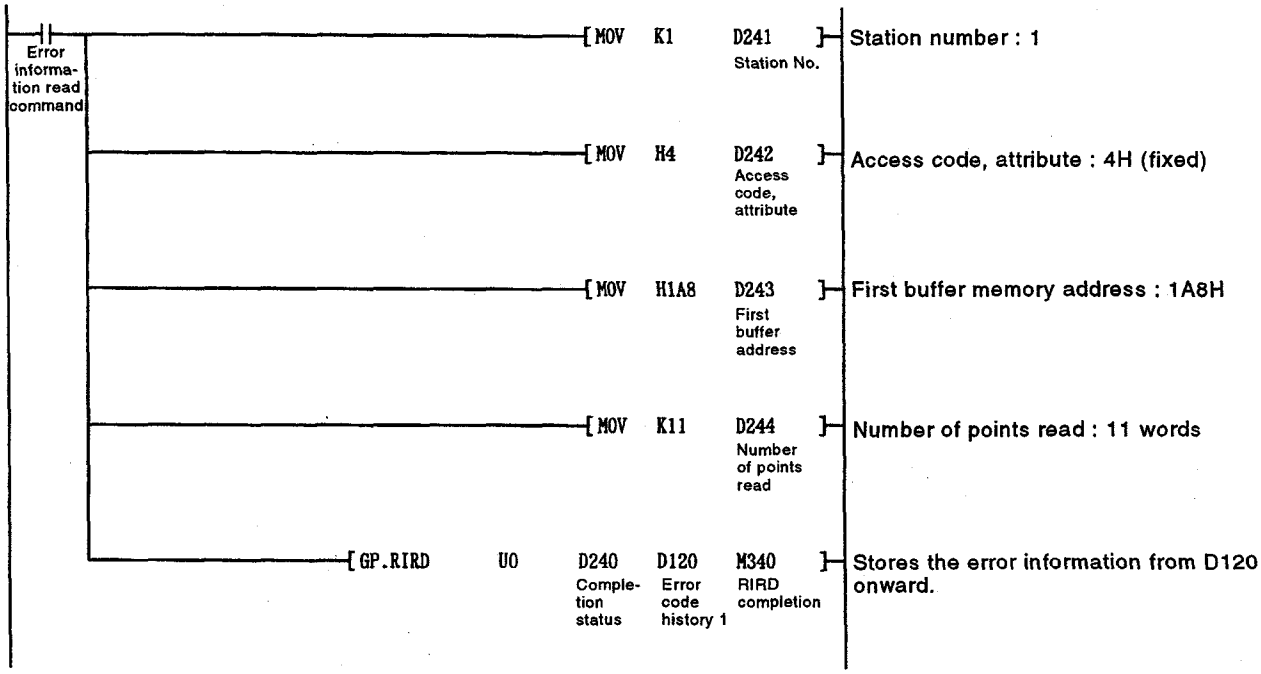
(a) Writing AJ65BT-R2 initial setting data (RIWT instruction)



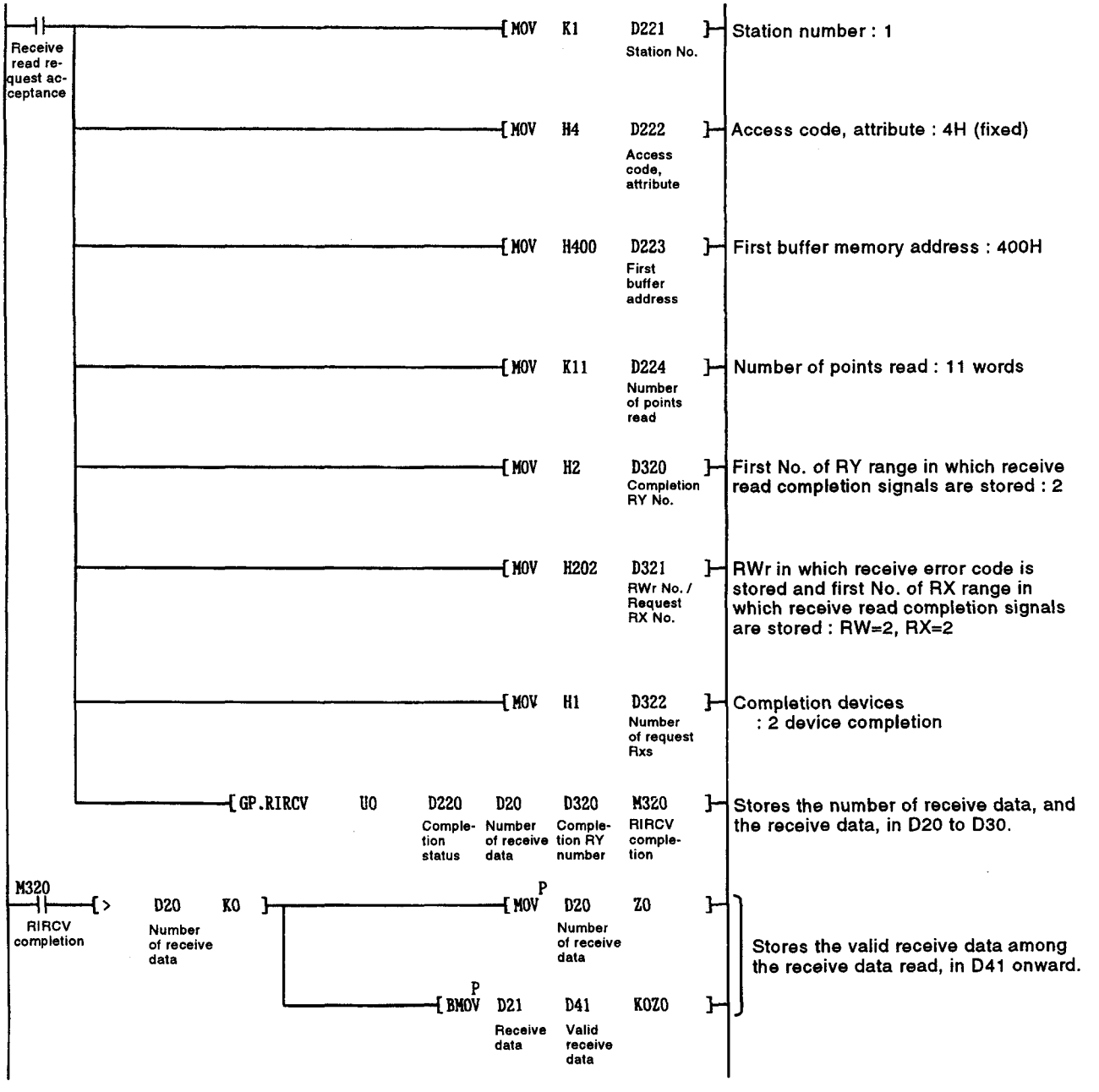
(b) Writing send data (RISEND instruction)



(c) Reading error information (RIRD instruction)

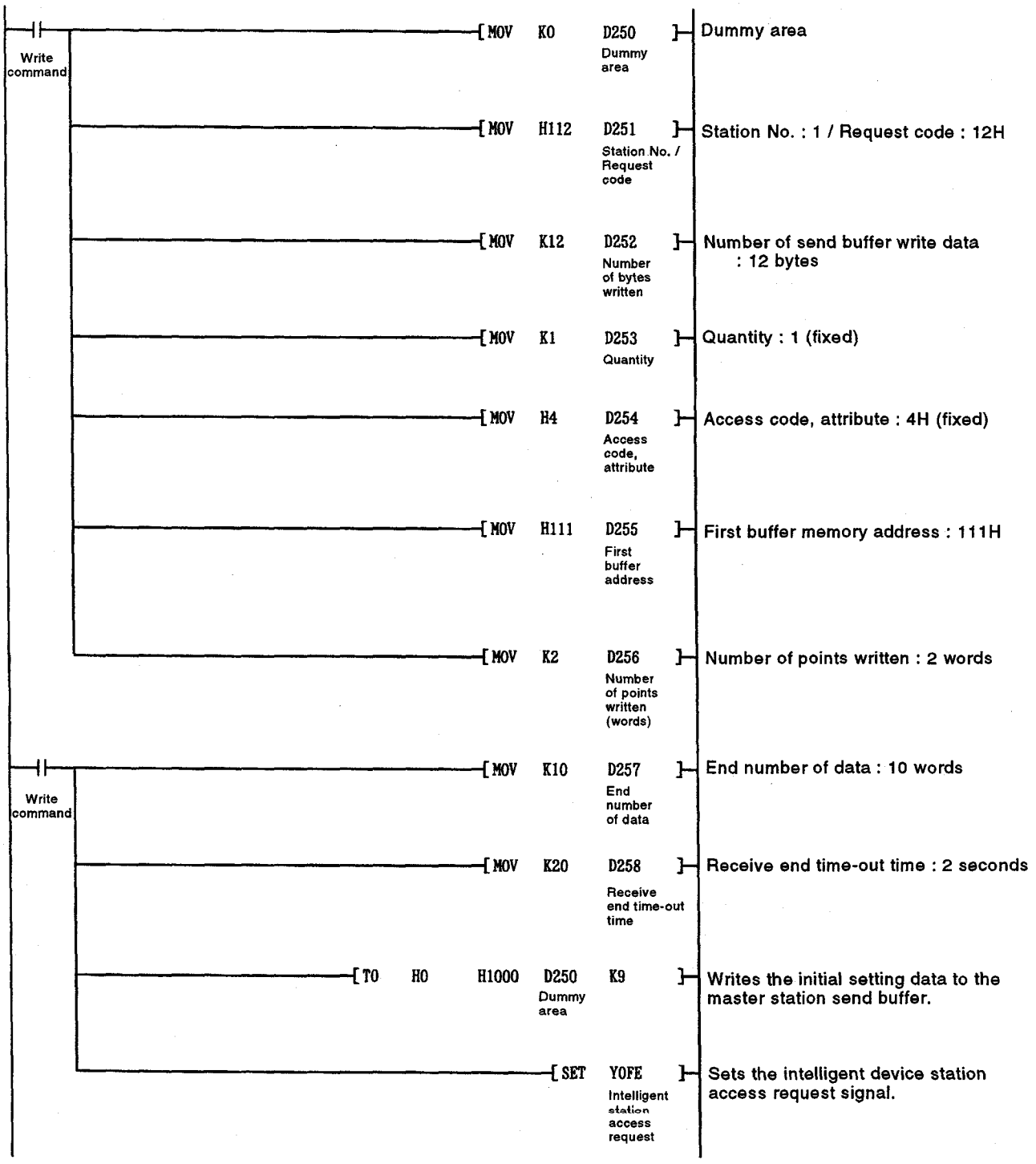


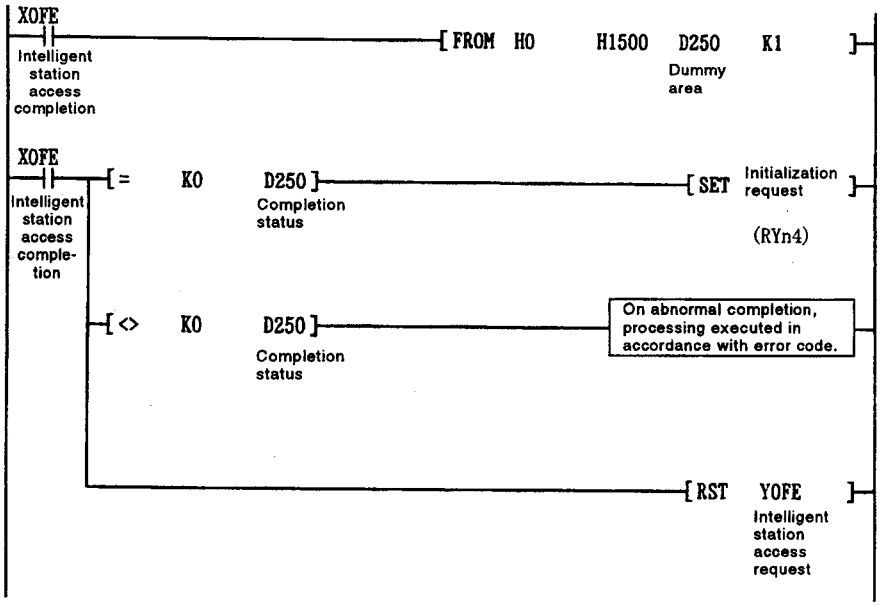
(d) Reading receive data (RIRCV instruction)



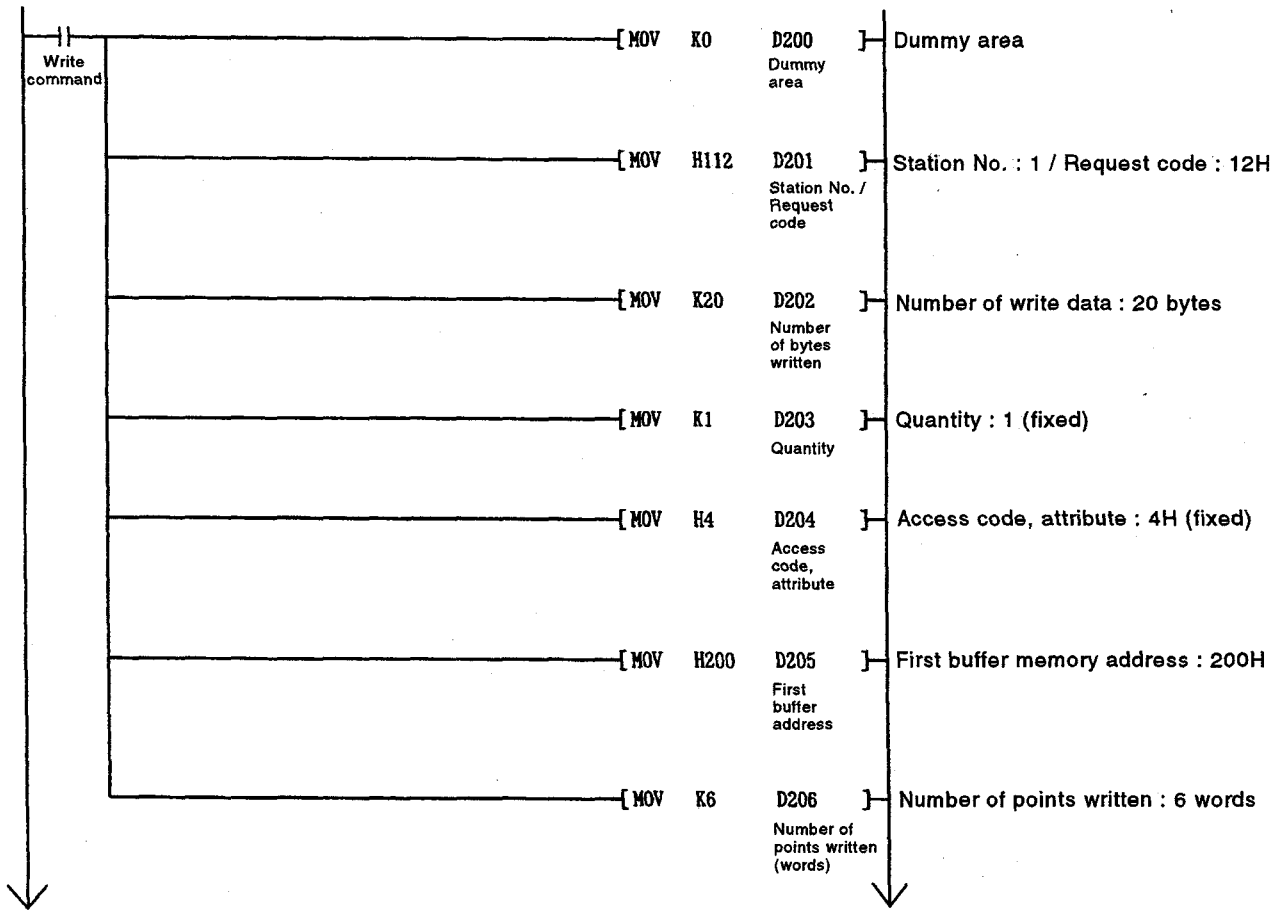
(4) Program using FROM and TO instructions (application instructions)

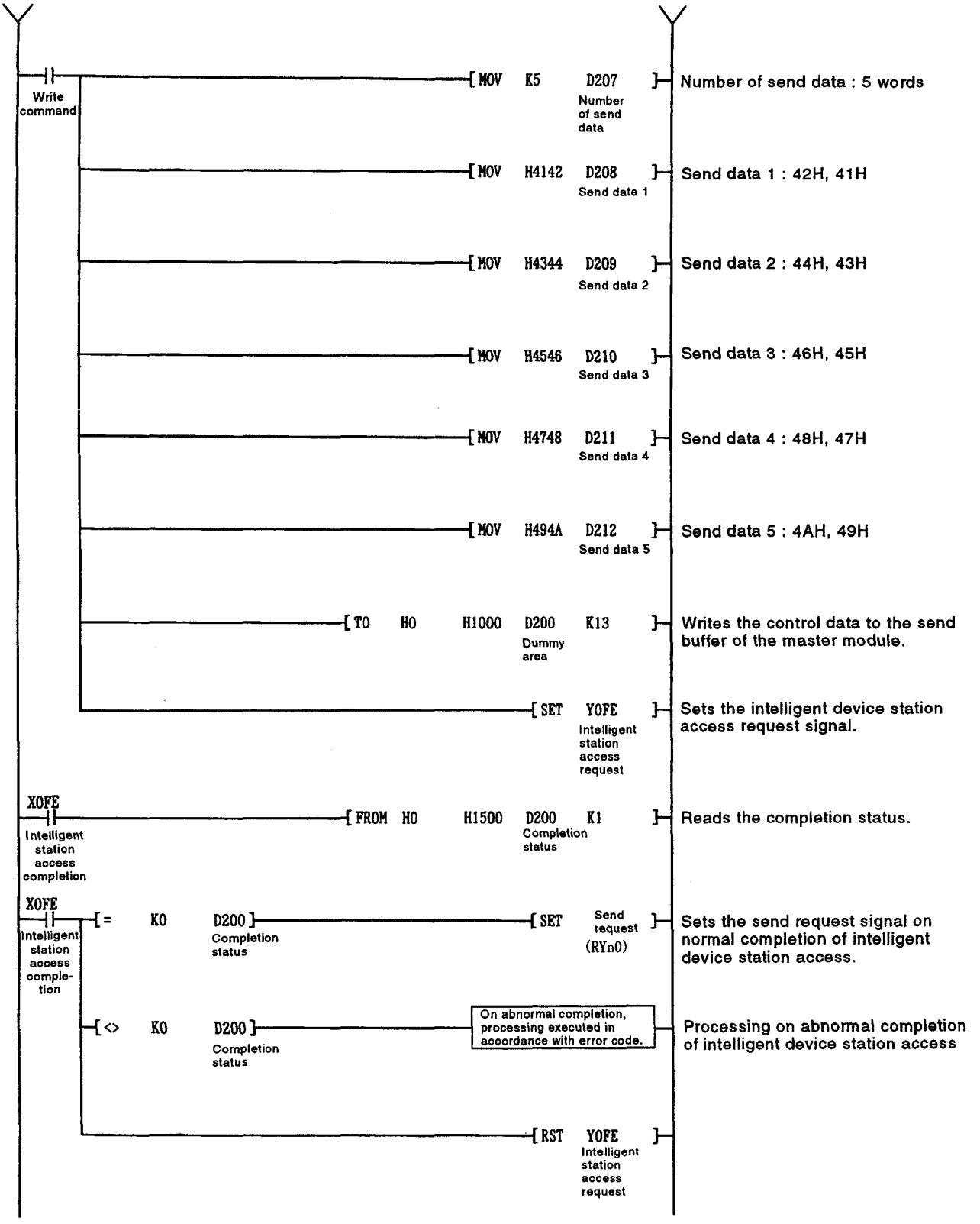
(a) Writing AJ65BT-R2 initial setting data



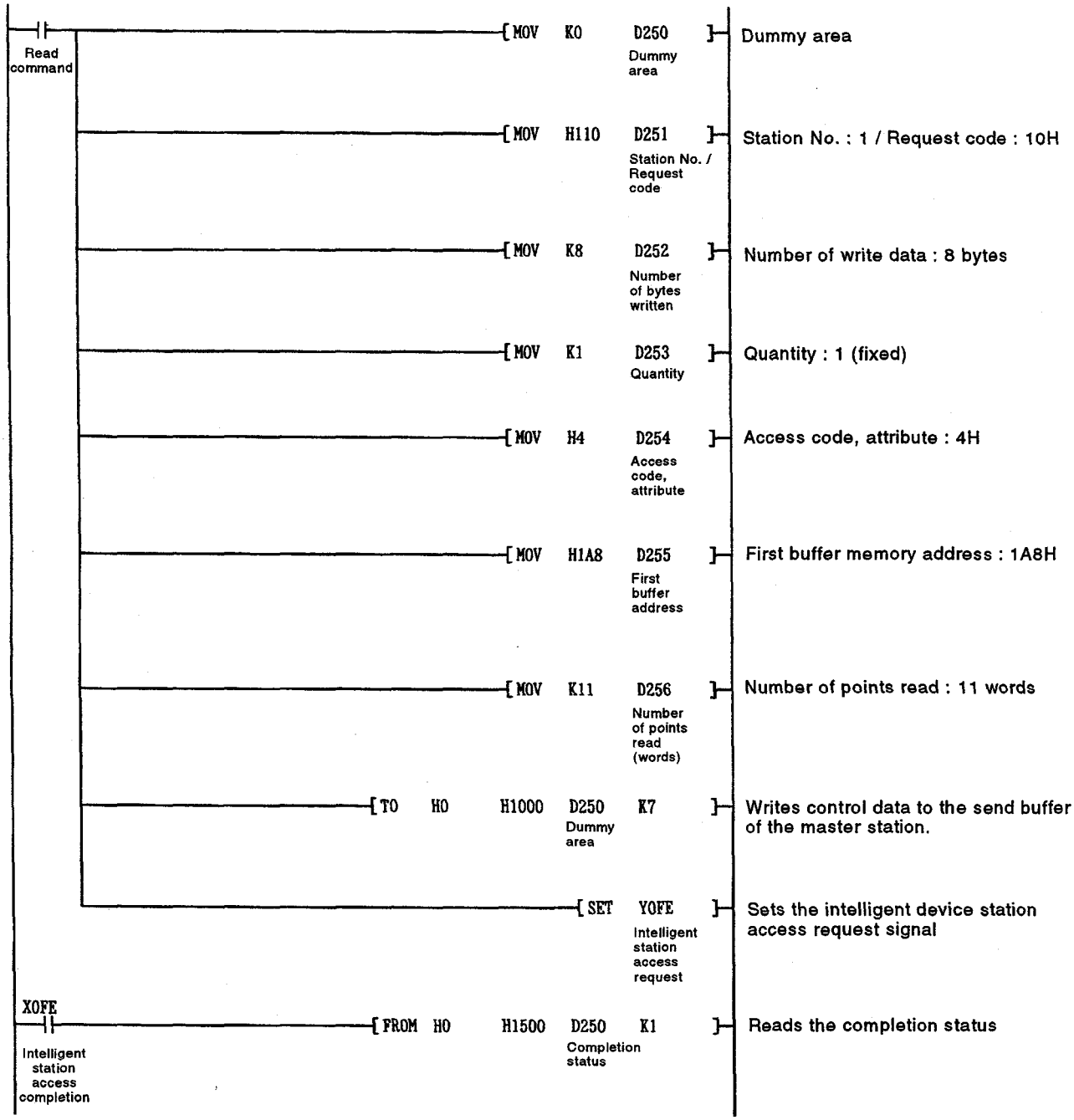

X0FE
Intelligent station access completion
FROM H0 H1500 D250 K1
Dummy area
Reads the completion status.
X0FE
Intelligent station access comple-tion
= K0 D250
Completion status
SET Initialization request
(RYn4)
Sets the initialization request signal on normal completion of intelligent device station access.
<> K0 D250
Completion status
On abnormal completion, processing executed in accordance with error code.
Processing on abnormal completion of intelligent device station access
RST Y0FE
Intelligent station access request

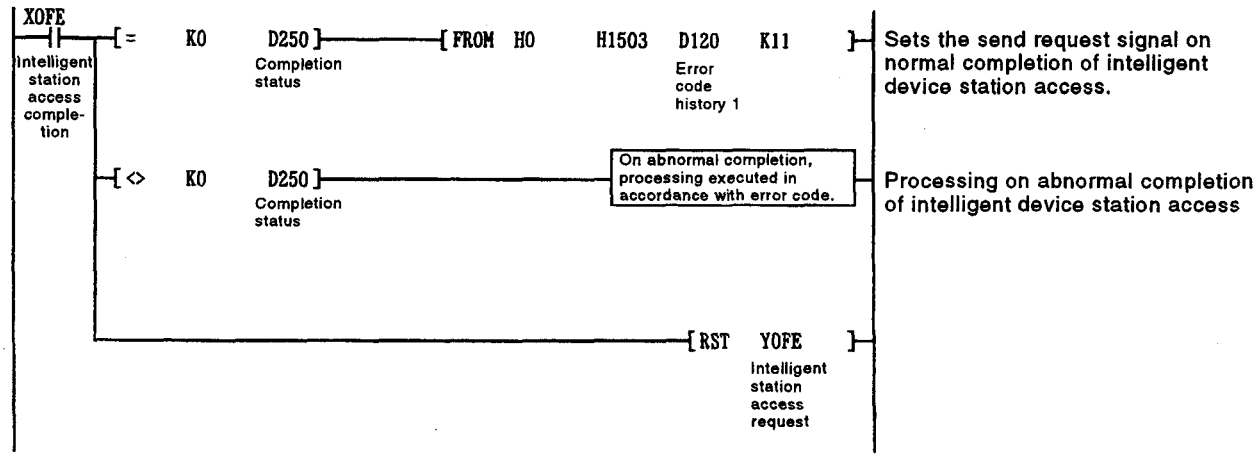
(b) Writing send data



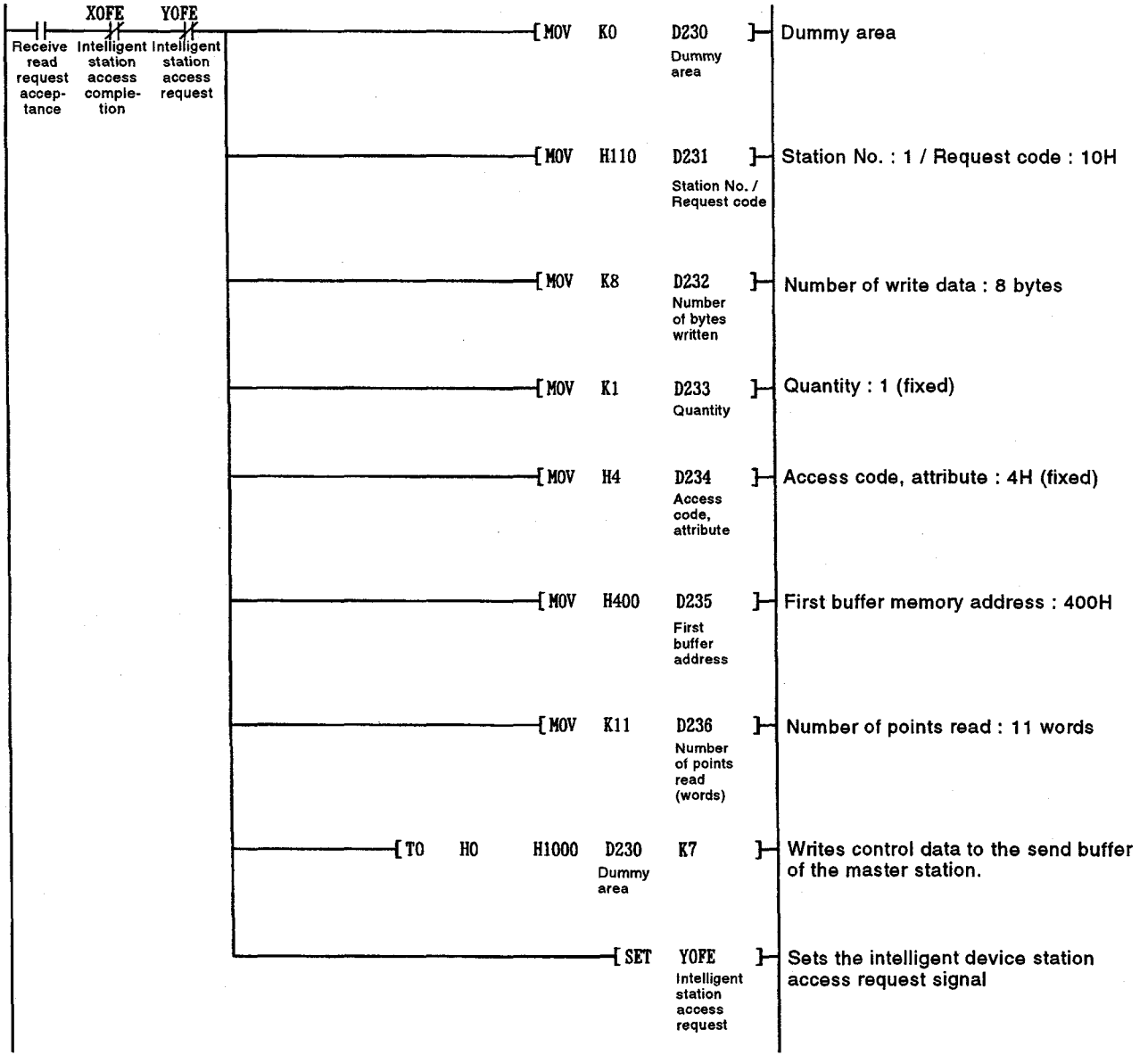

Write command
[MOV K5 D207] Number of send data
Number of send data : 5 words
[MOV H4142 D208] Send data 1
Send data 1 : 42H, 41H
[MOV H4344 D209] Send data 2
Send data 2 : 44H, 43H
[MOV H4546 D210] Send data 3
Send data 3 : 46H, 45H
[MOV H4748 D211] Send data 4
Send data 4 : 48H, 47H
[MOV H494A D212] Send data 5
Send data 5 : 4AH, 49H
[TO H0 H1000 D200 K13] Dummy area
Writes the control data to the send buffer of the master module.
[SET YOFE] Intelligent station access request
Sets the intelligent device station access request signal.
XOFE
Intelligent station access completion
[FROM H0 H1500 D200 K1] Completion status
Reads the completion status.
XOFE
Intelligent station access comple-tion
[= K0 D200] Completion status
[SET Send request (RYn0)]
Sets the send request signal on normal completion of intelligent device station access.
[<> K0 D200] Completion status
On abnormal completion, processing executed in accordance with error code.
Processing on abnormal completion of intelligent device station access
[RST YOFE] Intelligent station access request

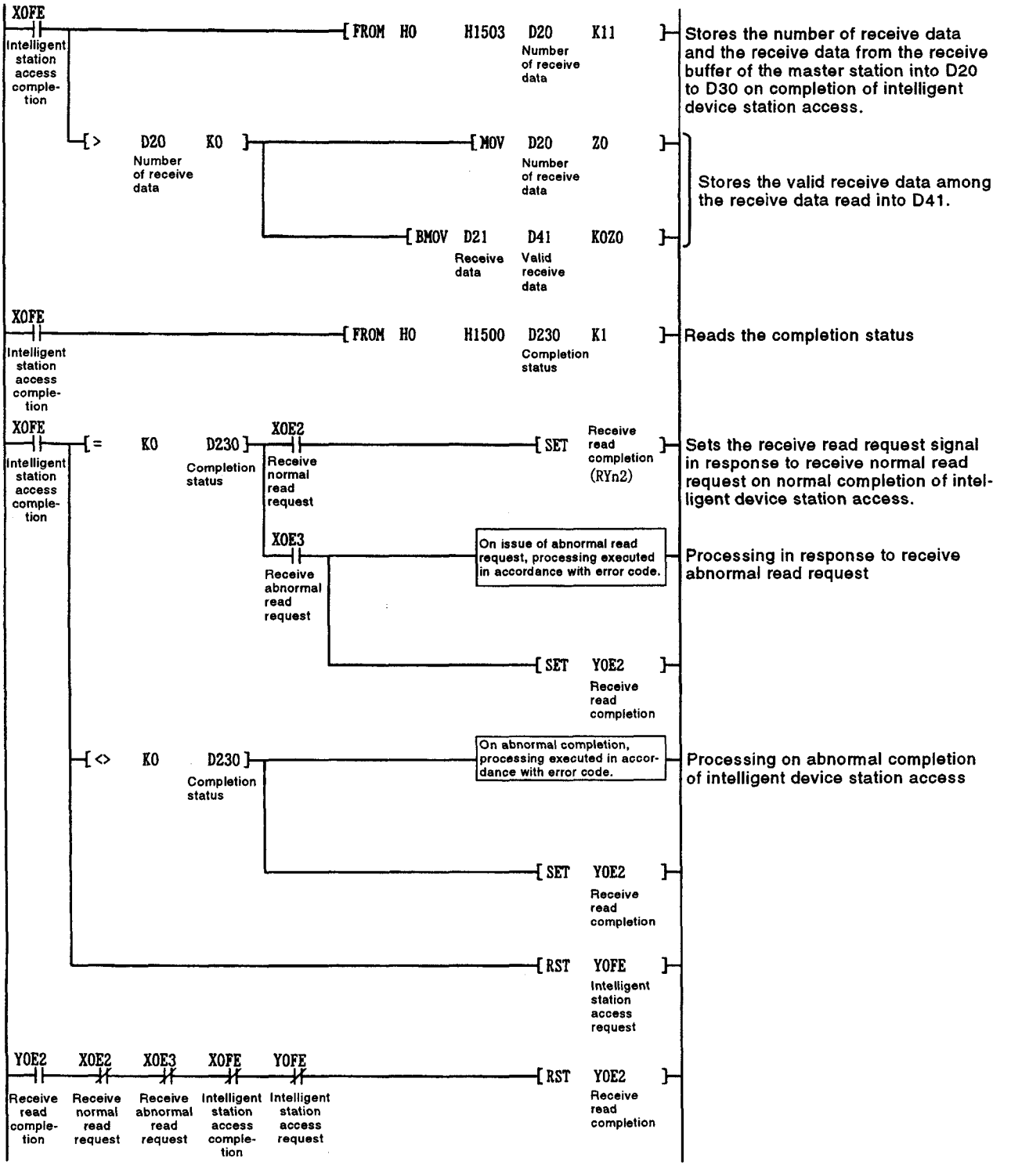
(c) Reading error information




XOFE
Intelligent station access comple-tion
[= K0 D250]
Completion status
[FROM H0 H1503 D120 K11]
Error code history 1
Sets the send request signal on normal completion of intelligent device station access.
[<> K0 D250]
Completion status
On abnormal completion, processing executed in accordance with error code.
Processing on abnormal completion of intelligent device station access
[RST YOFE]
Intelligent station access request

(d) Reading receive data




X0FE
Intelligent station access comple-tion
[FROM H0 H1503 D20 K11]
Number of receive data
Stores the number of receive data and the receive data from the receive buffer of the master station into D20 to D30 on completion of intelligent device station access.
[> D20 K0]
Number of receive data
[MOV D20 Z0]
Number of receive data
[BMOV D21 D41 KOZ0]
Receive data
Valid receive data
Stores the valid receive data among the receive data read into D41.
X0FE
Intelligent station access comple-tion
[FROM H0 H1500 D230 K1]
Completion status
Reads the completion status
X0FE
Intelligent station access comple-tion
[= K0 D230]
Completion status
X0E2
Receive normal read request
[SET Y0E2]
Receive read completion (RYn2)
Sets the receive read request signal in response to receive normal read request on normal completion of intel-ligent device station access.
X0E3
Receive abnormal read request
On issue of abnormal read request, processing executed in accordance with error code.
Processing in response to receive abnormal read request
[SET Y0E2]
Receive read completion
[<> K0 D230]
Completion status
On abnormal completion, processing executed in accor-dance with error code.
Processing on abnormal completion of intelligent device station access
[SET Y0E2]
Receive read completion
[RST Y0FE]
Intelligent station access request
Y0E2
Receive read comple-tion
X0E2
Receive normal read request
X0E3
Receive abnormal read request
X0FE
Intelligent station access comple-tion
Y0FE
Intelligent station access request
[RST Y0E2]
Receive read completion

6. NO-PROTOCOL COMMUNICATION WITH EXTERNAL DEVICES

6.1 Method Using the Buffer Memory Automatic Update Function

6.1.1 Outline of data communication

(1) Flow of processing when sending data to the external device
The flow of processing when sending data to the external device using the buffer memory automatic update function is shown in Fig. 6.1.
To send data with buffer memory automatic updating effective, set the mode setting switch to "1" (buffer memory automatic update function effective), and make the initial settings for the automatic update area (detailed explanation: Section 5.5.4).

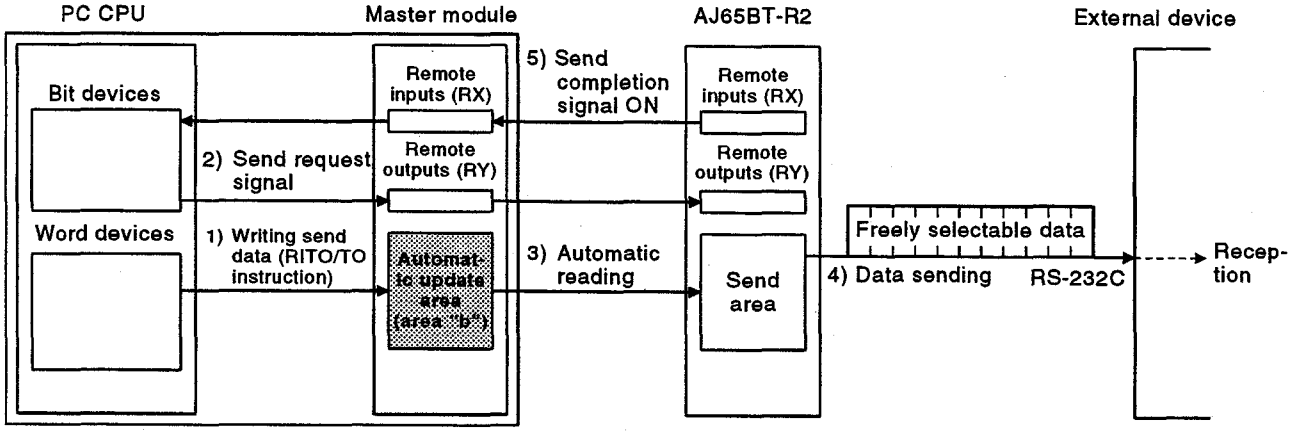
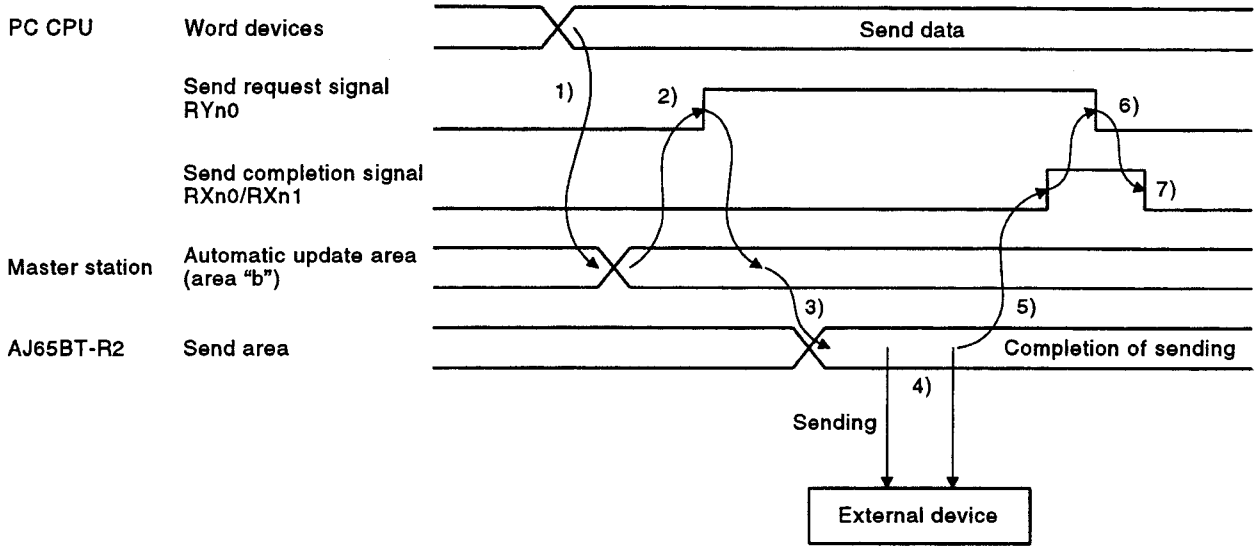


Fig. 6.1 Outline of Data Communication (Sending)



1) The send data is stored in word devices of the PC CPU. It is written to the buffer memory (automatic update area) of the master module by a TO/G(P).RITO instruction in a sequence program.
2) The send request signal (RYn0) is turned ON by the sequence program.
3) The AJ65BT-R2 reads the data in the buffer memory (area "b") of the master module and stores it in its own send area.
4) The AJ65BT-R2 sends the data from its send area to the external device.
5) On completion of data sending to the external device, the AJ65BT-R2 turns the send completion signal (RXn0/RXn1) ON.
6) The send request signal (RYn0) is turned OFF by the sequence program.
7) The AJ65BT-R2 turns the send completion signal (RXn0/RXn1) OFF.

(2) Flow of processing when receiving data from the external device
The flow of processing when receiving data from the external device when using the buffer memory automatic update function is shown in Fig. 6.2. To receive data with buffer memory automatic updating effective, set the mode setting switch to "1" (buffer memory automatic update function effective), and make the initial settings for the automatic update area (detailed explanation: Section 5.5.4).

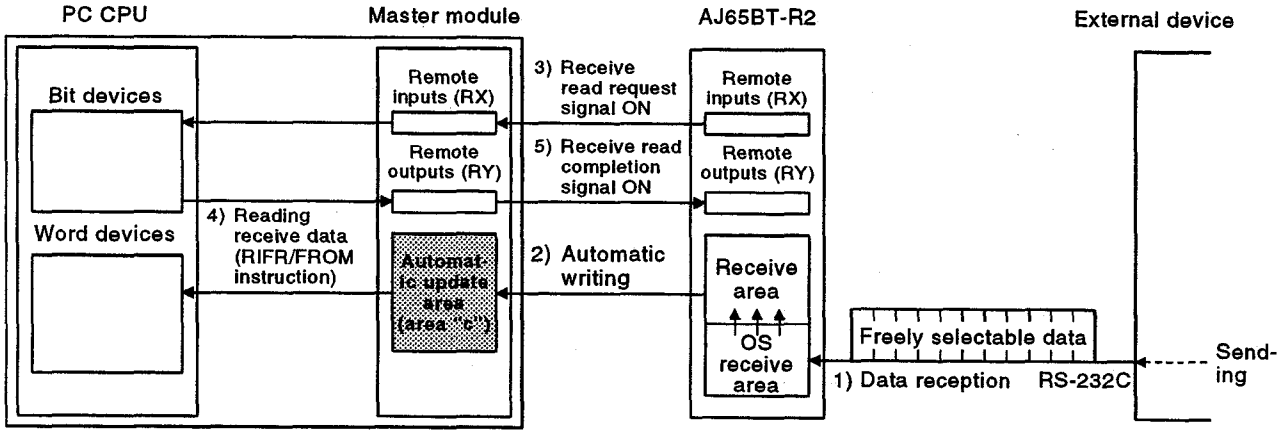
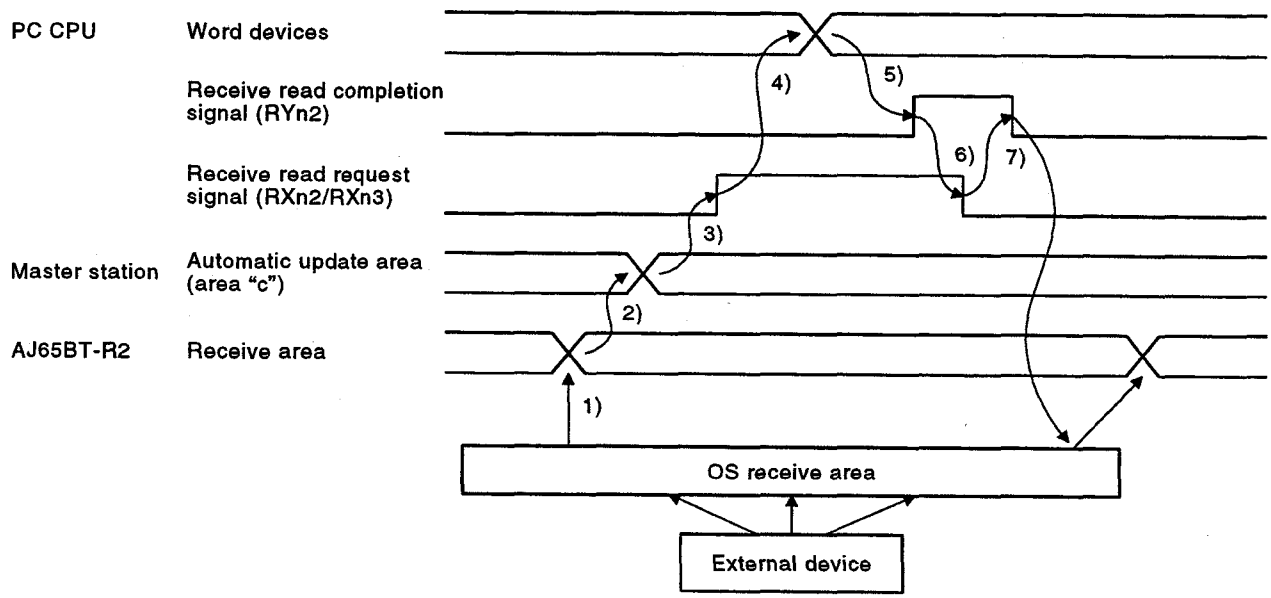


Fig. 6.2 Outline of Data Communication (Receiving)



1) The AJ65BT-R2 stores the receive data from the external device in the receive area via the OS receive area.
2) On completion of reception from the external device (*1), the AJ65BT-R2 writes the contents of the receive area to the buffer memory (automatic update area) of the master module.
3) The AJ65BT-R2 turns ON the receive read request signal (Rxn2/RXn3) to the PC CPU.
4) The data stored in the buffer memory of the master module is read with a FROM/G(P).RIFR instruction in the sequence program.
5) The receive read completion signal (RYn2) is turned ON by the sequence program.
6) The AJ65BT-R2 turns the receive read request signal (RXn2/RXn3) OFF.
7) The receive read completion signal (RYn2) is turned OFF by the sequence program.

*1 This means when data equivalent to the receive end number of data, or data up to the final receive frame, have been stored in the receive area.

6.2 Method When Not Using the Buffer Memory Update Function

6.2.1 Outline of data communication

(1) Flow of processing when sending data to the external device
The flow of processing when sending data to the external device when not using the buffer memory automatic update function is shown in Fig. 6.3.

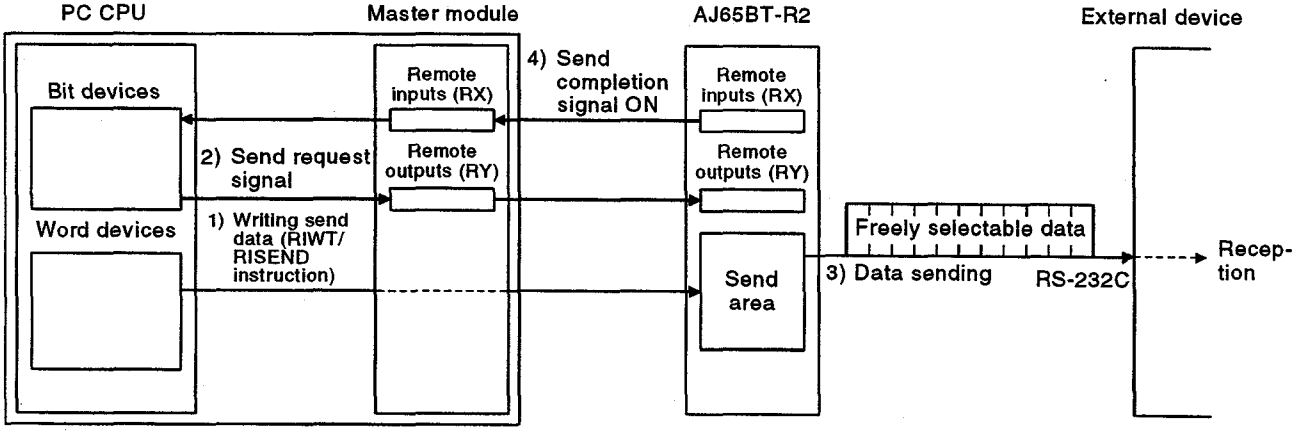
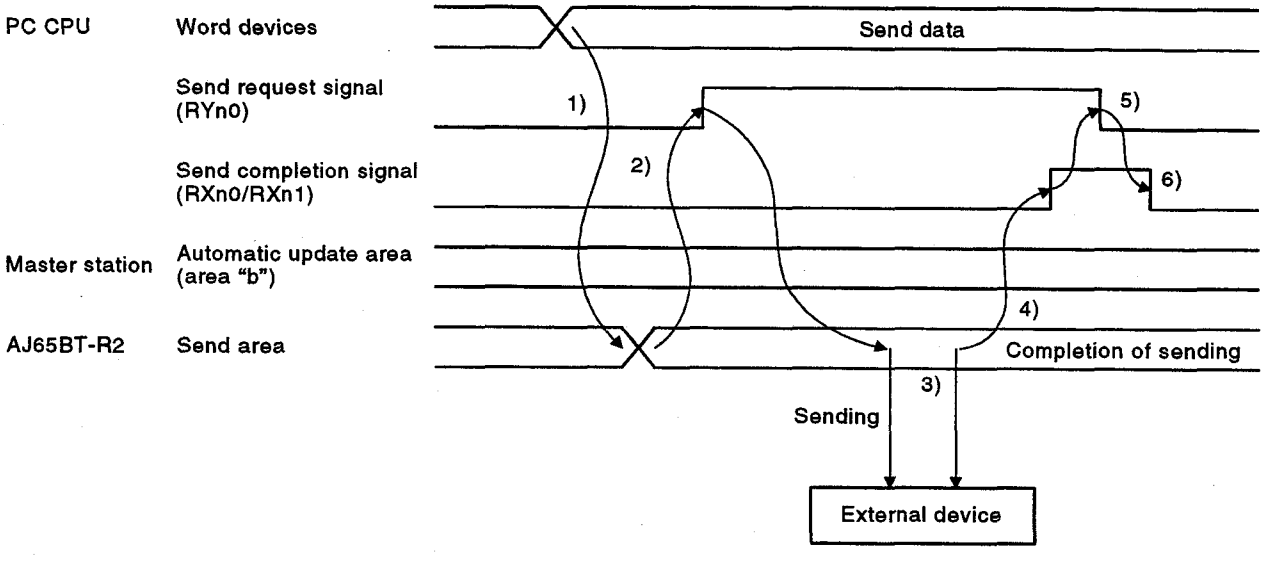


Fig. 6.3 Outline of Data Communication (Sending)



1) The send data is stored in word devices of the CPU. The send data is written to the send area of the AJ65BT-R2 by a G(P).RIWT/G(P).RIS END instruction in the sequence program.
2) The send request signal (RYn0) is turned ON by the sequence program.
3) Data is sent from the send area of the AJ65BT-R2 to the external device.
4) On completion of sending to the external device, the AJ65BT-R2 turns ON the send completion signal (RXn0/RXn1).
5) The send request signal (RYn0) is turned OFF by the sequence program.
6) The AJ65BT-R2 turns OFF the send completion signal (RXn0/RXn1).

(2) Flow of processing when receiving data from the external device
The flow of processing when receiving data from the external device when not using the buffer memory automatic update function is shown in Fig. 6.4.

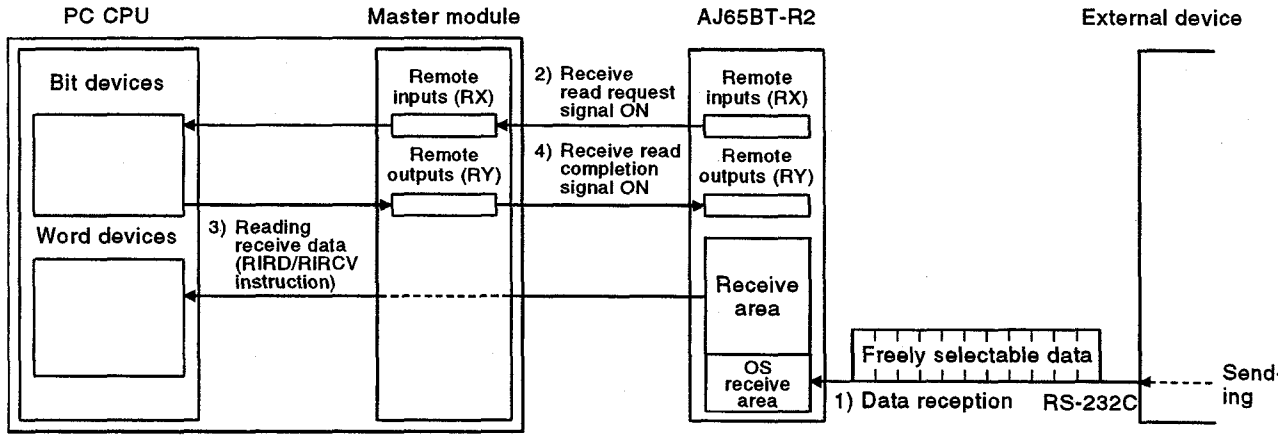
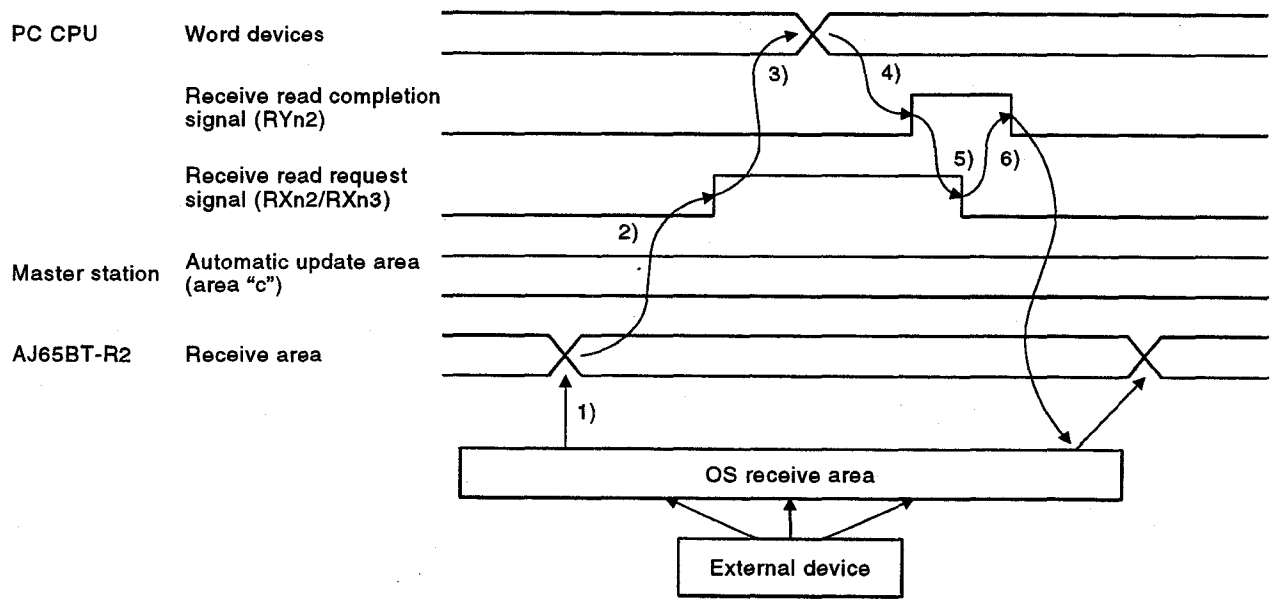


Fig. 6.4 Outline of Data Communication (Receiving)



1) The AJ65BT-R2 stores the data from the external device in the receive area via the OS receive area.
2) On completion of reception from the external device (*1), the AJ65BT-R2 turns ON the receive read request signal (RXn2/RXn3) to the PC CPU.
3) The data stored in the receive area of the AJ65BT-R2 is read with a G(P).RIRD/G(P).RIRCV instruction in the sequence program.
4) The receive read completion signal (RYn2) is turned ON by the sequence program.
5) The AJ65BT-R2 turns the receive read request signal (RXn2/RXn3) OFF.
6) The receive read completion signal (RYn2) is turned OFF by the sequence program.

*1 This means when data equivalent to the receive end number of data, or data up to the final receive frame, have been stored in the receive area.

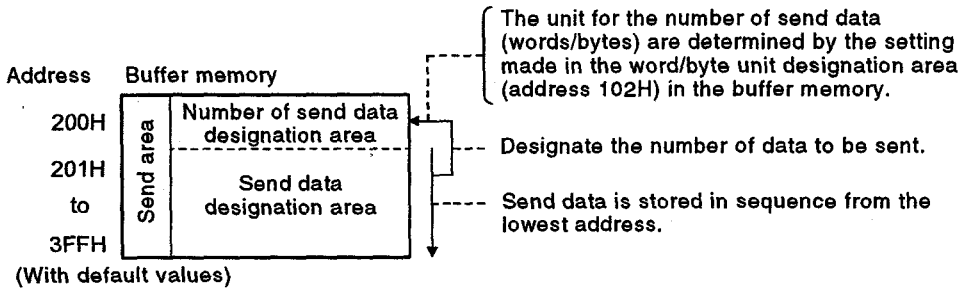
6.3 Designation of Send/Receive Areas, and Data Writing

(1) About the send area

The send area is a buffer memory area of the AJ65BT-R2 to which the PC CPU writes send data and the number of send data in order to send data from the PC CPU to the external device.

Addresses 200H to 3FFH of the buffer memory are allocated as default values for the send area.

The send area can be modified in accordance with the purpose of data sending, the specifications of the external device, and the length of the send data. (For details on the method for modification, see Section 5.2.1.)



POINT

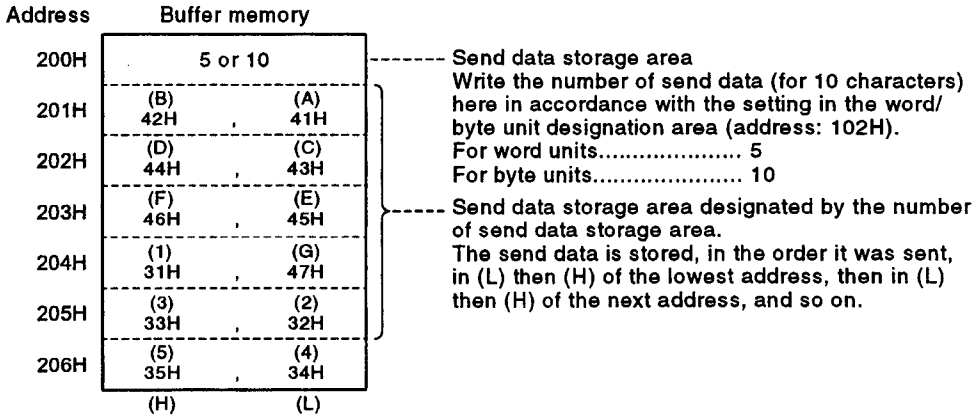
Ensure that the quantity of data in the freely selectable data part sent in one sending event from the PC CPU to the external device does not exceed the size of the AJ65BT-R2's send data storage area.

(Send data storage area) ≥ (quantity of data in freely-selectable data part sent from PC CPU)

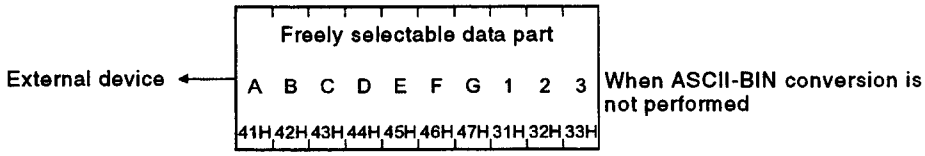
When it is necessary to send a quantity of data which cannot all be accommodated in the send data storage area, increase the size of the send area. It is possible to change the addresses and size of the send area.

(2) Methods for designating and writing send data
Data to be sent from the PC CPU to the external device is designated by using the send area of the buffer memory.
The methods for designating and writing send data are outlined below.
1) Write, in the number of send data designation area, the number of words or number of bytes (depending on the word/byte unit designation) of data to be written (or already written) to the send data designation area (default addresses: 201H to 3FFH).
2) Write the data to be written (freely-selectable data part in the send message) into the send data storage area.

Example : Sending the 10 characters "ABCDEFG123" (send area = default values)



When the send request signal (RYn0) is turned ON after execution of 1) and 2) above, the AJ65BT-R2 sends the designated number of the designated data to the send data storage area, in sequence starting from the lowest address.

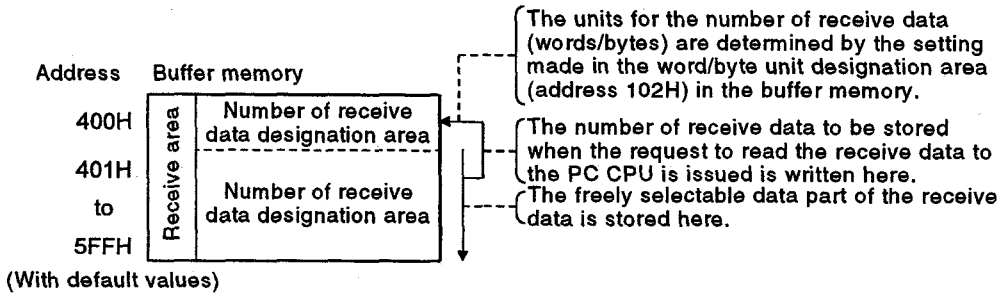


6.4 Receive Area, and Sequence of Receive Data

(1) About the receive area

The receive area is a buffer memory area of the AJ65BT-R2 which stores the receive data and the number of receive data in order to read the freely selectable data part of a messages received from the external device. Addresses (400H to 5FFH) of the buffer memory are allocated as default values for the receive area.

The receive area can be modified in accordance with the purpose of data reception, the specifications of the external device, and the length of the receive data. (For details on the method for modification, see Section 5.2.1.)



(With default values)

POINT

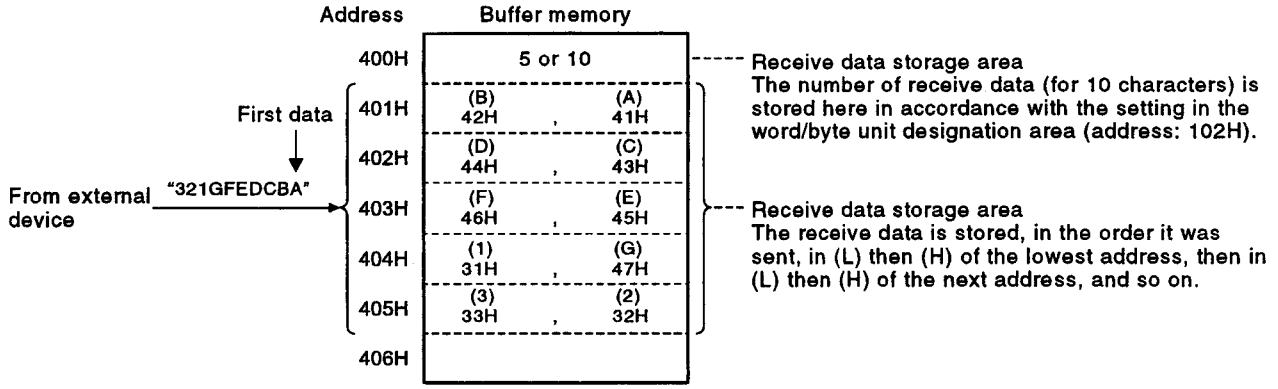
Ensure that the quantity of data in the freely selectable data part sent in one sending event from the PC CPU to the external device does not exceed the size of the AJ65BT-R2's receive data storage area.

(Receive data storage area) ≥ (quantity of data in freely-selectable data part sent from PC CPU)

When it is necessary to receive a quantity of data which cannot all be accommodated in the receive data storage area, increase the size of the receive area. It is possible to change the addresses and size of the receive area.

(2) Sequence of receive data
The sequence in which data received from the external device is stored in the receive area is described here.
1) The freely selectable data part of the received message is stored in the AJ65BT-R2 buffer memory (receive data storage area).
2) If ASCII-BIN conversion is performed, the binary data after conversion is stored.
3) When data is stored in the receive data storage area it is stored in the order in which it is received, starting with (L) → (H) of the lowest address, then (L) → (H) of the next address, and so on.

Example : Storing the 10 characters "ABCDEFG123", which are the freely selectable data part of the received data (receive area = default values)



When data equivalent to the receive end number of data has been received, the AJ65BT-R2 turns ON the receive data read request signal (RXn2/RXn3) to the sequence program.

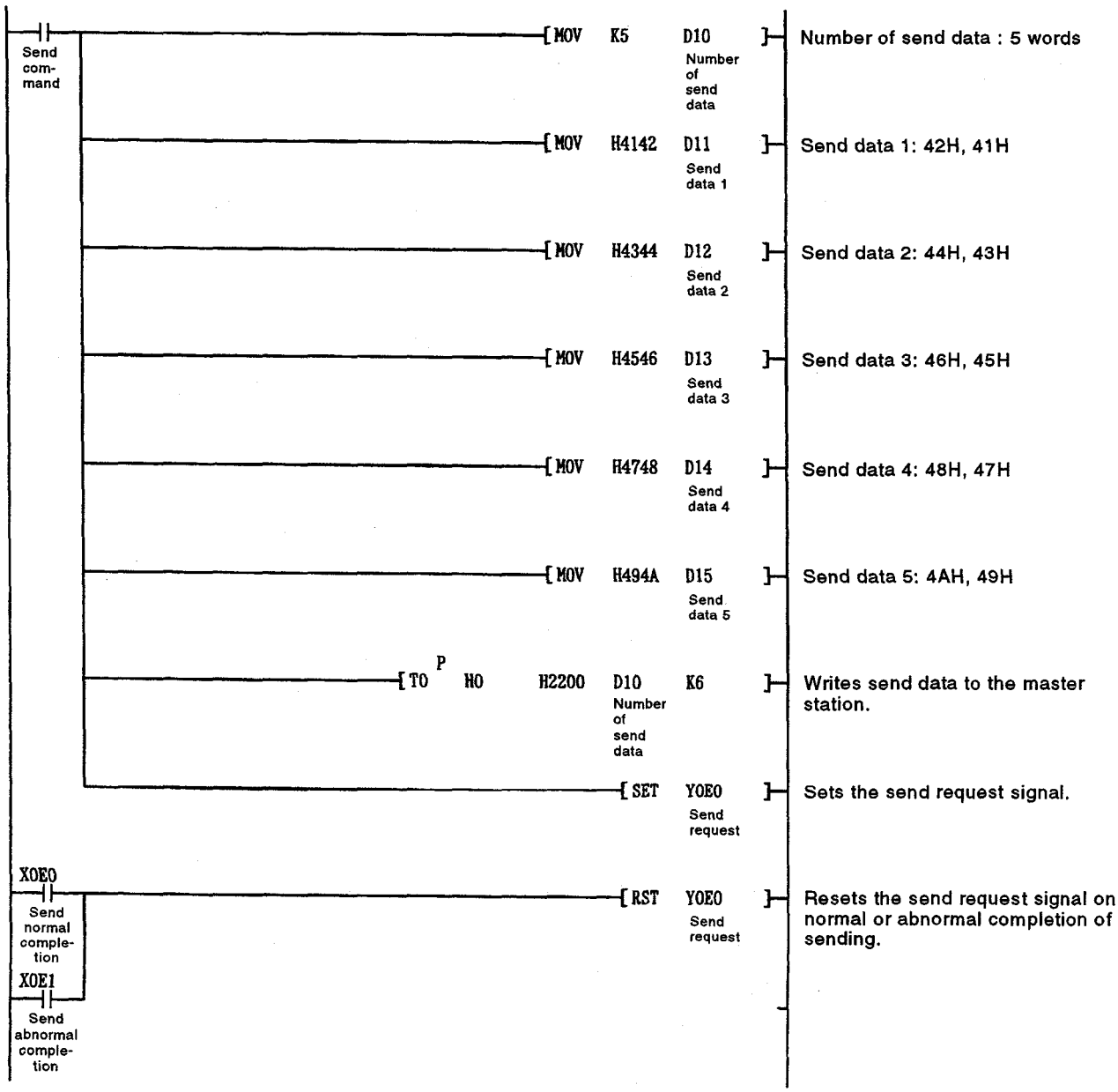
6.5 Example Programs for No-Protocol Communication

Examples of sequence programs for no-protocol data communication are presented below.

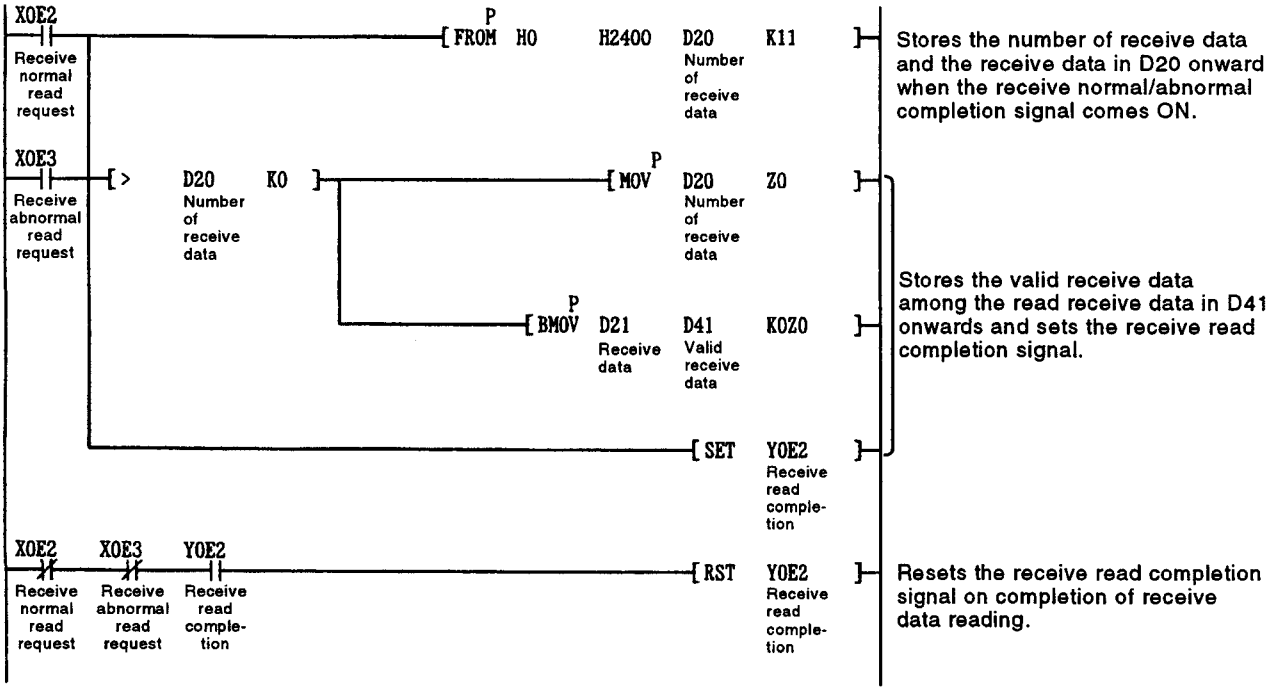
- First master module I/O number X/Y00 to 1F
- AJ65BT-R2 station number No. 1
- Remote inputs (station No.1) XE0 to YFF (RX0 to RX1F)
- Remote outputs (station No.1) YE0 to XFF (RY0 to RY1F)
- Automatic update area address
  When using a QnA series master module (e.g. AJ61QBT11) :
  2000H to 2FFFH
  When using an A series master module (e.g. AJ61BT11) :
  0H to FFFH of bank 2

(1) Program using FROM/TO instructions (buffer memory automatic update function effective, for QnACPU)

(a) Sending



(b) Receiving (receiving 10 words of data)

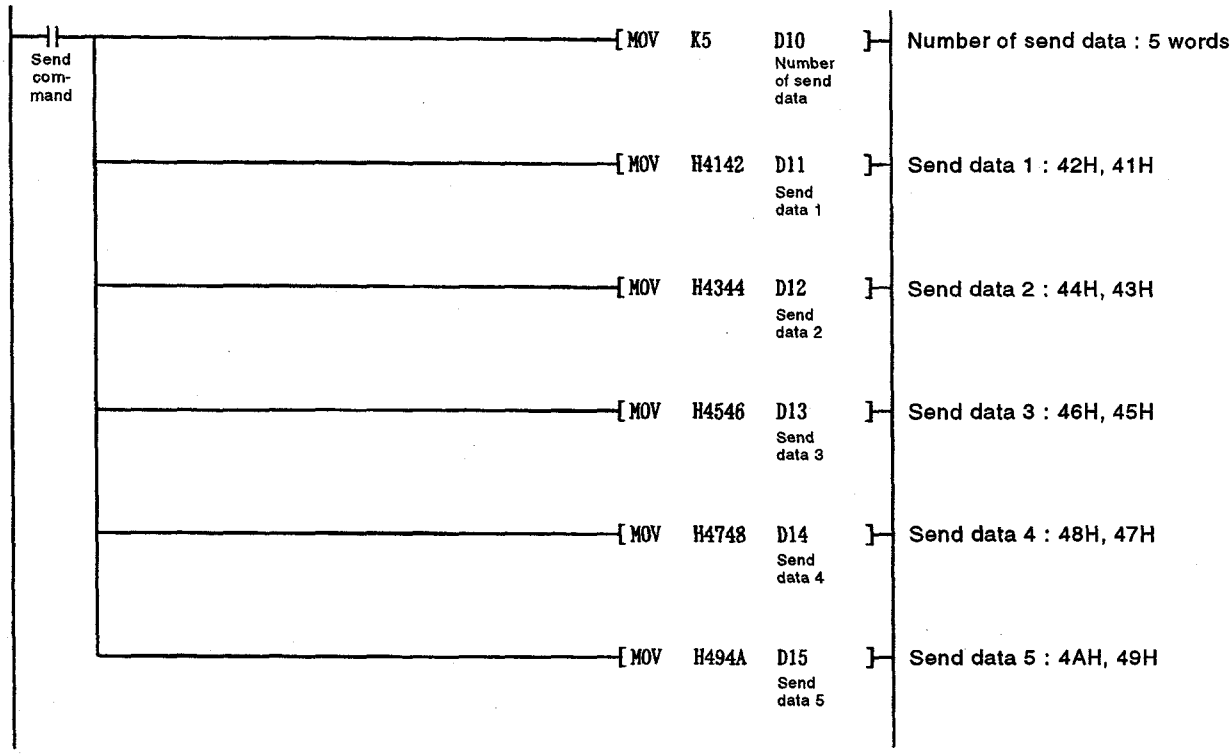


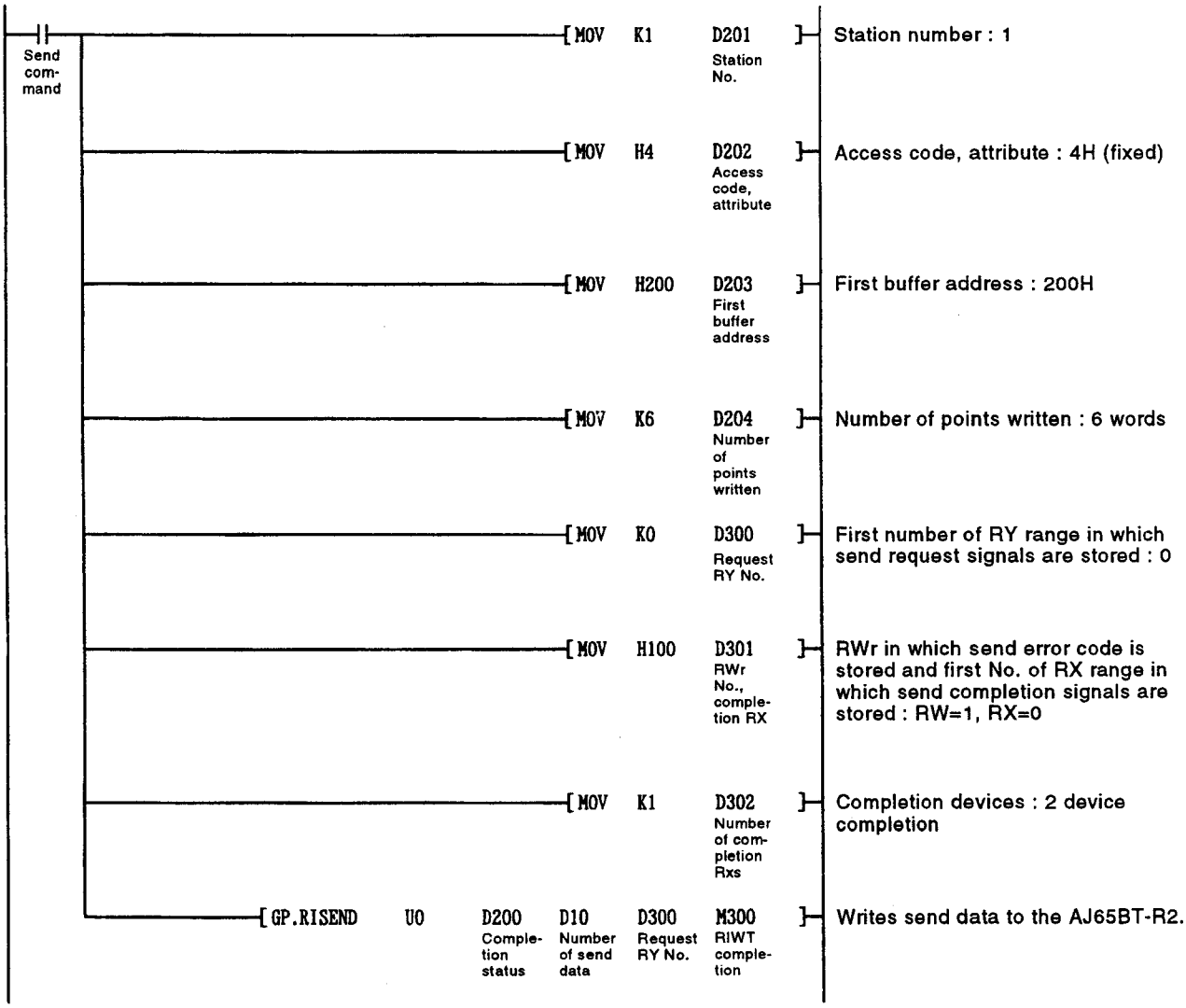
POINT

For an example of a sequence program for an A series master module (AJ61BT11/A1SJ61BT11), see Section 5.5.5 (4).

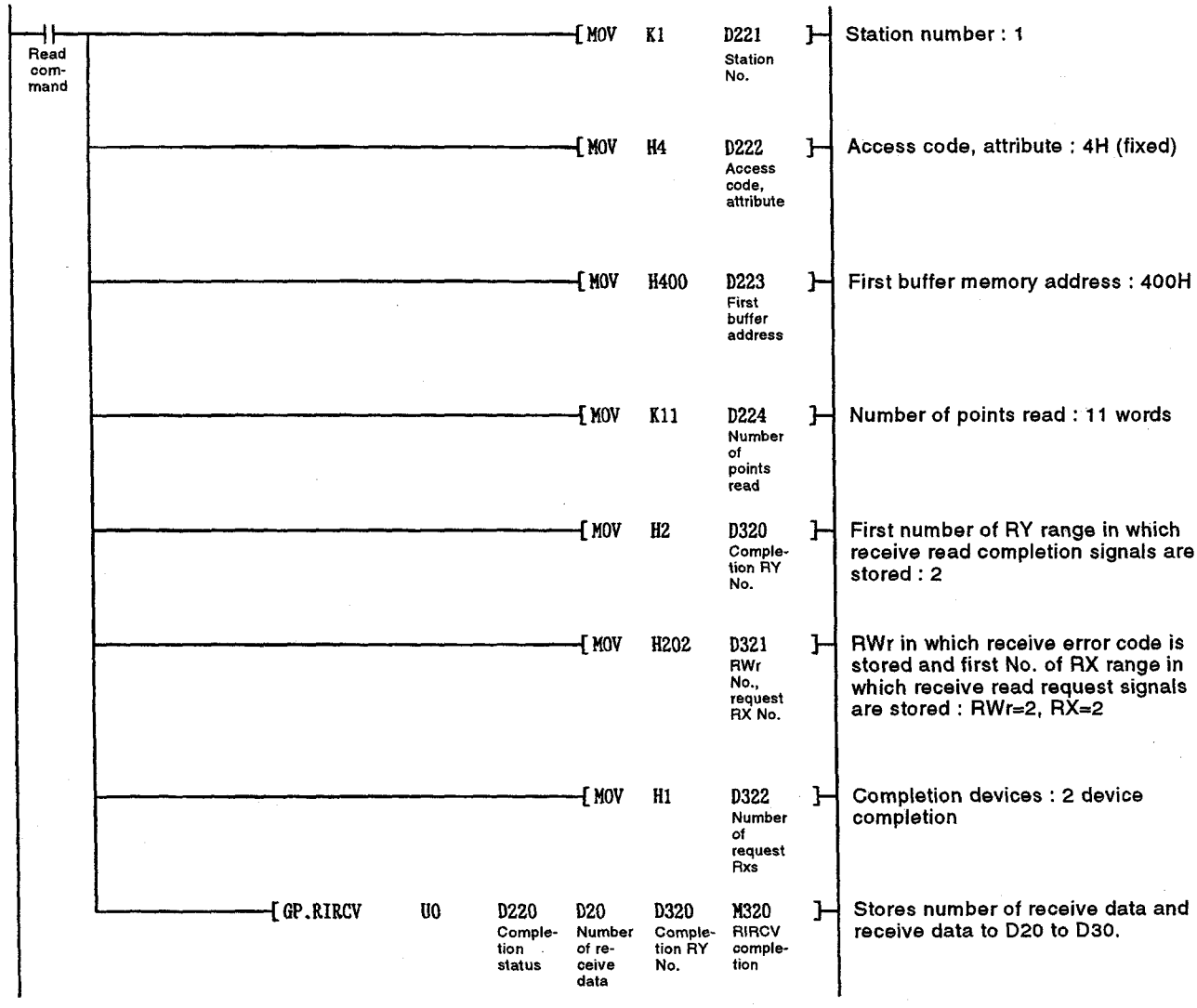
(2) Program using dedicated instructions (RISEND, RIRCV)

(a) Sending



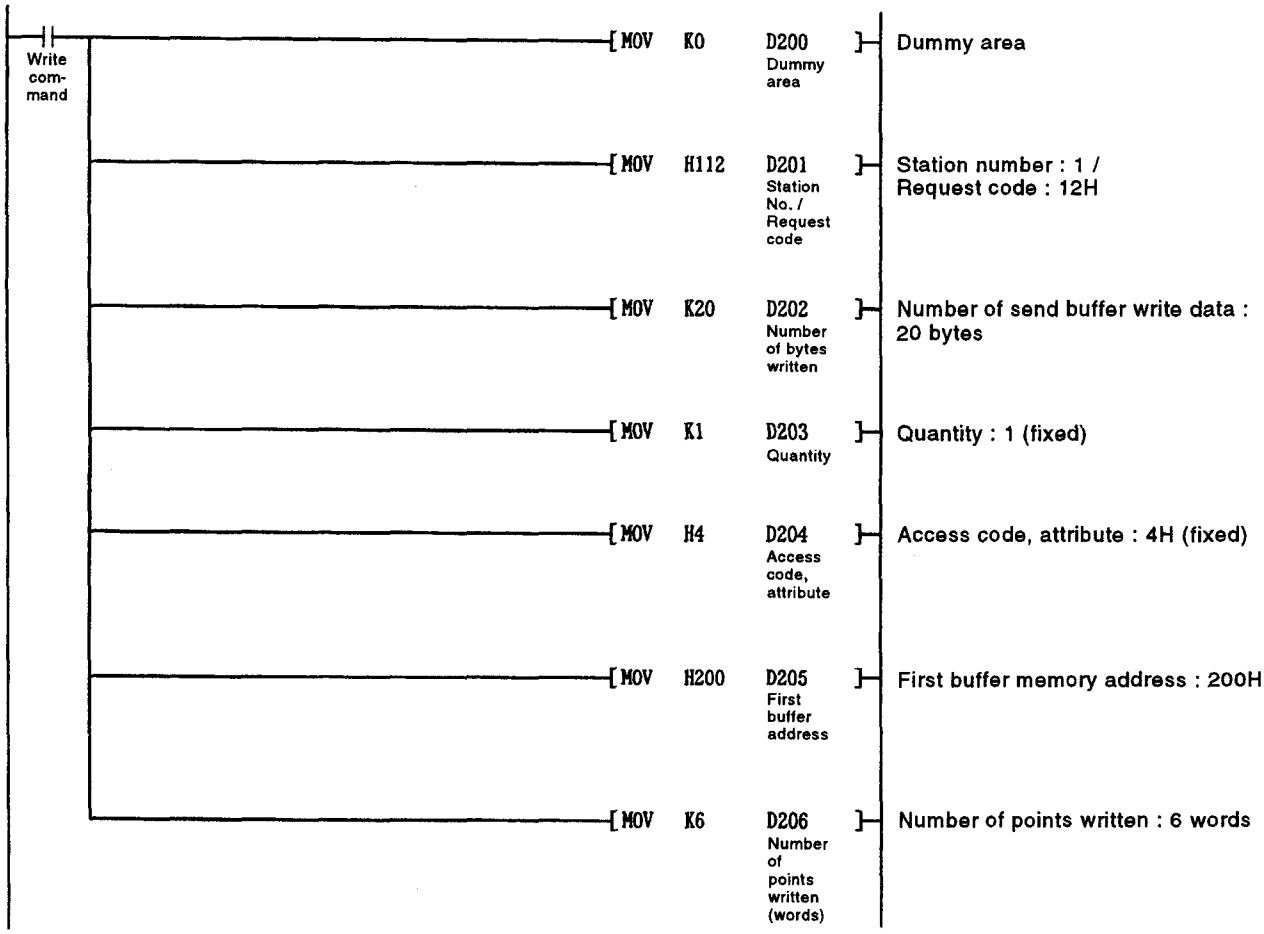

Send command
MOV K1 D201 Station No.
Station number : 1
MOV H4 D202 Access code, attribute
Access code, attribute : 4H (fixed)
MOV H200 D203 First buffer address
First buffer address : 200H
MOV K6 D204 Number of points written
Number of points written : 6 words
MOV K0 D300 Request RY No.
First number of RY range in which send request signals are stored : 0
MOV H100 D301 RWr No., completion RX
RWr in which send error code is stored and first No. of RX range in which send completion signals are stored : RW=1, RX=0
MOV K1 D302 Number of completion Rxs
Completion devices : 2 device completion
GP.RISEND U0 D200 Completion status D10 Number of send data D300 Request RY No. M300 RIWT completion
Writes send data to the AJ65BT-R2.

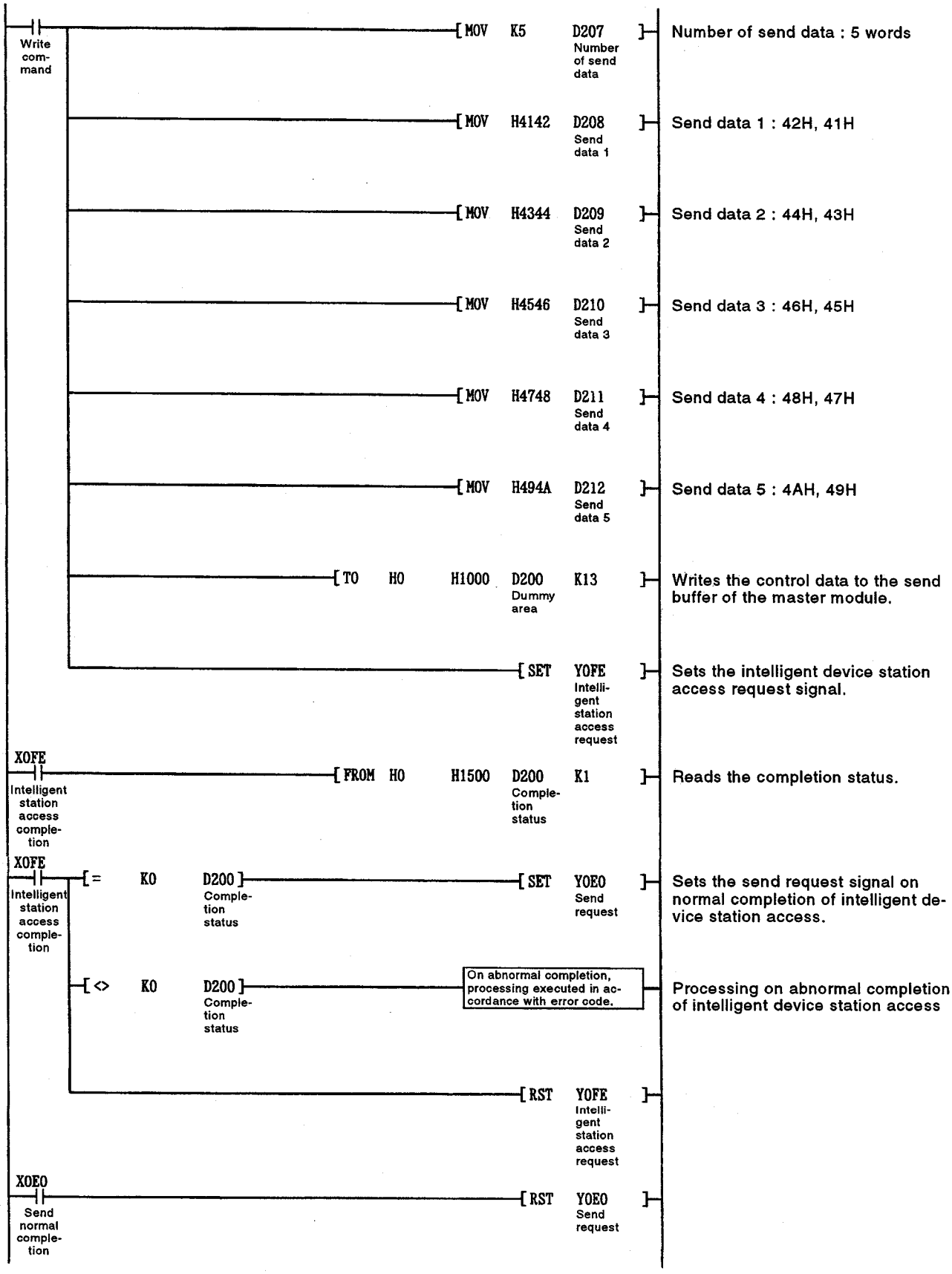
(b) Receiving


Read command
MOV K1 D221 Station No.
Station number : 1
MOV H4 D222 Access code, attribute
Access code, attribute : 4H (fixed)
MOV H400 D223 First buffer address
First buffer memory address : 400H
MOV K11 D224 Number of points read
Number of points read : 11 words
MOV H2 D320 Completion RY No.
First number of RY range in which receive read completion signals are stored : 2
MOV H202 D321 RWr No., request RX No.
RWr in which receive error code is stored and first No. of RX range in which receive read request signals are stored : RWr=2, RX=2
MOV H1 D322 Number of request Rxs
Completion devices : 2 device completion
GP.RIRCV U0 D220 Completion status D20 Number of receive data D320 Completion RY No. M320 RIRCV completion
Stores number of receive data and receive data to D20 to D30.

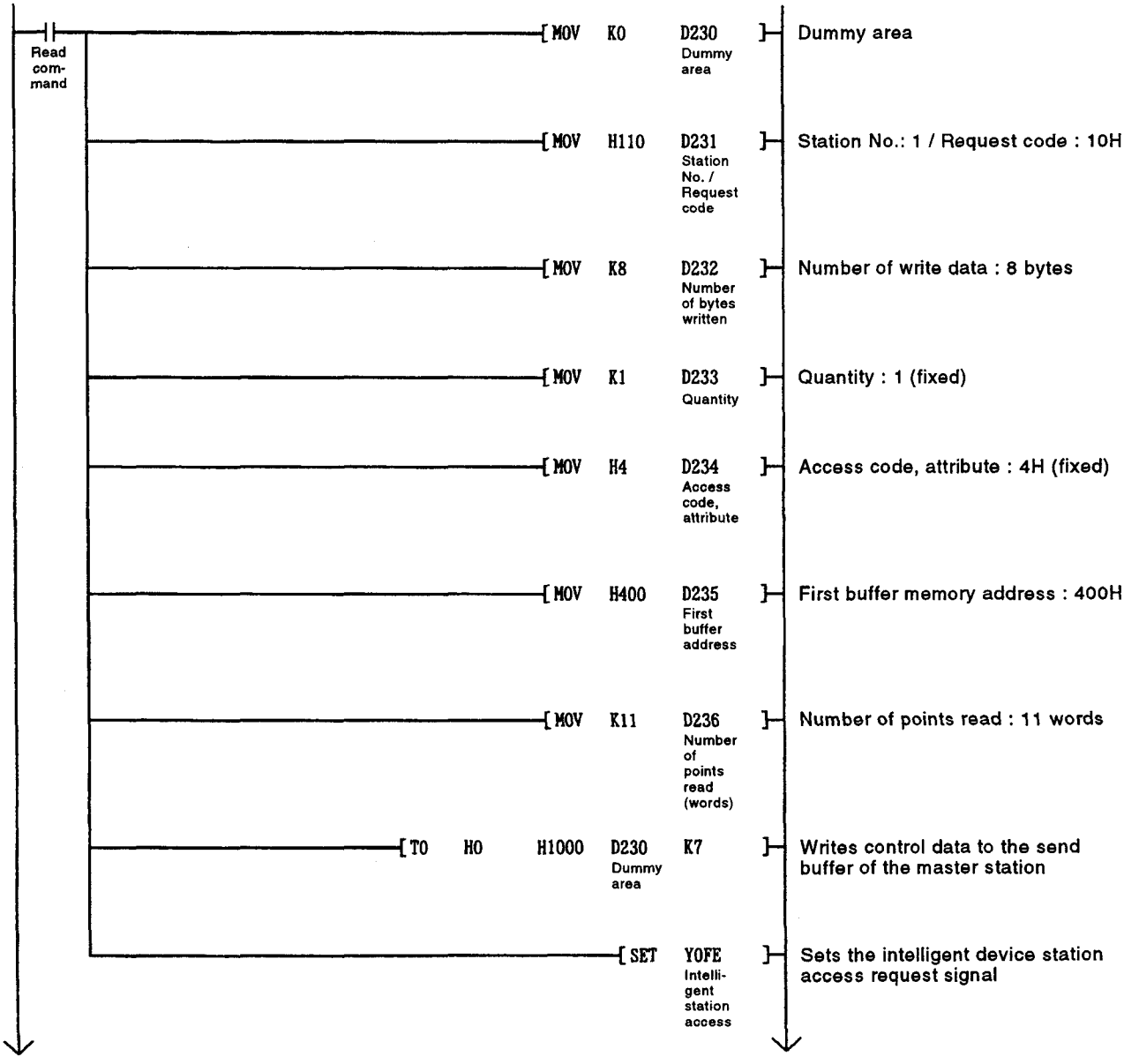
(3) Programs using FROM/TO instructions (buffer memory automatic update function ineffective)

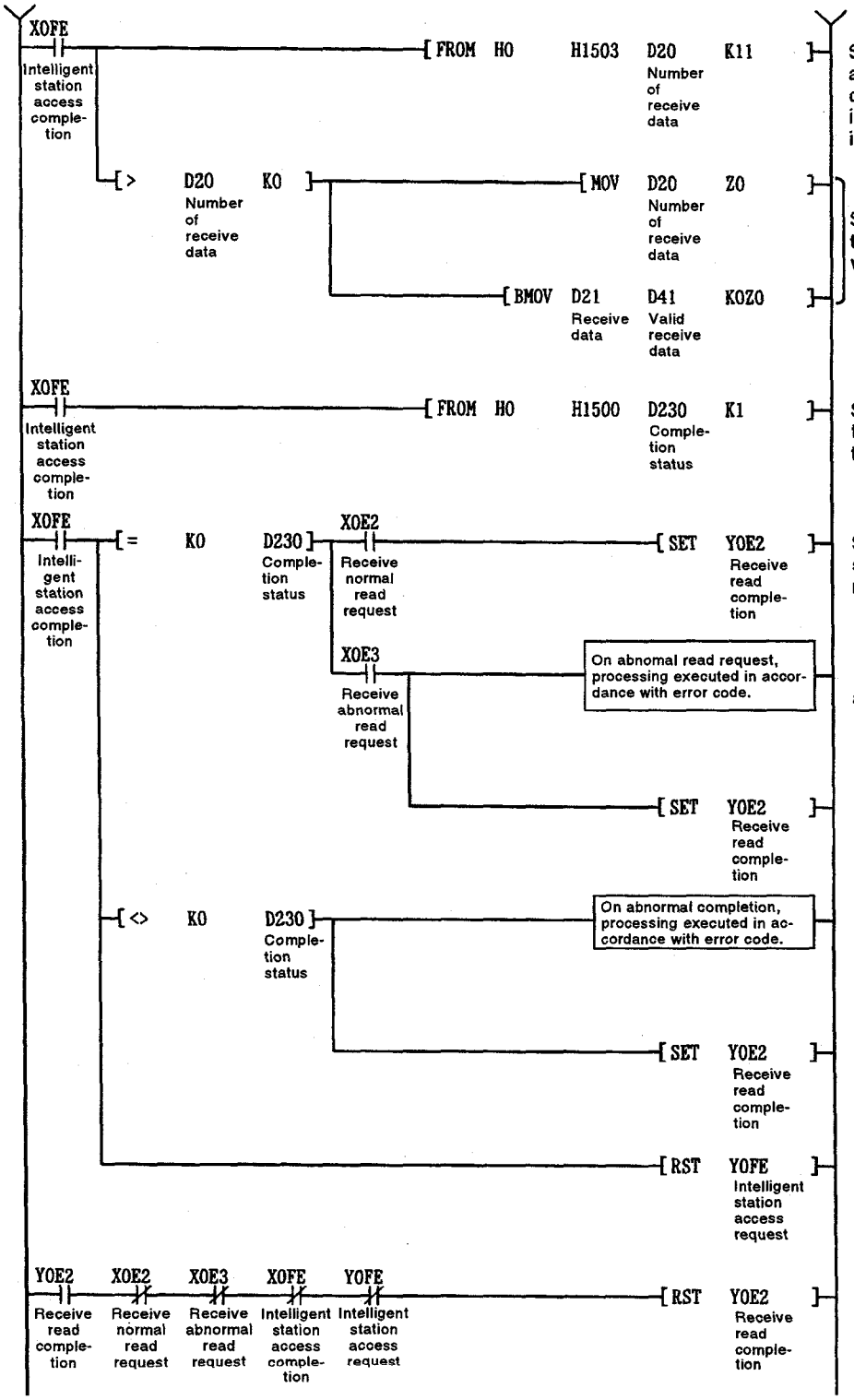
(a) Sending




Write command
[MOV K5 D207] Number of send data
Number of send data : 5 words
[MOV H4142 D208] Send data 1
Send data 1 : 42H, 41H
[MOV H4344 D209] Send data 2
Send data 2 : 44H, 43H
[MOV H4546 D210] Send data 3
Send data 3 : 46H, 45H
[MOV H4748 D211] Send data 4
Send data 4 : 48H, 47H
[MOV H494A D212] Send data 5
Send data 5 : 4AH, 49H
[TO H0 H1000 D200 K13] Dummy area
Writes the control data to the send buffer of the master module.
[SET YOFE] Intelligent station access request
Sets the intelligent device station access request signal.
XOFE
Intelligent station access completion
[FROM H0 H1500 D200 K1] Completion status
Reads the completion status.
XOFE
Intelligent station access completion
[= K0 D200] Completion status
[SET YOE0] Send request
Sets the send request signal on normal completion of intelligent device station access.
[<> K0 D200] Completion status
On abnormal completion, processing executed in accordance with error code.
Processing on abnormal completion of intelligent device station access
[RST YOFE] Intelligent station access request
XOE0
Send normal completion
[RST YOE0] Send request

(b) Receiving


Read command
[MOV K0 D230 Dummy area
Dummy area
[MOV H110 D231 Station No. / Request code
Station No.: 1 / Request code : 10H
[MOV K8 D232 Number of bytes written
Number of write data : 8 bytes
[MOV K1 D233 Quantity
Quantity : 1 (fixed)
[MOV H4 D234 Access code, attribute
Access code, attribute : 4H (fixed)
[MOV H400 D235 First buffer address
First buffer memory address : 400H
[MOV K11 D236 Number of points read (words)
Number of points read : 11 words
[TO H0 H1000 D230 Dummy area K7
Writes control data to the send buffer of the master station
[SET Y0FE Intelligent station access
Sets the intelligent device station access request signal


X0FE
Intelligent station access completion
[FROM H0 H1503 D20 K11]
Number of receive data
Stores the number of receive data and the receive data from the receive buffer of the master station into D20 to D30 on completion of intelligent device station access.
[> D20 K0]
Number of receive data
[MOV D20 Z0]
Number of receive data
[BMOV D21 D41 K0Z0]
Receive data
Valid receive data
Stores the valid receive data among the receive data read into D41 onward.
X0FE
Intelligent station access completion
[FROM H0 H1500 D230 K1]
Completion status
Stores the completion status from the send buffer of the master station into D230.
X0FE
Intelligent station access completion
[= K0 D230]
Completion status
X0E2
Receive normal read request
[SET Y0E2]
Receive read completion
Sets the receive read completion signal in response to the receive normal read request signal.
X0E3
Receive abnormal read request
On abnomal read request, processing executed in accordance with error code.
Processing in response to receive abnormal read request
[SET Y0E2]
Receive read completion
[<> K0 D230]
Completion status
On abnormal completion, processing executed in accordance with error code.
Processing on abnormal completion of intelligent device station access
[SET Y0E2]
Receive read completion
[RST Y0FE]
Intelligent station access request
Y0E2
Receive read completion
X0E2
Receive normal read request
X0E3
Receive abnormal read request
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
[RST Y0E2]
Receive read completion
Resets the receive read completion signal on completion of receive data reading.

7. FRAME COMMUNICATION USING THE DEFAULT REGISTERED FRAME

In frame communication, a fixed data sequence (called a "frame") is registered in advance in the AJ65BT-R2 in order to carry out communication of data in a message format that complies with the specifications of the external device being communicated with, and messages containing freely selectable data are sent and received between the AJ65BT-R2 and external device using this frame.
There are two types of frame for frame communication, as indicated below, and messages can be sent and received after designating the registration numbers of the default registered frames or user-registered frames.
By using the frame communication function, the parts of the program that deal with checking the received message at the PC CPU side and preparation of send data can be reduced.
This section describes frame communication using default registered frames.

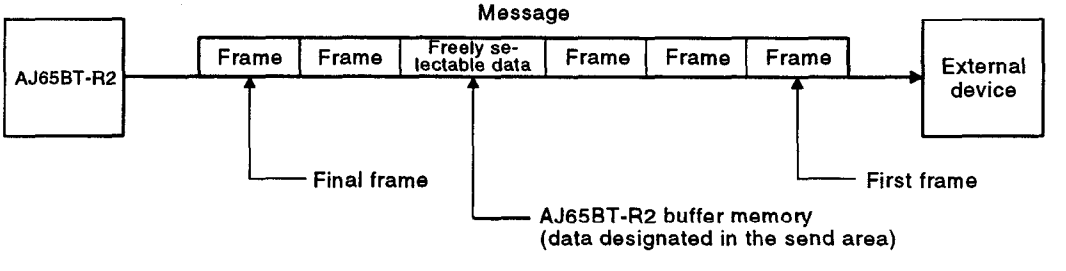
Type of Frame	General Description	Registered Frame No.	Frame Contents	Reference Page
Default registered frame	• Frame registered in the AJ65BT-R2 in advance. • The contents of the frame cannot be changed.	01H to FEH (1 to 254)	The data of codes 01H to FEH which correspond to the registration numbers are registered as 1 byte.	Section 3.7
		100H to 353H (256 to 353)	Data is registered assuming the sequence of data and special characters handled at the external device.	
User-registered frames (*1)	• Frames that the user registers in the E^2PROM of the AJ65BT-R2 with a freely selectable character string. • Up to 200 frames can be registered. • The contents of frames can be changed.	3E8H to 4AFH (1000 to 1199)	Character string designated as required by the user (1 to 80 bytes)	Chapter 8

*1 In frame sending using the send frame 2 area, the data written in the send area of the AJ65BT-R2 is also treated as a frame (frame No. 8000H).

7.1 Outline of Data Communication

7.1.1 Frame sending

Frame sending means the sending of a message comprising up to 100 frames only, or freely selectable data with a fixed number of frames (maximum total of 99) appended at the beginning and end, from the AJ65BT-R2 to the external device. In messages where frames are appended to freely selectable data, the frame at the beginning is called the "first frame" and the frame at the end is called the "final frame".
Example:



In frame sending, it is possible to designate the units (words or bytes) for the freely selectable data to be sent, and the send time-out time, in the same way as for no-protocol sending.
There are two methods for frame sending: one which uses the send frame 1 area of the AJ65BT-R2 and one which uses the send frame 2 area.

(1) Method using the send frame 1 area
Frame sending can be carried out by appending one frame each at the beginning and end of the freely selectable data.
The first frame and final frame for sending are designated in the send first frame number/send final frame number areas (addresses 118H and 119H) of the frame 1 area (detailed explanation: Section 5.2.2).
The protocol for frame sending is no-protocol sending with a part for send frame designation added.
A schematic diagram for frame sending using the send frame 1 area is presented in Figure 7.1.

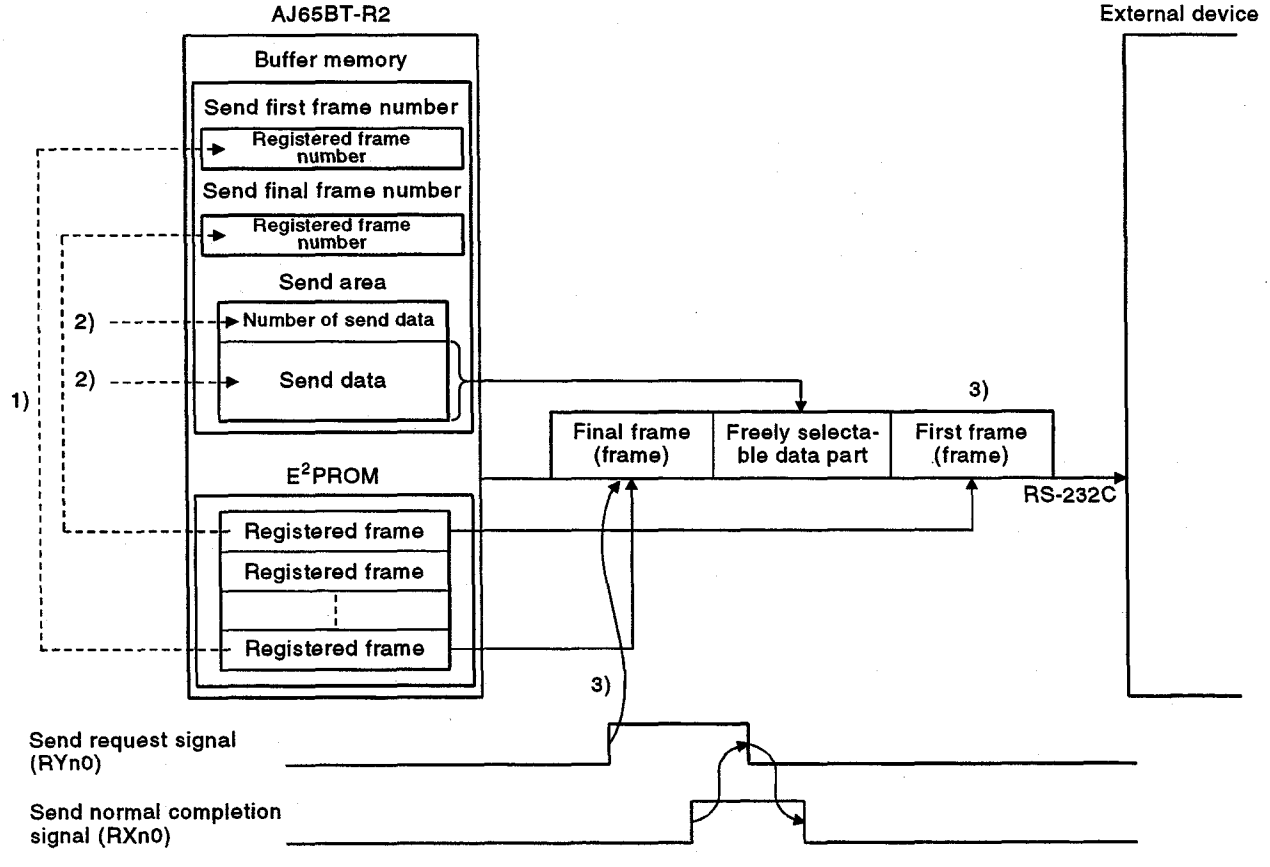


Fig. 7.1 Schematic Diagram of Frame Sending (Using Send Frame 1 Area)

1) Designate the registered frame number for the send first frame in the "send first frame number" area of the AJ65BT-R2 buffer memory. Also designate the registered frame number for the final frame in the "send final frame number" area.
2) Designate the number of send data, and the send data, for the freely selectable data part to be sent.
3) When the send request signal is turned ON, data is sent from the AJ65BT-R2 to the external device.

(2) Method using the send frame 2 area
A maximum of 100 frames only, or freely selectable data with a total of up to 99 frames appended at its beginning and end can be sent.
The frame for sending is designated in the "send table designation" area of the send frame 2 area (detailed explanation: Section 5.2.2).
The protocol for frame sending is no-protocol sending with a part for send frame designation added.
A schematic diagram for frame sending using the send frame 2 area is presented in Figure 7.2.

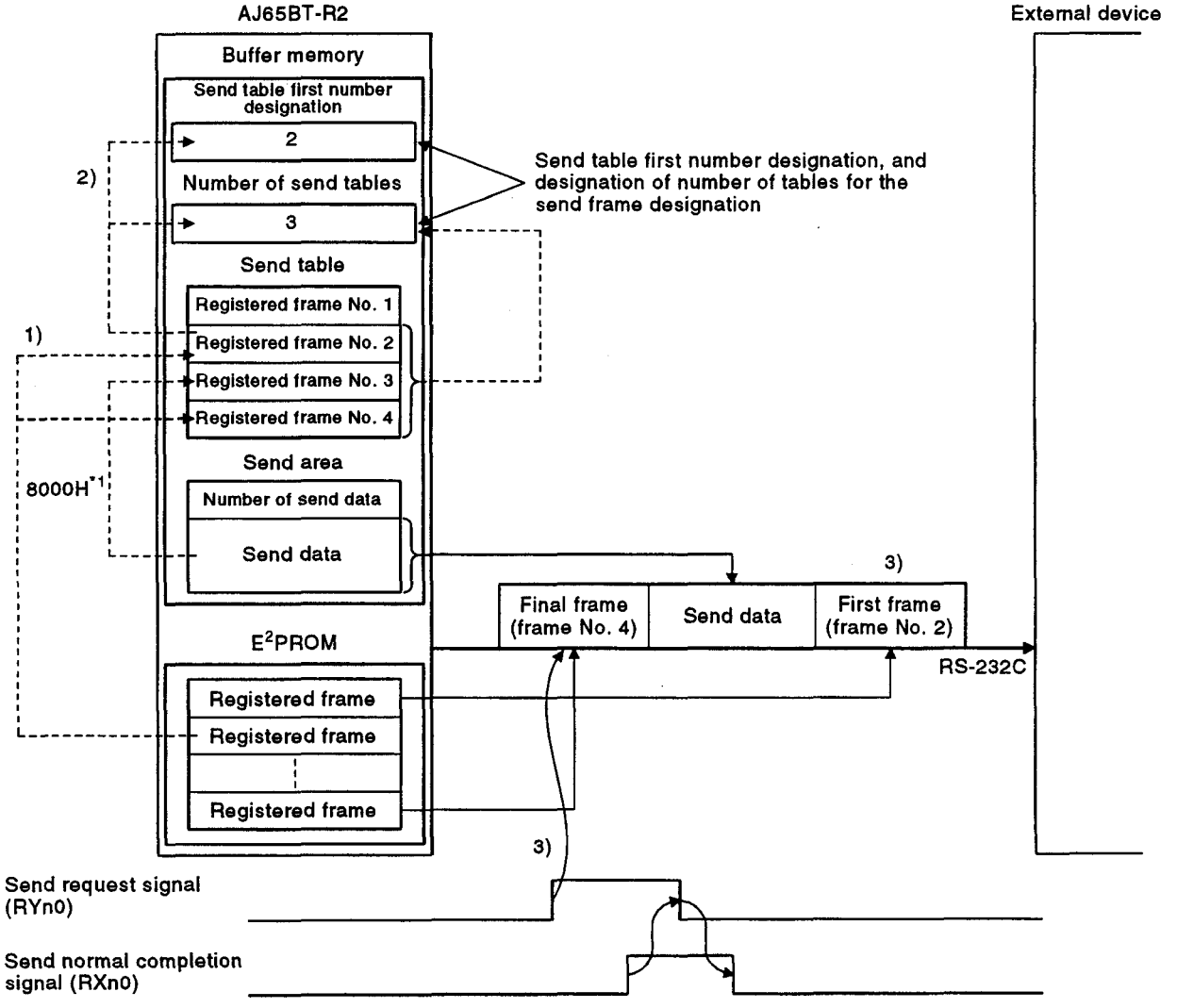


Fig. 7.2 Schematic Diagram of Frame Sending (Using Send Frame 2 Area)

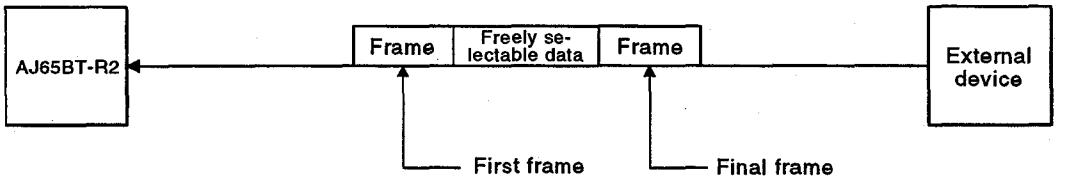
1) Designate the registered frame numbers of the frames to be sent in the send table.
2) Designate the first number of the send table for which the registered frame numbers of the frames to be sent have been designated, in the "send table first number designation" area of the AJ65BT-R2 buffer memory.
Also, designate the number of send tables for which registered frame numbers to be sent have been designated in the "number of send tables" area.
3) When the send request signal (RYn0) is turned ON, data is sent from the AJ65BT-R2 to the external device.

*1 To send the data written in the send area, designate the frame number 8000H.

7.1.2 Frame receiving

Frame receiving means the checking and storage in buffer memory of a message that contains data in the same sequence as that in the frame registered in the AJ65BT-R2, and which has been received by the AJ65BT-R2 from an external device.
When reception processing starts on reception of a message by the AJ65BT-R2, the first sequence of data is called the "first frame" and the last sequence of data is called the "final frame"; taking the data of each frame as one group, a maximum of four groups can be set in the buffer memory of the AJ65BT-R2 in advance.
(Set in the "receive first/final frame number" area (addresses: 108H to 10BH, 10CH to 10FH)) It is possible to set combinations in which there is no first frame or no final frame (detailed explanation: Section 7.2.2).

Example:



The protocol for frame receiving is the protocol for no-protocol receiving with a part that designates the frame for receiving added.
On reception of data in the same sequence as that of any of the set frames, the AJ65BT-R2 starts data receive processing, and on reception of the final frame, or after data making up the "receive end number of data" has been received, it carries out read request processing with respect to the PC CPU.
The AJ65BT-R2's check on the frames of the received message is performed on the first frame and final frame.
In frame receiving, word/byte unit designation, receive time-out time designation, and receive end number of data designation are possible with respect to the freely selectable data part in the same way as in no-protocol receiving.

* Depending on the setting made for receive first frame/receive final frame cancel designation in the initial settings of the AJ65BT-R2, it is possible to read either the freely selectable data only, or all of the data, to the PC CPU.
* If one or more receive first frames are designated, the receive data between reception of the final frame - or data that completes reception of the receive end number of data - and the next first frame is ignored.

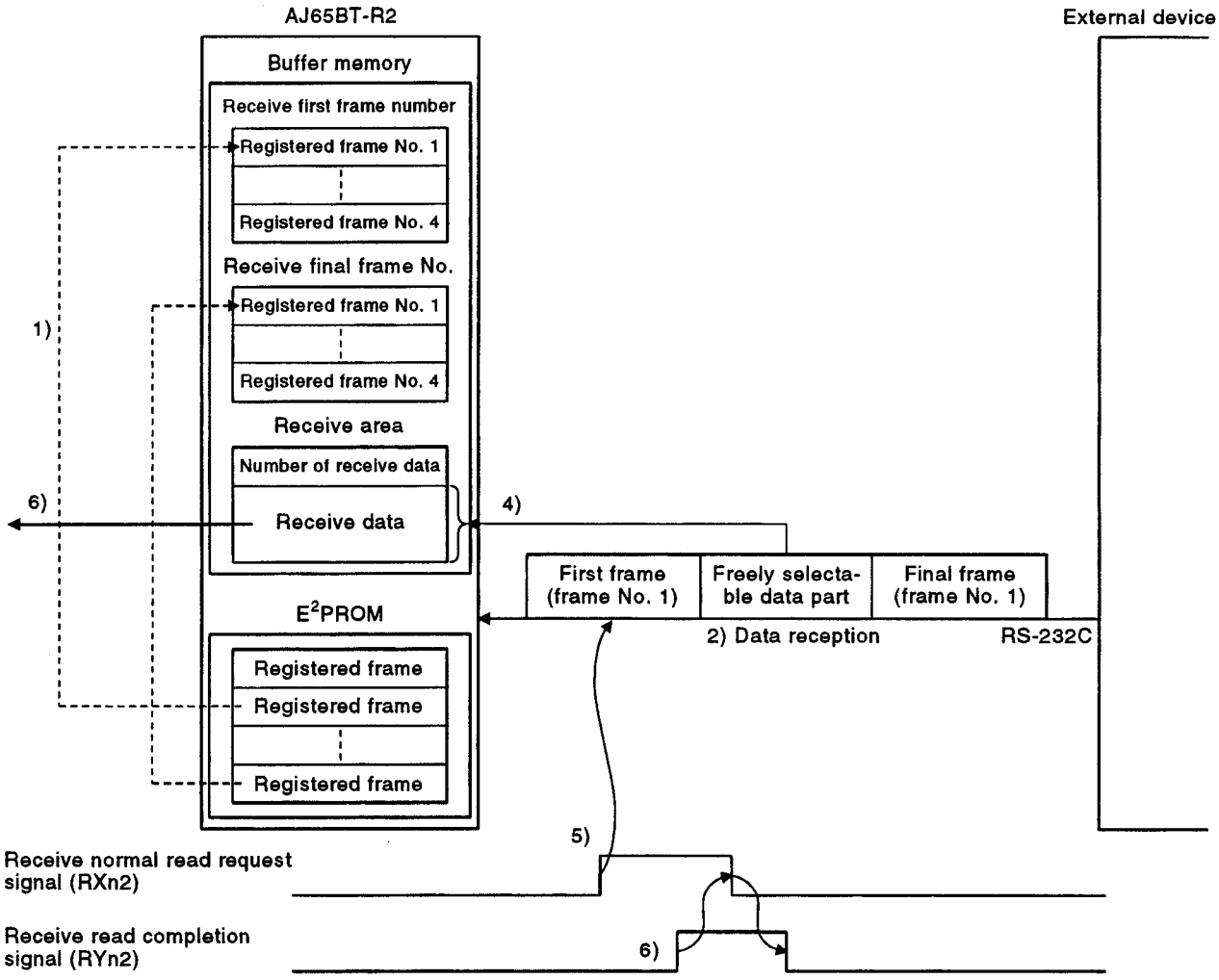


Fig. 7.3 Schematic Diagram of Frame Receiving

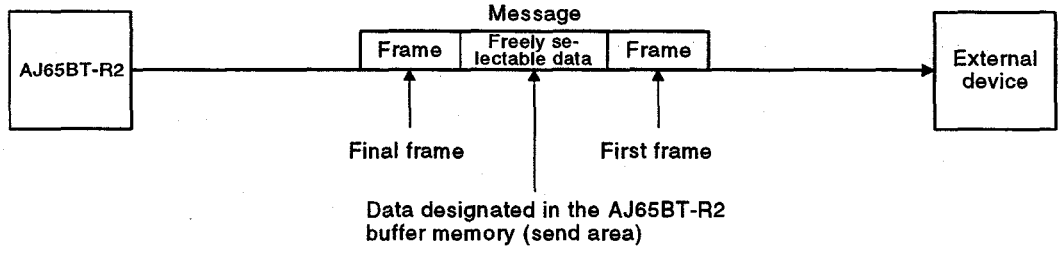
1) Designate the registered frame numbers for receiving in the receive first /final frame number area.
2) Data is received from the external device.
3) If there is any data (first frame) in the same sequence as in any of the registered frames designated with the receive first frame numbers, receive processing is started.
4) On reception of data in the same sequence as the designated final frame corresponding to the received first frame, or on receiving data making up the "receive end number of data", the AJ65BT-R2 stores the freely selectable data part in the receive area.
5) On completion of reception of the designated message, the AJ65BT-R2 turns ON the receive normal read request signal (RXn2) to the PC CPU (assuming normal completion).
6) The PC CPU reads the receive data from the AJ65BT-R2 and turns ON the receive read completion signal (RYn2).

7.2 About Send/Receive Data in Frame Communication

7.2.1 Send data

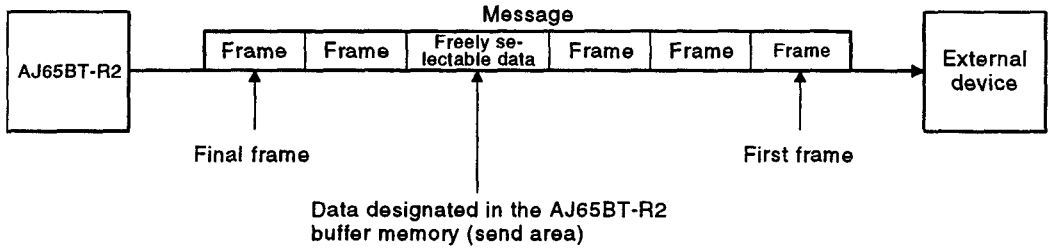
(1) Sequence of send data
The sequence of data when it is sent by frame sending is as shown in the figure below.
For both sending using the send frame 1 area and sending using the send frame 2 area, if there is no send designation for any data part, the corresponding data will not exist.

1) When using the send frame 1 area
Example:



- Presence/absence of first frame/final frame part
If one or more frame numbers are designated in the send first frame number area (address 118H), and send final frame number area (address 119H) of the send frame 1 area, the registered data corresponding to those numbers is sent.
If "0" is designated, the corresponding data is not sent.
- Presence/absence of freely selectable data part
If "1" or greater is set in the number of send data designation area of the send area, the designated number of words or bytes of data are sent from the send data designation area. If "0" is set in the number of send data designation area, the freely selectable data part is not sent.

2) When using the send frame 2 area
Example :



- Presence/absence of frame parts
  If there are designations (other than "0") in the send table first number designation area (address 120H), number of send tables designation area (address 121H), and send table designation area (addresses: 122H to 185H) of the send frame table 2 area, the registered data of the registered frame numbers designated in the send table area are sent.
  If "0" is designated in the send table first number designation area (address 120H), no data is sent using the frame 2 area.

- Presence/absence of freely selectable data part
  If the frame number "8000H" is designated in the send table designation area, the number of words or bytes of data designated in the number of send data designation area is sent from the send data designation area.
  The data in the AJ65BT-R2's send area is also treated as one frame (frame No. 8000H).
  The data in the send area can be designated at any position from the first to the final position in the send table designation area.

POINT

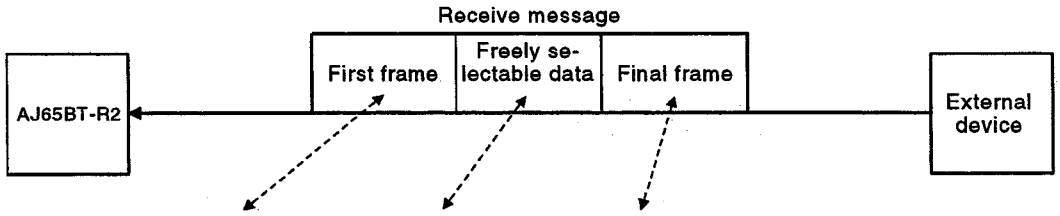
- Do not include data in the same sequence as that in the send first frame and send final frame in the freely selectable data part.
  If there is such data in the freely selectable data part, it could be misinterpreted as the send first frame or send final frame by the communicating external device.

7.2.2 About receive data

(1) Sequence of receive data
Messages received in frame receiving must comply with one of the data sequences indicated in the combination table below.

Group 1 { 1) 2) 4) 5) } Or Group 2 { 3) 6) 7) }

This means that settings in the receive first frame number/receive final frame number areas (addresses 108H to 10BH, 10CH to 10FH) of the AJ65BT-R2 buffer memory can only be made within the group 1) 2) 4) 5) or the group 3) 6) 7).



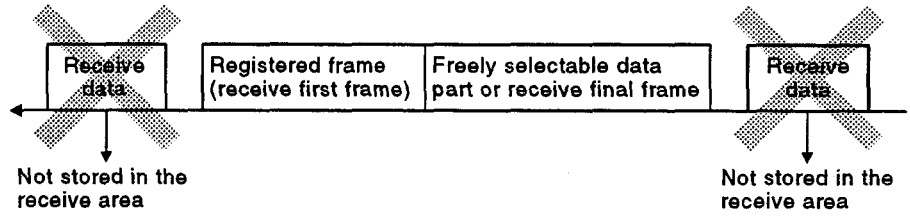
Combination	Registered Frame (Receive First Frame)	Freely Selectable Data Part	Registered Frame (Receive Final Frame)	Group 1	Group 2
1)	o	o	o	o	
2)	o	o	—	o	
3)	—	o	o		o
4)	o	—	o	o	
5)	o	—	—	o	
6)	—	o	—		o
7)	—	—	o		o

o : Receive data — : No receive data

If the combination of designations for the first frame or final frame made in the receive first frame number area/receive final frame number area (addresses 108H to 10BH, 10CH to 10FH) of the AJ65BT-R2 buffer memory mixes group 1 and group 2 (for example 1) 2) 3)), receive processing will only be carried out with respect to group 1.
Group 2 data may be ignored or be subject to abnormal receive processing.

POINTS

(1) If one or more combinations for which receive first frame is designated 1) 2) 4) 5) in the combination table) are set, match the receive end number of data (set at buffer memory address 111H) to the length of the received freely selectable data part.
If a receive first frame is designated, data between reception of the final frame - or data that makes up the receive end number of data - and the next first frame is not stored in the receive area of the AJ65BT-R2.



(2) Do not include data in the same sequence as that of the receive first frame or receive final frame in the freely selectable data part.
If there is such data in the freely selectable data part, the AJ65BT-R2 may misinterpret it as the send first frame or send final frame.

(3) Keep the length of the message received in frame receiving within the size of the receive data storage area.
If it exceeds the size of the receive data storage area, a "receive data buffer size exceeded" error will occur.

(4) If "not canceled" is set for the receive first frame/receive final frame cancel designation, the first and receive final frames will be included in the number of receive data on completion of reception.
In this case, the number of receive data when a request to read receive data is issued to the PC CPU is as follows.

Number of receive data = receive end number of data + (actual number of bytes of data in frames stored in receive area)

Consequently, there is a discrepancy between the receive end number of data designation and the number of receive data.

7.2.3 Reading receive data

(1) Comparison with no-protocol communication
The table below shows the timings for reception start and reception completion for frame receiving and for receiving data during no-protocol communication.

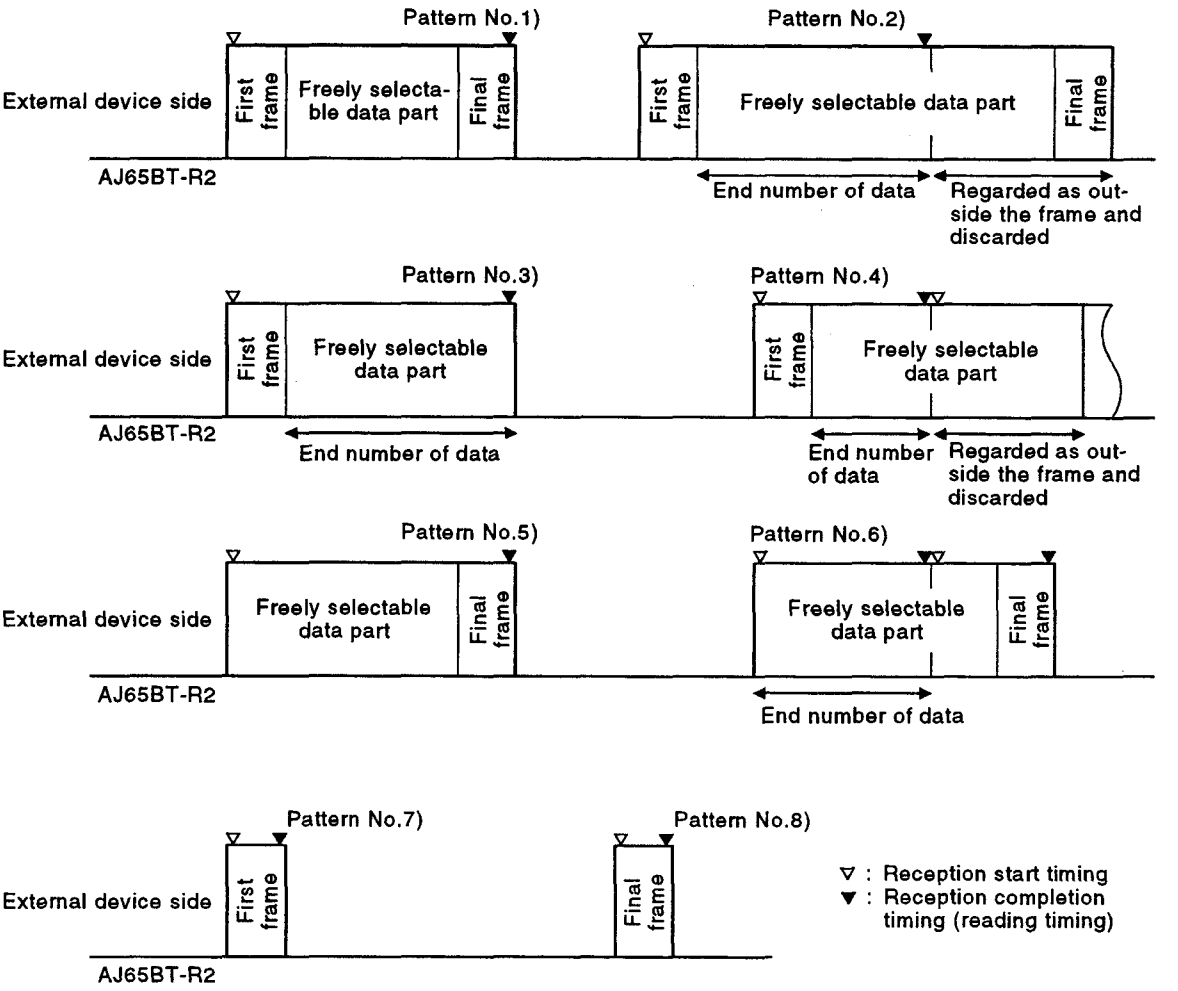
	Frame Receiving (see (2) for each timing)	Data Reception during No-Protocol Communication
Reception start	When a receive first frame and receive final frame are set: on reception of the first frame. When only a receive first frame is set : on reception of the first frame. When only a receive final frame is set : on reception of the first data in the freely selectable data part. (If there is no freely selectable data part, on reception of the receive final frame)	On reception of the first data.
Reception completion	• On reception of data making up the receive end number of data, or on reception of the final frame. (Depends on condition set in advance ... see (2).) • On occurrence of a receive error (e.g. when the receive time-out time is reached). * All data up to either of the reception events described above or occurrence of an error is stored in the receive area of the buffer memory. (*1)	• On reception of the receive end number of data. • On occurrence of a receive error (e.g. when the receive time-out time is reached). * All received data is stored in the receive area of the buffer memory.

*1 The received message is stored in compliance with the receive first frame/receive final frame cancel designation (made in buffer memory address 110H).
When no receive first frame/receive final frame designation is made, only the freely selectable data is stored in the receive area.
Even if just one or the other of the receive first frame and receive final frame designations is made, both the designated frame part and the freely selectable data part are stored in the receive area in the order in which they were received.

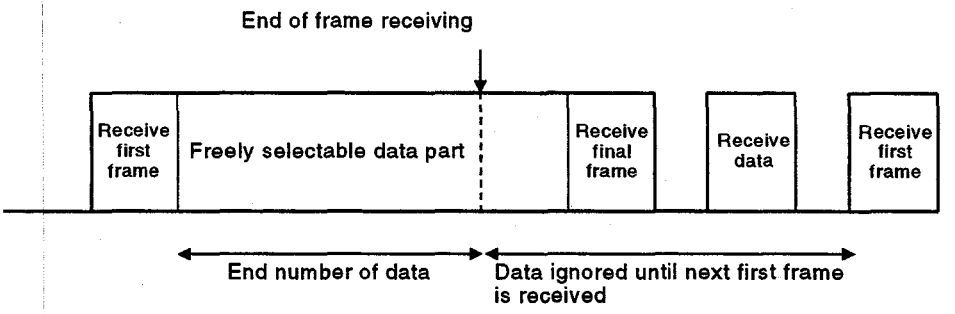
(2) Receive data and read timing

The timing when the AJ65BT-R2 issues a request to read receive data to the PC CPU in response to the final frame or receive end number of data is described here. The numbers in the table correspond to the receive message/timing pattern examples presented under the table.

Setting \ Receive Data: Freely Selectable Data Part Receive Data		Timing Pattern Number (see below): On Reception of First Frame	On Reception of Freely Selectable Data Part in Received Message	On Reception of Final Frame	Remarks
When both receive first frame and receive final frame are set	Number of receive data > receive end number of data	2)			For details on data that can be read at the PC CPU, see Section 7.2.3 (1) *1.
	Number of receive data ≤ receive end number of data	1)			
	Receive end number of data = 0				
When only the receive first frame is set	Number of receive data > receive end number of data	4)			
	Number of receive data ≤ receive end number of data	3)			
	Receive end number of data = 0	7)			
When only the receive final frame is set	Number of receive data > receive end number of data	6)			—
	Number of receive data ≤ receive end number of data	5)			
	Receive end number of data = 0	8)			



*1 When only a receive first frame designation is made, frame receiving is completed when the number of data set in the receive end number of data designation area (address 111H) has been received.
Note also that even when both receive first frame and receive final frame designations have been made, frame receiving is ended when the receive end number of data is reached, and data is then ignored until the next first frame is received.
Example:



*2 If the receive end number of data is set as "0" when both receive first frame and receive final frame designations are made, frame receiving is ended when the receive final frame is received.
This enables you to vary the length of the freely selectable data part.

POINT

When the AJ65BT-R2 detects an error during data reception, it stores freely selectable data part data in the receive data, up to the point immediately before the error occurred, in the receive area of the buffer memory, and turns ON the receive abnormal read request signal (RXn3).

7.3 Buffer Memory Settings for Frame Communication

7.3.1 Items to be set in the buffer memory

The buffer memory settings to be set for frame communication are shown in Table 7.1 (detailed explanation: Section 5.2.2).
In order to carry out frame communication, you must create a sequence program to read from and write to the buffer memory areas used.

Table 7.1 Buffer Memory Settings Relating to Frame Communication

Buffer Memory Address	Name			Description	
102H	Word/byte unit designation			Designate whether the units for the number of send data and number of receive data in data communication are to be words or bytes.	
108H to 10BH	Receive first frame number			Designate the number of the first frame in frame receiving.	Max. 4 groups
10CH to 10FH	Receive final frame number			Designate the number of the final frame in frame receiving.	
110H	Receive first frame/receive final frame cancel designation			Designate whether the data in the first frame part and final frame part are stored in the receive area or not in frame receiving.	
111H	Receive end number of data designation			Designate the number of data at which reception is to stop when only a fixed length of receive data (of the "freely selectable data part" in the case of frame receiving) is to be read.	
112H	Receive time-out time designation			Designate the receive time-out time for data receiving.	
118H	Send frame 1 area	Send first frame number		Designate the number of the first frame for frame sending.	
119H		Send final frame number		Designate the number of the final frame for frame sending.	
11AH	Send time-out time designation			Designate the send time-out time, from the start to the completion of data sending.	
120H	Send frame 2 area	First send table number designation		Write the first position of the send table designation area when executing frame sending.	
121H		Number of send tables		Write the number of registered frames that are to be sent, starting from the position designated in the first send table number designation area.	
122H		Send table designation	No. 1	Designate the numbers of the frames to be sent. When sending data written in the send area, use "8000H" as a provisional registered frame number.	
to			to		
185H			No. 100		

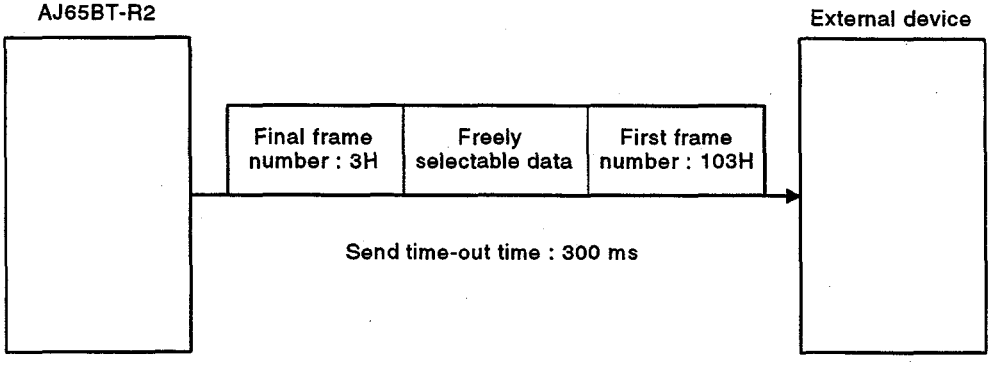
POINT

After the settings in the special purpose area of the AJ65BT-R2 buffer memory have been changed, carry out AJ65BT-R2 initialization processing as described in Section 9.7.
The AJ65BT-R2 buffer memory special purpose areas for which initialization processing is necessary are the areas indicated in the "Initialization" column of Table 3.6 in Section 3.6.

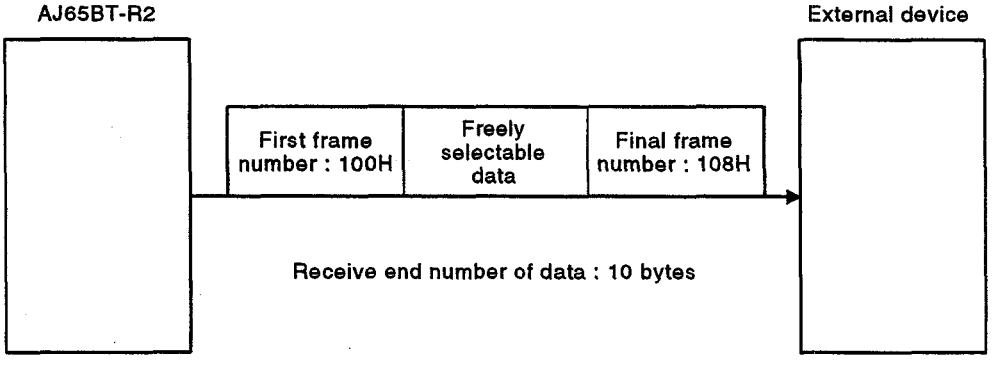
7.3.2 Buffer memory setting example

An example of the buffer memory settings for frame communication is given here.
When frame communication is carried out under the conditions indicated below, the buffer memory settings should be as shown at the bottom of the page.
For the method for making the buffer memory settings, see Chapter 5.

[Sending]



[Receiving]



Address	AJ65BT-R2	Address	Set value	
102H	Word/byte unit designation	102H	1	.... Byte units
108H	Receive first frame number 1	108H	100H	.... Receive first frame number 1: 100H
10CH	Receive final frame number 1	10CH	108H	.... Receive final frame number 1: 108H
110H	Receive first frame/receive final frame cancel designation	110H	0H	.... Do not cancel the receive first frame/ receive final frame.
111H	Receive end number of data designation	111H	10H	.... Receive end number of data: 10 bytes
118H	Send first frame number	118H	103H	.... Send first frame number: 103H
119H	Send final frame number	119H	3H	.... Send final frame number: 3H

7.4 Monitor Send Function

The monitor send function is a function whereby the AJ65BT-R2 monitors devices or statuses in accordance with settings made in advance by the user, and on detection of the data send command (data send timing), sends the contents of the send tables designated by the user to the external device.
When the user sends data using the monitor send function, he/she can designate the following AJ65BT-R2 processing as required.

1) The master module device or master module/PC CPU status monitored by the AJ65BT-R2 in order to detect the data send timing.
2) The condition for data send timing
   (send trigger generation trigger: see Section 7.4.1)
3) The monitoring interval in which the AJ65BT-R2 monitors the device or status that determines data send timing.

Using this function makes it unnecessary for the PC CPU to deal with data send timing.

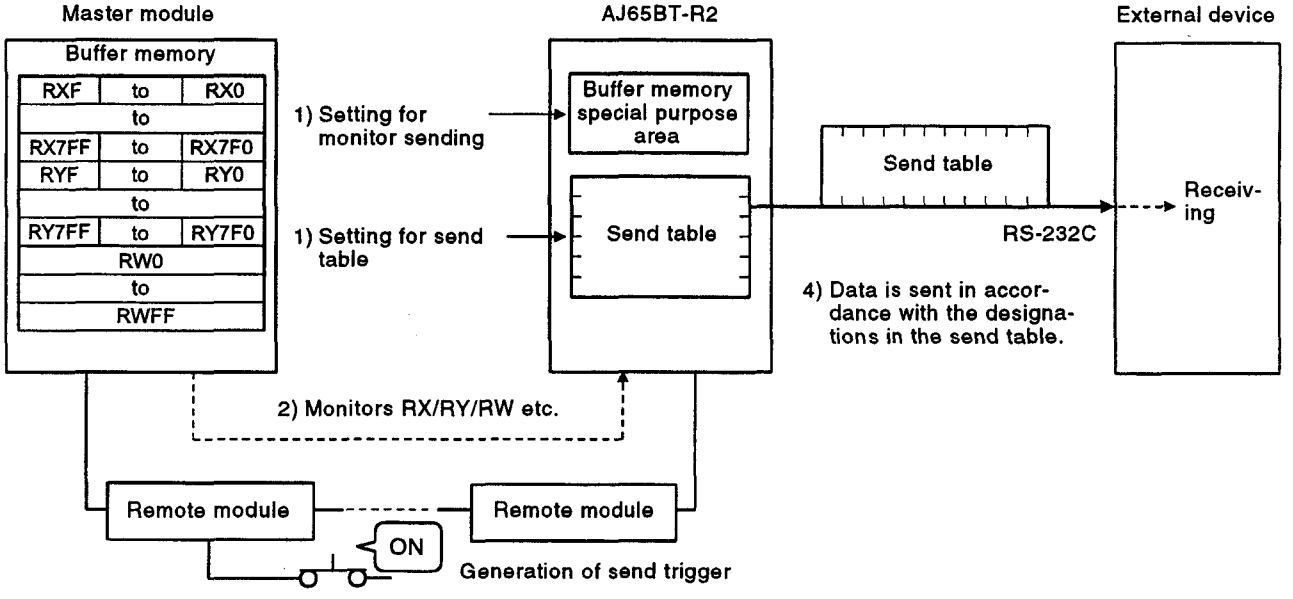


Fig. 7.4 Schematic Diagram of Data Communication

1) Designate the data for monitor sending in each of the following buffer memory areas: the monitor interval designation area (address: 70H), the monitored number area (address: 71H), and the area for monitor designations 1 to 64 (addresses: 78H to F7H).
   Also, designate the frame numbers of the registered frames to be sent (the send area can also be designated) in the send table designation area (addresses 122H to 185H) of the AJ65BT-R2 buffer memory.
2) The AJ65BT-R2 monitors devices or statuses in the CC-Link.
3) On detection of the send trigger, the AJ65BT-R2 sends the user-designated send table contents to the external device.

7.4.1 Send triggers that can be designated for monitor send function

The devices and statuses that can be monitored by the AJ65BT-R2 in order to detect the data send timing (hereafter called the "send trigger") for data sending using the monitor send function are described here.
The send triggers that can be designated with the monitor send function are as follows.

(1) Monitoring RX/RY/RW as send trigger
The AJ65BT-R2 monitors the following user-designated data of the master module in the CC-Link, and if the user-designated send condition has been established, executes data send processing.
1) Change in status of RX or RY (leading edge/trailing edge)
2) Change in RW value from 0 to other than 0.

(2) Monitoring a status as send trigger
The AJ65BT-R2 monitors one of the following statuses of the master module in the CC-Link or the PC CPU at the station where the master module is mounted, and if the user-designated send condition has been established, executes data send processing.
1) Change in the data link status of the CC-Link (between "data link operation in progress" and "stopped")
2) Change in the operation status of the PC CPU (RUN/STOP)
3) Change in the status of the PC CPU (normal/abnormal)
(The AJ65BT-R2 makes this judgment on the basis of whether access is normal or abnormal on accessing the PC CPU from the AJ65BT-R2.)

7.4.2 Buffer memory settings for monitor send

(1) Items to be set in the buffer memory
The items to be set in the buffer memory for the monitor send function are indicated in Table 7.2.
When monitor send is executed, besides the settings made in the areas indicated in the table below, the settings of the send tables to be sent are also set in the send frame designation 2 area (see Section 7.3.1) using a sequence program.

Table 7.2 Items Set in Buffer Memory for Monitor Send

Buffer Memory Address	Name		Description
70H	Monitor interval designation		Designate the monitoring interval for monitoring by the AJ65BT-R2 of the device or status for send trigger detection. (Units: 100 ms)
71H	Monitored number		Designate the number of monitor designations made in the monitor designation area (immediately below) to monitor devices or statuses used for send trigger detection by the AJ65BT-R2.
78H	Monitor designation 1	Monitored object designation	Monitored object designation : Designate the device or status to be used for detection of the send trigger by the AJ65BT-R2. Send data designation : Designate the destination of the data sent on occurrence of the send trigger due to establishment of the send condition. (First number of send tables, and number of tables)
79H		Send data designation	
7AH to 7BH	Monitor designation 2	Monitored object designation	
		Send data designation	
7CH to F5H	to		
F6H to F7H	Monitor designation 64	Monitored object designation	
		Send data designation	
102H	Word/byte unit designation		Designate whether to make the units for the number of send data and number of receive data in data communication words or bytes.
11AH	Send time-out time designation		Designate the send time-out time, from the start to completion of data sending.

POINT

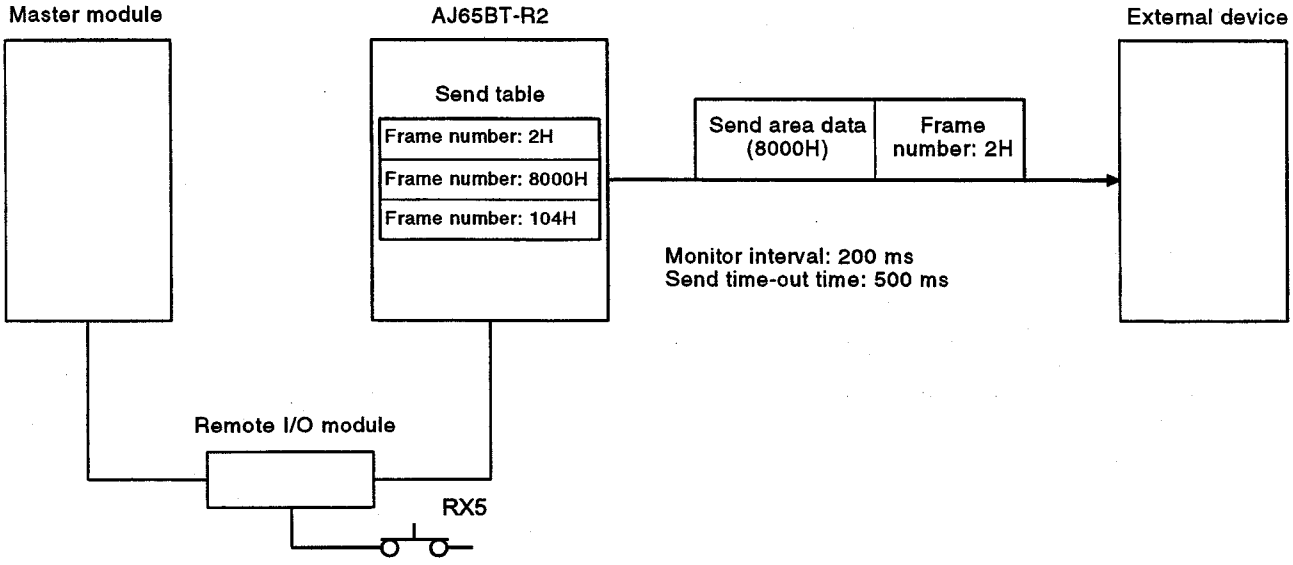
After the settings in the special purpose area of the AJ65BT-R2 buffer memory have been changed, carry out AJ65BT-R2 initialization processing as described in Section 9.7.
The AJ65BT-R2 buffer memory special purpose areas for which initialization processing is necessary are the areas indicated in the "Initialization" column of Table 3.6 in Section 3.6.

(2) Buffer memory setting example

An example of buffer memory settings made when executing monitor send is described here.

When monitoring RX5 of the remote I/O module at station 1 and sending the contents of a send table on occurrence of the send trigger, the buffer memory settings would be as shown below.

For the method for making the buffer memory settings, see Chapter 5.



Address	AJ65BT-R2	Address	Set value	
70H	Monitor interval designation		2	.... Monitor interval: 200 ms
71H	Monitored number		1	.... Monitored number: 1
78H	Monitored object designation 1		1005H	.... Monitored object: Leading edge of RX5
79H	Send data designation 1		0201H	.... Send data designation: Data from send table 1 to 2
11AH	Send time-out designation		5	.... Send time-out time: 500 ms
122H	Send table designation 1		2H	.... Send table 1: Registered frame No. 2H
123H	Send table designation 2		8000H	.... Send table 2: Send area data
124H	Send table designation 3		104H	.... Send table 3: Registered frame No. 104H

7.4.3 Cautions on using the monitor send function

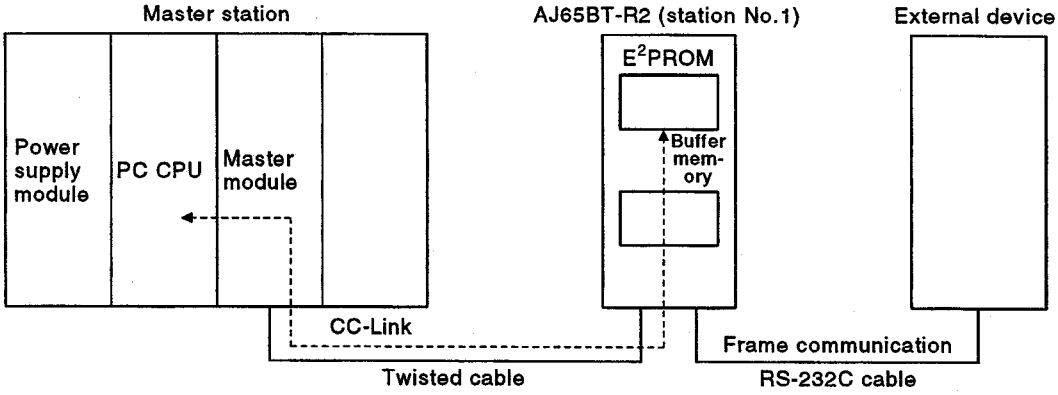
(1) Monitoring of the device/status that furnishes the send trigger is carried out at the intervals designated by the monitor interval designation area (address 70H) in the buffer memory.
The ON/OFF status, numerical value, or status that is the condition for generation of the send trigger must maintain its status for longer than the monitor interval (+ 100 ms).
If it does not, the AJ65BT-R2 may not be able to detect the send trigger.

(2) If the send processing for monitor send overlaps with other send processing (no-protocol sending/frame sending), the AJ65BT-R2 sends the send data in the order of occurrence of the send processings.
Example : If the send trigger for monitor send occurs while the AJ65BT-R2 is executing no-protocol sending or frame sending, monitor sending is executed after the send processing for no-protocol sending/frame sending is completed.

(3) If the AJ65BT-R2 simultaneously detects more than one send trigger for monitor send, monitor send is executed in the order of detection of the send triggers.

8. USER-REGISTERED FRAMES

User-registered frames are used in place of the default registered frames used in frame communication as described in Chapter 7, to execute frame communication in which the user designates the data sequence as required.
By registering user-registered frames in advance in the E^2PROM via the AJ65BT-R2 buffer memory, they can be used to send data, and to check receive data, when using the frame communication function, and as send data when using the monitor send function.



User-registered frames can be registered, read, and deleted.

8.1 Characters that can be Registered in User-Registered Frames

Up to 200 user-registered frames can be registered in the E^2PROM.
They are registered in user-registered frame numbers 3E8H to 4AFH (1000 to 1199).
Two types of character can be registered for user-registered frames: normal characters and special characters. A maximum of 80 bytes can be registered.

(1) Normal characters
These are 1-byte data with data codes from 00H to FEH.
They are registration codes used to communicate the data with data codes 00H to FEH.

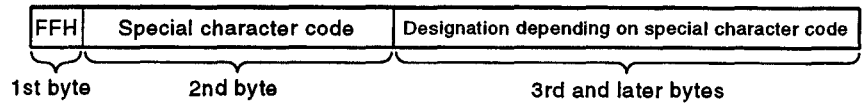
(2) Special characters
These are registration codes designated with registration code FFH in combination with one of the special character codes indicated in the table below (combination of FFH + 00H to FFH).
The following special characters can be used as part of a user-registered frame.

- 1-byte data for data sending (NULL: code = 00H)
- Freely selectable 1-byte data for data receiving (in the check by the AJ65BT-R2, freely selectable 1-byte data is treated as part of the user-registered frame)
- Data referenced to RX/RY, RW
  Freely selectable registered frame data is sent in accordance with the ON/OFF status of remote inputs (RX) or remote outputs (RY), or magnitude comparisons of remote register (RW) values.
- Sum check code
  Sends or receives a sum check calculated with respect to the designated range of a message to check sent and received messages.
- 1-byte FFH code (code = FFH)

8.2 How to Designate Special Characters

It is possible to designate a combination of normal characters (data codes 01H to FEH) and special characters (see (1) through (4)) totalling a maximum of up to 80 bytes, in the user-registered frame area (1C8H to 1EFH). The method for designating special characters is explained below.

(1) Configuration of special characters
Special characters are configured in the sequence shown below.



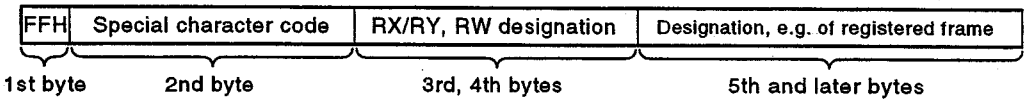
(2) Functions of special characters and applicability to communication
Table 8.1 shows the functions of the special characters, and indicates whether or not they can be used in communication.

Table 8.1 Special Character Functions and Applicability to Communication

Special Character Code	Function during Communication	Applicability					
		Sending				Receiving	
		Frame Sending (frame 1 area)		Frame Sending (frame 2 area)	Monitor Sending	Frame receiving	
		First	Final			First	Final
0H	When sending : Sends the data (1 byte) of data code 00H (NUL). When receiving : Cuts out the check on the relevant part (1 byte) of the registered frame. (Data is subjected to receive processing as normal data.)	o					
1H to BFH	Cannot be used.	—					
C0H to DFH	Sends freely selectable registered frame data in response to ON/OFF of remote input (RX) or remote output (RY), or magnitude comparison of numerical value in remote register (RW). For details, see (3) "RX/RY/RW reference special characters".	o				x	
E0H to EDH	Cannot be used.	—					
EEH to FAH	Send and receive the sum check with respect to the designated range of the message, as a check on send and received messages. For details, see (4) "Special characters for sum check codes".	x	o	x		x	o
FBH to FEH	Cannot be used.	—					
FFH	Sends and receives the data (1 byte) of data code FFH.	o					

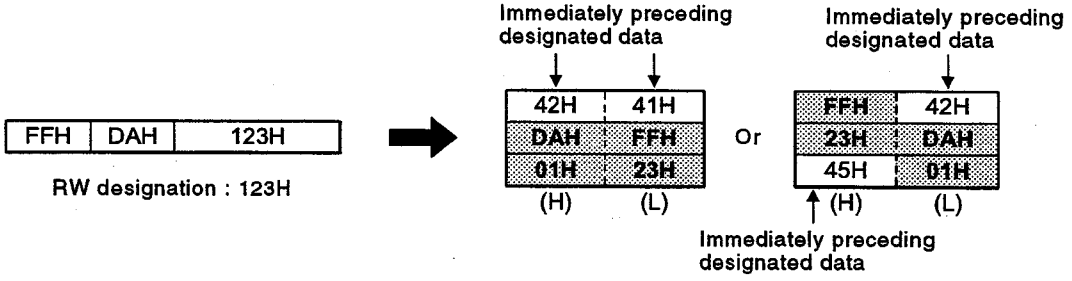
o : Can be used
x : Cannot be used

(3) RX/RY/RW reference special characters
The RX/RY/RW reference special characters serve to refer to the ON/OFF statuses of designated remote inputs (RX) or remote outputs (RY) of the master station, or the values in remote registers (RW), and send the data of the designated registered frame in accordance with this data.
The RX/RY/RW reference special characters are designated in the sequence indicated below.

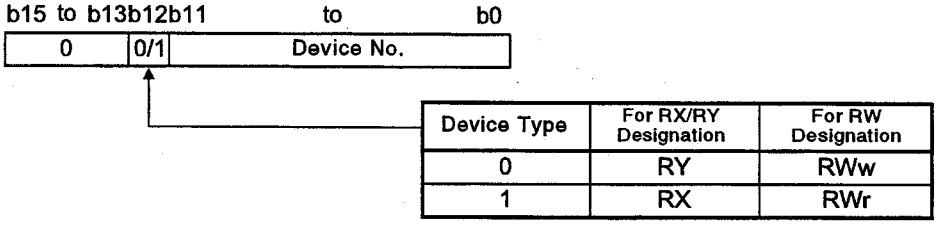


(a) Method for buffer memory designations
RX/RY/RW reference special characters are written following the immediately preceding designated characters.

Example : When 123H is designated as an RW designation, data is written to the buffer memory as follows.



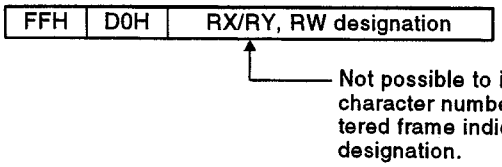
(b) Method of designating RX/RY, RW
The RX/RY, RW designation in the third and fourth bytes of an RW/RY/RW reference special character is made as shown below.



Device Type	For RX/RY Designation	For RW Designation
0	RY	RWw
1	RX	RWr

POINTS

- When performing frame sending or monitor sending, if the result obtained on analyzing and expanding a user-registered frame including a special character exceeds 2048 bytes, a "send data size exceeded error (BB92H)" occurs.
- When a special character that designates a registered frame number is used (special character code = C0H, C1H, D0H), it is not possible to designate another special character that designates a registered frame number within the registered frame designated by this special character.



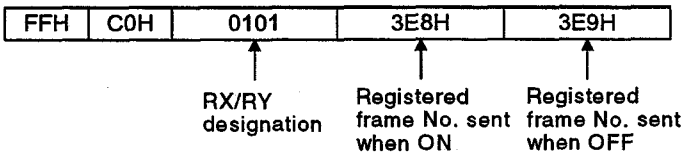
Details on RX/RY/RW reference special characters are presented in Table 8.2.

Table 8.2 RX/RY/RW Reference Special Character List

	Registration Code	Special Character Code	RX/RY, RW Designation	Registered Frame Designation	Total Number of Bytes	Function During Sending
Number of bytes	1	1	2	2 2 2 2	—	———
RX/RY/RW reference special characters	FFH	C0H	RX/RY designation	1) 2) — — 1) No. of registered frame that becomes data sent in ON status. 2) No. of registered frame that becomes data sent in OFF status.	8	Refers to the remote input (RX)/remote output (RY) ON/OFF status during frame sending, and sends the registered data of the registered frame depending on whether the designated RX/RY is ON or OFF.
		C1H	RW designation	1) 2) 3) 4) 1) Comparison value (-32768 to 32767) 2) Registered frame No. of registered data sent when RW = comparison value. 3) Registered frame No. of registered data sent when RW > comparison value. 4) Registered frame No. of registered data sent when RW < comparison value.	12	Refers to the remote register (RW) value during frame sending, compares it with the designated value (value of 1)), and sends the designated registeted frame depending on the result of the comparison.
		D0H	RW designation	———	4	Refers to the value of a remote register (RW) during frame sending, and sends either the registered data in a registered frame or the contents of the send area depending on this value.
		D8H	RW designation	———		Refers to the value of a remote register (RW) during frame sending - regarding it as an unsigned value (0 to 65535) - and sends it after conversion to a decimal, 5-digit, ASCII code.
		D9H	RW designation	———		Refers to the value of a remote register (RW) during frame sending - regarding it as a signed value (-32768 to 32767) - and sends it after conversion to a decimal, 6-digit, ASCII code.
		DAH	RW designation	———		Refers to the value of a remote register (RW) during frame sending - regarding it as an unsigned value (0 to 65535) - and sends it after conversion of the lower 2 digits to a decimal ASCII code.
		DBH	RW designation	———		Refers to the value of a remote register (RW) during frame sending, and sends this value after conversion to a 4-digit hexadecimal character string.
		DCH	RW designation	———		Refers to the value of a remote register (RW) during frame sending, and sends the lower byte of this value without change (as a binary value).
		DDH	RW designation	———		Refers to the value of a remote register (RW) during frame sending, and sends two bytes of this value without change (as a binary value), the lower bytes first, then the higher byte.

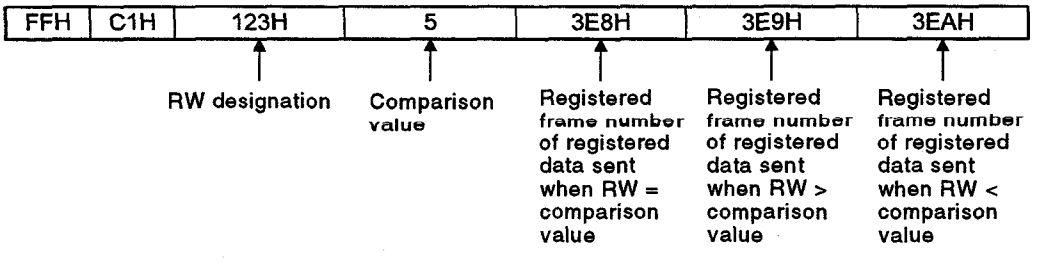
1) Send data corresponding to special character No. C0H
The user-registered frame part corresponding to special character number C0H refers to the remote input (RX)/remote output (RY) ON/OFF status during frame sending, and depending on whether the designated RX/RY is ON or OFF, sends the registered data in the designated registered frame.
The registered frame number is designated as one of the following.
Default registered frame : 01H to 161H (1 to 353)
User-registered frame : 3E8H to 4AFH (1000 to 1199)

Example : Sending of designated data in accordance with ON/OFF status of RX1
When RX1 is ON : The registered data of registered frame number 3E8H is sent.
When RX1 is OFF : The registered data of registered frame number 3E9H is sent.



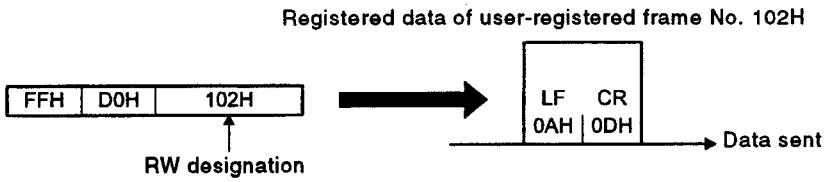
2) Send data corresponding to special character No. C1H
The user-registered frame part corresponding to special character number C1H refers to the value of a remote register (RW) during frame sending, compares it with a designated value, and, depending on the result, sends the registered data in the designated registered frame.
If the value referred to is 8000H, the contents of the send area are sent.
Designate the registered frame number as one or other of the following.
Default registered frame : 01H to 161H (1 to 353)
User-registered frame : 3E8H to 4AFH (1000 to 1199)

Example : Referring to the value of RW123, and sending data of the designated registered frame under the following conditions.
When RW = comparison value :
Registered data of registered frame No. 3E8H is sent.
When RW > comparison value :
Registered data of registered frame No. 3E9H is sent.
When RW < comparison value :
Registered data of registered frame No. 3EAH is sent.



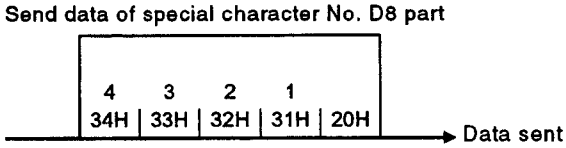
3) Send data corresponding to special character No. D0H
The user-registered frame part corresponding to special character number D0H refers to the value of a remote register (RW) during frame sending, and, depending on this value, sends the data in the registered frame or the contents of the send area.
The designated RW value is regarded as the registered frame number. If the RW value is 8000H, the contents of the send area are sent.
Designate the registered frame number as one of the following.
Default registered frame : 01H to 161H (1 to 353)
User-registered frame : 3E8H to 4AFH (1000 to 1199)
Send area : 8000H

Example : When the RW value referred to is 102H.



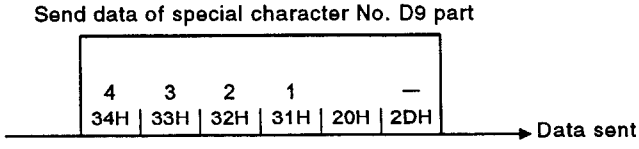
4) Send data corresponding to special character No. D8H
The user-registered frame part corresponding to special character number D8H refers to the value of a remote register (RW) during frame sending, and regarding this value as an unsigned value (0 to 65535), sends it after conversion to a decimal, 5-digit ASCII code.
If the RW value referred to has 4 or less digits, the data is sent after conversion to an ASCII code comprising a "space string" plus numerical value.

Example : When the designated RW value is 1234.



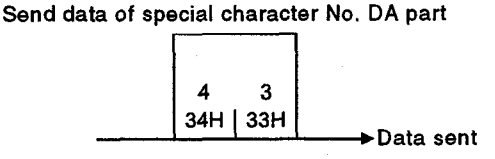
5) Send data corresponding to special character D9H
The user-registered frame part corresponding to special character number D9H refers to the value of a remote register (RW) during frame sending, and regarding this value as a signed value (-32768 to 32767), sends it after conversion to a decimal, 6-digit ASCII code.
If the RW value referred to has 5 or less digits, the data is sent after conversion to an ASCII code comprising a "space string" plus numerical value.
If the value is a negative value, the data is sent with "-" as the first character, and if it is positive value it is sent with a space as the first character.

Example : When the designated RW value is -1234.



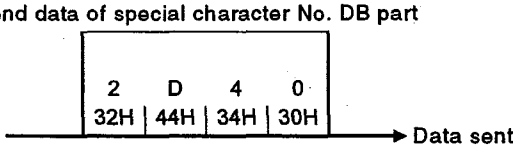
6) Send data corresponding to special character No. DAH
The user-registered frame part corresponding to special character number DAH refers to the value of a remote register (RW) during frame sending, and regarding this value as an unsigned value (0 to 65535), sends the least significant 2 digits after conversion to a decimal ASCII code.
If the RW value referred to has only 1 digit, the data is sent after conversion to an ASCII code comprising a "0" plus the numerical value.

Example : When the designated RW value is 1234.



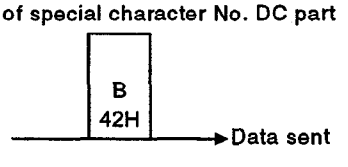
7) Send data corresponding to special character No. DBH
The user-registered frame part corresponding to special character number DBH refers to the value of a remote register (RW) during frame sending, and sends this value after conversion to a 4-digit decimal ASCII code.
If the converted value has 3 or less digits, the data is sent after conversion to an ASCII code comprising a "0" plus the numerical value.

Example : When the designated RW value is 1234 (4D2H).



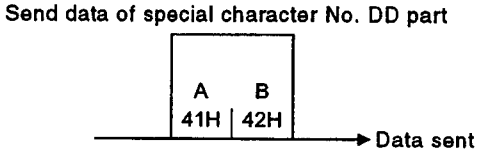
8) Send data corresponding to special character No. DCH
The user-registered frame part corresponding to special character number DCH refers to the value of a remote register (RW) during frame sending, and sends the data of the lower byte of this value without change (as a binary value).
(The higher byte is not sent.)

Example : When the designated RW value is 16706 (4142H).



9) Send data corresponding to special character No. DDH
The user-registered frame part corresponding to special character number DDH refers to the value of a remote register (RW) during frame sending, and sends two bytes of this value without change (as a binary value), the lower byte first, then the higher byte. The lower byte of the designated RW is the first character, and the higher byte is the second character.

Example : When the designated RW value is 16706 (4142H).



(4) Special characters for sum check code
The special characters for the sum check code serve to ensure that a sum check code within the fixed range for the message is sent/received, in order to increase the reliability of the data sent to and received from the external device.
The sum check codes and data contents for sending/receiving are indicated below.

Table 8.3 List of Special Characters for Sum Check Code

	Registration Code	Special Character Code	Data Contents in Sending/Receiving / Handling at AJ65BT-R2		Communication Sequence
Special characters for sum check code	FFH	EEH	The sum check code for the range of send/receive data (message) excluding the first frame 1 frame part is sent/received.	The lower 2 bytes of the calculated sum check code are sent/received without change as a 2-byte binary code.	(L) → (H)
		F0H		The lowest 1 byte of the calculated sum check code is sent/received without change as a 1-byte binary code.	———
		F1H		The lowest 1 byte of the calculated sum check code is sent/received after conversion to a 2-digit ASCII code.	From the higher digits
		F3H		The lowest 4 bits of the calculated sum check code is sent/received after conversion to a 1-digit ASCII code.	———
		F4H	The sum check code which applies to the send/receive data (message) including the first frame 1 frame part is sent/received. *1	The lower 2 bytes of the calculated sum check code are sent/received without change as a 2-byte binary code.	(L) → (H)
		F6H		The lowest 1 byte of the calculated sum check code is sent/received without change as a 1-byte binary code.	———
		F7H		The lowest 1 byte of the calculated sum check code is sent/received after conversion to a 2-digit ASCII code.	From the higher digits
		F9H		The lowest 4 bits of the calculated sum check code is sent/received after conversion to a 1-digit ASCII code.	———
		FAH		The lowest 1 byte of the two's complement of the calculated sum check code is sent/received after conversion to a 2-digit ASCII code.	From the higher digits

*1 When no first frame is designated, the calculation is performed by taking the range of the send/receive data part as the object of the sum check.

(a) Send/receive data corresponding to special character numbers EEH to F3H

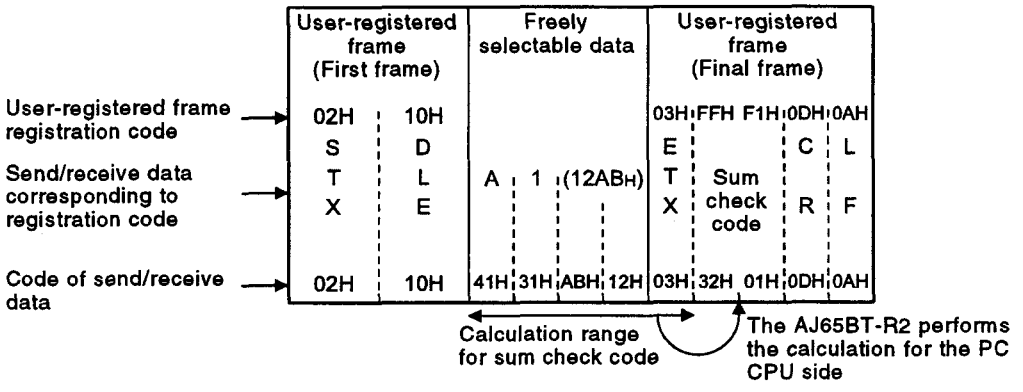
The user-registered frame part corresponding to special character numbers EEH to F3H sends/receives the sum check code which is calculated with respect to the range of send/receive data (message) excluding the first frame and is expressed as binary or ASCII data.

The range for calculation of the sum check code and the send/receive data contents and sequence are indicated below.

- Calculation range

  The data subject to the sum check is that from the data immediately following the user-registered frame in the first part of the send/receive data (first frame of data) to the data immediately before the sum check code designation.

  Example : Data sequence for sending/receiving



- Method for calculating the sum check code

  The sum check code is the value obtained by adding the data within the range indicated above, as binary data.

  In the case of the example:

  $$41H + 31H + ABH + 12H + 03H = \overset{(H)\ (L)}{0132H}$$

- If the registered code FFH, or a code in the range EEH to F3H is included in the user-registered frame, the data contents (sequence) when the corresponding sum check code is sent/received is indicated below using the message shown in the example.

Registration Code	Contents (Sequence) during Sending/Receiving
FFH, EEH	01H, 32H sent/received, from 32H
FFH, F0H	32H sent/received
FFH, F1H	"3", "2" sent/received, from "3"
FFH, F3H	"2" sent/received

(b) Send/receive data corresponding to special character codes F4H to F9H

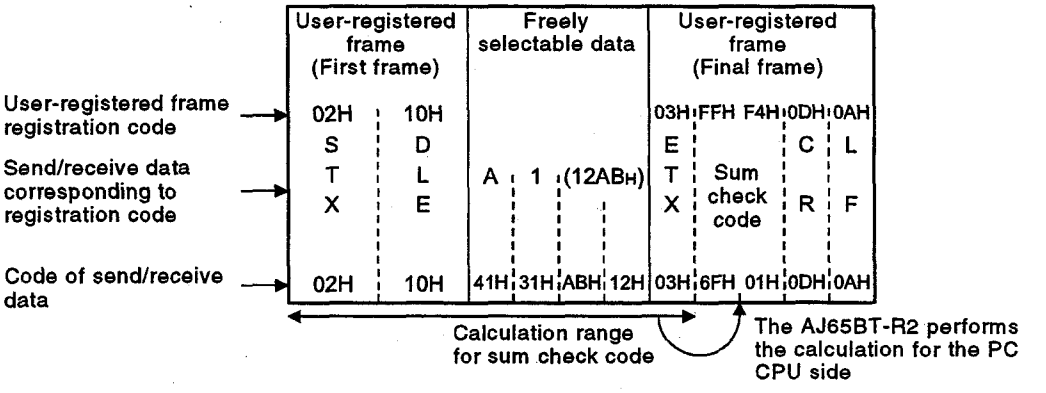
The user-registered frame part corresponding to special character codes F4H to F9H sends/receives the sum check code which is calculated with respect to the range of data (message) including the user-registered frame (first frame) and is expressed as binary or ASCII data.

The range for calculation of the sum check code and the send/receive data contents and sequence are indicated below.

- Calculation range

  The data subject to the sum check is that from the data immediately following the user-registered frame in the first part of the send/receive data to the data immediately before the sum check code designation.

  Example : Data sequence for sending/receiving



- Method for calculating the sum check code

  The sum check code is the value obtained by adding the data within the range indicated above, as binary data.
  (The same as the calculation method in (a))
  In the case of the example:

  $$02H + 10H + 41H + 31H + ABH + 12H + 03H = \overset{(H)\ (L)}{0144H}$$

- If a special character code in the range F4H to F9H is included in the user-registered frame, the data contents (sequence) when the corresponding sum check code is sent/received is indicated below using the message shown in the example.

Special Character Code	Contents (Sequence) during Sending/Receiving
F4H	01H, 6FH sent/received, from 6FH
F6H	6FH communicated
F7H	"6", "F" sent/received, from "6"
F9H	"F" sent/received

(c) Send/receive data corresponding to special character code FAH
The user-registered frame part corresponding to special character code FAH sends/receives the lowest byte of the value obtained by deriving the two's complement of the sum check code calculated with respect to the range of data (message) including the user-registered frame (first frame), this lowest byte being expressed as binary or ASCII data.
The range for calculation of the sum check code and the send/receive data contents and sequence are indicated below.

- Calculation range
  The range for calculation of the sum check code is the same as for (b).
- Method for calculating the sum check code
  The sum check code is the value obtained by deriving the two's complement of the result of adding the data within the range described above as binary data.
  In the case of the example in (b) above:

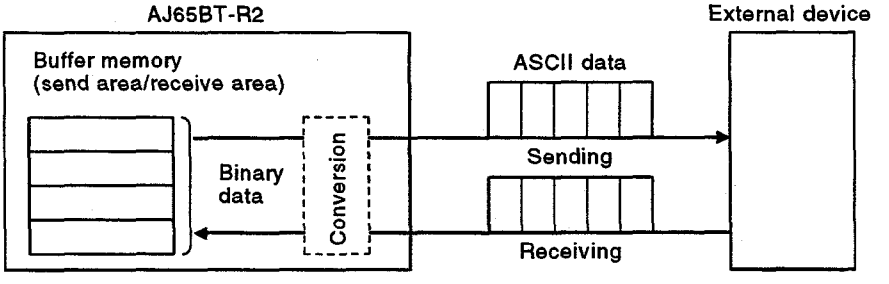
$$02H + 10H + 41H + 31H + ABH + 12H + 03H = \overset{(H)\ (L)}{0144H}$$

		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Added values	0144H	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0
			14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Inversion (one's complement)	FEBBH	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+1 (two's complement)	FEBCH	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0

The lowest byte ("B" "C") of the value (FEBCH) that is the two's complement of 0144H is sent/received in the sequence "B" then "C".

POINTS

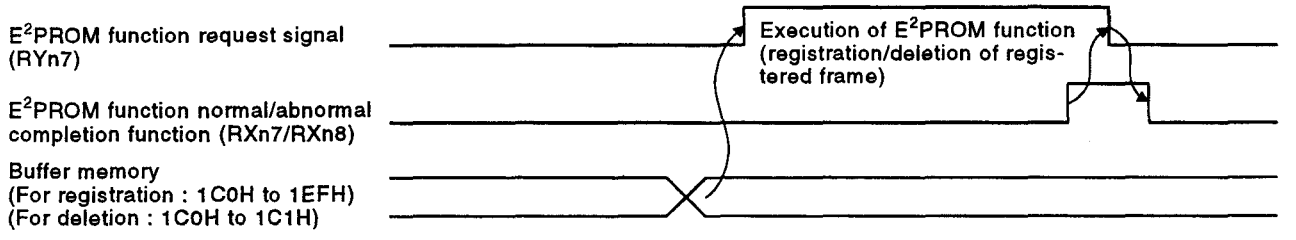
- If, on reception of the registered frame that includes the sum check code, the value of the received sum check code does not match, a "sum check error" (BB28H) occurs.
- When sending the registered frame that includes the special character for the sum check code, it can only be used as the final frame in sending by using the send frame 1 area.
  It cannot be used as the final frame in sending by using the send frame 2 area.
- It is not possible to designate only the special character for the sum check code in a user-registered frame.
- When sending/receiving a sum check code, set the RS-232C data bit length to 8 bits.
- It is not possible to use multiple sum checks in one user-registered frame.
- For sending when ASCII/binary conversion is designated, calculate the sum check with respect to the send data after conversion to ASCII data. For receiving, calculate the sum check with respect to the receive data before conversion to binary data.



8.3 Registering, Reading and Deleting User-Registered Frames

Registration, reading, and deletion of user-registered frames are carried out by making an E^2PROM function designation and registered frame designation in the buffer memory special purpose area indicated below in advance, an then turning ON the E^2PROM function request signal (RYn7). The buffer memory settings to be made in order to register, read, and delete user-registered frames are indicated below.

- I/O signals when registering/deleting user-registered frames



- I/O signals when reading a user-registered frame

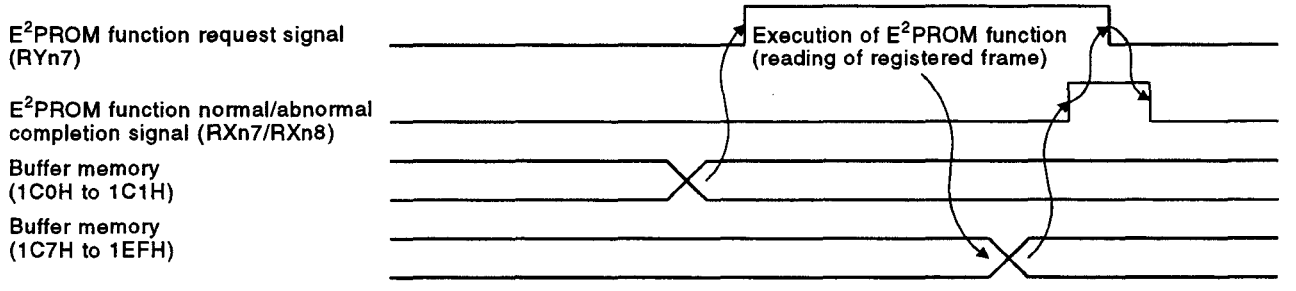


Table 8.4 Buffer Memory

Buffer Memory Address	Setting Item	Details	Set Value	Processing		
				Registration	Reading	Deletion
1C0H	E^2PROM function designation	Designates the E^2PROM function. For a registered frame function, designate registration, reading, or deletion of the registered frame.	0 : Buffer memory set value registration 1 : Registration of user-registered frame 2 : Reading of user-registered frame 3 : Deletion of user-registered frame 4 : Initialization of buffer memory set values	o	o	o
1C1H	User-registered frame number designation	Designates the registration number of the user-registered frame when registering, reading, or deleting a registered frame in the E^2PROM.	3E8H to 4AFH (1000 to 1199)	o	o	o
1C7H	Registered frame byte designation	Designates the total number of bytes of a registered frame to be registered or read into the E^2PROM.	1 to 80	o	●	x
1C8H to 1EFH	User-registered frame	In frame registration, stores the registration data of the user-registered frame to be registered. In frame reading, stores the registration data of the registered user-registered frame.	(Registration data)	o	●	x

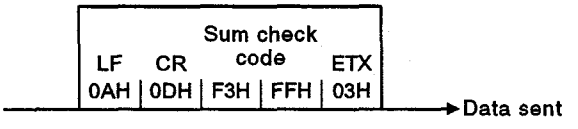
o : Must be set
x : Cannot be set
● : Stored

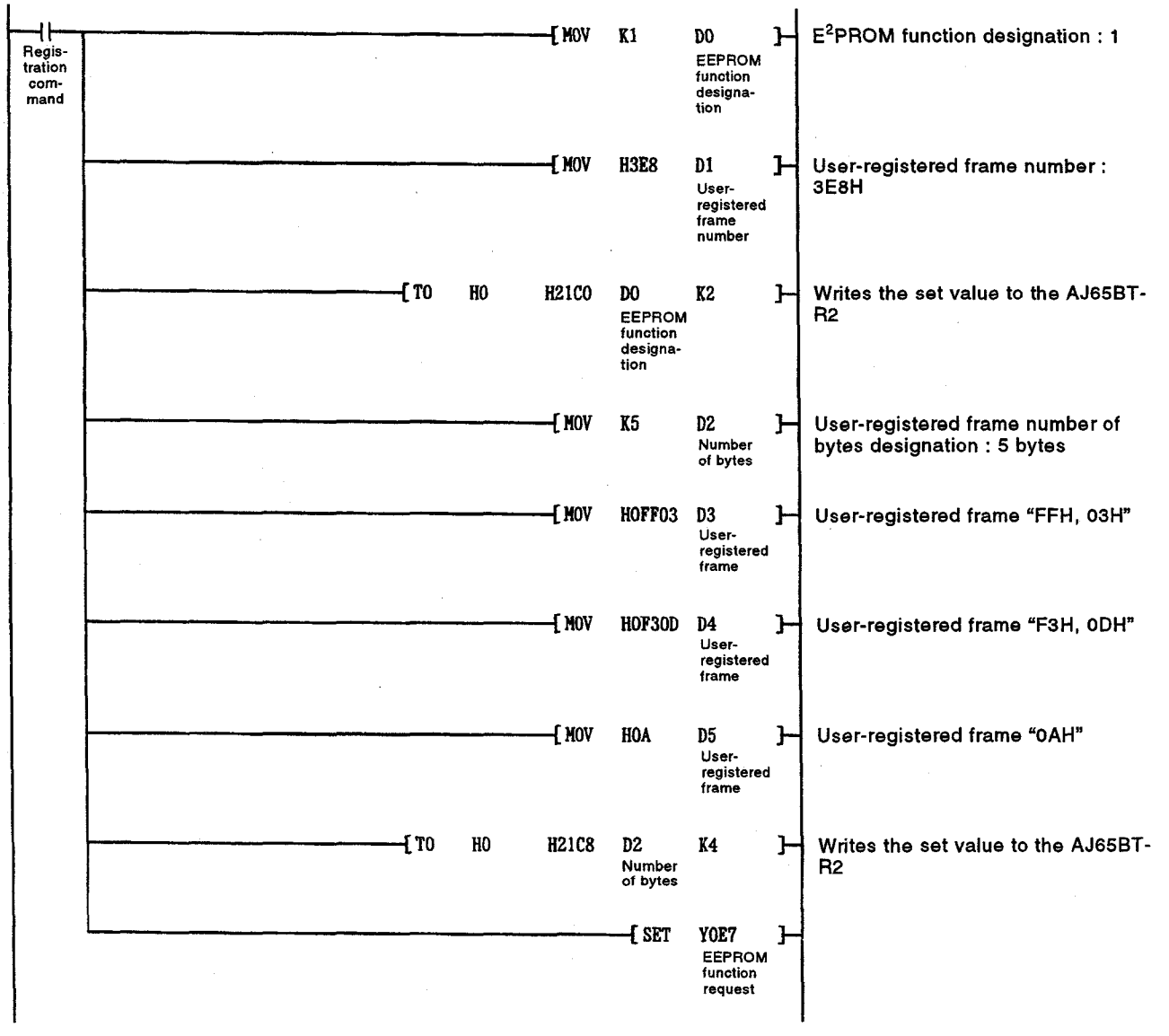
8.4 Example Sequence Program for Registering a User-Registered Frame

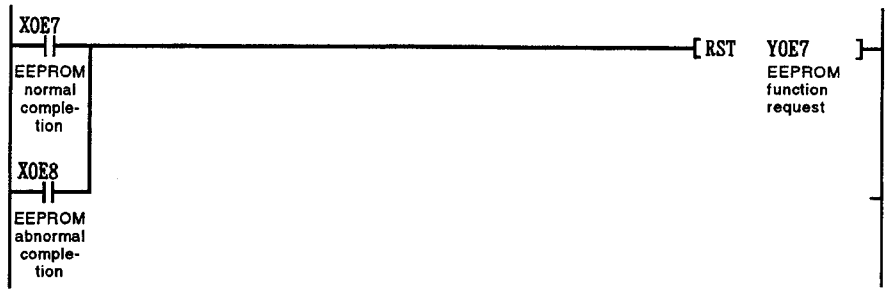
This example program uses TO instructions (buffer memory automatic update function effective, for use with QnACPU).

- Master module first I/O number — X/Y00 to 1F
- For remote input (station No.1) — XE0 to XFF (RX0 to RX1F)
- For remote output (station No.1) — YE0 to YFF (RY0 to RY1F)
- Allocation of automatic update area — 600H per station (addresses 2000H to 25FFH)

User-registered frame to be registered (final frame)







Resets the E^2PROM function request signal when the E^2PROM normal/abnormal completion signal comes ON.

9. SPECIAL FUNCTIONS

9.1 Special Function List

Table 9.1 Special Function List

Function		Function Outline	Refer to
Send cancel function		Forcibly stops data sending from the AJ65BT-R2 to the external device before completion after the issue of a send request from the master station to the AJ65BT-R2.	Section 9.2
Forced receive completion function		Forcibly stops reception and reads the receive data received up to that point when, for example, the receive data from the external device has reached the receive end number of data.	Section 9.3
Flow control function		Suspends and starts data sending from the external device in accordance with the free area available in the OS receive area of the AJ65BT-R2. Also suspends and starts data sending from the AJ65BT-R2 in accordance with requests from the external device.	Section 9.4
ASCII-BIN conversion function		Converts data to be sent and received between ASCII and binary.	Section 9.5
RW update function		Allocates the remote registers (RW) of the master station, and the area automatically updated at the AJ65BT-R2 side, to the buffer memory.	Section 9.6
Initialization function		Executes initialization of the AJ65BT-R2.	Section 9.7
OS receive area clear function		Clears the receive data in the OS receive area of the AJ65BT-R2.	Section 9.8
E^2PROM function	Buffer memory setting value registration function	Registers the setting values to be set in the special purpose area of the buffer memory in the E^2PROM, and returns the setting values registered in the E^2PROM to the defaults held by the AJ65BT-R2.	Section 9.9
	User-registered frame function	Registers user-registered frames in the E^2PROM, and reads/deletes user-registered frames registered in the E^2PROM.	Chapter 8
Signal read/write function		Executes reading/output control of the signal statuses of the RS-232C interface stored in the buffer memory.	Section 9.10

9.2 Send Cancel Function

This function forcibly stops sending of data from the AJ65BT-R2 to the external device before completion, after the output of a send request from the PC CPU to the AJ65BT-R2.
After the send request signal (RYn0) has been turned ON, if the send cancel request signal (RYn1) is turned ON before the send completion signal (RXn0/RXn1) comes ON, data sending to the external device is stopped.
When this function is executed, the send abnormal completion signal (RXn1) comes ON, and the "send cancel error" error code is stored in the send error code area (address 1B1H) of the buffer memory.
The send cancel function is outlined below by reference to an example in which the buffer memory automatic update function is effective.

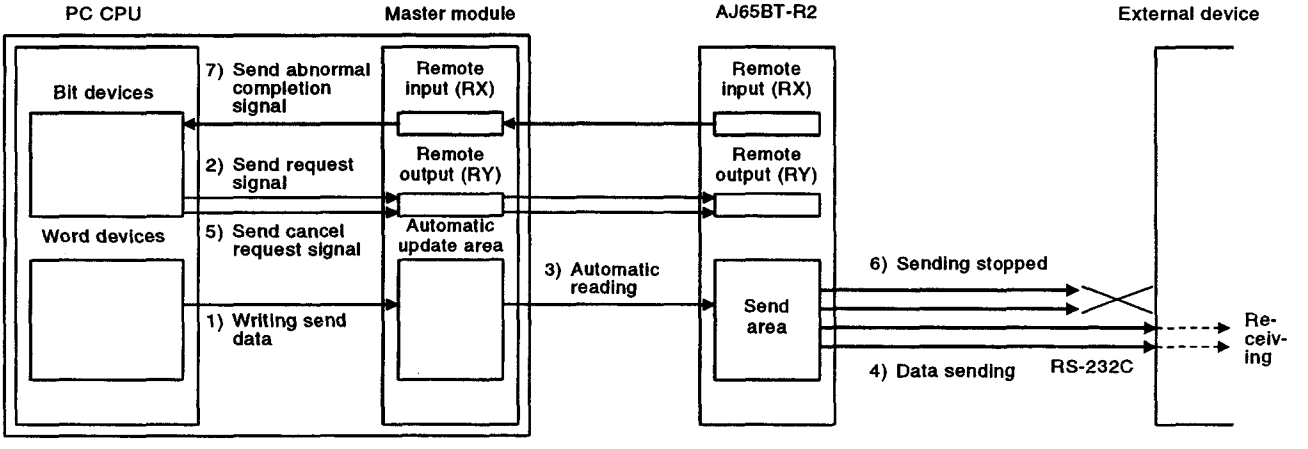
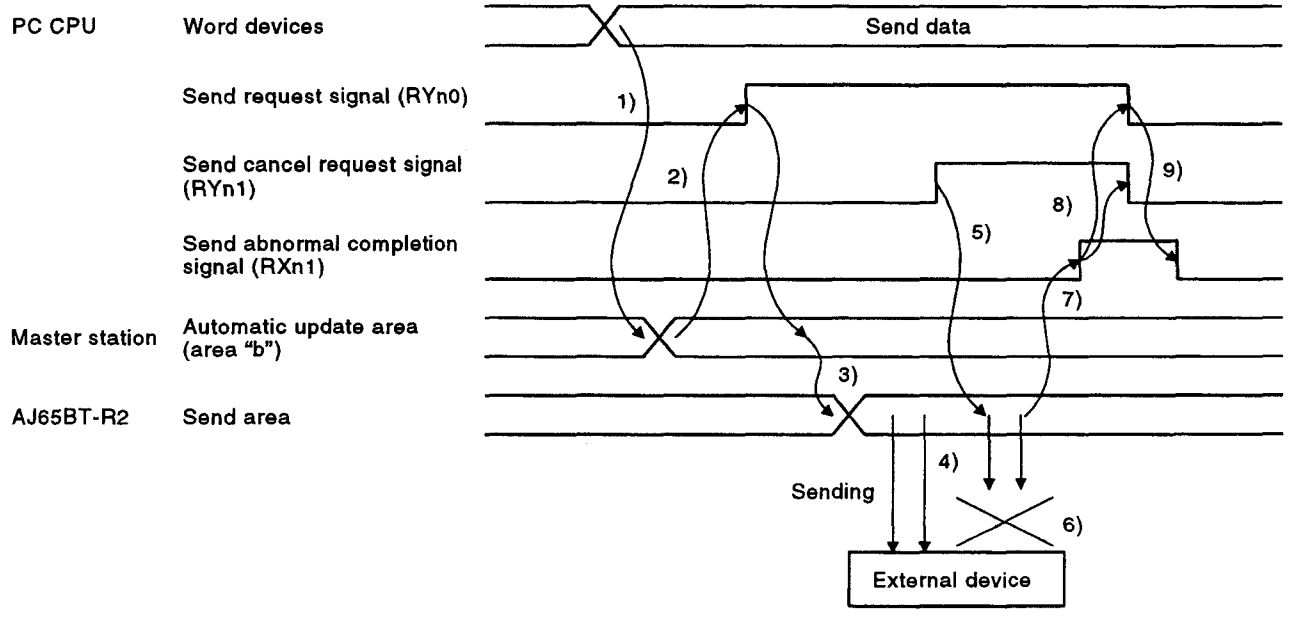


Fig. 9.1 Schematic Diagram of Send Cancel Function



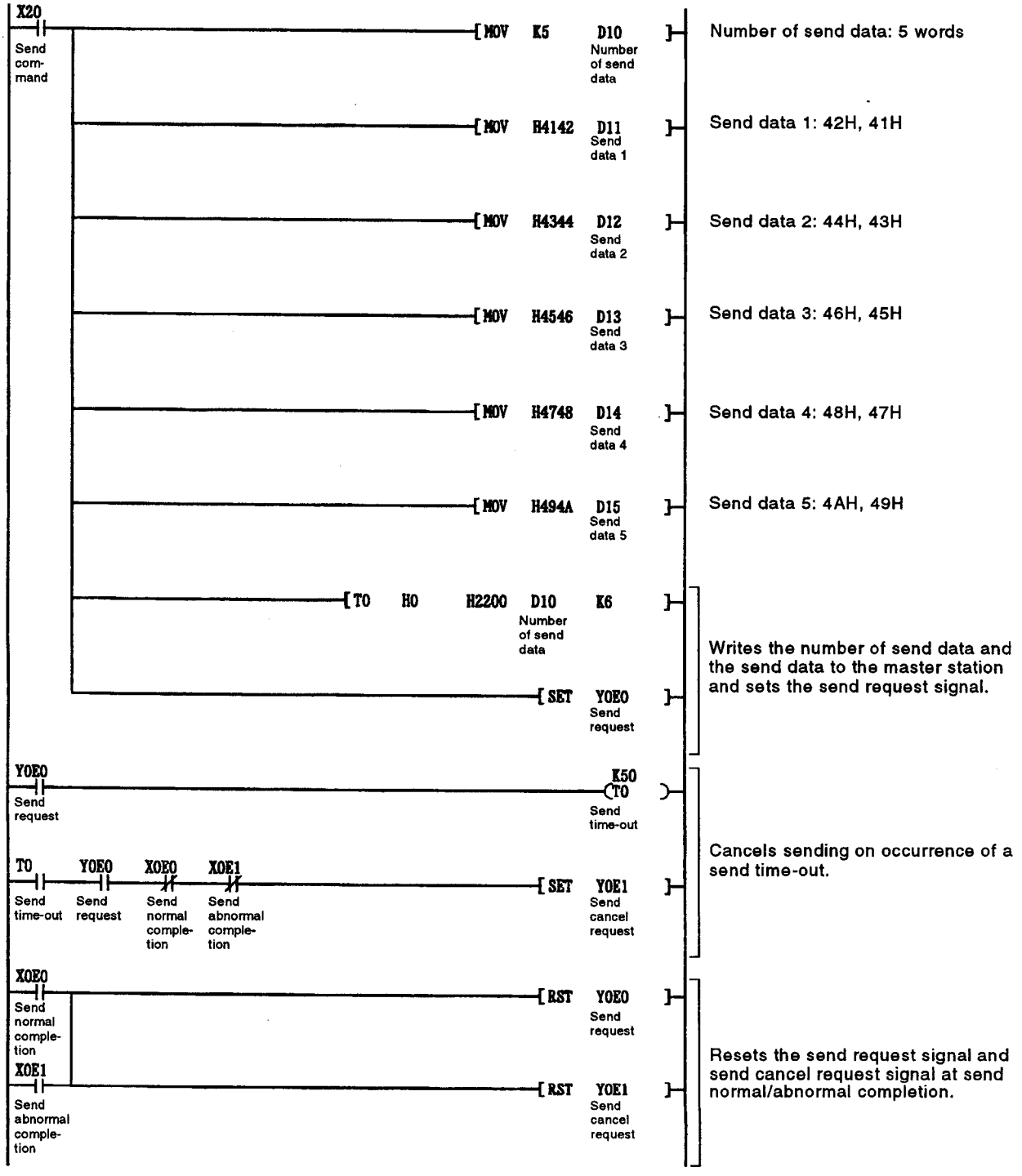
1) Store the send data in the word devices of the PC CPU. Write it to the master station buffer memory (automatic update area) corresponding to the send area of the AJ65BT-R2 by using, for example, a G(P).RITO instruction in a sequence program.
2) Turn ON the send request signal (RYn0) with a sequence program.
3) The AJ65BT-R2 reads the data in the buffer memory of the master module and stores it in the send area of the AJ65BT-R2.
4) The AJ65BT-R2 sends the data from the send area to the external device.
5) To cancel the send request before completion, turn ON the send cancel request signal (RYn1) in the sequence program.
6) The AJ65BT-R2 stops sending data to the external device.
7) On stopping the sending of data to the external device, the AJ65BT-R2 turns the send abnormal completion signal (RXn1) ON.
8) Turn OFF the send request signal (RYn0) and send cancel request signal (RYn1) with the sequence program.
9) The AJ65BT-R2 turns the send abnormal request signal (RXn1) OFF.

POINTS

- When sending data using the monitor send function, sending cannot be stopped with the send cancel function.
- To resend data whose sending has been stopped with the send cancel function, execute send processing again.
  The data will be sent again starting from the beginning.

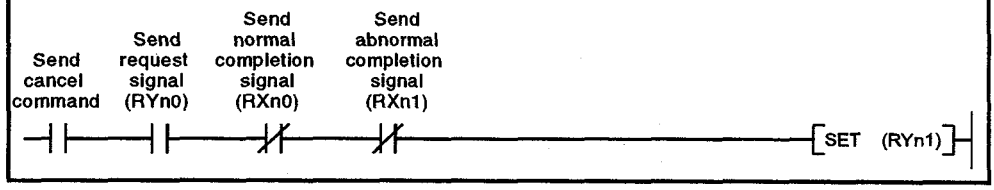
An example of a sequence program in which the send cancel function is used is presented below.
This example makes use of FROM/TO instructions (buffer memory automatic update function effective, for QnACPU).

- Master module first I/O numbers : X/Y00 to 1F
- For remote inputs (station No.1) : XE0 to XFF (RX0 to RX1F)
- For remote outputs (station No.1) : YE0 to YFF (RY0 to RY1F)
- Allocation for automatic update area : 600H per station (addresses 2000H to 25FFH)



POINT

In order to ensure that the send cancel request signal is not received when there is no send request, provide the following interlock circuit.



9.3 Forced Receive Completion Function

This function forcibly completes reception and reads the current receive data when the receive read request signal does not come ON.
It serves to forcibly end data reception in cases where the receive data cannot be read, for example when data making up the receive end number of data has not been received after the elapse of a fixed time, or when data whose first frame/final frame cannot be specified is received.
A portion of the receive data currently stored in the OS receive data that is equivalent to the maximum size of the receive area is transferred to the receive area.
The forced receive completion function is outlined below by reference to an example in which the buffer memory automatic update function is effective.

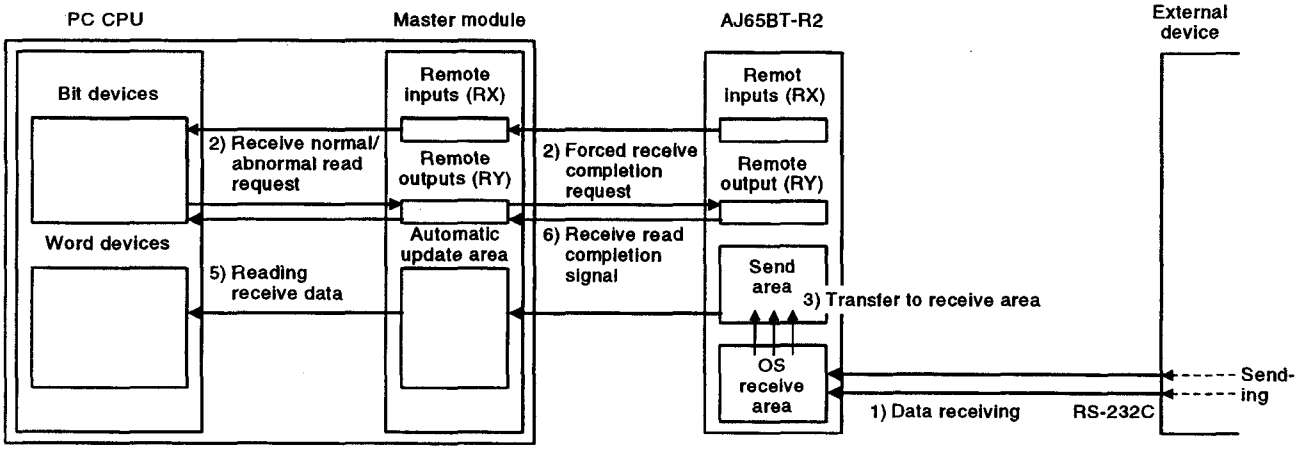
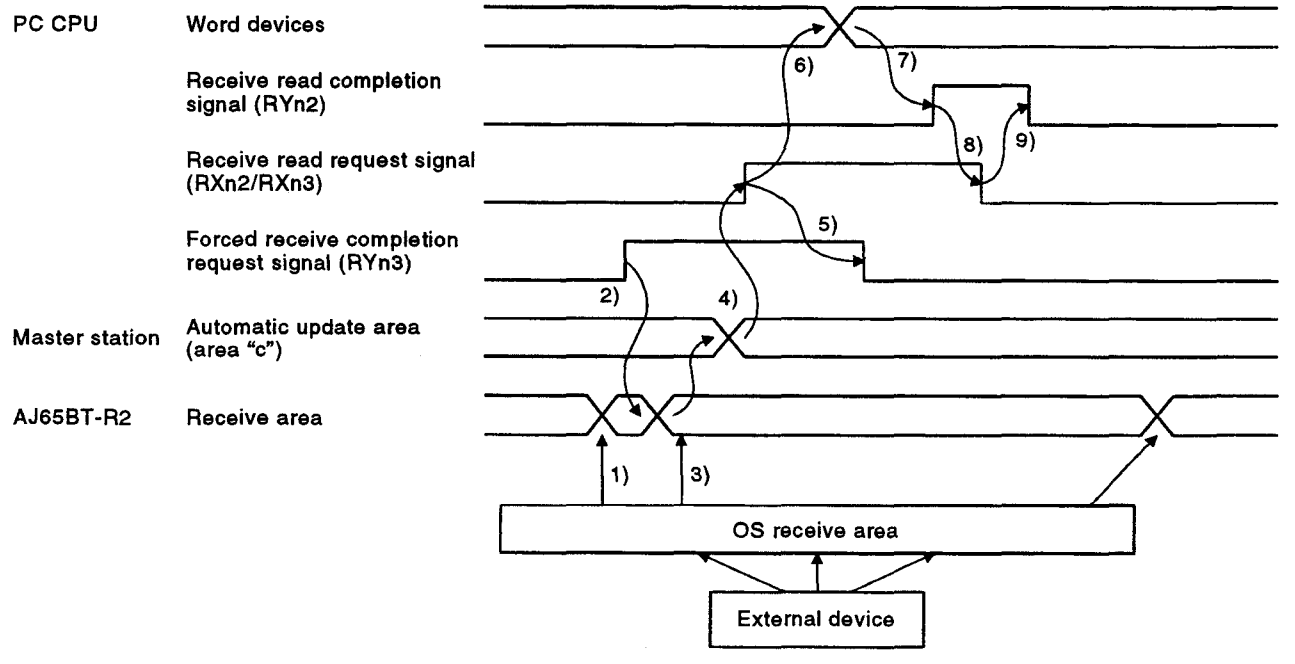


Fig. 9.2 Schematic Diagram of Forced Receive Completion Function



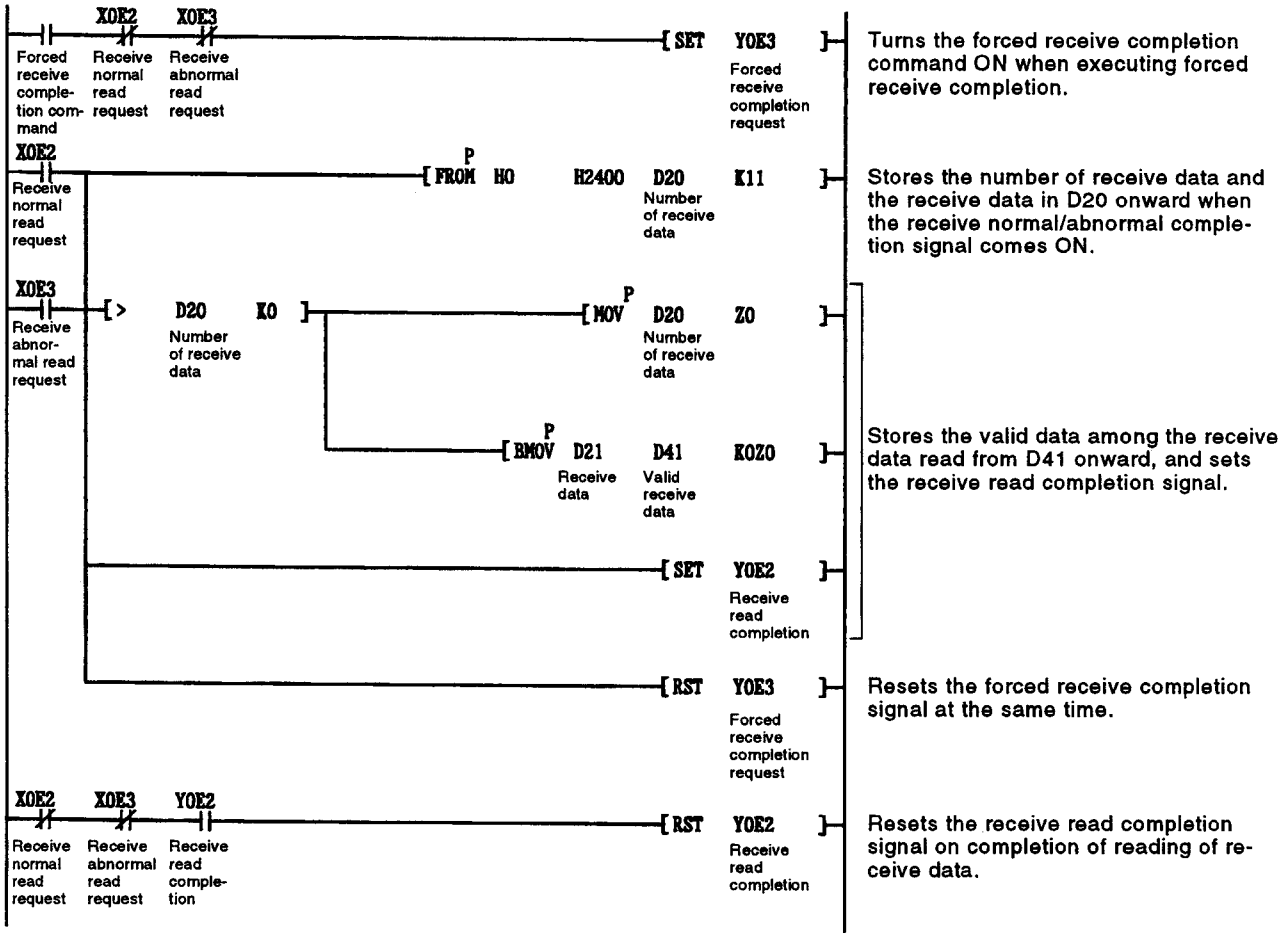
1) The AJ65BT-R2 stores the receive data from the external device in the receive area, routed through the OS receive area.
2) To forcibly complete reception, turn ON the forced receive completion signal (RYn3) in the sequence program.
3) The AJ65BT-R2 stores the data stored in the OS receive area in the receive area.
   The data that was stored in the receive area is sent to the automatic update area of the master station.
4) On completion of data transfer to the automatic update area of the master station, the AJ65BT-R2 turns ON the receive read request signal (RXn2/RXn3) to the PC CPU.
5) Turn OFF the forced receive completion signal (RYn3) with the sequence program.
6) Read the data stored in the buffer memory of the master module with, for example, a G(P).RIFR instruction in the sequence program.
7) Turn ON the receive read completion signal (RYn2) with the sequence program.
8) The AJ65BT-R2 turns OFF the receive read request signal (RXn2/RXn3).
9) Turn the receive read completion signal (RYn2) OFF with the sequence program.

POINTS

- Forced receive completion is only effective when no receive first frame numbers have been designated.
  The function will be ineffective if a first frame number has been designated.
- If, when the receive data stored in the OS receive area is transferred to the receive area on execution of forced receive completion, there is data exceeding the size of the receive area in the OS receive area, receive completion is executed by storing an amount of receive data equivalent to the receive area size in the receive area.

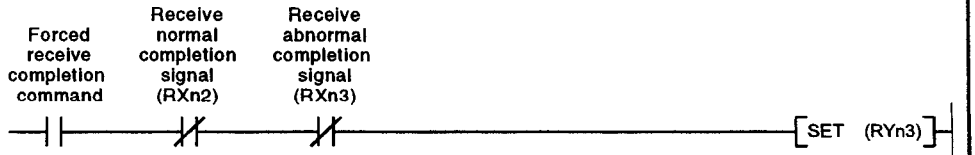
An example of a sequence program in which the forced receive completion function is used is presented below.
This example makes use of FROM/TO instructions (buffer memory automatic update function effective, for QnACPU).

- Master module first I/O numbers : X/Y00 to 1F
- For remote inputs (station No.1) : XE0 to XFF (RX0 to RX1F)
- For remote outputs (station No.1) : YE0 to YFF (RY0 to RY1F)
- Allocation for automatic update area : 600H per station (addresses 2000H to 25FFH)
- Units for number of receive data : Words
- Receive end number of data designation : 10 words



POINT

In order to ensure that the forced receive completion request signal is not received when there is no receive read request, provide the following interlock circuit.



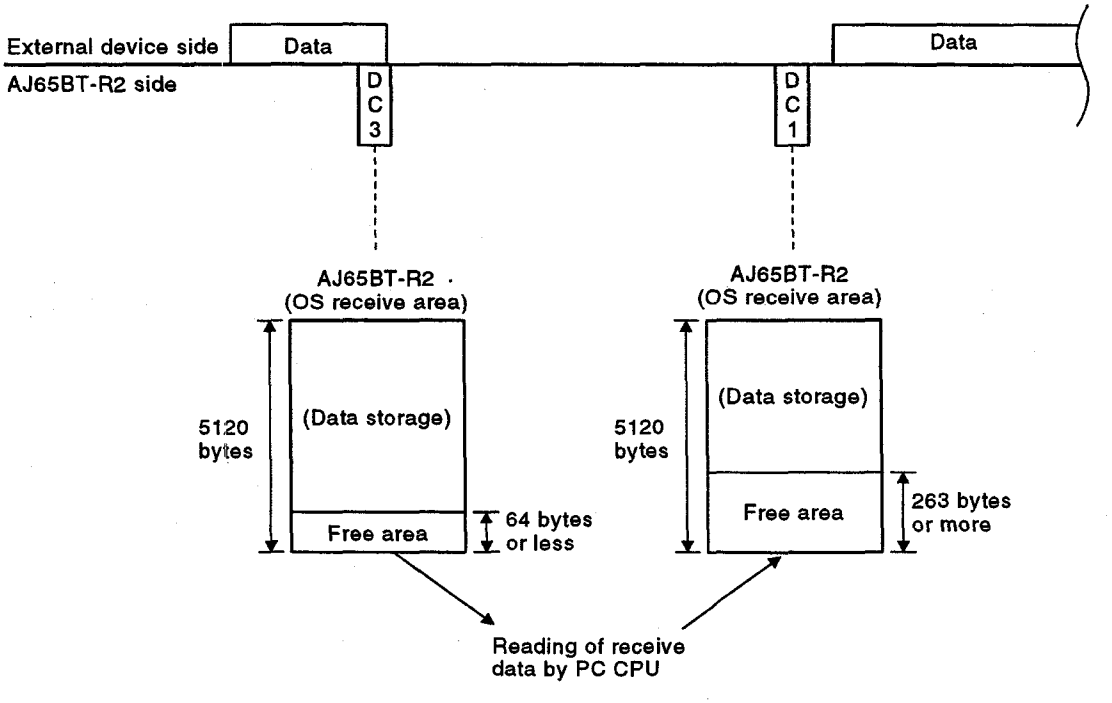
9.4 Flow Control Function

This function informs the communicating device whether or not data can be received at the host station.

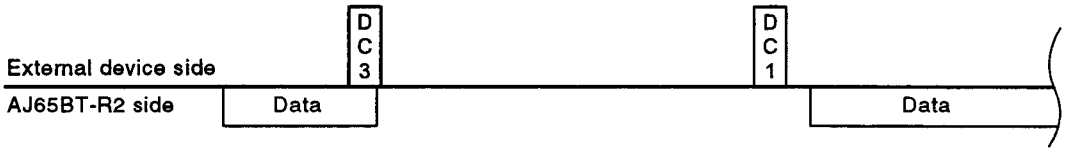
- When the AJ65BT-R2 is receiving data
  The suspension/reinstatement of data sending to the AJ65BT-R2 is notified to the external device in accordance with the available free area in the OS receive area of the AJ65BT-R2.
- When the AJ65BT-R2 is sending data
  Data sending from the AJ65BT-R2 is suspended and reinstated in accordance with requests from the external device.
  There are two methods for notifying suspension and reinstatement: DC code control and DTR(ER)/DSR(DR) signal control (hereafter abbreviated to "DTR/DSR signal control").

(1) DC code control
The AJ65BT-R2 notifies the external device whether or not data can be received at the host station by sending DC1 and DC3, and confirms the possibility of data reception at the external device on the basis of the reception of DC1 and DC3.

(a) DC1/DC3 send control
When the free area in the OS receive area of the AJ65BT-R2 has become 64 bytes or less, DC3 is sent to the external device and data sending from the external device to the AJ65BT-R2 is suspended.
When the free area in the OS receive area becomes 263 bytes or greater due to reading of the receive data by the PC CPU, DC1 is sent to the external device and data sending from the external device to the AJ65BT-R2 is restarted.



(b) DC1/DC3 receive control
On reception of the DC3 code, the AJ65BT-R2 suspends data sending to the external device, and when the DC1 code is received, restarts data sending to the external device.



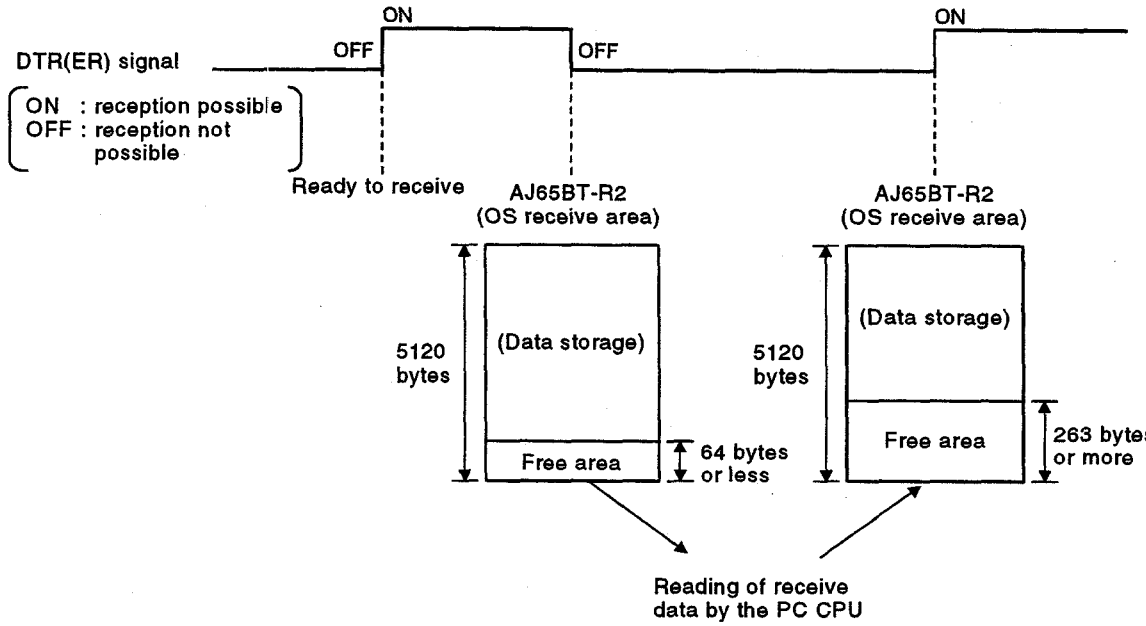
POINTS

- When the power is turned ON, and in the initialization status, the status is actually the DC1 sending status (data reception possible) and DC1 receiving status (data sending possible). However, DC1 is not sent to the external device, and the AJ65BT-R2 does not wait for DC1 to be received from the external device.
- While DC code control is being executed, DC1/DC3 codes received from the external device are not stored in the receive area of the AJ65BT-R2.
- The codes for DC1 and DC3 are 11H and 13H. It is not possible to change these codes.
- If, when DC code control is being executed, the send/receive data contains DC code data (11H, 13H) used for DC code control, use the ASCII-BIN conversion function.
  If the ASCII-BIN conversion function is not used, DC code data used for DC code control cannot be included.

(2) DTR/DSR signal control
The AJ65BT-R2 notifies the external device whether or not data reception at the host station is possible by means of the DTR(ER) signal, and confirms whether or not data reception is possible at the external device using the DSR(DR) signal.

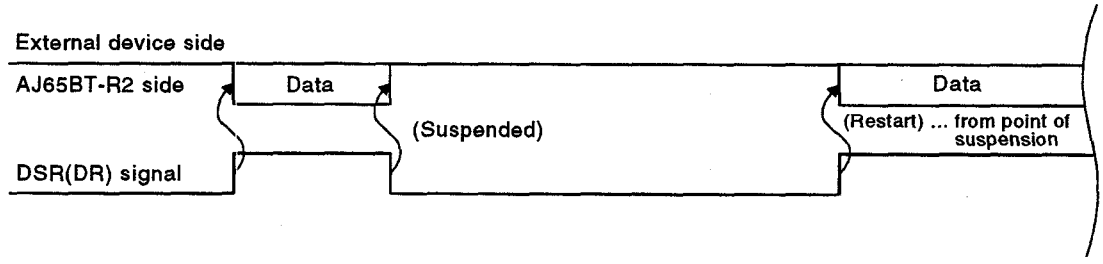
(a) DTR(ER) control

When the free area in the OS receive area has become 64 bytes or less, the AJ65BT-R2 turns the DTR(ER) signal OFF, and suspends data sending from the external device to the AJ65BT-R2. When the free area in the OS receive area becomes 263 bytes or more due to reading of receive data by the PC CPU, the DTR(ER) signal is turned ON, restarting data sending from the external device to the AJ65BT-R2.



(b) DSR(DR) control

If there is send data when the DSR(DR) signal is ON, the AJ65BT-R2 sends it to the external device; if there is send data when the DSR(DR) signal is OFF, it is not sent to the external device.



(3) Buffer memory setting for flow control designation
When executing flow control, make the flow control designation in the buffer memory special purpose area shown below.
For details on making the designation in the special purpose area, see Section 5.2.2.

Buffer Memory Address	Name	Description
100H	Flow control designation	Designate whether or not to execute DTR/DSR control or DC code control for data communication between the AJ65BT-R2 and external device. 0 : Flow control not executed. 1 : Execute flow control with DTR/DSR control. (Default) 2 : Execute flow control with DC code control.

POINTS

- If the buffer memory setting is "execute flow control with DTR/DSR control", the RYnA DTR(ER) signal setting is invalid.
- If the setting value in the special purpose area above is changed, the initialization processing described in Section 9.7 must be executed.

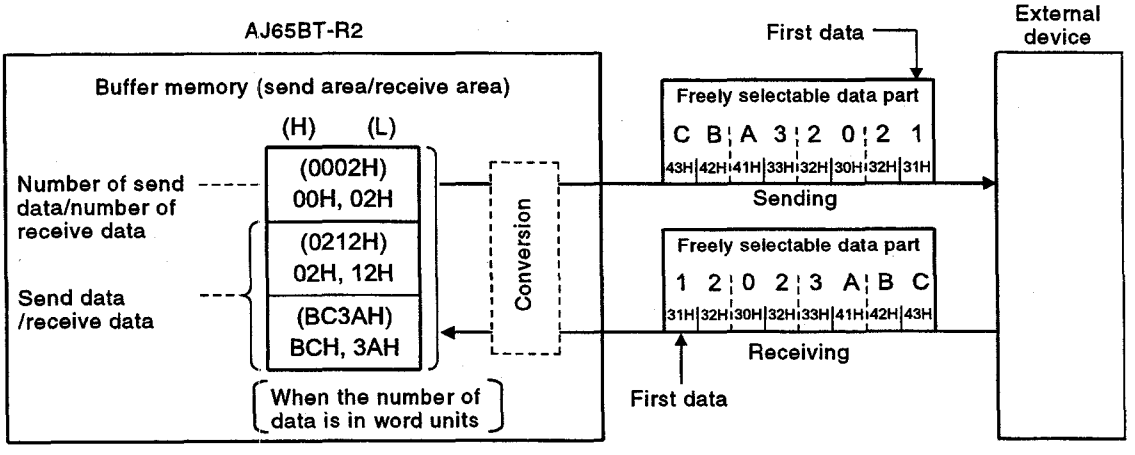
9.5 ASCII-BIN Conversion Function

This function sets ASCII-BIN conversion in order to send and receive data as ASCII codes in data communication between the AJ65BT-R2 and external device.
Make the setting in accordance with the specifications of the external device.
The AJ65BT-R2 performs ASCII-BIN conversions as follows.

- When sending ..... Regards the data in the send area as binary data and converts it to ASCII data.
- When receiving ..... Regards the receive data as ASCII data, converts it to binary data and stores it in the receive area.

(1) Sending sequence for sending with ASCII-BIN conversion
The data sent when sending with ASCII-BIN conversion is sent from the lower byte first; from the higher digits after conversion to ASCII code.

(2) Receiving sequence for sending with ASCII-BIN conversion
The receive data when receiving with ASCII-BIN conversion is stored from the lower byte first: it is converted to binary code taking the odd characters of the receive data to be the upper digits of one-byte data after conversion, and stored in the receive area.



(3) Cautions to observe when using the ASCII-BIN conversion send/receive functions

1) The range of send/receive data that can be converted is the data of data codes 30H to 39H ("0" to "9") and 41H to 46H ("A" to "F").
2) If ASCII-BIN conversion is designated for frame sending or monitor sending, only the send data part (contents of the send area) is converted to ASCII code.
   Registered frames (in the case of sending using the send frame 1 area, the first frame/final frame) are not converted to ASCII.
3) When ASCII-BIN conversion is designated for frame receiving, only the receive data part (data stored in the receive area) is converted to binary.
   The first frame and final frame are not converted to binary. The receive data is compared with the data of the receive first frame/final frame unchanged from when they were registered.
4) When ASCII-BIN conversion is designated for no-protocol sending or when using the monitor send function, if the number of bytes of binary data before conversion exceeds 2048, a "send data size exceeded error" (BB92H) occurs.
5) When ASCII-BIN conversion is designated with the frame communication function, if the combined total of the send/receive data after ASCII-BIN conversion and the first and final frames exceeds 2048 bytes, a "send/receive data size exceeded error" (BB92H/BBA2H) occurs.

(4) Buffer memory setting for ASCII-BIN conversion function
When executing ASCII-BIN conversion, make the designation in the buffer memory special purpose area shown below.
For details on making the designation in the special purpose area, see Section 5.2.2.

Buffer Memory Address	Name	Description
103H	ASCII-BIN conversion designation	Designate whether or not to execute ASCII-BIN conversion to send and receive data as ASCII codes when communicating data between the AJ65BT-R2 and external device. 0 : ASCII-BIN conversion not executed. (Default) 1 : ASCII-BIN conversion executed.

POINT

If the setting value in the special purpose are above is changed, the initialization processing described in Section 9.7 must be executed.

9.6 RW Update Function

The RW update function is a function that makes allocations in the buffer memory for the master station remote registers (RW), and an area that is automatically updated, at the AJ65BT-R2 side.
When a cause for communication of data between the area designated by the RW update first address designation area (43H to 4AH) in the AJ65BT-R2 buffer memory and the master module remote registers (RW) occurs, the data in the relevant area of the AJ65BT-R2 is automatically updated.

(Causes of automatic updating) ... (Details: Section 9.6.1)

- OFF → ON status change of remote input (RX) or remote output (RY) signal for automatic updating between the AJ65BT-R2 and the master module.
- Establishment of send condition when using the monitor send function
- Occurrence of a send error when using the monitor send function

Etc.

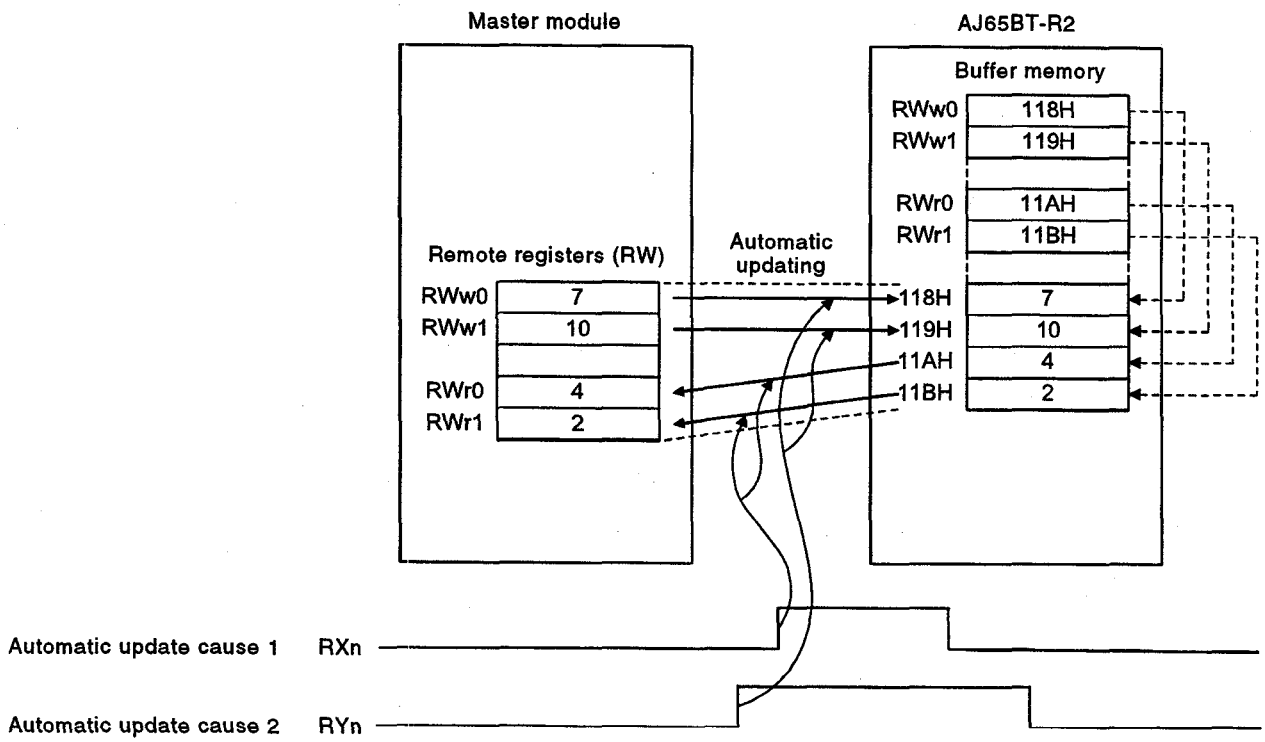


Fig. 9.5 Schematic Diagram of RW Update Function

By making the following setting, the user can read from/write to the buffer memory of the AJ65BT-R2 using the RW update function.

- AJ65BT-R2 side
  Allocate each area of the AJ65BT-R2 for which the RW update function is to be used by following the method described in Section 5.6. (For the default allocations, see Section 9.6.1 (1).)

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

- The data written in the master module remote registers (write area) (RWw) from the PC CPU is automatically written into the corresponding buffer memory area of the AJ65BT-R2 when the relevant automatic update cause occurs.
- The data in the corresponding buffer memory of the AJ65BT-R2 is automatically written into the relevant master module remote registers (read area) (RWr) on occurrence of the relevant automatic update cause, enabling the data to be read to the PC CPU.

(1) Update timing for RW update function
Data updating of the remote registers (RW) of the master module and the AJ65BT-R2 buffer memory can be carried out using the RW update function in either of the following two timings.
1) At the time intervals designated in the "RW update interval designation" area of the buffer memory
2) On occurrence of the update causes listed in the table below

Update Timing	Direction of Data Communication Master ↔ AJ65BT-R2
• Immediately before the AJ65BT-R2 turns ON the send normal completion signal (RXn0)/send abnormal completion signal (RXn1). • Immediately before the AJ65BT-R2 turns ON the receive normal read request signal (RXn2)/receive abnormal read request signal (RXn3). • Immediately before the AJ65BT-R2 turns ON the initialization normal completion signal (RXn4)/initialization abnormal completion signal (RXn5). • Immediately before the AJ65BT-R2 turns ON the E^2PROM function normal completion signal (RXn7)/E^2PROM function abnormal completion signal (RXn8). • Immediately after the AJ65BT-R2 detects the OFF → ON status change of the error reset request signal (RY(n+1)A). • Immediately after the AJ65BT-R2 detects an error when data is sent using the monitor send function. • Immediately before the AJ65BT-R2 turns ON the initial data setting completion signal (RX(n+1)9).	Rwr ← buffer
Immediately after the AJ65BT-R2 detects the OFF → ON status change of the send request signal (RYn0).	RWw → buffer
Immediately before the AJ65BT-R2 turns ON the receive normal read request signal (RXn2)/receive abnormal read request signal (RXn3).	RWr ← buffer
Immediately after the AJ65BT-R2 detects the OFF → ON status change of the initialization request signal (RYn4).	RWw → buffer
Immediately after the AJ65BT-R2 detects the OFF → ON status change of the initial data setting request signal (RY(n+1)9).	RWr ← buffer
Immediately after the AJ65BT-R2 detects the OFF → ON status change of the E^2PROM function request signal (RYn7).	RWw → buffer
Immediately before the AJ65BT-R2 turns ON the E^2PROM function normal completion signal (RXn7)/E^2PROM function abnormal completion signal (RXn8).	RWr ← buffer
Immediately after establishment of the condition for the monitor send function.	RWw → buffer

(2) Buffer memory setting for RW update function
When executing the RW update function, make the designations in the buffer memory special purpose area shown below.
For details on making the designations in the special purpose area, see Section 5.2.1.

Buffer Memory Address	Name	Description
40H	RW update interval designation	Designate the interval for data updating between the remote registers (RW) of the master station and the buffer memory of the AJ65BT-R2.
41H, 42H	RW updating effective/ ineffective designation	Designate whether RW updating is effective or ineffective.
43 to 4AH	RW refresh destination address designation area	Designate the addresses of the remote registers (RW) at the master station side and the updated buffer memory area at the AJ65BT-R2 side (see below).

As the default values in the RW refresh destination address designation area in the buffer memory special purpose area for the RW update function, the following buffer memory addresses are set.
Designate the buffer memory addresses at the AJ65BT-R2 side that are allocated to the remote registers (RW), as required.

Master Station → AJ65BT-R2			
Buffer Memory Address	Remote Registers	Default Allocation Addresses	Area Name
43H	RWw0	118H	Send first frame number
45H	RWw1	119H	Send final frame number
47H	RWw2	120H	First send table number designation
49H	RWw3	121H	Number of send tables

AJ65BT-R2 → Master Station			
Buffer Memory Address	Remote Register	Default Allocation Address	Area Name
44H	RWr0	1B0H	General error code
46H	RWr1	1B1H	Send error code
48H	RWr2	1B2H	Receive error code
4AH	RWr3	1B6H	Number of data in OS receive area storage

POINTS

- The default values for buffer memory addresses 41H to 42H are such that only the read area remote register (RWr) allocations are valid, not write area remote register (RWw) allocations.
To make write area remote register (RWw) allocations valid, change the default value for the buffer memory RWw update effective/ineffective designation (41H).
- After the settings in the special purpose area of the AJ65BT-R2 buffer memory have been changed, carry out AJ65BT-R2 initialization processing as described in Section 9.7.
The AJ65BT-R2 buffer memory special purpose areas for which initialization processing is necessary are the areas indicated in the "Initialization" column of Table 3.6 in Section 3.6.

9.7 AJ65BT-R2 Initialization Function

When the settings in the special purpose area of the AJ65BT-R2 buffer memory area are changed, AJ65BT-R2 initialization processing must be carried out.
AJ65BT-R2 initialization processing means stopping the processing currently being performed by the AJ65BT-R2 and returning the AJ65BT-R2 to its status at startup.
AJ65BT-R2 initialization processing is executed with a sequence program.

(Details of AJ65BT-R2 initialization processing)
In AJ65BT-R2 initialization processing, the following processing relating to communication with the external device via the RS-232C interface is carried out.

1) Stopping send/receive processing
2) Stopping receive area clear processing
3) Stopping send cancel processing
4) Stopping forced receive completion processing
5) Initialization of flow control processing
6) Initialization of frame communication processing
7) Initialization of control signal statuses
8) Initialization of the OS receive area
9) Initialization of error causes (e.g. turning LEDs OFF)

* The initialization function does not cover initialization processing of the RX/RY/RW devices associated with AJ65BT-R2 data link operation, or of the buffer memory.

POINT

After the settings in the special purpose area of the AJ65BT-R2 buffer memory have been changed, carry out AJ65BT-R2 initialization processing as described in Section 9.7.
The AJ65BT-R2 buffer memory special purpose areas for which initialization processing is necessary are the areas indicated in the "Initialization" column of Table 3.6 in Section 3.6.

(1) Operation outline for the initialization function

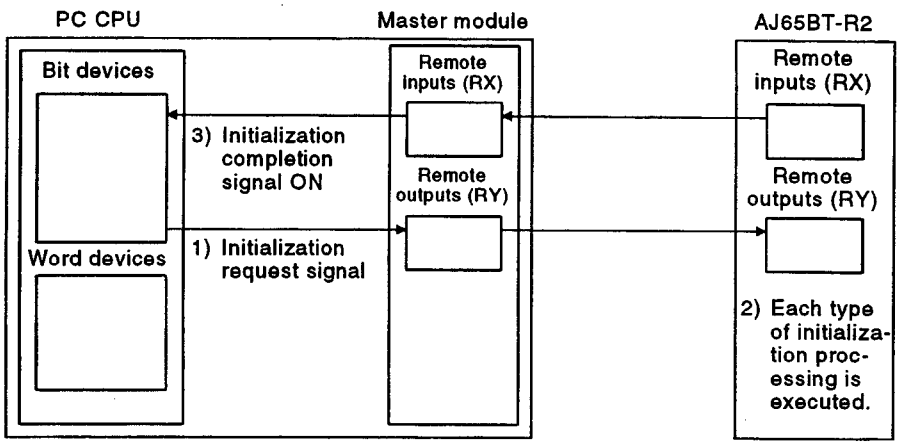
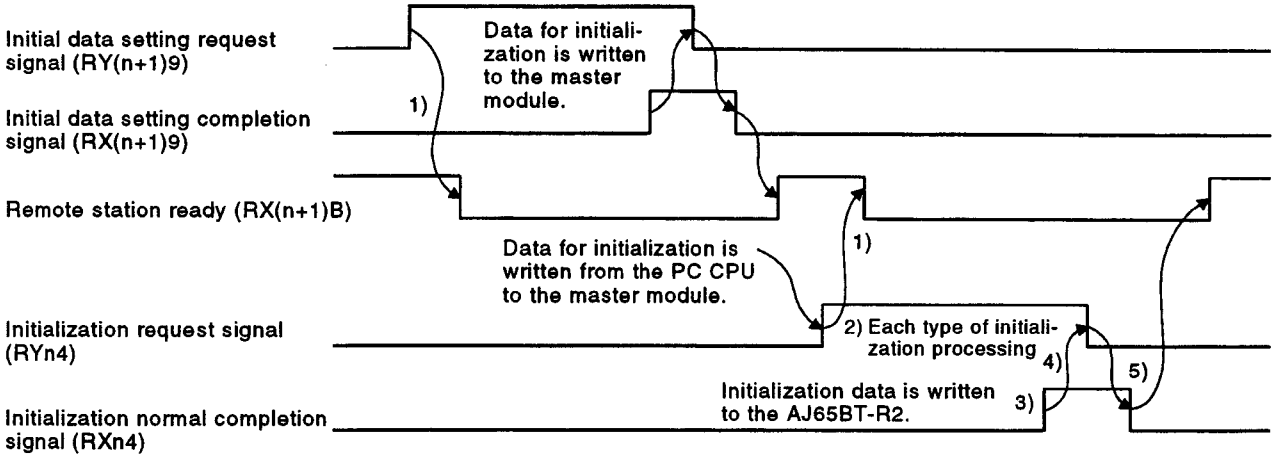


Fig. 9.6 Schematic Diagram of AJ65BT-R2 Initialization



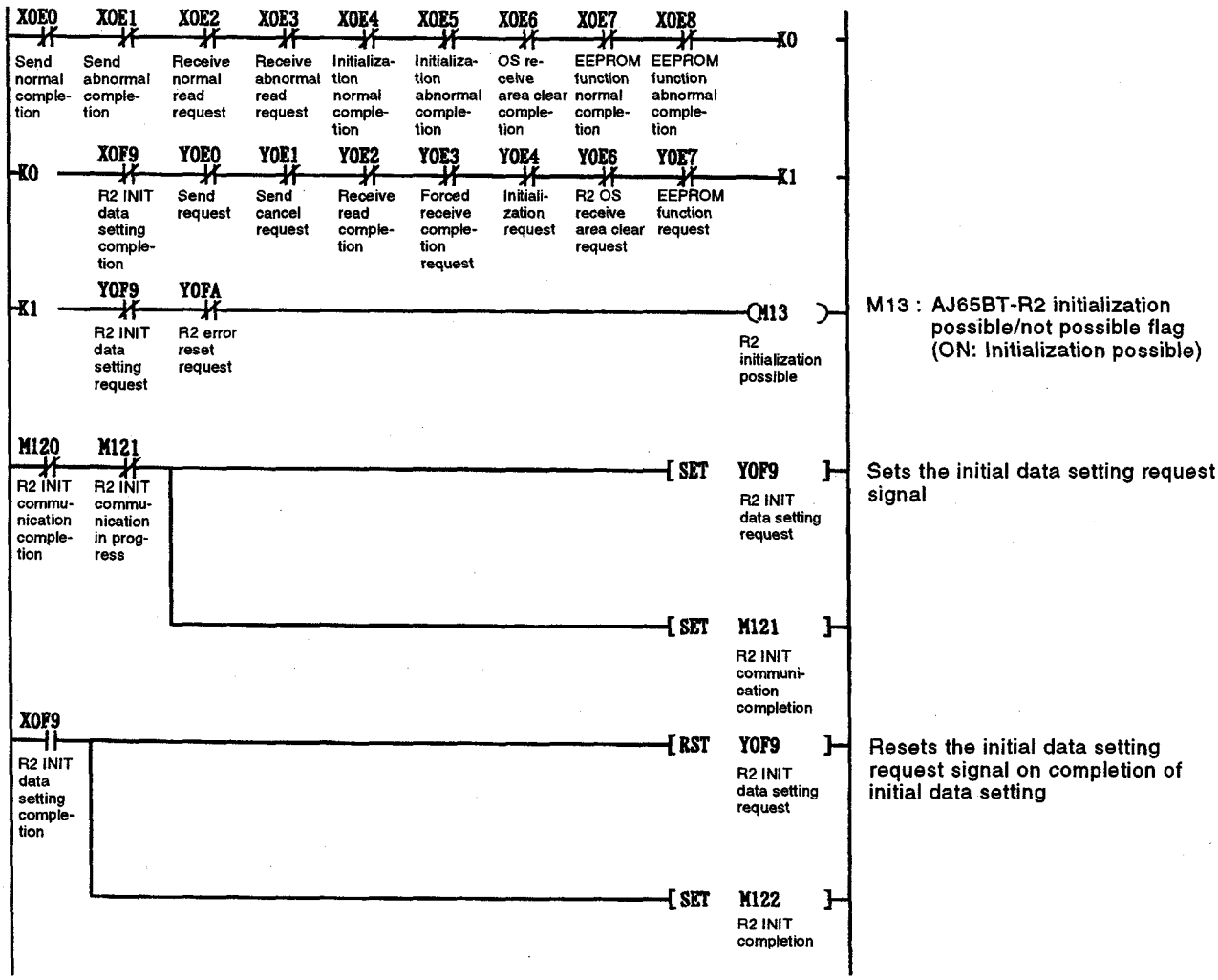
1) When initialization of the AJ65BT-R2 becomes necessary - for example to make changes to the AJ65BT-R2 buffer memory special purpose area or to initialize the communication statuses - turn ON the initialization request signal (RYn4) with a sequence program.
2) The AJ65BT-R2 starts each type of initialization processing.
3) On completion of initialization processing, the AJ65BT-R2 turns ON the initialization normal/abnormal completion signal (RXn4/RXn5).
4) Turn OFF the initialization request signal (RYn4) with the sequence program.
5) The AJ65BT-R2 turns the initialization normal/abnormal completion signal (RXn4/RXn5) OFF.

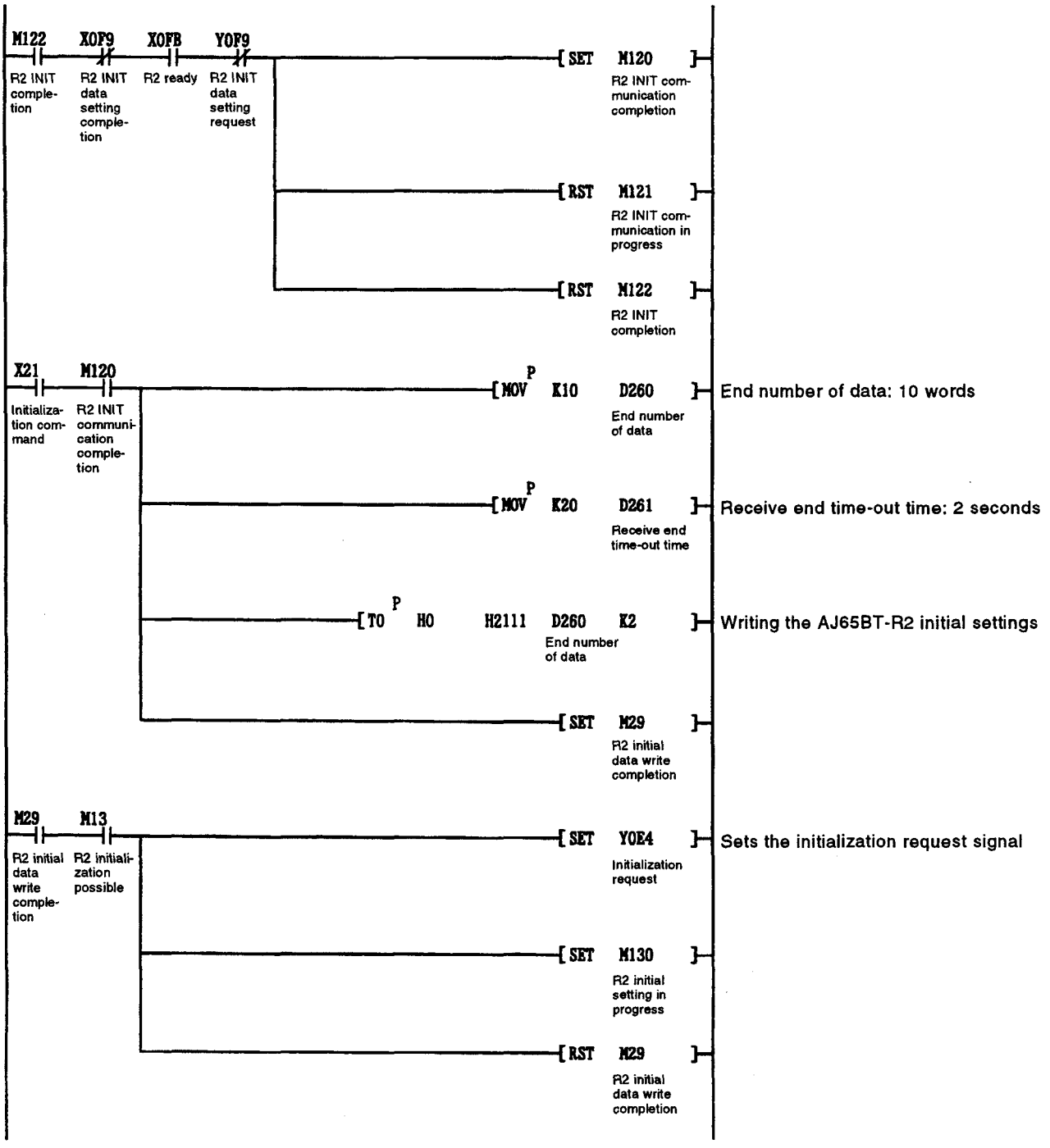
POINT

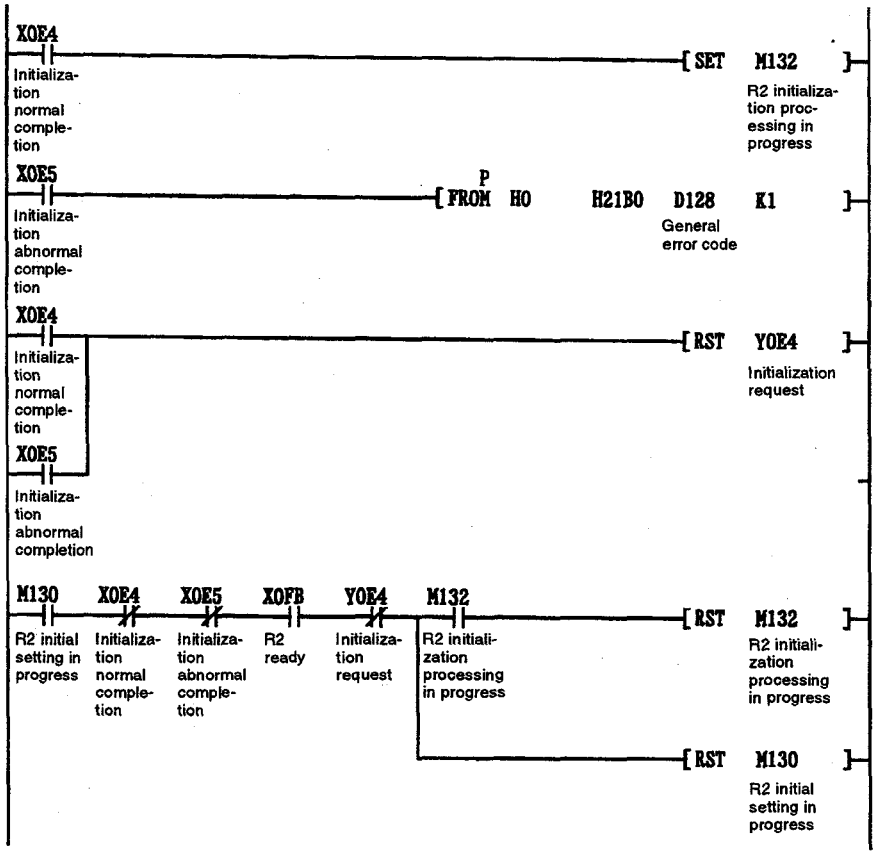
If initialization of the AJ65BT-R2 is completed abnormally, eliminate the cause of the error, then repeatedly issue the initialization request until normal completion is achieved.
The AJ65BT-R2 will not accept other requests until initialization has been completed normally.
(When an initialization error occurs, the remote station ready signal (RX(n+1)B) goes OFF.)

(2) Example sequence program using the initialization function
An example of a sequence program in which the initialization function is used is presented below.
This example makes use of FROM/TO instructions (buffer memory automatic update function effective, for QnACPU).

- Master module first I/O numbers : X/Y00 to 1F
- For remote inputs (station No.1) : XE0 to XFF (RX0 to RX1F)
- For remote outputs (station No.1) : YE0 to YFF (RY0 to RY1F)
- Allocation for automatic update area : 600H per station (addresses 2000H to 25FFH)

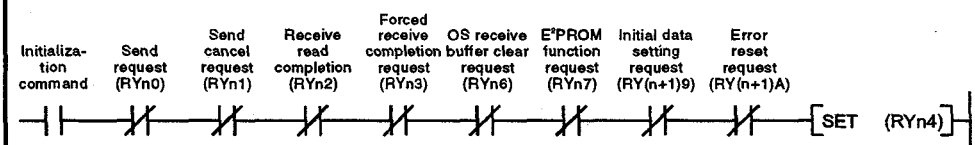



M122
R2 INIT completion
X0F9
R2 INIT data setting completion
X0FB
R2 ready
Y0F9
R2 INIT data setting request
SET M120
R2 INIT communication completion
RST M121
R2 INIT communication in progress
RST M122
R2 INIT completion
X21
Initialization command
M120
R2 INIT communication completion
MOV P K10 D260
End number of data
End number of data: 10 words
MOV P K20 D261
Receive end time-out time
Receive end time-out time: 2 seconds
TO P H0 H2111 D260 K2
End number of data
Writing the AJ65BT-R2 initial settings
SET M29
R2 initial data write completion
M29
R2 initial data write completion
M13
R2 initialization possible
SET Y0E4
Initialization request
Sets the initialization request signal
SET M130
R2 initial setting in progress
RST M29
R2 initial data write completion



POINT

In order to ensure that all request signals (RY) are OFF when the initialization request is issued, provide the following interlock circuit.



If initialization is executed when an RX or RY is ON, the processing currently being executed is stopped.
Turn OFF all RY devices except Yn4 before executing initialization.

9.8 OS Receive Area Clear Function

This function initializes the OS receive area (*1) inside the AJ65BT-R2. When the sequence program turns the OS receive area clear request signal (RYn6) ON, the OS receive area is initialized.

*1 About the OS receive area

(1) The OS receive area is an area for OS use, where the AJ65BT-R2 temporarily stores the following receive data:
   1) The data received up to occurrence of the cause for issue of the request to read receive data to the PC CPU in accordance with the "receive end number of data" and "receive final frame" set by the user.
   2) Data received from the external device when a request to read receive data stored in the receive area of the buffer memory to the PC CPU is issued.

(2) The data stored in the OS receive area is stored in (transferred to) the receive area of the buffer memory by the AJ65BT-R2 on occurrence of the following causes.
   1) Cause for request to read receive data to the PC CPU in accordance with the "receive end number of data" and "receive final frame" set by the user.
   2) Use of the forced receive completion signal.

(3) The number of words/bytes of receive data stored in the OS receive area can be designated in the "number of data in OS receive area storage area" (address: 1B6H). (See Section 5.3.)
   However, when the buffer memory automatic update function is used, since the value in the number of data in OS receive area storage area is updated in accordance with the automatic update timing, it is not possible to accurately read the number of receive data at the time of completion of reception.
   To check the number of receive data stored in the OS receive area, read the number of receive data using the RW update function.
   It is not possible to read the contents of the OS receive area directly from the PC CPU.

(1) Operation outline for the OS receive area clear function

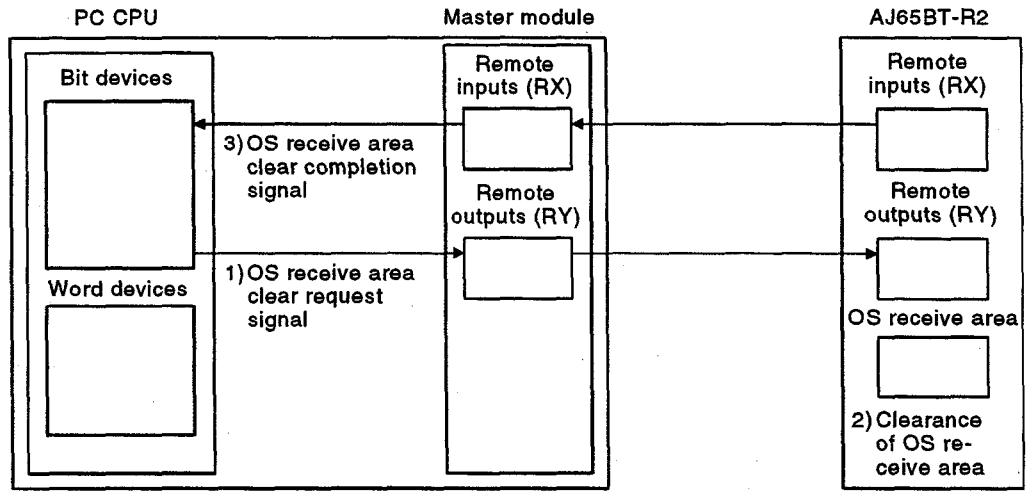
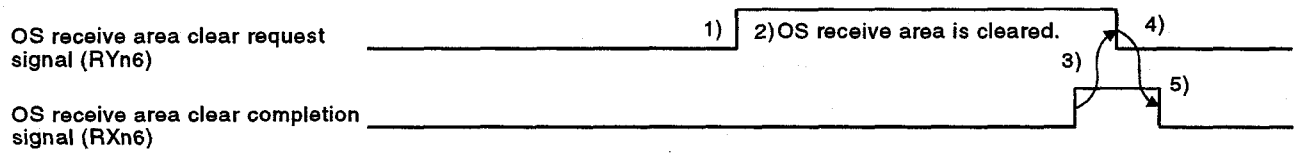


Fig. 9.7 Schematic Diagram of OS Receive Area Clearance



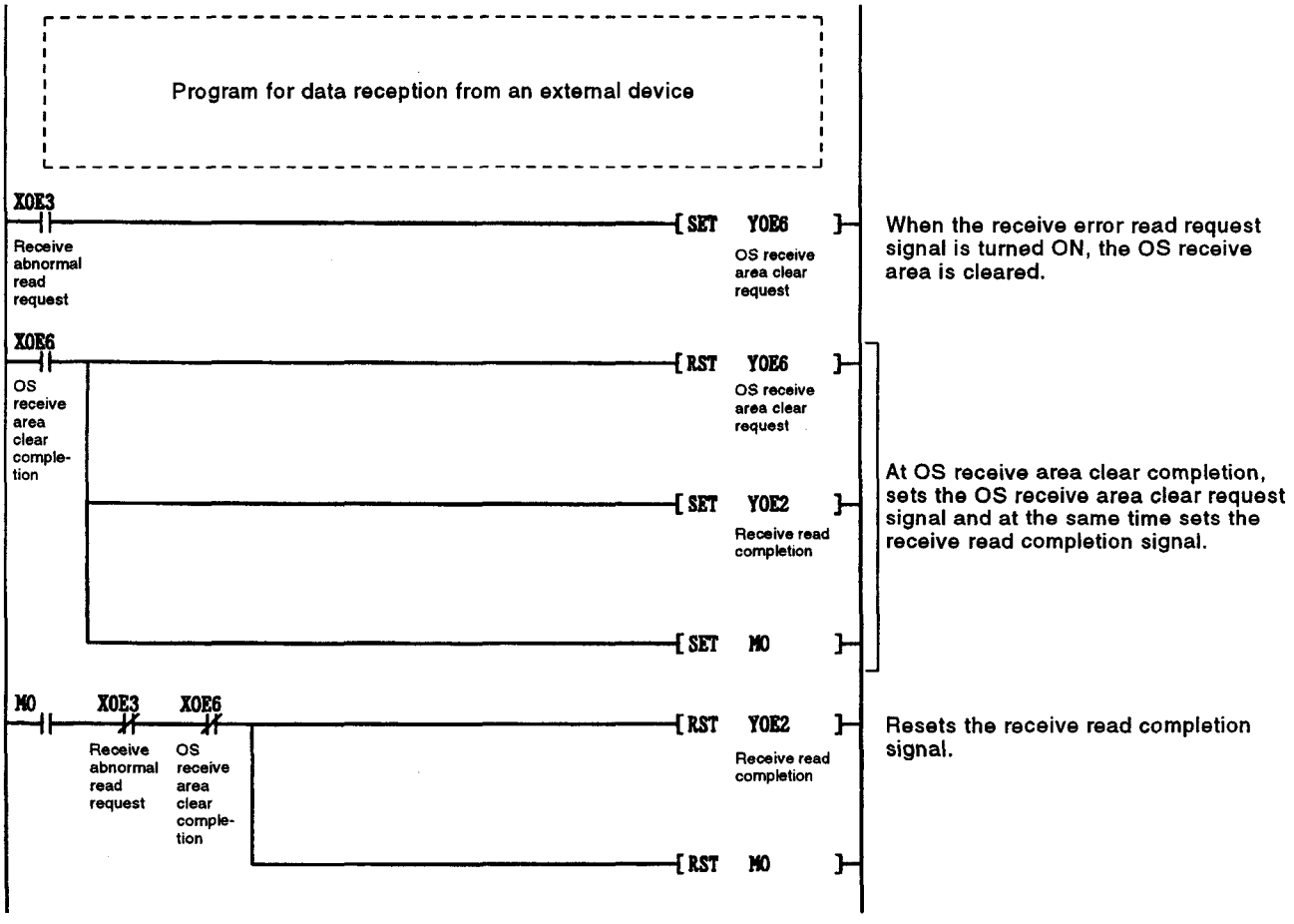
1) Turn ON the OS receive area clear request signal (RYn6) with the sequence program.
2) Clearance of the OS receive area starts.
3) On completion of clearance of the OS receive area, the AJ65BT-R2 turns ON the OS receive area clear completion signal (RXn6).
4) Turn OFF the OS receive area clear request signal (RYn6) with the sequence program.
5) The AJ65BT-R2 turns OFF the OS receive area clear completion signal (RXn6).

POINTS

- The OS receive area clear function clears only the OS receive area.
  It does not clear the receive area of the buffer memory.
- If the OS receive area clear function is executed when performing no-protocol receiving or frame receiving, all the receive data stored in the OS receive area is cleared.

(2) Example sequence program for OS receive area clearance
An example of a sequence program to execute the OS receive area clear function is presented below.

- Master module first I/O numbers : X/Y00 to 1F
- For remote inputs (station No.1) : XE0 to XFF (RX0 to RX1F)
- For remote outputs (station No.1) : YE0 to YFF (RY0 to RY1F)



9.9 Buffer Memory Setting Value Registration Function

This function registers the setting values to be set in the special purpose area of the buffer memory into the E^2PROM, and returns the setting values registered in the E^2PROM to the default values held by the AJ65BT-R2.
The buffer memory setting values registered in the E^2PROM (including the setting values changed by the user) are used as the default values when the AJ65BT-R2 is started up.
The buffer memory special purpose areas for which registration of setting values in the E^2PROM of the AJ65BT-R2 is possible are the areas indicated in the "Registration" column of Table 3.6 in Section 3.6.
After this registration in the E^2PROM, a sequence program for changing the default values of the buffer memory special purpose area is no longer necessary.

(1) Operation outline of the buffer memory setting value registration function
Registration/initialization of the buffer memory setting values is achieved by designating either registration or initialization of the buffer memory setting values in the buffer memory E^2PROM function designation area (address 1C0H) shown below and turning ON the E^2PROM function request signal (RYn7).

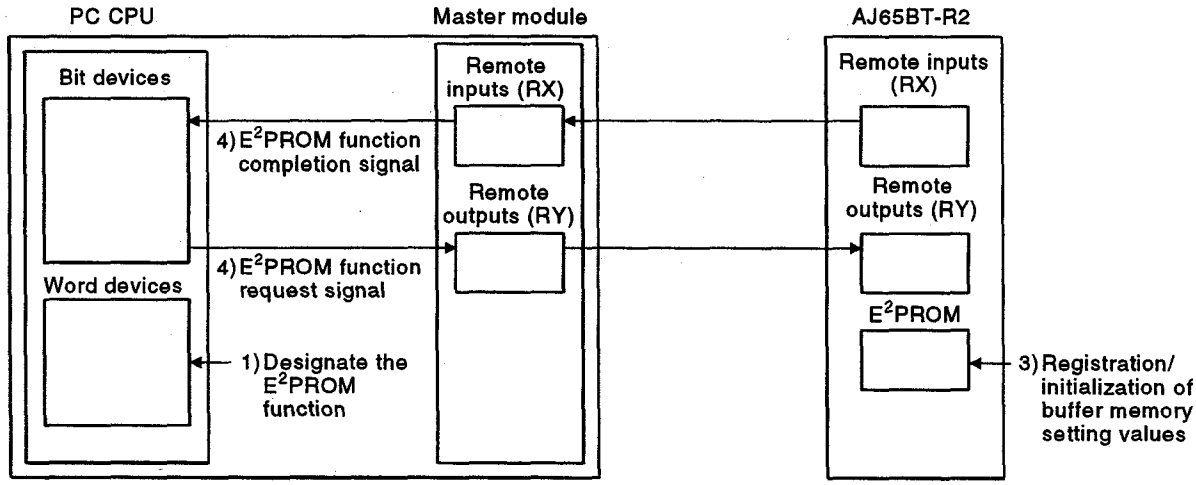
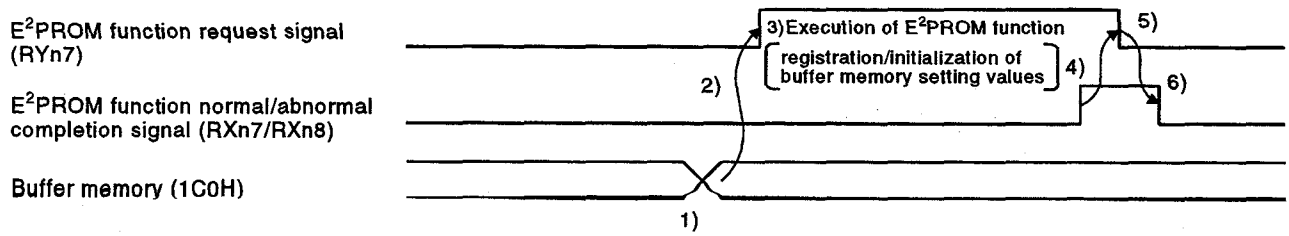


Fig. 9.8 Schematic Diagram for Buffer Memory Setting Value Registration Function



1) Write "0" (buffer memory setting value registration) or "4" (buffer memory setting value initialization) for the E^2PROM function setting (address 1C0H) of the AJ65BT-R2 E^2PROM area.
2) Turn ON the E^2PROM function request signal (RYn7) with the sequence program.
3) The AJ65BT-R2 executes the E^2PROM function (registration or initialization of buffer memory setting values in the E^2PROM).
4) On completion of execution of the E^2PROM function, the AJ65BT-R2 turns ON the E^2PROM function normal/abnormal completion signal (RXn7/RXn8).
5) Turn OFF the E^2PROM function request signal (RYn7) with the sequence program.
6) The AJ65BT-R2 turns OFF the E^2PROM function normal/abnormal completion function (RXn7/RXn8).

(2) Buffer memory settings for the buffer memory setting value registration function
The buffer memory settings for the buffer memory setting value registration function are indicated below.
For details on making the designation in the buffer memory special purpose area, see Section 5.4.

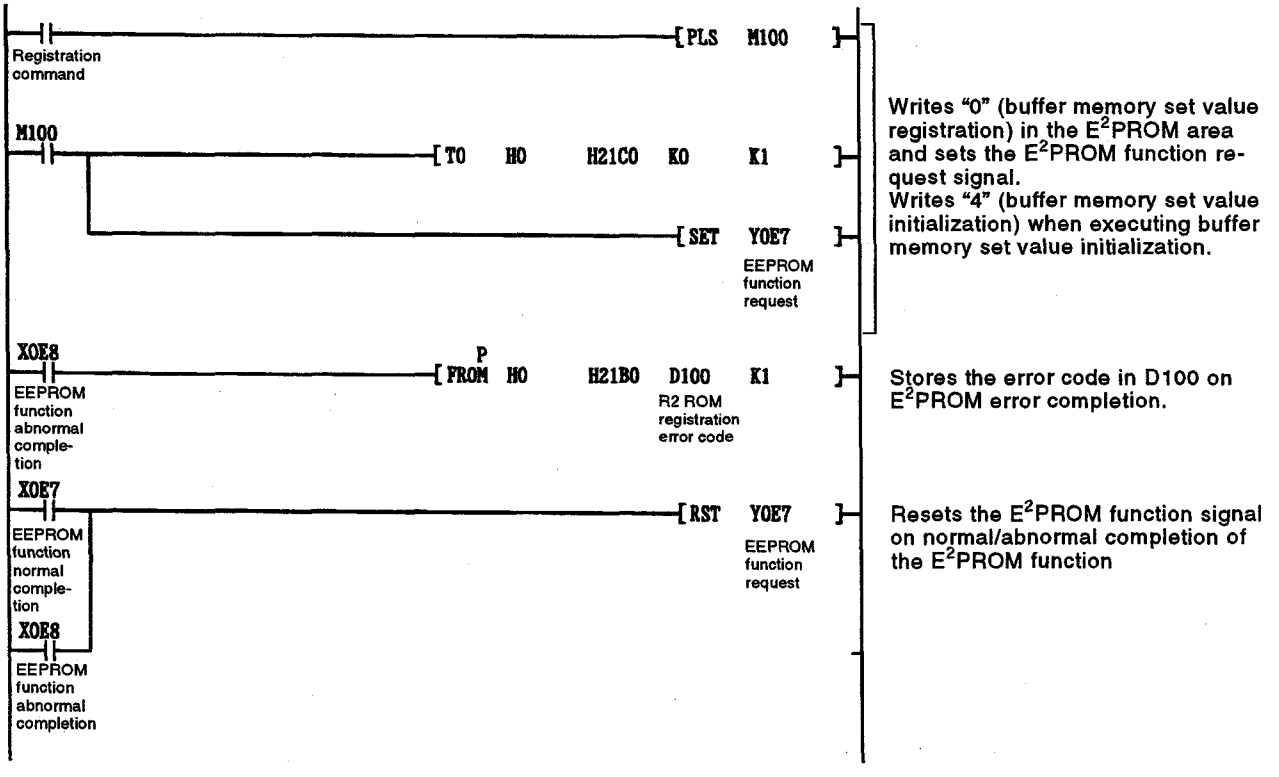
Buffer Memory Address	Name	Description
1C0H	E^2PROM function designation	Designates the E^2PROM function. When using the buffer memory setting value registration function, designate either registration or initialization of the buffer memory setting values. 0 : Buffer memory setting value registration 4 : Buffer memory setting value initialization

REMARK

It is possible to check whether the values in the buffer memory special purpose area when the AJ65BT-R2 is started up are the default values held by the AJ65BT-R2 or the default values registered in the E^2PROM by referring to buffer memory address 1A7H.

(3) Example sequence program using the buffer memory setting value registration function
An example of a sequence program in which the buffer memory setting value registration function is used is presented below.
This example makes use of FROM/TO instructions (buffer memory automatic update function effective, for QnACPU).

- Master module first I/O numbers : X/Y00 to 1F
- For remote inputs (station No.1) : XE0 to XFF (RX0 to RX1F)
- For remote outputs (station No.1) : YE0 to YFF (RY0 to RY1F)
- Allocation for automatic update area : 600H per station (addresses 2000H to 25FFH)



9.10 RS-232C Control Signal Read/Write Function

9.10.1 Correspondence between RS-232C control signals and remote I/O signals

Remote Input/ Output Signals		RS-232C Control Signals	Details
Input signals	RXn9	CS(CTS) signal	The ON/OFF statuses of the control signals for inputs are reflected in the corresponding remote input signals (RXn9 to RXnB).
	RXnA	DR(DSR) signal	
	RXnB	CD signal	
Output signals	RYn9	RS(RTS) signal	The ON/OFF statuses of remote output signals are reflected in the output of the corresponding control signals.
	RYnA	ER(DTR) signal	

Updating between the RS-232C control signals and the I/O signals (RX/RY) is done in 100 ms intervals.
For details on each RS-232C signal, see Section 3.3.

9.10.2 Cautions to observe when using the RS-232C control signal read/write function

(1) To control RYn9 with the RS(RTS) signal, designate "1" ("follows RY9") for the RS(RTS) signal status designation (address 101H) of the buffer memory.
If "0" ("always ON") is designated for the RS(RTS) signal status designation (address 101H) of the buffer memory, the RS(RTS) signal will remain ON at all times regardless of whether RYn9 goes ON or OFF. (Conforms to the setting at the buffer memory side.)

(2) To control RYnA with the ER(DTR) signal, set the buffer memory flow control designation (address 100H) to other than "ER/DR(DSR/DTR) signal control".
If "1" (ER/DR(DTS/DSR) signal control) is designated for the buffer memory flow control designation (address 100H), ON/OFF status changes of RYnA are ignored.

10. TROUBLESHOOTING

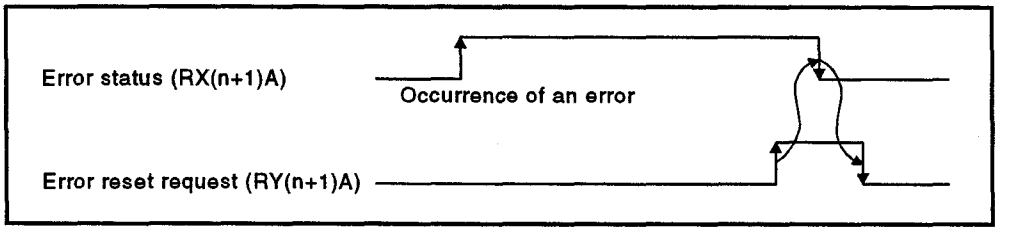
10.1 Error Codes

10.1.1 About the error code storage area

On occurrence of an error, the AJ65BT-R2 stores the error code in one of the three error code storage areas provided for different functions (see below) and lights the ERR LED.
It also stores up to eight previously occurring error codes, in their order of occurrence, in the error code history (addresses 1A8H to 1AFH). (The ninth and later errors are not stored.)
The ERR LED is turned off, and the error code storage area cleared, by turning ON the error reset request signal (RY(n+1)A).

Table 10.1 Error Code Storage Area List

Address	Name	Error Code Storage Buffer Memory
1A8H to 1AFH	Error code history	Stores up to eight errors that have occurred previously, in the order of their occurrence.
1B0H	General error codes	Stores the error code when the initialization abnormal completion signal (RXn5) or E^2PROM function abnormal completion signal (RXn8) comes ON, or when a time-out error occurs.
1B1H	Send error codes	Stores the error code when the send abnormal completion signal (RXn1) comes ON.
1B2H	Receive error codes	Stores the error code when the receive abnormal read request signal (RXn3) comes ON.



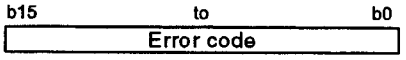
POINT

When an error occurs on issue of the initial data setting request signal (RY(n+1)9), error processing is not performed even if the error reset request signal (RY(n+1)A) is turned ON.

10.1.2 Error code list

The configuration of the error codes stored in the buffer memory, and the error code list, are presented below.
For details on PC CPU and master module error codes, refer to the user's manuals for each of these modules.

(1) Error code configuration



(2) Error code list

Error Code	Error Name	Cause of Error	Corrective Action
0000	———	Normal	
0001 to 4FFF	———	Refer to the user's manual for the PC CPU.	
B000 to BAFF	———	Refer to the user's manual for the master module.	
BB07	Automatic update time-out error	Time-out occurred when using the buffer memory automatic update function.	• Increase the value of the transient time-out designation (address 105H).
BB11	Send time-out error	Time-out occurred when sending data.	• Correct the flow control status or flow control designation (address 100H), or the flow control designation of the external device. • Check the wiring of the RS-232C cable. • Increase the value set for the receive time-out time designation (address 112H).
BB21	Receive time-out error	Time-out occurred when receiving data.	• Correct the flow control status or flow control designation (address 100H), or the flow control designation of the external device. • Check the wiring of the RS-232C cable. • Increase the value set for the send time-out time designation (address 11AH). • Decrease the value set for the receive end number of data designation (address 111H).
BB23	RS-232C receive overrun error	An overrun occurred during RS-232C reception.	• Reduce the transmission speed. • Note that noise could also be the cause.
BB24	RS-232C framing error	A framing error occurred during RS-232C reception.	• Correct the transmission specifications at the AJ65BT-R2 and external device. • Note that noise could also be the cause.
BB25	RS-232C receive parity error	A parity error occurred during RS-232C reception.	• Correct the transmission specifications at the AJ65BT-R2 and the external device. • Note that noise could also be the cause.
BB26	OS receive area overflow error	The OS receive area has overflowed.	• Execute flow control for communication with the external device. • Correct the flow control designation or flow control designation of the external device (address 100H). • Check the RS-232C cable wiring.

Error Code List (Continued)

Error Code	Error Name	Cause of Error	Corrective Action
BB28	Sum check error	The received check sum is abnormal.	• Correct the check sum designation for the registered frame. • Check the data received from the external device. • Note that noise could be the cause.
BB29	Special character usage error	A special character that cannot be used in the first frame or final frame was used in frame receiving.	• Correct the receive first frame/final frame numbers by referring to Table 8.2 in Section 8.2.
BB2A	ASCII → binary conversion error	Receive data that cannot be converted from ASCII to binary was received.	• Check the data received from the external device. • Note that noise could also be the cause.
BB41	Command error	A CT value that cannot be used with AJ65BT-R2 was used.	• Correct the CT value.
BB42	Receive frame error	The contents of the data received at the AJ65BT-R2 are abnormal.	• Correct the access code, number of points processed, attribute, etc.
BB81	First address designation error	There is a mistake in the designation value of the send/receive area first address designation area of the buffer memory.	• Set correct data by referring to the buffer memory list in Section 3.7.
BB82	Allocation designation error	There is a mistake in the designation values for the various allocation designation areas of the buffer memory.	
BB83	Parameter error	There is a mistake in the designation values of the parameter area of the buffer memory.	
BB88	E^2PROM function designation error	A value outside the range 0 to 4 has been designated in E^2PROM function designation (address 1C0H).	• Correct the value designated for E^2PROM function designation (address 1C0H).
BB89	User-registered frame number designation error	A value outside the range 1000 to 1199 has been designated for the user-registered frame number designation (address 1C1H).	• Correct the value designated for user-registered frame number designation (address 1C1H).
BB8A	Registered frame number of bytes designation error	A value outside the range 1 to 80 has been designated for the user-registered frame number of bytes designation (address 1C7H).	• Correct the value designated for the user-registered frame number of bytes designation (address 1C7H).
BB8B	Registered frame designated contents error	There is an unusable special character in the user-registered frame.	• Correct the contents of the user-registered frame.
BB8C	E^2PROM write error	An E^2PROM write time-out error has occurred.	• There may be a hardware fault : contact your nearest Mitsubishi representative.

Error Code List (Continued)

Error Code	Error Name	Cause of Error	Corrective Action
BB8D	User-registered frame not registered error	The designated user-registered frame number is not registered.	• Check if the designated user-registered frame number is registered.
BB92	Send data size exceeded error	The send data exceeds the maximum size for send data.	• Ensure that the total number of send data for frame sending is within 2048 bytes.
BB93	Number of send data error	The number of send data exceeds the size of the send area.	• Correct the number of send data (default address : 200H) and send area size (address 1H).
BB94	Send cancel request signal ON error	The send cancel request signal (RYn1) was already ON when a send request was made.	• Turn the send cancel request signal (RYn1) OFF before issuing the send request.
BB95	User-registered frame send error	The designated user-registered frame cannot be sent.	• Check if the designated user-registered frame is registered.
BB96	Special character usage error	A special character that cannot be used in a first frame has been designated for frame sending.	• Make a correct send first frame designation by referring to Table 8.2 in section 8.2.
BB97	Table send information error	Undesignatable data has been sent when sending a send table.	• Correct the data designated by the send table (addresses 122H to 185H) and monitor designations 1 to 64 (address 78H to F7H).
BB98	Registered frame contents send error	A special character that cannot be sent is included in the in the designated user-registered frame number.	• Correct the data contents of the designated user-registered frame number.
BBA2	Receive data size exceeded error	The receive data exceeds the maximum size for receive data.	• Set a number of receive data that can be accommodated in the receive area size.

10.2 Checking Errors with the LED Lamps

This section describes how to check errors with the LED lamps of the AJ65BT-R2.
For errors that relate to the PC CPU and master module, refer to the user's manuals for the PC CPU and master module.

(1) When the RUN LED of the AJ65BT-R2 is off

Cause	Action to Take
A watchdog timer error has occurred.	Reset the AJ65BT-R2 power. *1 If the RUN LED does not light after resetting, there may be a hardware fault: contact your nearest Mitsubishi representative.

(2) When the L RUN LED of the AJ65BT-R2 is off

Cause	Action to Take
A watchdog timer error has occurred.	Reset the AJ65BT-R2 power. *1 If the RUN LED does not light after resetting, there may be a hardware fault: contact your nearest Mitsubishi representative.
There is a disconnection or short in the cables.	Identify the wire in the transmission cables affected by the disconnection or short and repair it.
Master station has stopped link operation.	Check if an error has occurred at the master station.
24 V power is not being supplied to the AJ65BT-R2, or the voltage is low.	Check the voltage of the 24 V power supply.
Duplicated station number	Correct the station number setting at the module where there is station number duplication and reset the power *1.
An out-of-range setting has been made with a setting switch (station No. 0 or 65 or higher, transmission speed 5 to 9).	Correct the setting switch setting then reset the power *1.

(3) When the L ERR LED of the AJ65BT-R2 is flashing

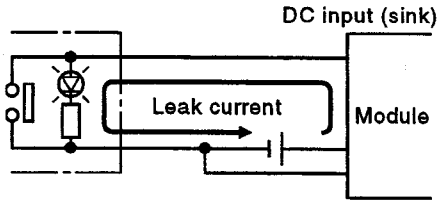
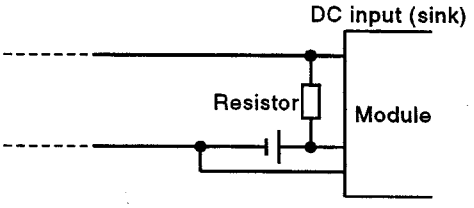
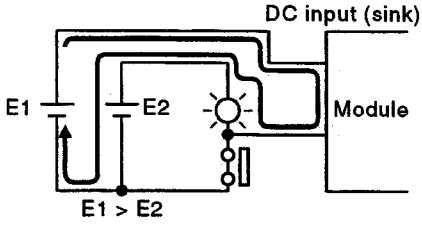
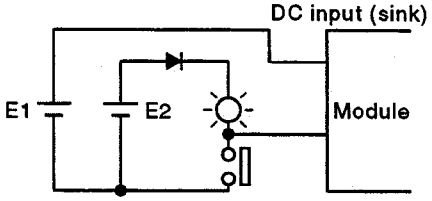
Cause	Action to Take
The setting of the station number or transmission speed setting switch was changed during normal operation.	Return the switch to its original setting and reset the power *1. If the L RUN LED does not light after resetting the power, there may be a hardware fault: contact your nearest Mitsubishi representative.
The station number setting switch or transmission speed setting switch is faulty.	If the L ERR LED starts flashing during operation even though the switch settings have not been changed, there may be a hardware fault: contact your nearest Mitsubishi representative.

(4) When the L ERR LED of the AJ65BT-R2 lights

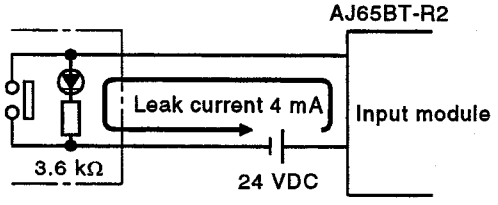
Cause	Action to Take
Some error has occurred during communication between the master station and AJ65BT-R2.	Check the error code stored in the buffer memory of the AJ65BT-R2, set correct data, then reset the power *1.
An out-of-range setting has been made with a setting switch (station No. 0 or 65 or higher, transmission speed 5 to 9).	Correct the setting switch setting then reset the power *1.
Terminal resistors have not been installed.	Check if the terminal resistors are installed. If they are not, connect them, then reset the power *1.
The module or transmission cable is affected by noise.	Ground the shield wire of the twisted cable at both ends (protected grounding) via the SLD or FG terminal. Ground the FG terminal of the module properly. If running wires through piping, ground the piping properly.

*1 "Reset the power" means turn the power OFF and then back ON, or turn the reset switch ON.

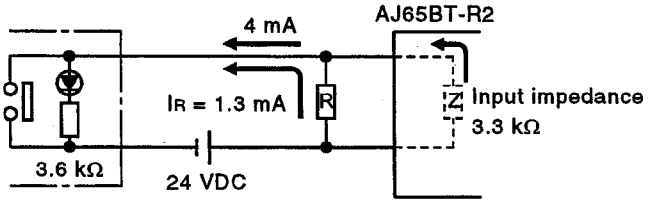
10.3 Examples of Trouble in General-Purpose Input Circuits

	Status	Cause	Corrective Action
Example 1	Input signal does not go OFF.	Drive by switch with LED indicator 	Connect a resistor that will make the voltage between the input terminal and COM1 higher than the OFF voltage, as shown below. 
Example 2	Input signal does not go OFF.	Sneak path due to use of two power supplies 	Use one power supply instead of two. Connect a sneak path prevention diode. (Figure below) 

<Example calculation for example 1>
Assume that a switch with an LED indicator is connected to the AJ65BT-R2 and the leak current is 4 mA:



(1) Since the OFF voltage of the AJ65BT-R2 does not reach the required value of 1.7 mA, the signal does not go OFF. Therefore, connect a resistor as shown below.



(2) Calculate the appropriate resistance for the connected resistor, R, as follows. To obtain the required AJ65BT-R2 OFF voltage of 1.7 mA, a resistor that allows a current of 1.3 mA or greater must flow to R :

I_R : Iz (input impedance) : R

$R \leq \frac{Iz}{I_R} \times$ (input impedance) $= \frac{1.7}{1.3} \times 3.3 = 4.3$ (kΩ)

$R < 4.3$ kΩ

If the resistance, R, is 3.9 kΩ, the power capacity, W, of resistor R is :

W = (input voltage)$^2 \div$ R = 31.2^2 (V) $\div$ 3.9 k (Ω) = 0.25 (W)

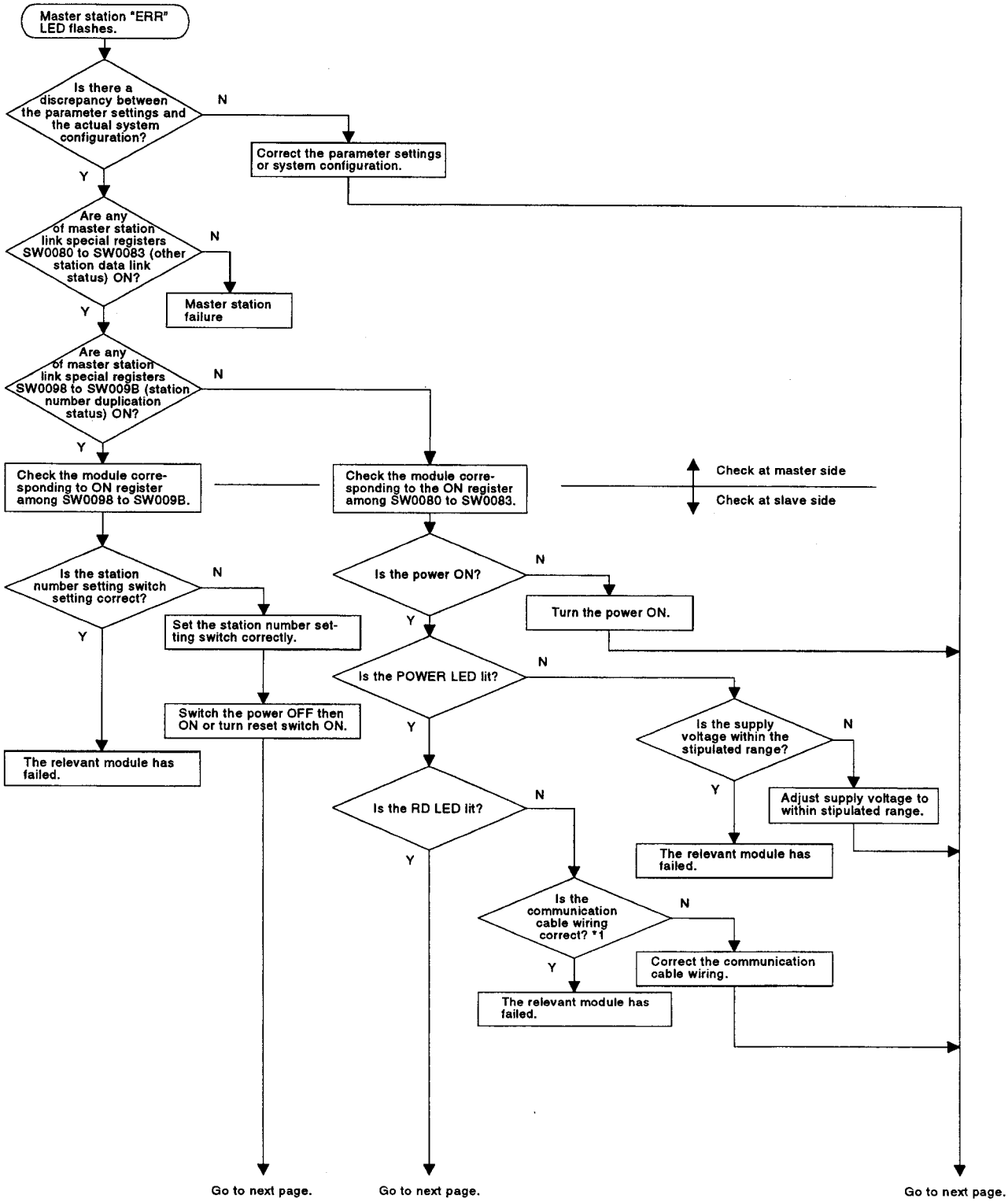
(3) Since a resistor with a power capacity of 3 to 5 times the actual power consumption is usually selected, a resistor of 3.9 kΩ and 1 W should be connected to the problem terminal.

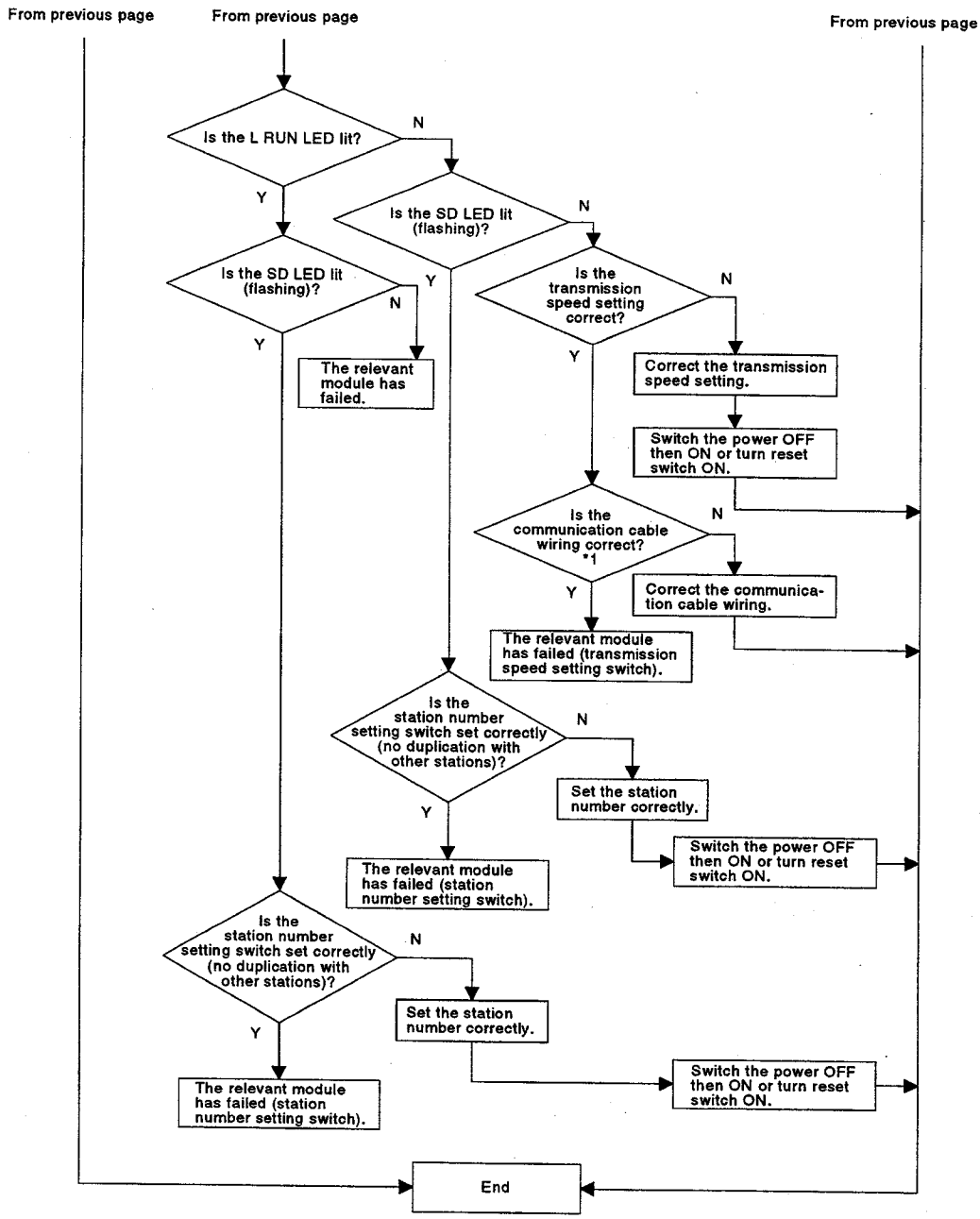
10.4 Troubleshooting Specific Symptoms

Symptom	Cause	Action to Take
"RD" does not flash when a message is sent from the external device.	The signal lines are not connected correctly.	Check if the RD, SD, and other connections between the AJ65BT-R2 and the external device have been made correctly.
	The send control signal at the external device side is not ON.	Ensure that the wiring is such that send control signals such as "DSR", "CS", etc., come ON, enabling communication with the external device.
	When flow control is being executed, the free area of the OS receive area of the AJ65BT-R2 becomes 64 bytes or less.	Execute receive processing to make the free area of the AJ65BT-R2 OS receive area 263 bytes or greater
	The transmission speed settings do not match.	Make the same transmission speed setting at the AJ65BT-R2 and the external device.
When a message is sent from the external device "RD" flashed but the read request signal did not come ON.	The receive end condition data has not been received.	Check if data of the fixed length set at the AJ65BT-R2 was sent from the external device. If communicating using registered frames, check if the final frame was sent.
	Transmission speed or other settings do not match.	Match the transmission speed or other settings of the AJ65BT-R2 and external device.
A message was sent from the AJ65BT-R2 but the external device did not receive it.	The external device's receive end condition data was not sent.	Send data that satisfies the receive end condition of the external device.
	The free area of the OS receive area is too small during execution of flow control.	Carry out processing such as receive processing at the external device to increase the free area of the OS receive area of the external device.
	Transmission speed or other settings do not match.	Match the transmission speed or other settings of the AJ65BT-R2 and external device.
The ERR LED lights	There is a mistake in the mode setting switch/transmission specification setting switch settings.	Read the error code from the buffer memory, check the error details and correct the settings.
	The AJ65BT-R2 detects an error during data sending.	Read the error code from the buffer memory and take appropriate action depending on the error details.
	The AJ65BT-R2 detects an error during data receiving.	Read the error code from the buffer memory and take appropriate action depending on the error details.
Communication is sometimes possible and sometimes not.	There is a connection fault in the signal cable wiring.	Replace the cables, or secure the connection properly.
Data that cannot be read has been received.	Parity bit settings do not match.	Match the parity check settings at the AJ65BT-R2 and external device.
	The stop bit bit length settings do not match.	Set the same number of stop bits at the AJ65BT-R2 and external device.
	The transmission speed settings do not match.	Make the same transmission speed setting at the AJ65BT-R2 and the external device.
It is not known whether the cause of a communication error is at the AJ65BT-R2 side or the external device side.	——	Perform the following test at the AJ65BT-R2 to determine which side the error is on. 1) Carry out a hardware check. Check if the AJ65BT-R2 is mounted securely. Check if any of the pins at the module are bent or otherwise abnormal. 2) Carry out the AJ65BT-R2 hardware test (see Section 4.6). Check that there is no error in the hardware test. Check the CPU status. Check that no error that stops CPU operation has occurred.

10.5 Procedure on Occurrence of Communication Error between Master Station and AJ65BT-R2

If a station number duplication bit in link registers SW0098 to SW009B (station number duplication status) has come ON, check the AJ65BT-R2 at the relevant station number by following the flow diagram below.

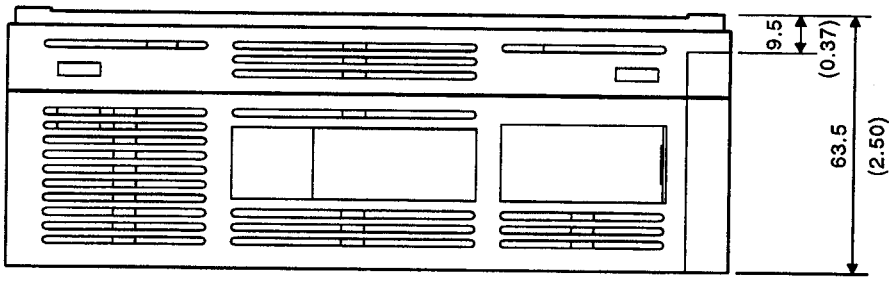


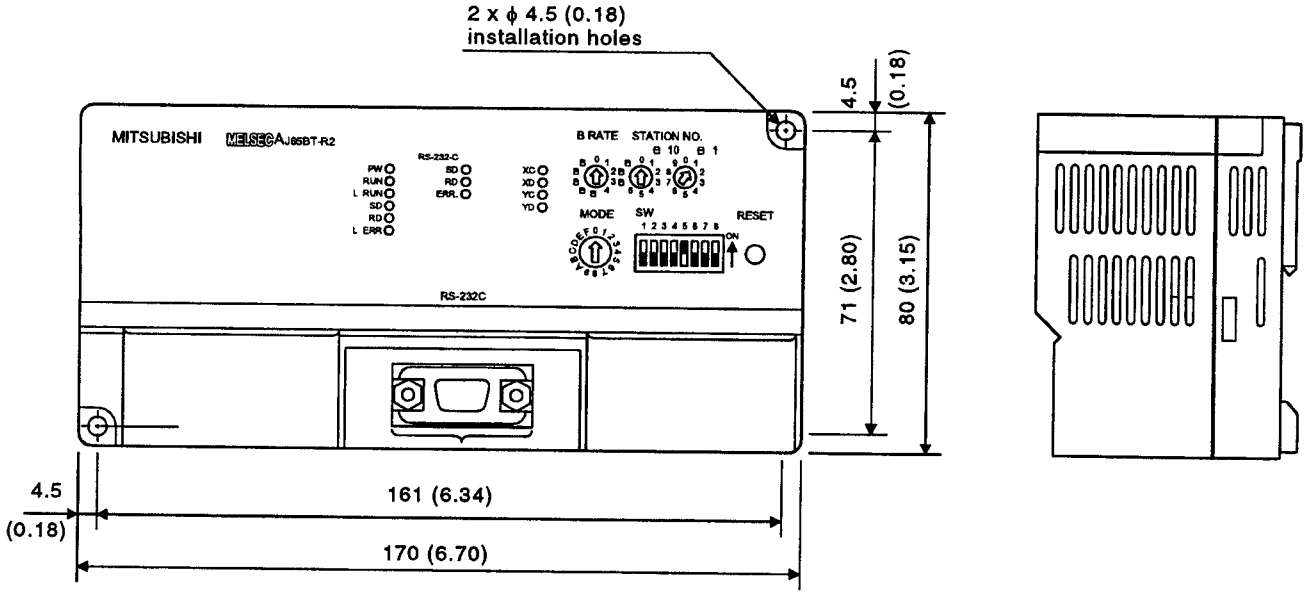


*1 Points to check : short circuit, reversed connections, disconnection, terminal resistors, FG connections, overall distance, station-to-station distance.

APPENDICES

APPENDIX 1 DIMENSIONS





Unit : mm (inch)

APPENDIX 2 CONTACTS FOR ENQUIRIES TO MAKERS OF CONNECTABLE PRODUCTS

(1) Bar code readers

NIPPON ELECTRIC INDUSTRY CO.,LTD.
JAPAN
19-9.TSUTSUMI-DORI 1-CHOME, SUMIDA-KU TOKYO 131.JAPAN
03-3613-9059

TOHKEN CO.,LTD.
Los Angeles
P.O.Box 4629 Anahelm.CA 92803-4629 714-641-6811
TOHKEN(HD)CO.,LIMITED
Hong Kong
Rm, 705, Multlfleld Plaza, No.3-7A,Prat
Avenue, Talm SnA Taui.Kowloon.Hong Kong 852-2369-7323

DATALOGIC,Inc.
U.S.A
3000 Earhart Court, Suite 135 Hebron,KY 41048 USA
+1-800-849-5358
DATALOGIC S.P.A.
Italy
Via Candini,2 40012 Lippo di Calderara di Reno
Bologna,Italy +39-51-6459211

(2) ID controllers

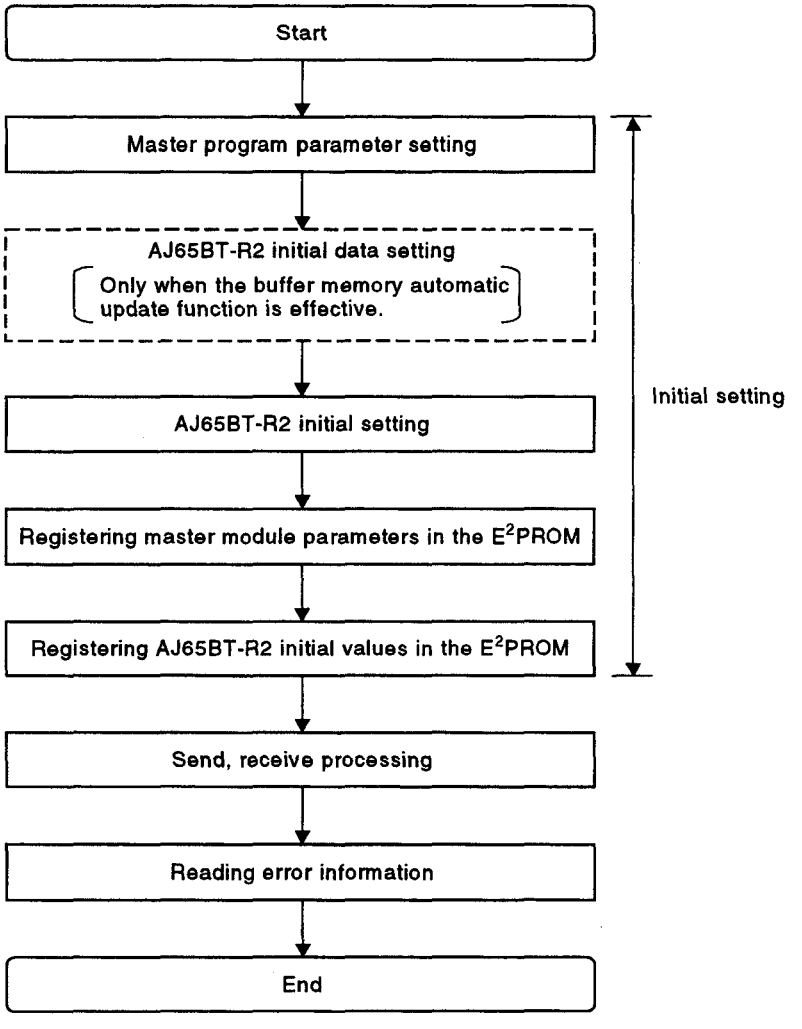
OMRON ELECTRONICS,INC.
U.S.A
1 East Commerce Drive,SCHAUMBURG,IL 60173 1-708-843-7900
OMRON EUROPE B.V.
The Netherlands
Wegalaan 67-69,2132 JD HOOFDDORP 31-2356-81-300
OMRON ELECTRONICS ASIA LTD.
Hong Kong
Unit 601-9. Tower 2, The Gateway No. 25,
Canton Road, Tsimshatsui, Kowloon Hong Kong 852-2375-3827

SUNX TRADING CO.,LTD.
JAPAN
Itsuwa Plaza Bldg.3th Fl.,2-26-9 Nishi-Gotanda,
Shinagawa-ku,Tokyo,141,Japan 03-3495-2601
SUNX Limited.
JAPAN
2431-1 Ushiyama-cho,Kasugai-shi,Aichi,486, Japan 0568-33-7211

APPENDIX 3 PROGRAM EXAMPLES

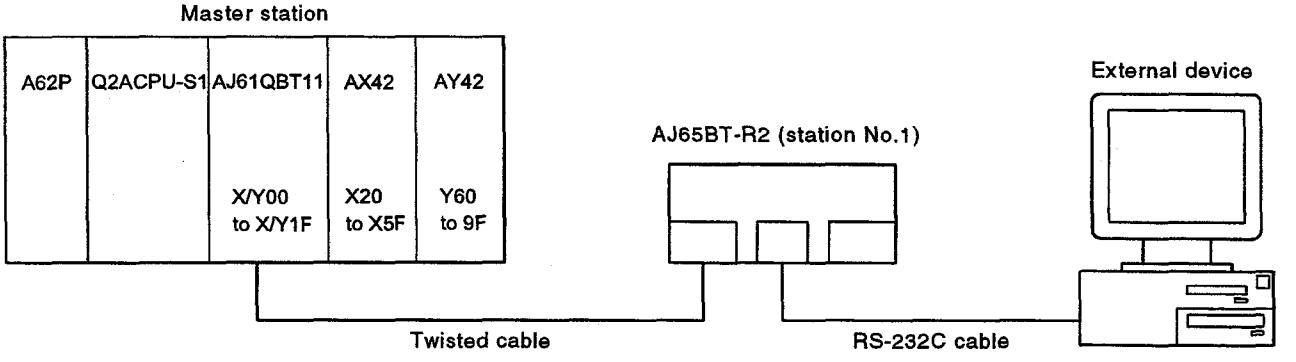
This appendix describes the parameter settings at the master station and AJ65BT-R2 and presents examples of programs for data communication between the AJ65BT-R2 and external devices.
These programs execute only the minimum processing required for each operation. If error processing or other processing is required, it must be added.
The addresses used in these programs must also be changed in accordance with the system used.
For details on instructions, refer to the Programming Manual.

3.1 Programming Procedure



3.2 Conditions for the Program Examples

(1) System configuration



(2) Contents of initial setting
1) Station number setting.....Station No.1

(3) Master module buffer memory addresses
1) For remote inputs (station No.1).....E0H to E1H (RX0 to RX1F)
2) For remote outputs (station No.1).....160H to 161H (RY0 to RY1F)

(4) Automatic update area allocation
600H per station (addresses 2000H to 25FFH)

(5) Batch refresh devices
Remote inputs (RX).....XE0 to XEF
Remote outputs (RY).....YE0 to YFF

(6) Switch settings

Switch	Application
X20	Send command
X23	Receive time-out reset command
X24	Error processing completion command
X25	Master station parameter registration in E^2PROM command
X26	AJ65BT-R2 initial value registration in E^2PROM command
X27	AJ65BT-R2 error reset command
X28	Error information read command
X29	Error processing completion command

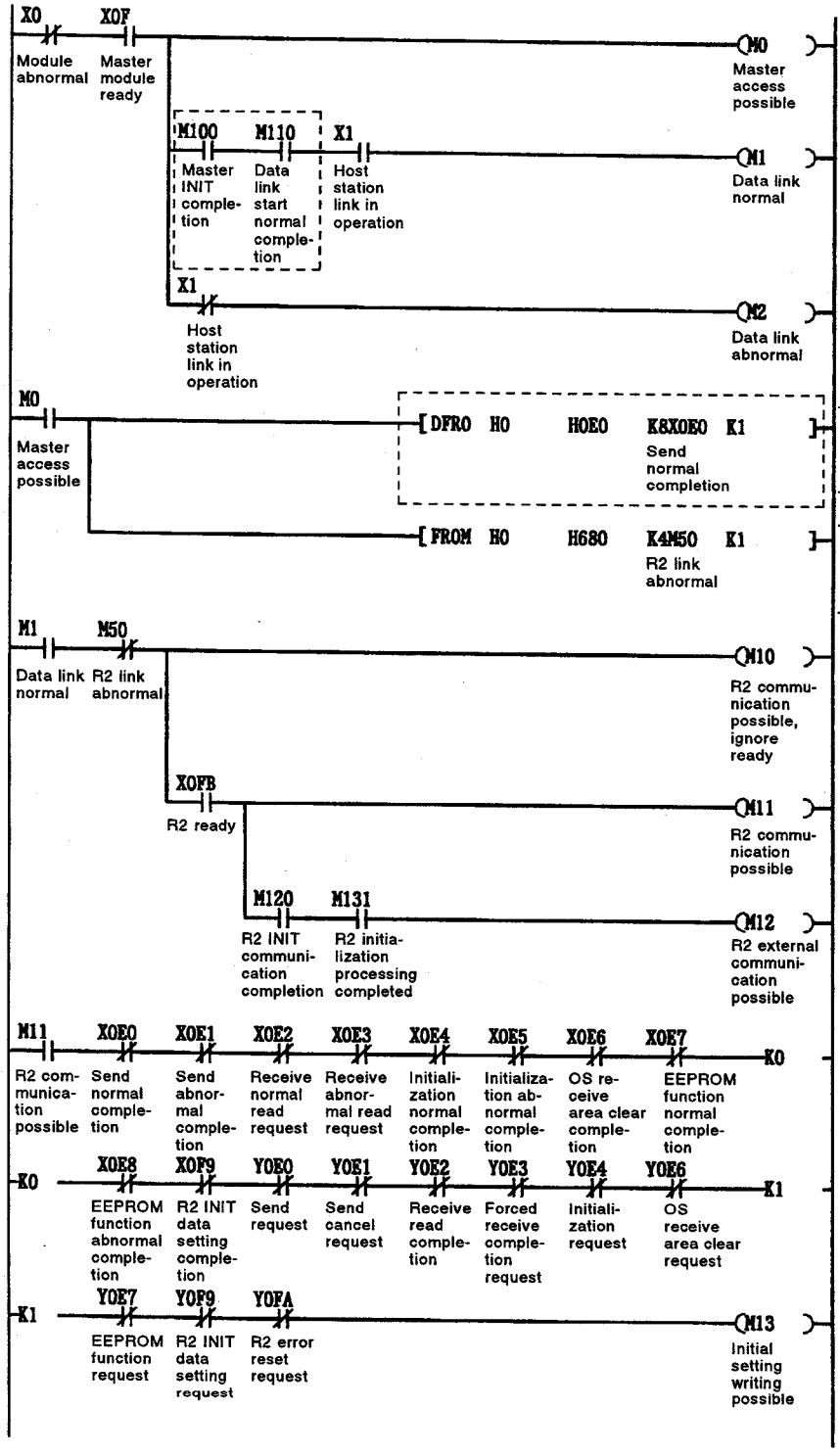
When using an A-series master module (AJ61BT11/A1SJ61BT11), it may be necessary to switch banks in the master module buffer memory when reading from or writing to the AJ65BT-R2 buffer memory from the PC CPU. (Does not apply to AnSHCPU.)
For details on the instruction for bank switching located before the part of a program in which the AJ65BT-R2 buffer memory is read from or written to, see Section 5.5.5 (4).

3.3 Example of Program When the Automatic Buffer Memory Update Function is Effective

When the parameter settings are set in the master module by using the GPPQ function, set the CC-Link parameter settings as shown below. This makes the parts of the program enclosed by dotted lines unnecessary.

Parameter Setting Item			Set Value
Number of units			1
Start unit I/O number			0
Unit type			M. Master station
Refresh all devices	Remote input (RX) (bit)		XE0
	Remote output (RY) (bit)		YE0
Number of connected stations	Total number of connected stations		1
Station information settings	Station type		Intelligent
	Number of occupied points		One
	Intelligent buffer specification (word)	Send	0
		Receive	0
		Automatic update	2048

(1) Program using FROM/TO (application) instructions (for QnACPU)
[Main program]



M0 : Access to master station possible/ not possible flag (ON: Access possible)

M1 : Data link normal flag (ON: Normal)

M2 : Data link abnormal flag (ON: Abnormal)

Reading of remote inputs of remote station (first station)

Reading of link status of 1st to 16th remote stations

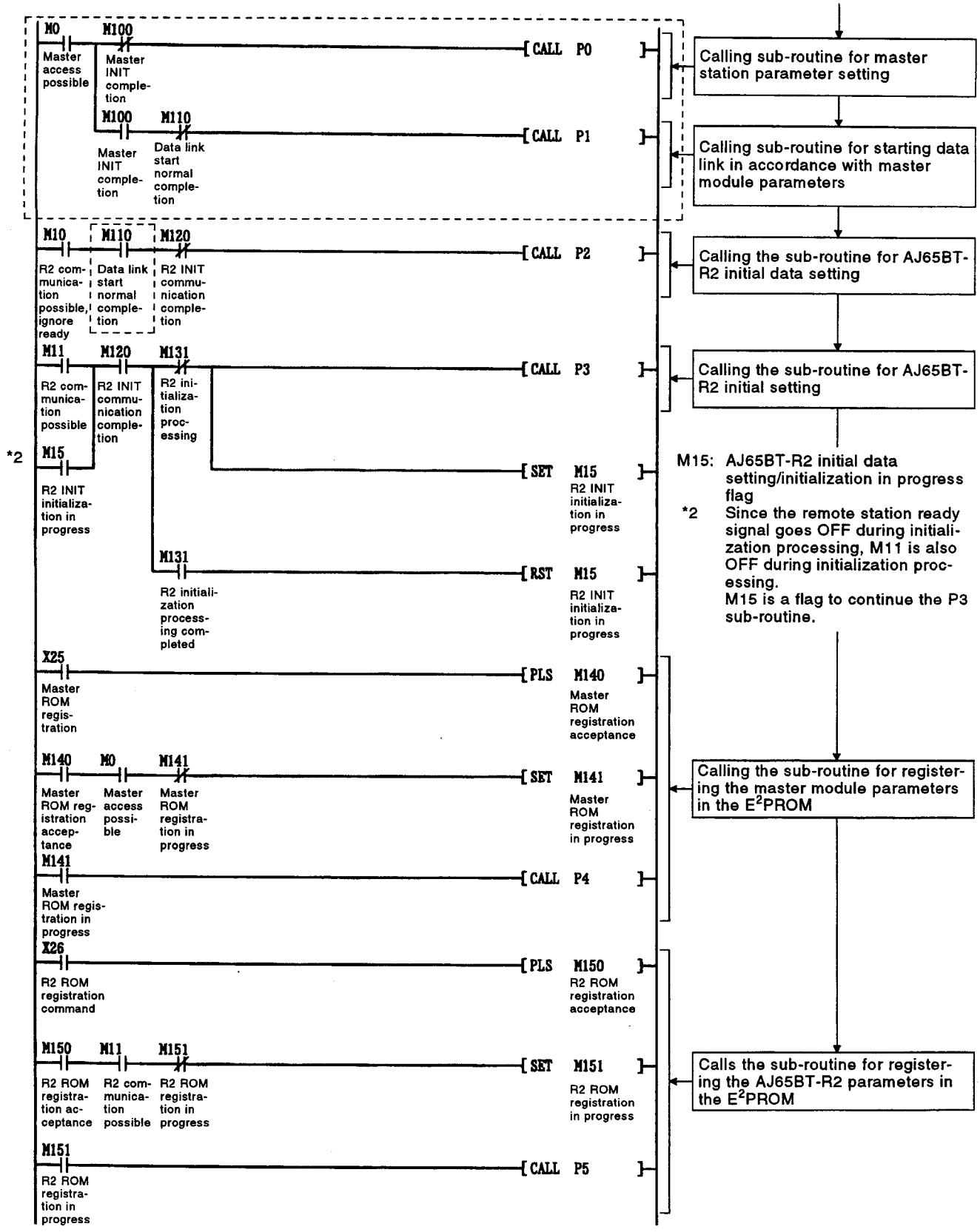
M10 : Communication with AJ65BT-R2 possible/not possible flag (remote station ready signal ignored) (ON: communication possible)

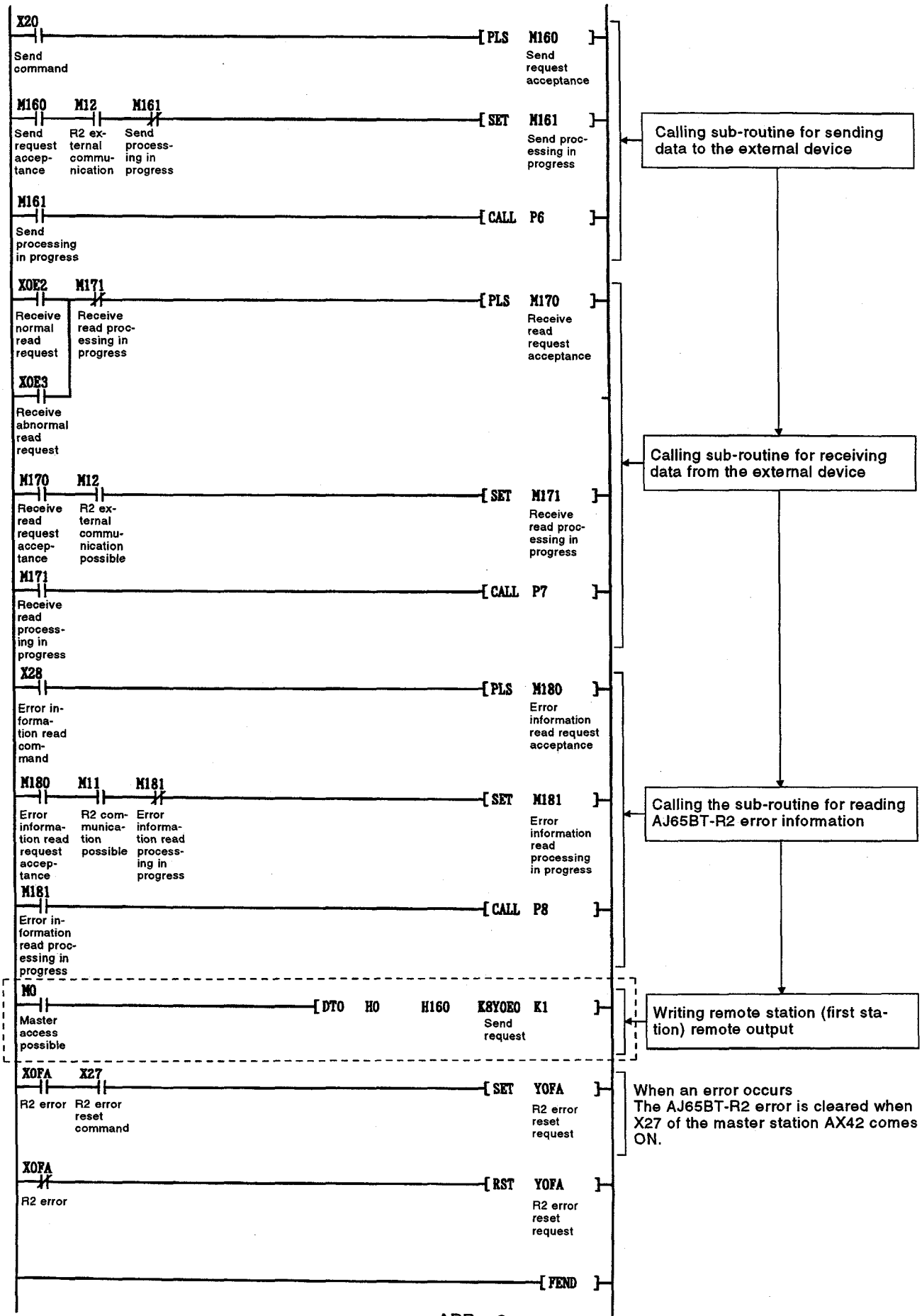
M11 : Communication with AJ65BT-R2 possible/not possible flag (ON: communication possible)

M12 : Communication with external device possible/not possible flag (ON: Communication possible)

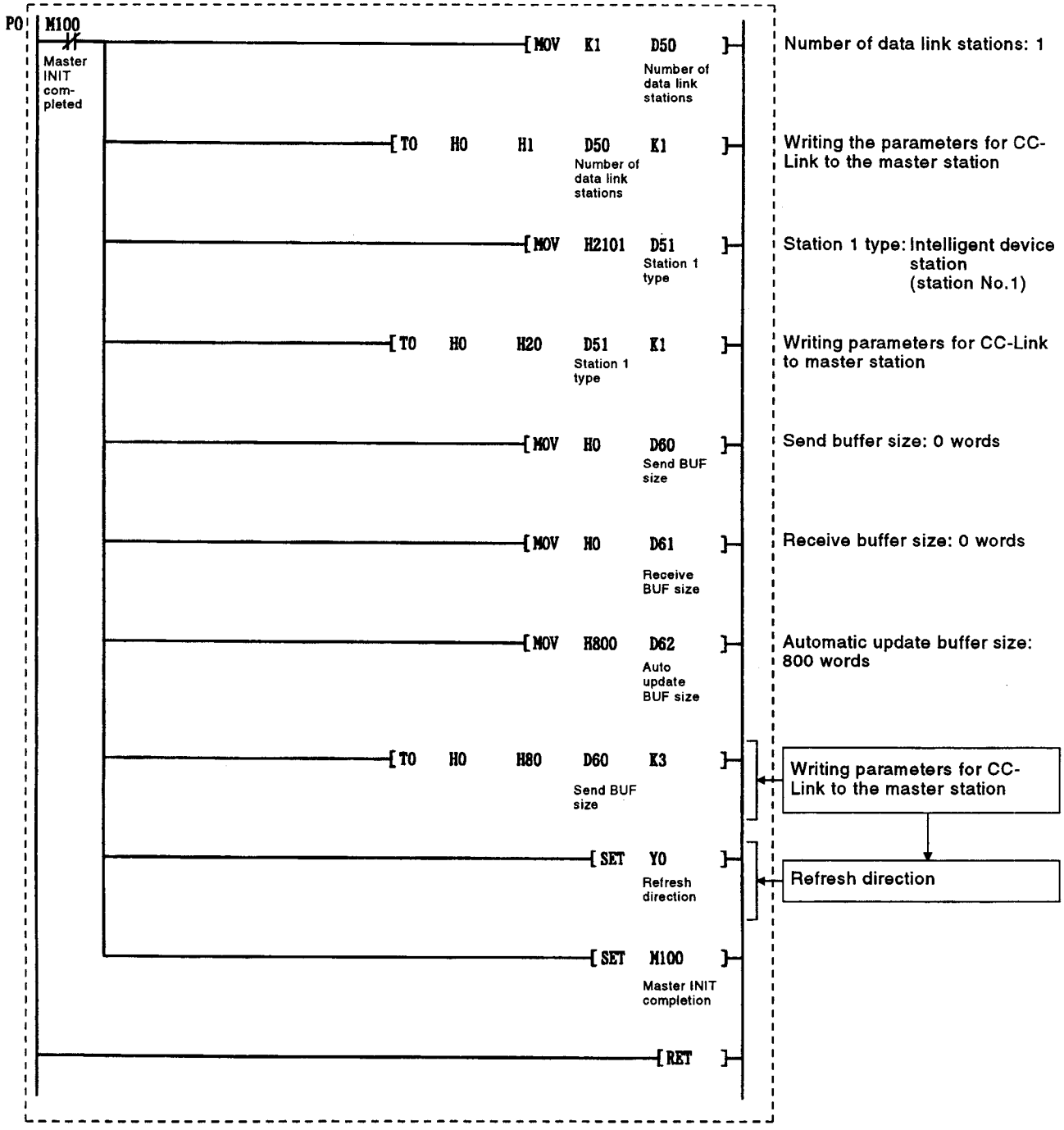
*1
M13 : AJ65BT-R2 initialization possible/ not possible flag (ON: Initialization possible) (See Section 9.7.)

*1 If initialization is executed while RX/RY signals are ON, the processing currently under way will be stopped.
Turn all RYs except RYn4 OFF before executing initialization.

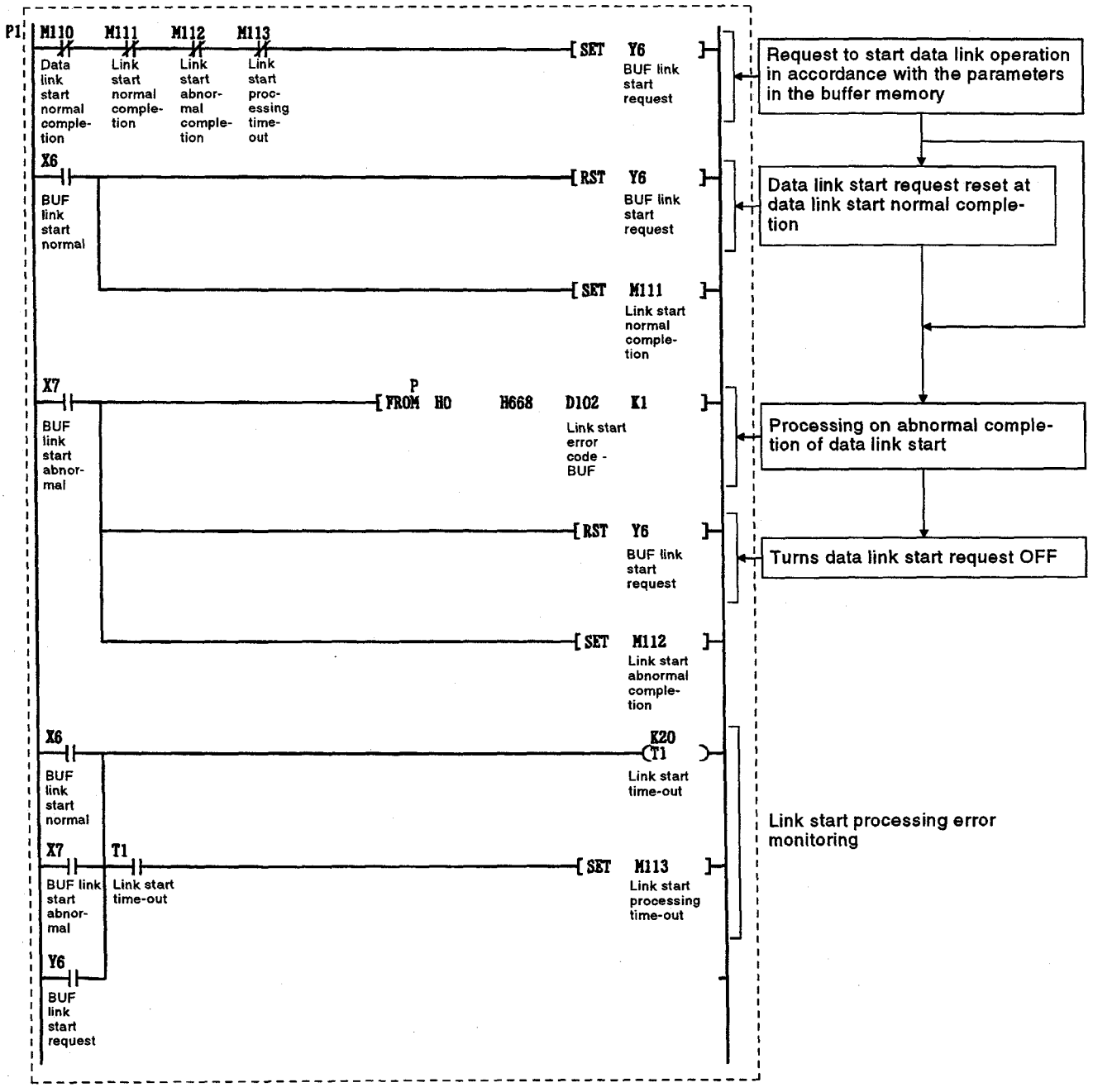

M0
Master access possible
M100
Master INIT completion
[CALL P0]
Calling sub-routine for master station parameter setting
M100
Master INIT completion
M110
Data link start normal completion
[CALL P1]
Calling sub-routine for starting data link in accordance with master module parameters
M10
R2 communication possible, ignore ready
M110
Data link start normal completion
M120
R2 INIT communication completion
[CALL P2]
Calling the sub-routine for AJ65BT-R2 initial data setting
M11
R2 communication possible
M120
R2 INIT communication completion
M131
R2 initialization processing
[CALL P3]
Calling the sub-routine for AJ65BT-R2 initial setting
*2
M15
R2 INIT initialization in progress
[SET M15]
R2 INIT initialization in progress
M131
R2 initialization processing completed
[RST M15]
R2 INIT initialization in progress
M15: AJ65BT-R2 initial data setting/initialization in progress flag
*2 Since the remote station ready signal goes OFF during initialization processing, M11 is also OFF during initialization processing.
M15 is a flag to continue the P3 sub-routine.
X25
Master ROM registration
[PLS M140]
Master ROM registration acceptance
M140
Master ROM registration acceptance
M0
Master access possible
M141
Master ROM registration in progress
[SET M141]
Master ROM registration in progress
Calling the sub-routine for registering the master module parameters in the E2PROM
M141
Master ROM registration in progress
[CALL P4]
X26
R2 ROM registration command
[PLS M150]
R2 ROM registration acceptance
M150
R2 ROM registration acceptance
M11
R2 communication possible
M151
R2 ROM registration in progress
[SET M151]
R2 ROM registration in progress
Calls the sub-routine for registering the AJ65BT-R2 parameters in the E2PROM
M151
R2 ROM registration in progress
[CALL P5]

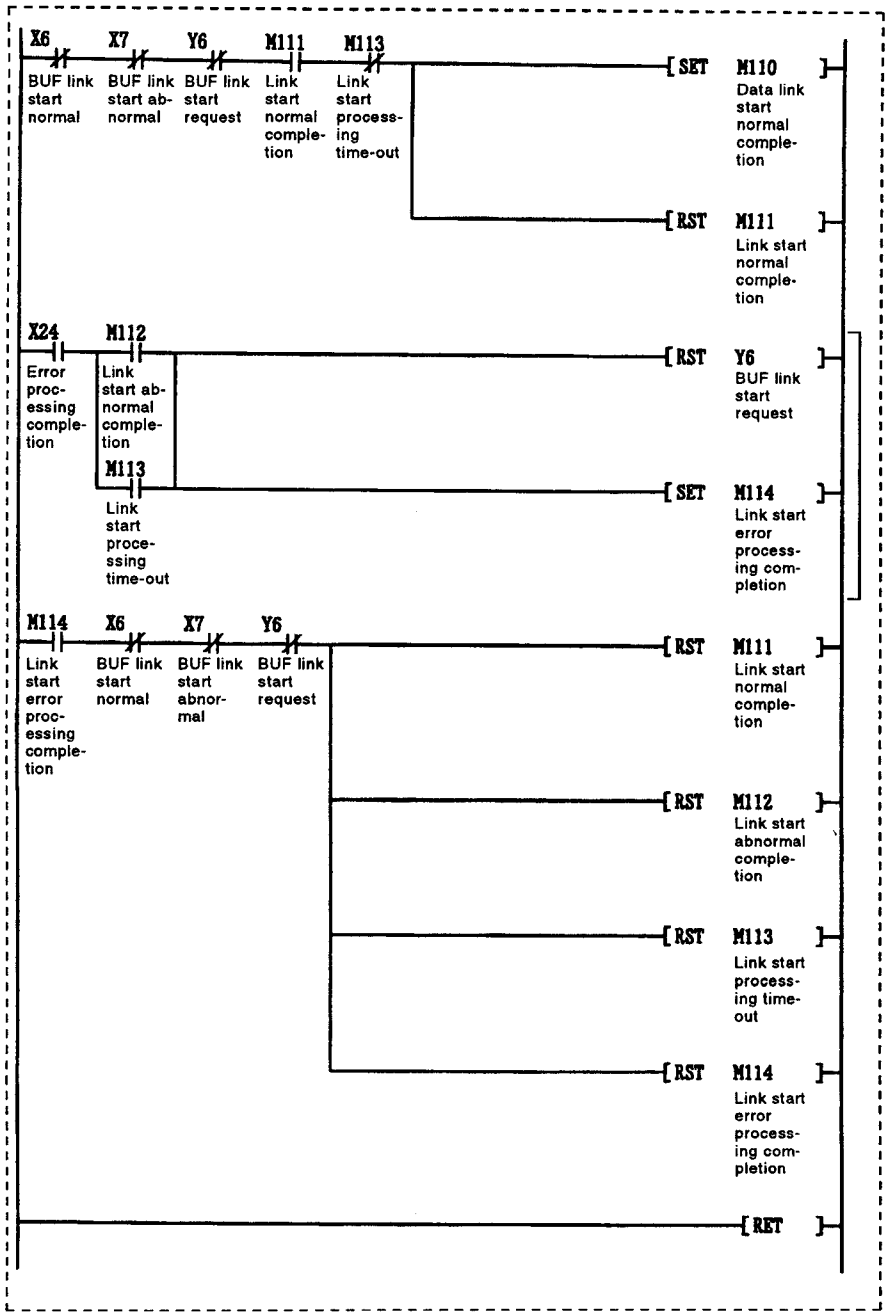

X20
Send command
[PLS M160]
Send request acceptance
M160
Send request acceptance
M12
R2 external communication
M161
Send processing in progress
[SET M161]
Send processing in progress
Calling sub-routine for sending data to the external device
M161
Send processing in progress
[CALL P6]
X0E2
Receive normal read request
X0E3
Receive abnormal read request
M171
Receive read processing in progress
[PLS M170]
Receive read request acceptance
Calling sub-routine for receiving data from the external device
M170
Receive read request acceptance
M12
R2 external communication possible
[SET M171]
Receive read processing in progress
M171
Receive read processing in progress
[CALL P7]
X28
Error information read command
[PLS M180]
Error information read request acceptance
M180
Error information read request acceptance
M11
R2 communication possible
M181
Error information read processing in progress
[SET M181]
Error information read processing in progress
Calling the sub-routine for reading AJ65BT-R2 error information
M181
Error information read processing in progress
[CALL P8]
M0
Master access possible
[DTO H0 H160 K8Y0E0 K1]
Send request
Writing remote station (first station) remote output
X0FA
R2 error
X27
R2 error reset command
[SET Y0FA]
R2 error reset request
When an error occurs
The AJ65BT-R2 error is cleared when X27 of the master station AX42 comes ON.
X0FA
R2 error
[RST Y0FA]
R2 error reset request
[FEND]

[Sub-routine program for master station parameter setting]



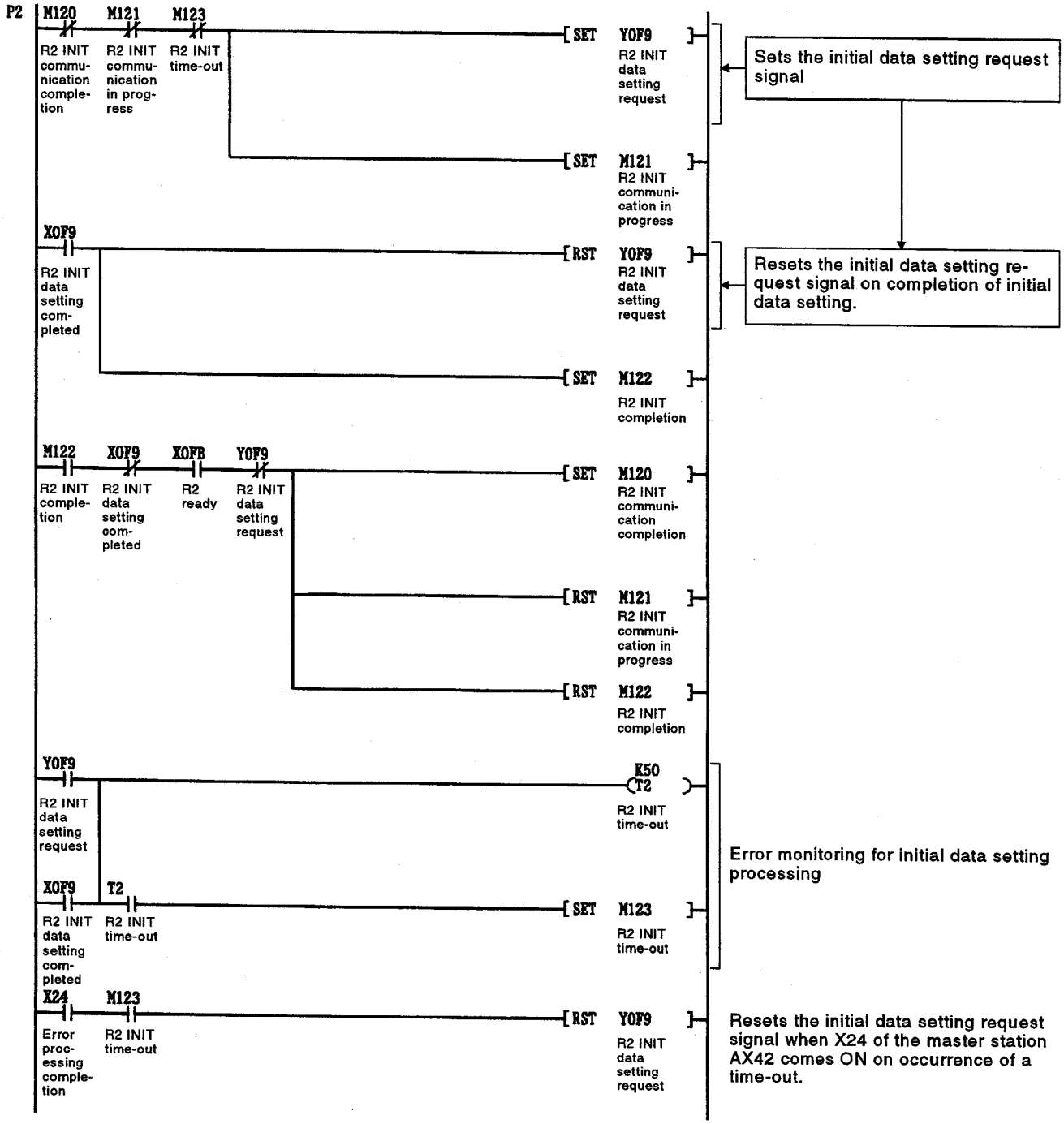
[Sub-routine program for starting data link in accordance with master module parameters]

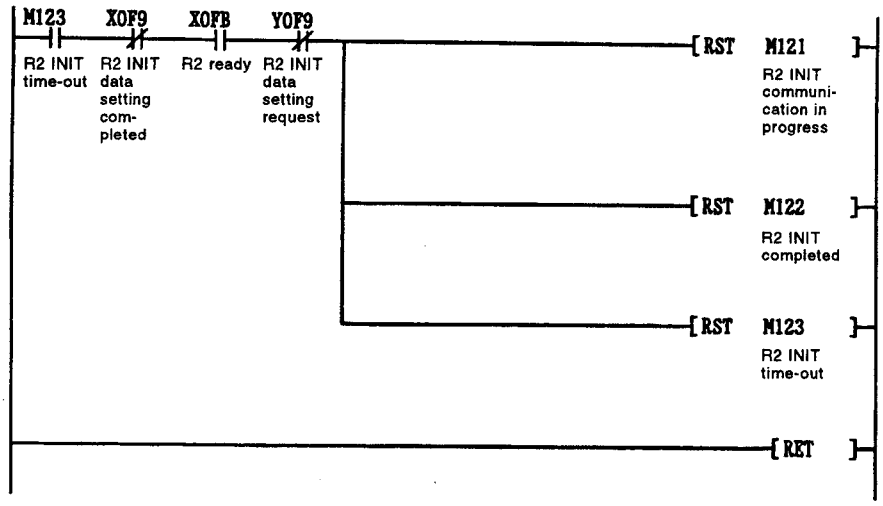




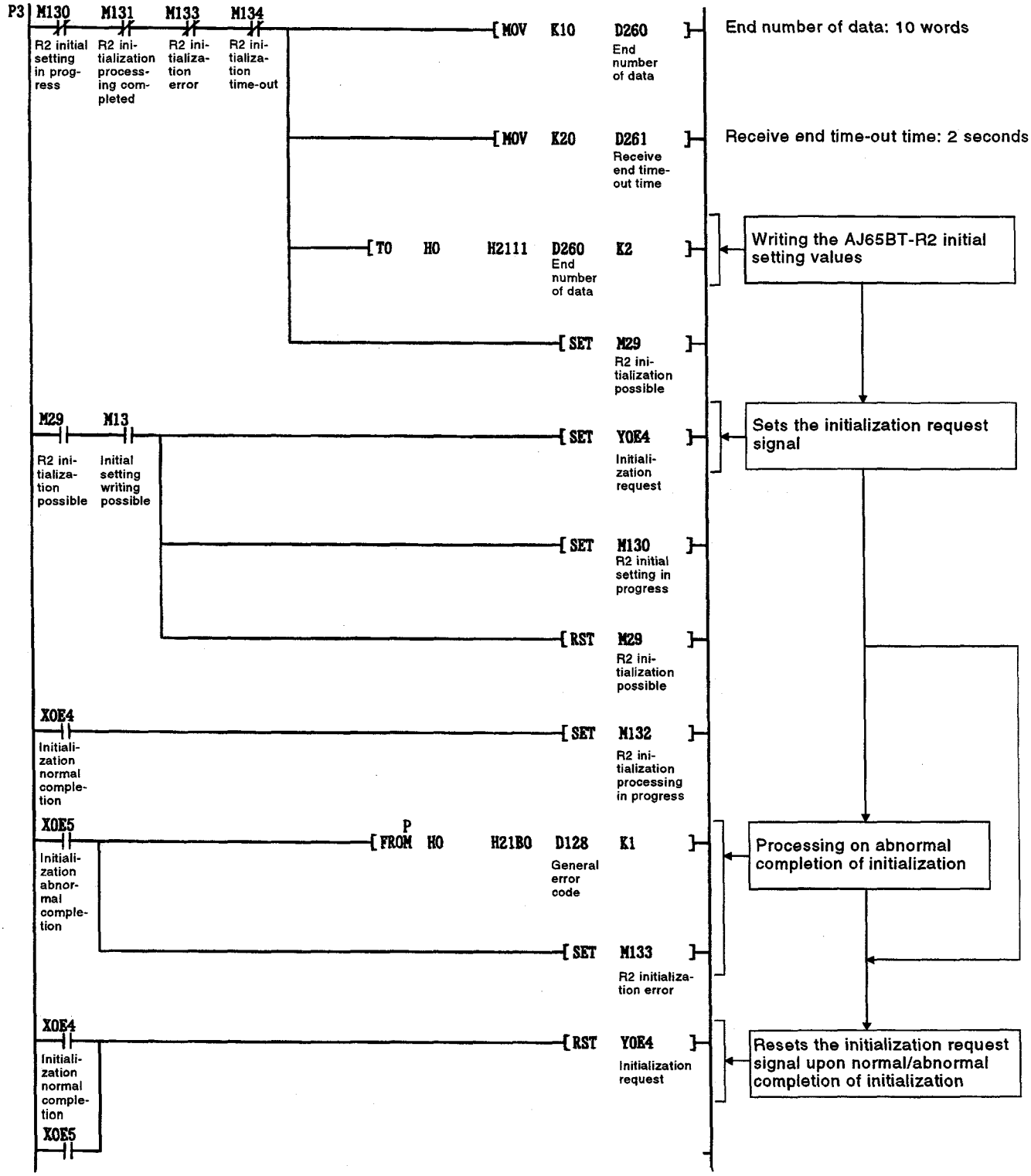
Resets the data link start request signal when X24 of the master station AX42 comes ON on occurrence of a time-out.

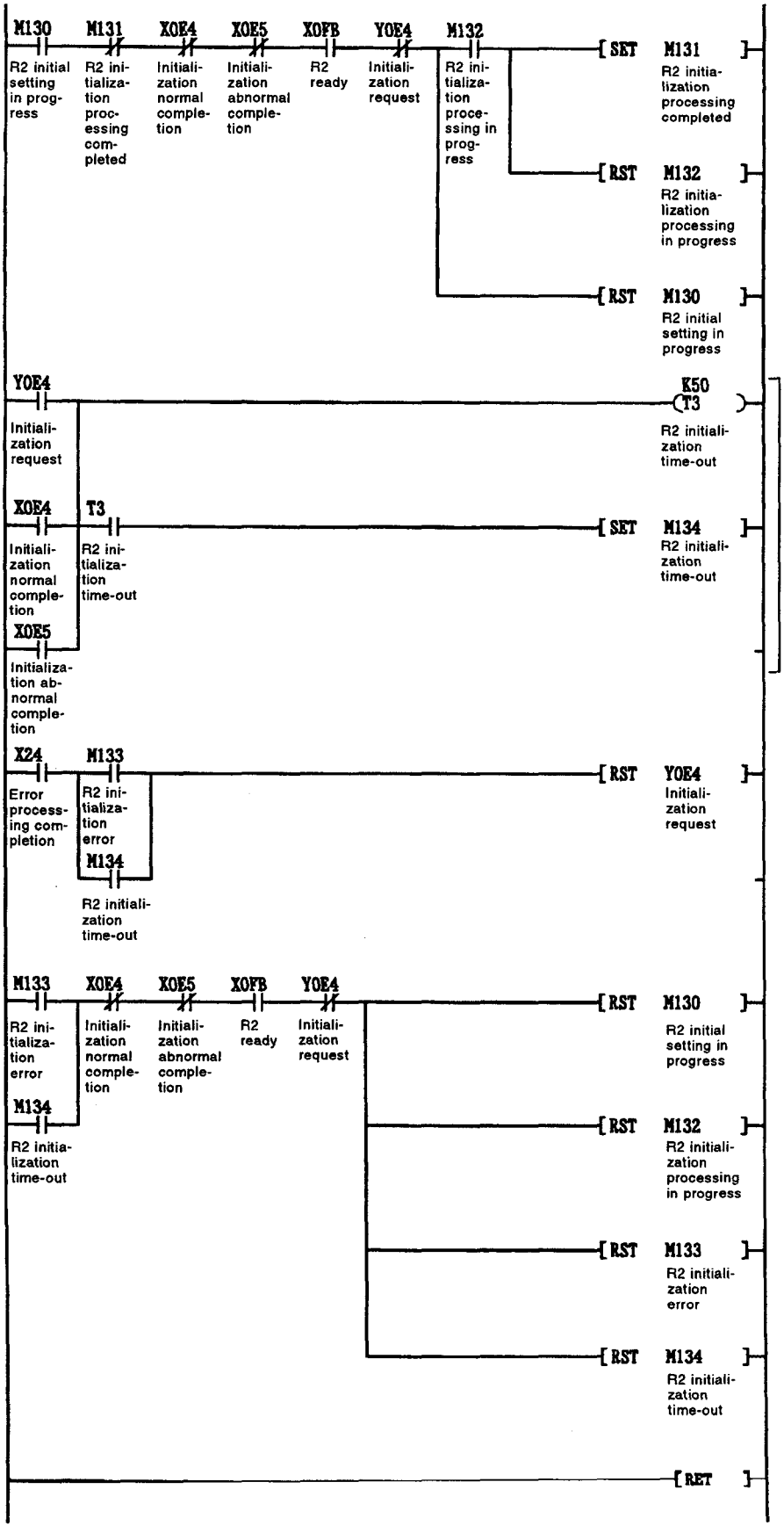
[Sub-routine program for AJ65BT-R2 initial data setting]



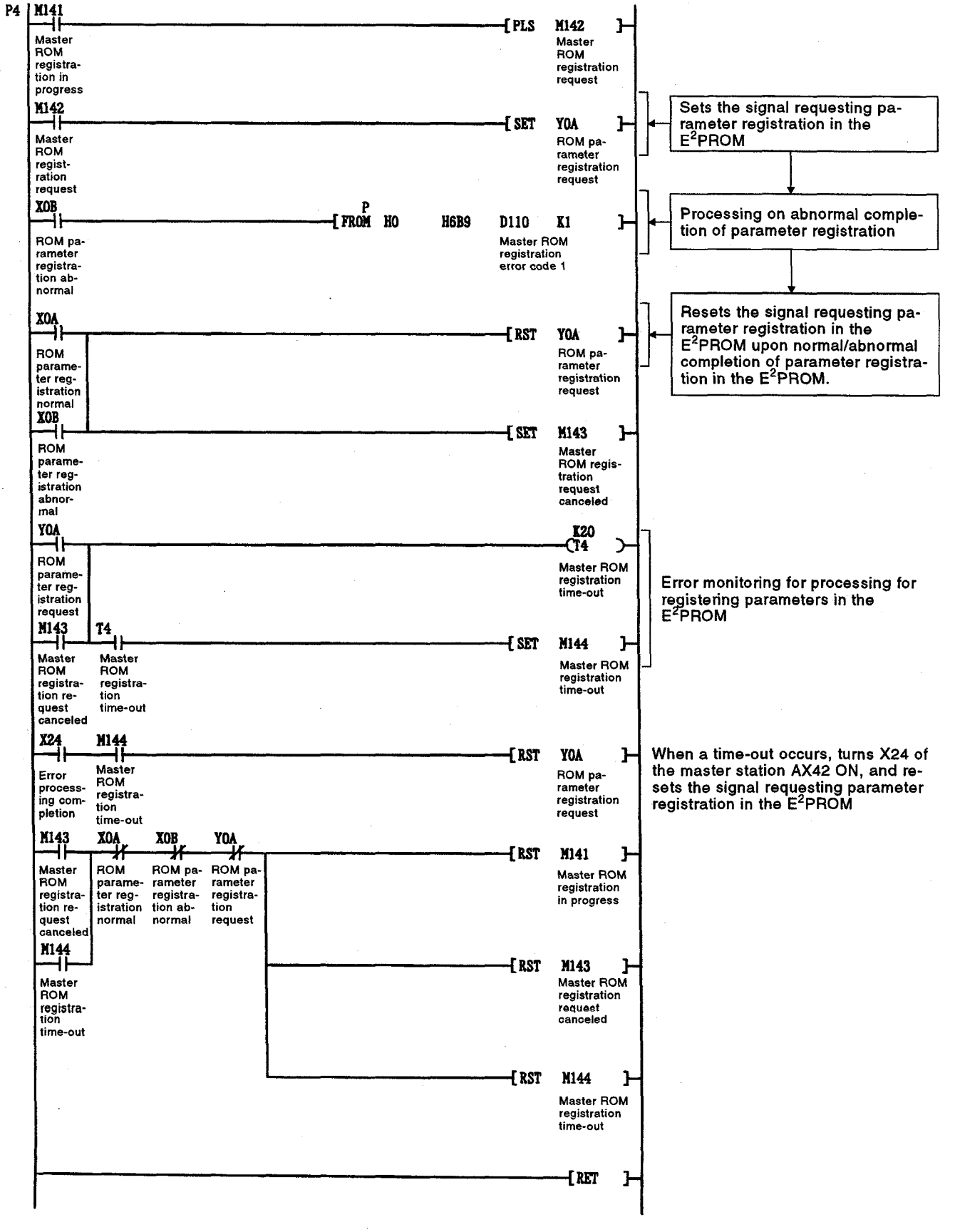

M123
X0F9
X0FB
Y0F9
R2 INIT time-out
R2 INIT data setting com-pleted
R2 ready
R2 INIT data setting request
RST M121
R2 INIT communi-cation in progress
RST M122
R2 INIT completed
RST M123
R2 INIT time-out
RET

[Sub-routine program for AJ65BT-R2 initial setting]

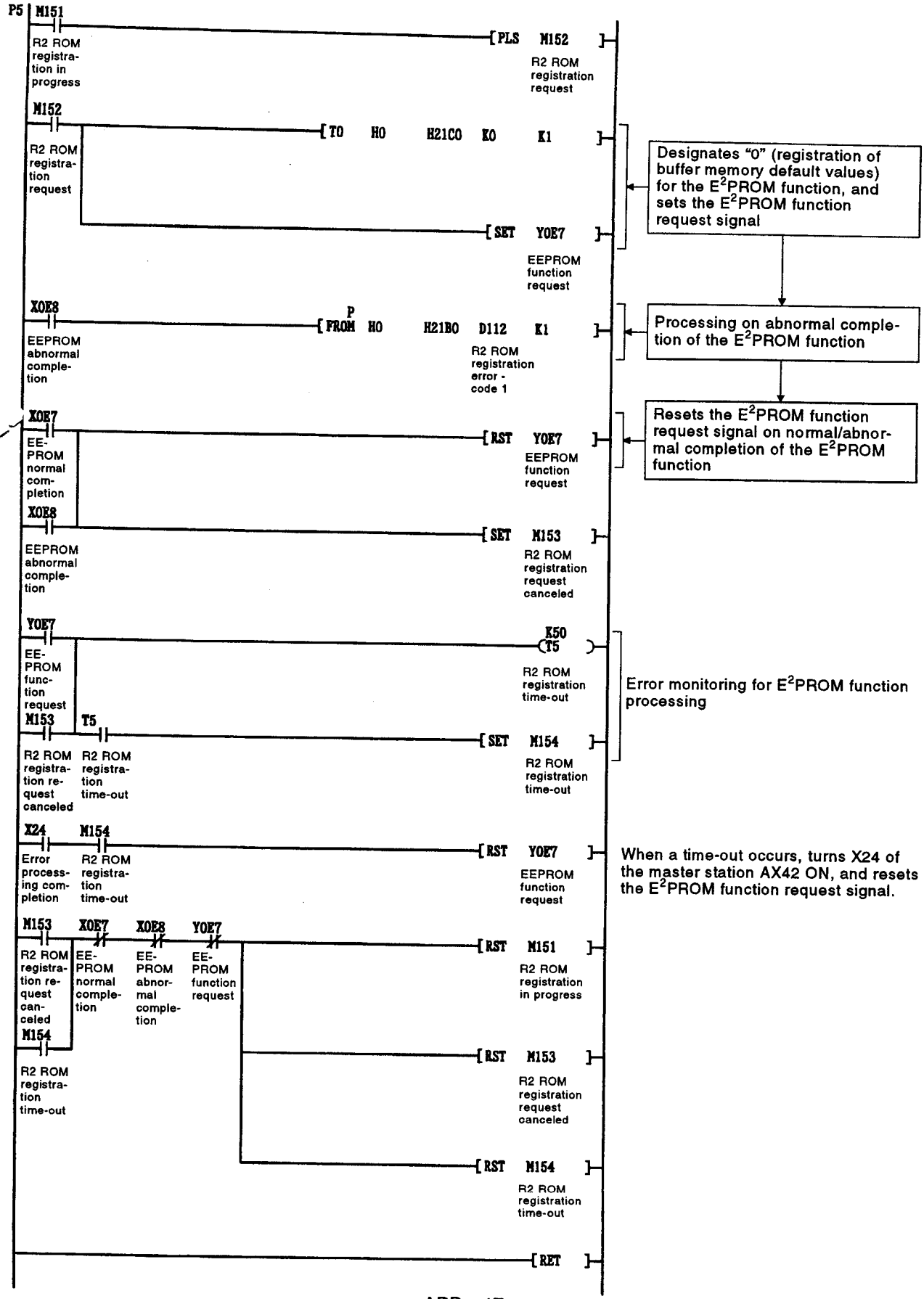



M130
R2 initial setting in progress
M131
R2 initialization processing completed
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
X0FB
R2 ready
Y0E4
Initialization request
M132
R2 initialization processing in progress
SET M131
R2 initialization processing completed
RST M132
R2 initialization processing in progress
RST M130
R2 initial setting in progress
Y0E4
Initialization request
K50
T3
R2 initialization time-out
X0E4
Initialization normal completion
T3
R2 initialization time-out
SET M134
R2 initialization time-out
X0E5
Initialization abnormal completion
Error monitoring for initialization processing
X24
Error processing completion
M133
R2 initialization error
M134
R2 initialization time-out
RST Y0E4
Initialization request
Resets the initialization request signal when X24 of the master station AX42 comes ON on occurrence of an initialization error or time-out.
M133
R2 initialization error
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
X0FB
R2 ready
Y0E4
Initialization request
M134
R2 initialization time-out
RST M130
R2 initial setting in progress
RST M132
R2 initialization processing in progress
RST M133
R2 initialization error
RST M134
R2 initialization time-out
RET

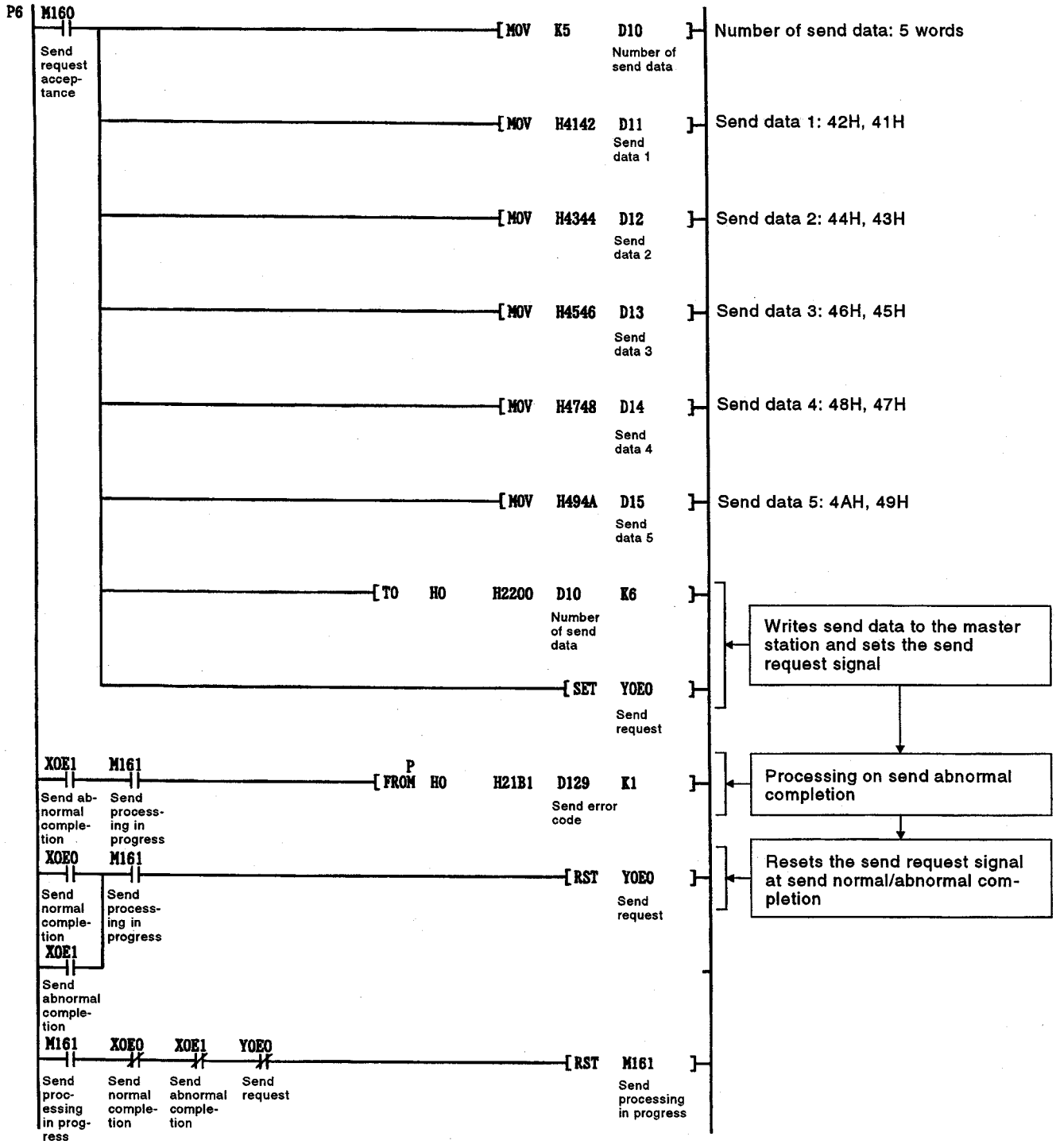
[Sub-routine program for registering master module parameters in the E^2PROM]

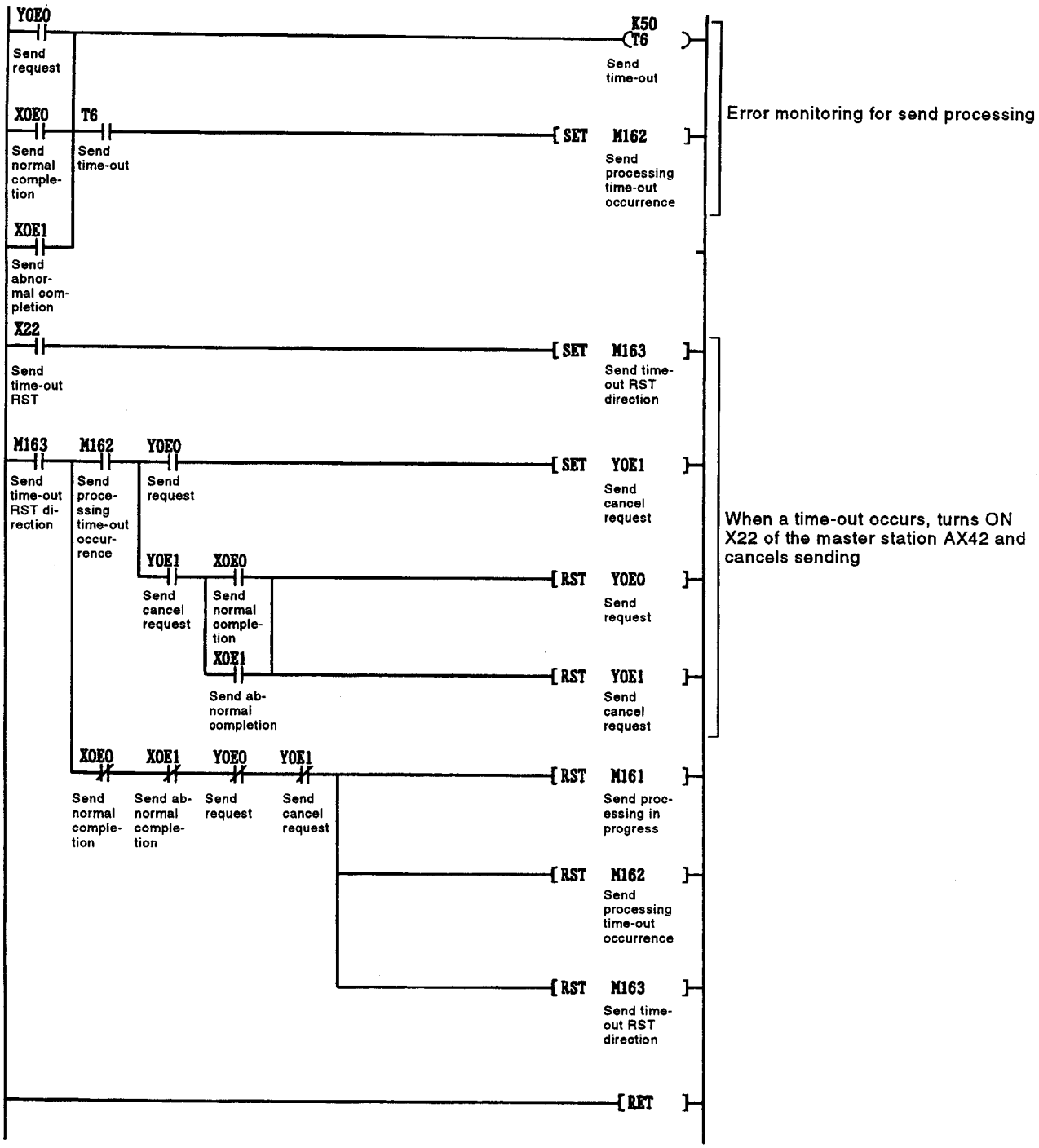


[Sub-routine program for registering AJ65BT-R2 parameters in the E^2PROM]

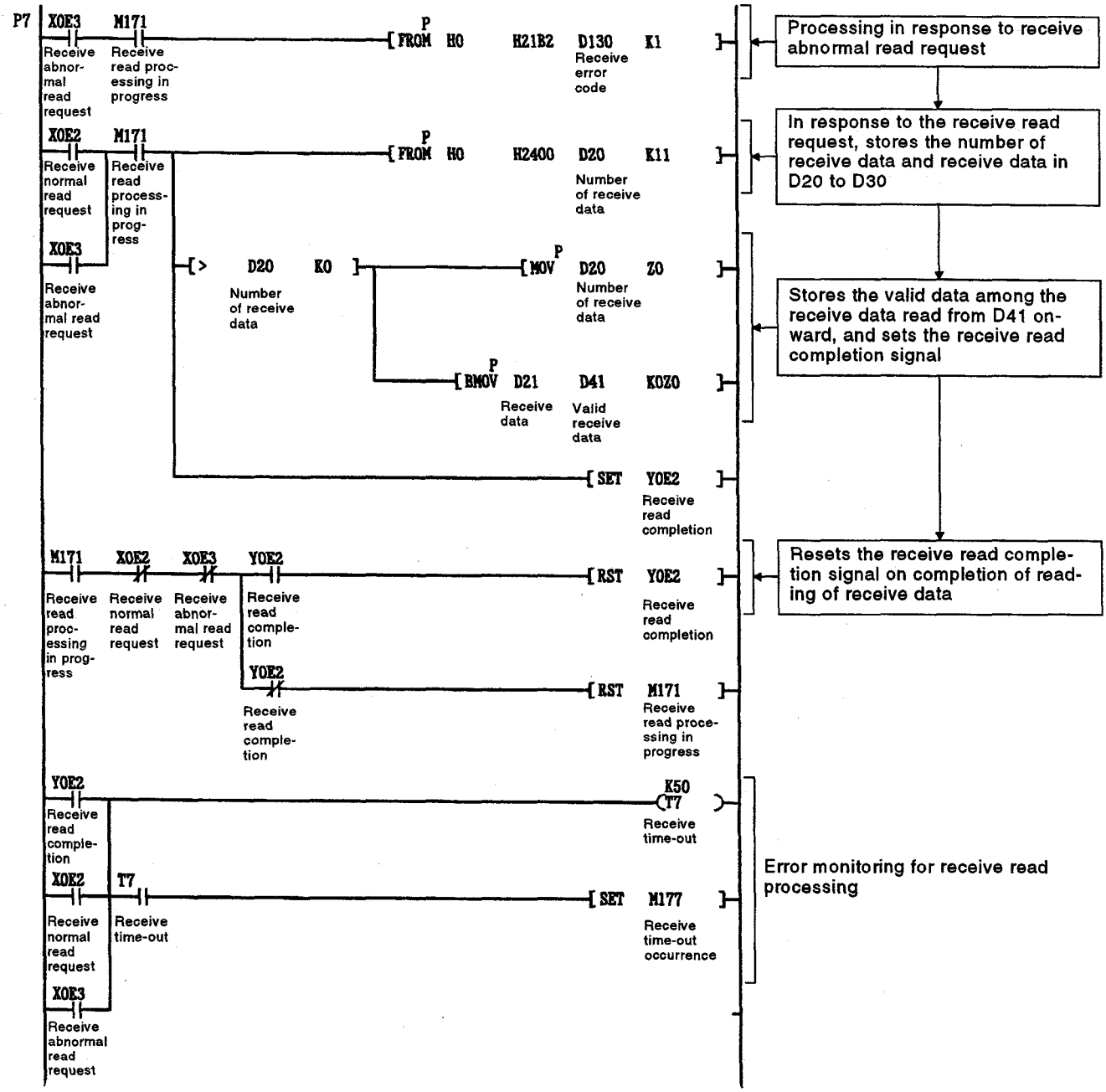


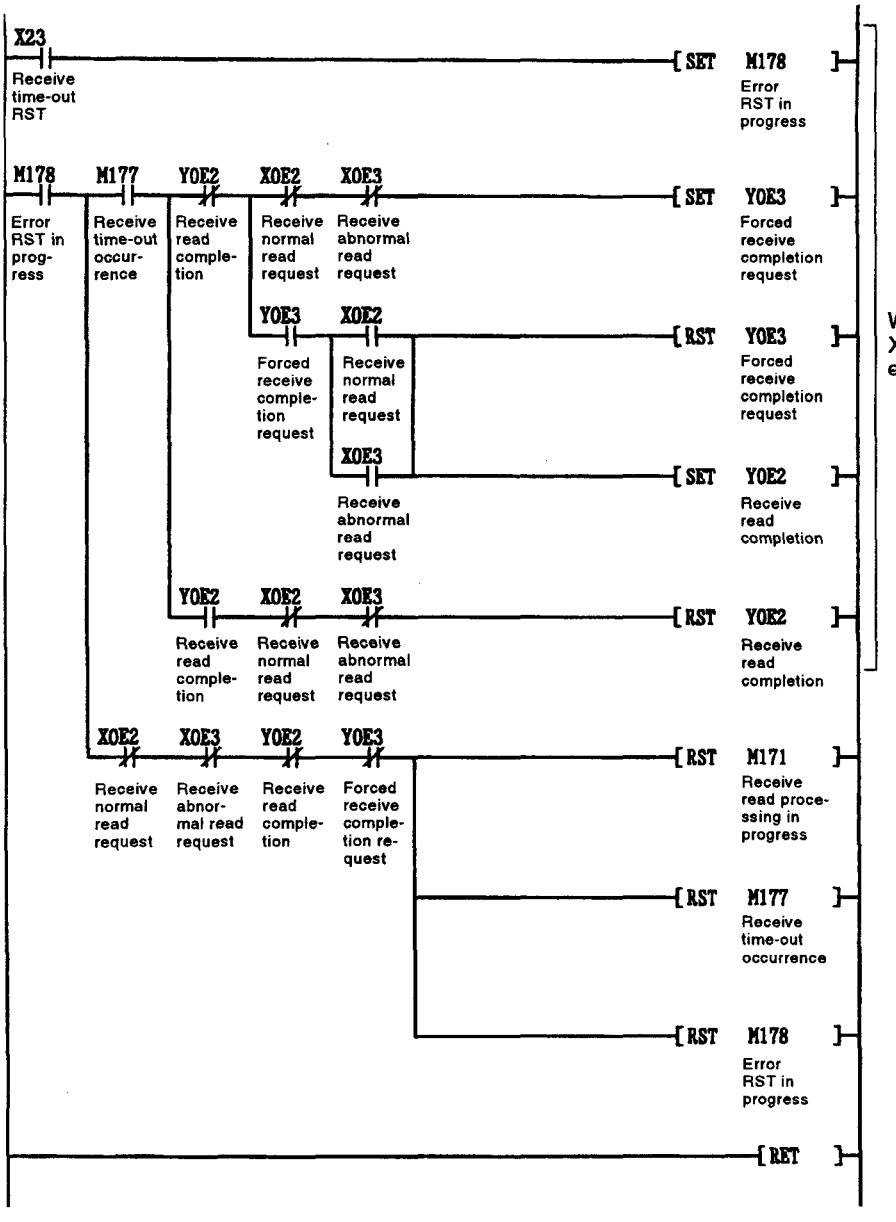
[Sub-routine program for sending data to an external device]




Y0E0
Send request
K50 T6
Send time-out
X0E0
Send normal completion
T6
Send time-out
SET M162
Send processing time-out occurrence
X0E1
Send abnormal completion
Error monitoring for send processing
X22
Send time-out RST
SET M163
Send time-out RST direction
M163
Send time-out RST direction
M162
Send processing time-out occurrence
Y0E0
Send request
SET Y0E1
Send cancel request
When a time-out occurs, turns ON X22 of the master station AX42 and cancels sending
Y0E1
Send cancel request
X0E0
Send normal completion
RST Y0E0
Send request
X0E1
Send abnormal completion
RST Y0E1
Send cancel request
X0E0
Send normal completion
X0E1
Send abnormal completion
Y0E0
Send request
Y0E1
Send cancel request
RST M161
Send processing in progress
RST M162
Send processing time-out occurrence
RST M163
Send time-out RST direction
RET

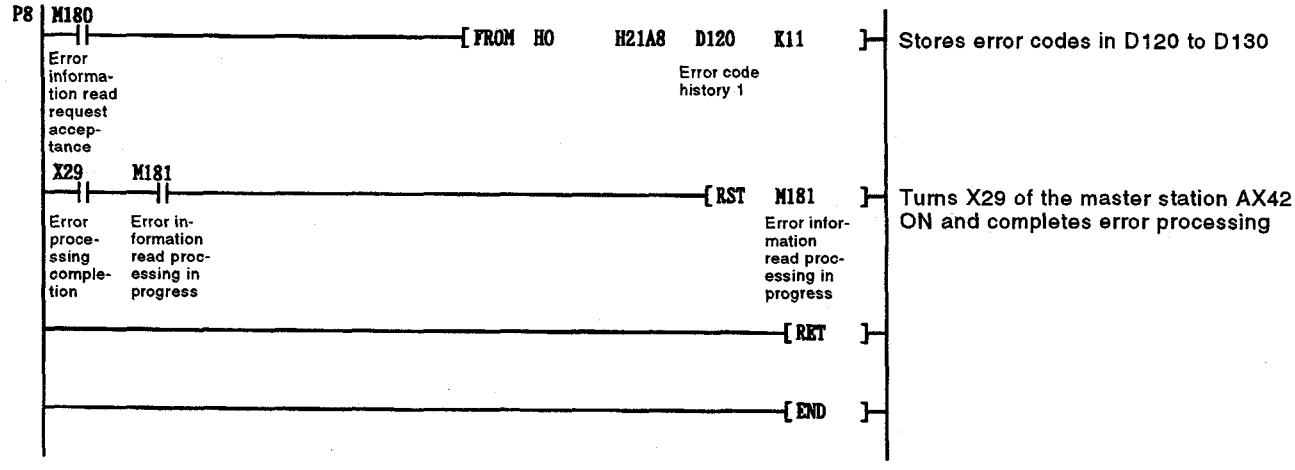
[Sub-routine program for receiving data from an external device]





When a time-out occurs, turns ON X23 of the master station AX42 and executes forced receive completion

[Sub-routine program for reading AJ65BT-R2 error information]



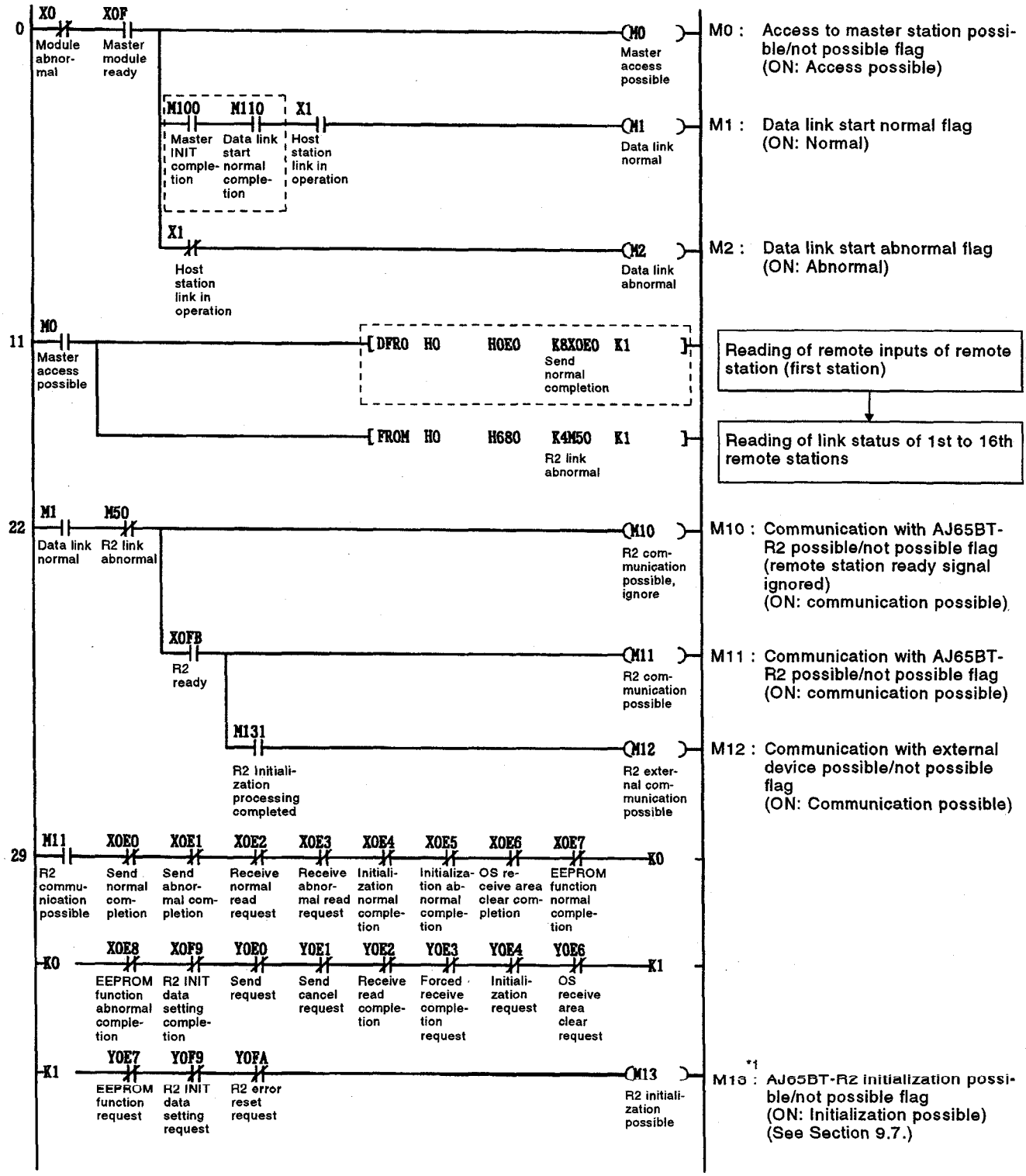
(2) Program using RIFR/RITO (dedicated instructions) (for QnACPU)
For details on programming when using RIFR/RITO instructions (dedicated instructions), refer to Section 5.5.5 (3).

3.4 Example of Program when the Automatic Buffer Memory Update Function is not Effective

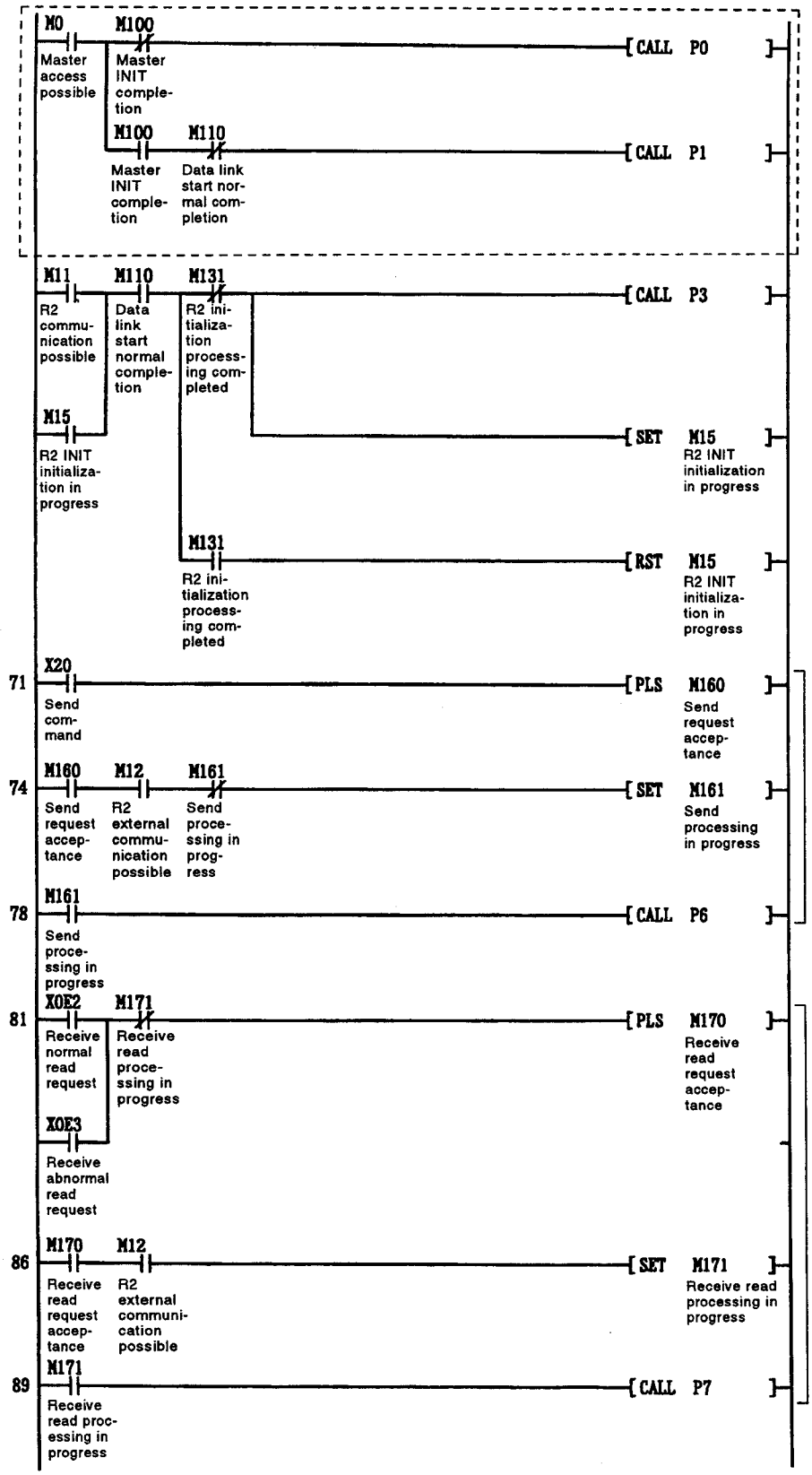
When the parameter settings are set in the master module by using the GPPQ function, set the CC-Link parameter settings as shown below. This makes the parts of the program enclosed by dotted lines unnecessary.

Parameter Setting Item			Set Value
Number of units			1
Start unit I/O number			0
Unit type			M. Master station
Refresh all devices	Remote input (RX) (bit)		XE0
	Remote output (RY) (bit)		YE0
Number of connected stations	Total number of connected stations		1
Station information settings	Station type		Intelligent
	Number of occupied points		One
	Intelligent buffer specification (word)	Send	1024
		Receive	1024
		Automatic update	0

(1) Program using RIWT, RIRD, RISEND, RIRCV instructions (dedicated instructions) (for QnACPU)
[Main program]



*1 If initialization is executed while RX/RY signals are ON, the processing currently under way will be stopped. Turn all RYs except RYn4 OFF before executing initialization.



Calling sub-routine for master station parameter setting

Calling sub-routine for starting data link in accordance with master module parameters

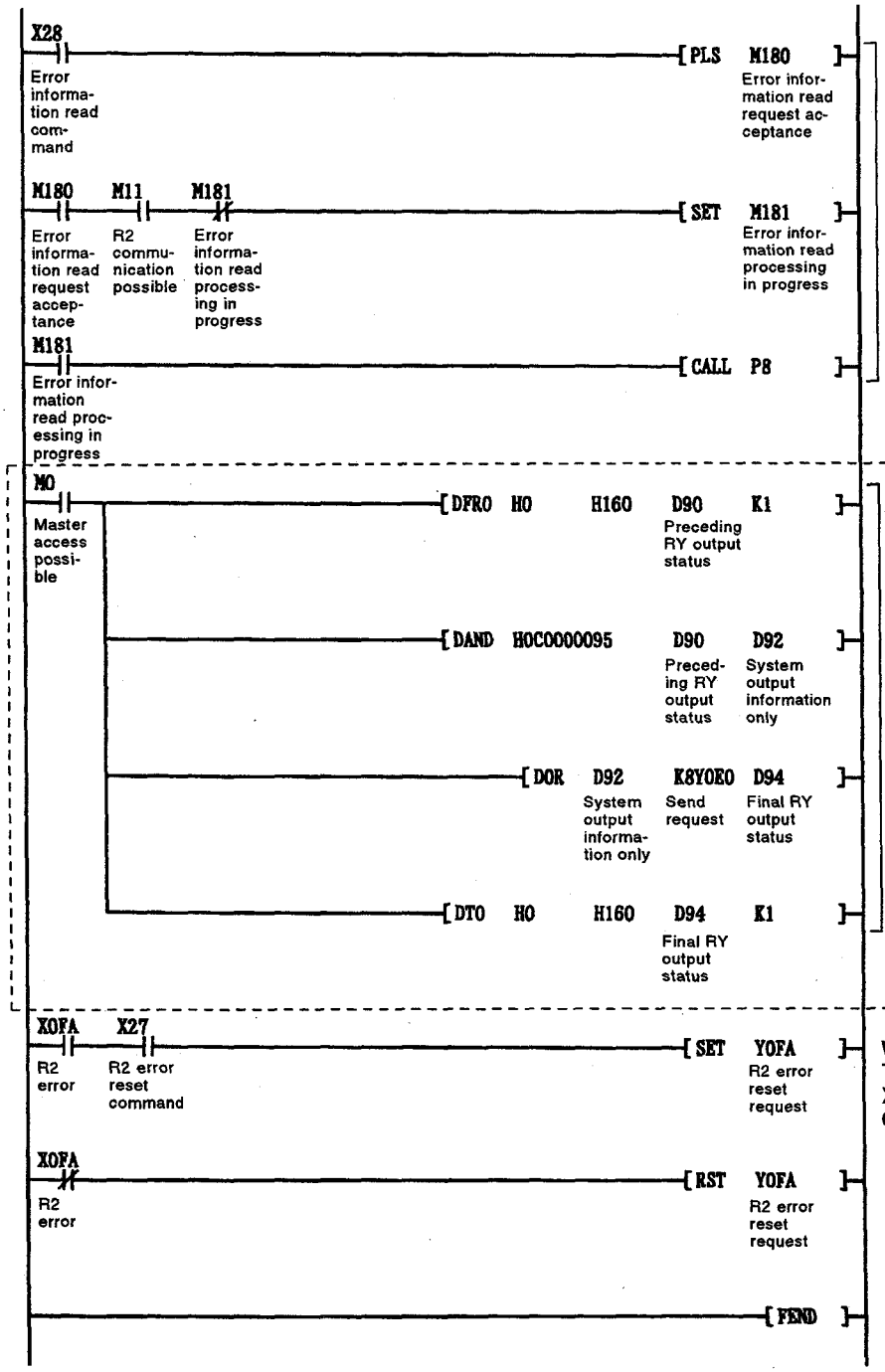
Calling the sub-routine for AJ65BT-R2 initial setting

M15 : AJ65BT-R2 initial data setting/ initialization in progress flag

*2 Since the remote station ready signal goes OFF during initialization processing, M11 is also OFF during initialization processing.
M15 is a flag to continue the P3 sub-routine.

Calling sub-routine for sending data to the external device

Calling sub-routine for receiving data from the external device



Calling the sub-routine for reading AJ65BT-R2 error information

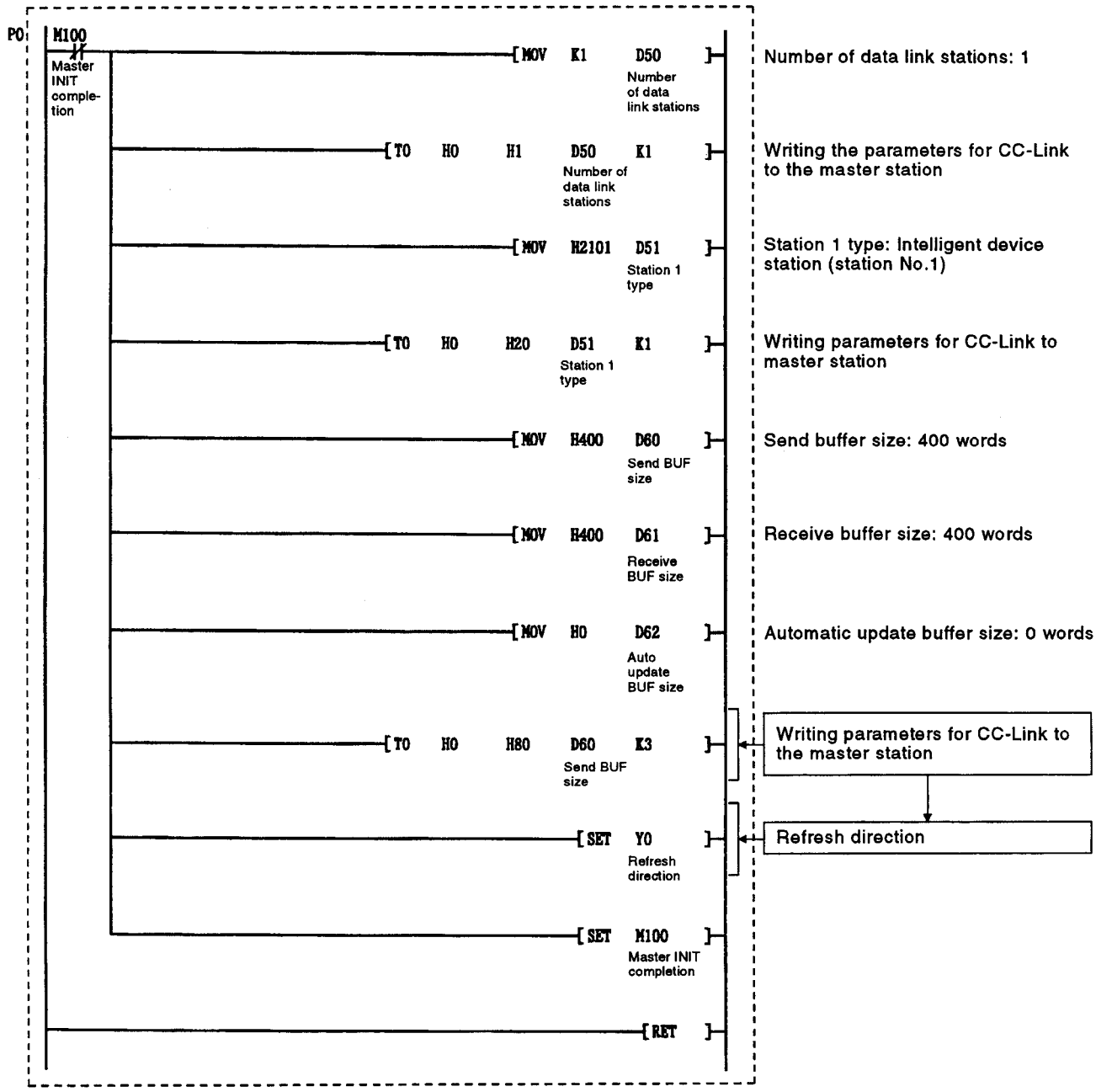
Writing remote output of remote station (first station)

Re-outputs the logical sum of the current output status to the AJ65BT-R2 and the RY control status in the program to the AJ65BT-R2.

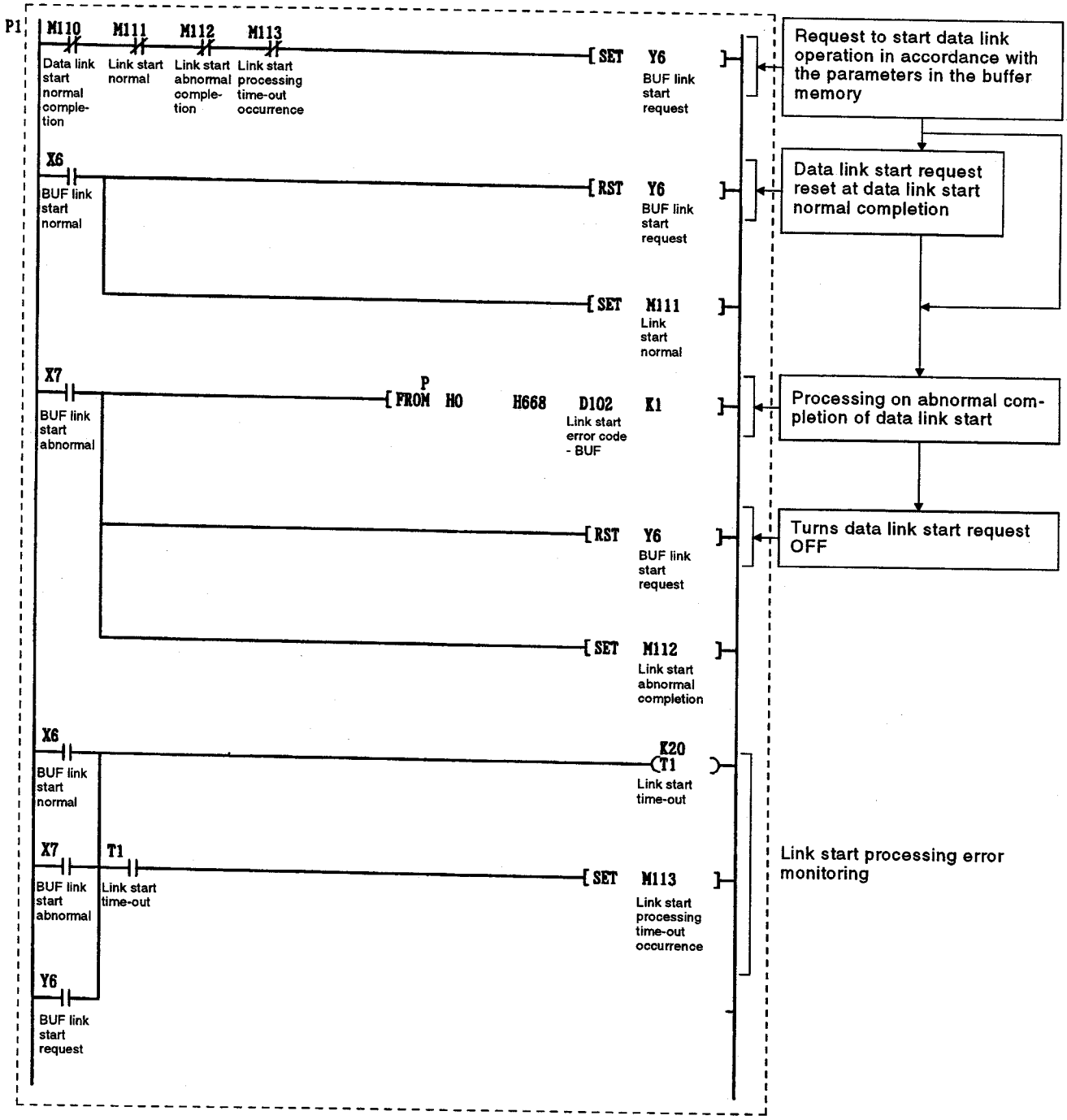
* When writing remote outputs using RIWT/RITO/RIRCV/ RISEND instructions (dedicated instructions), incorporate a program like the one shown to the left.

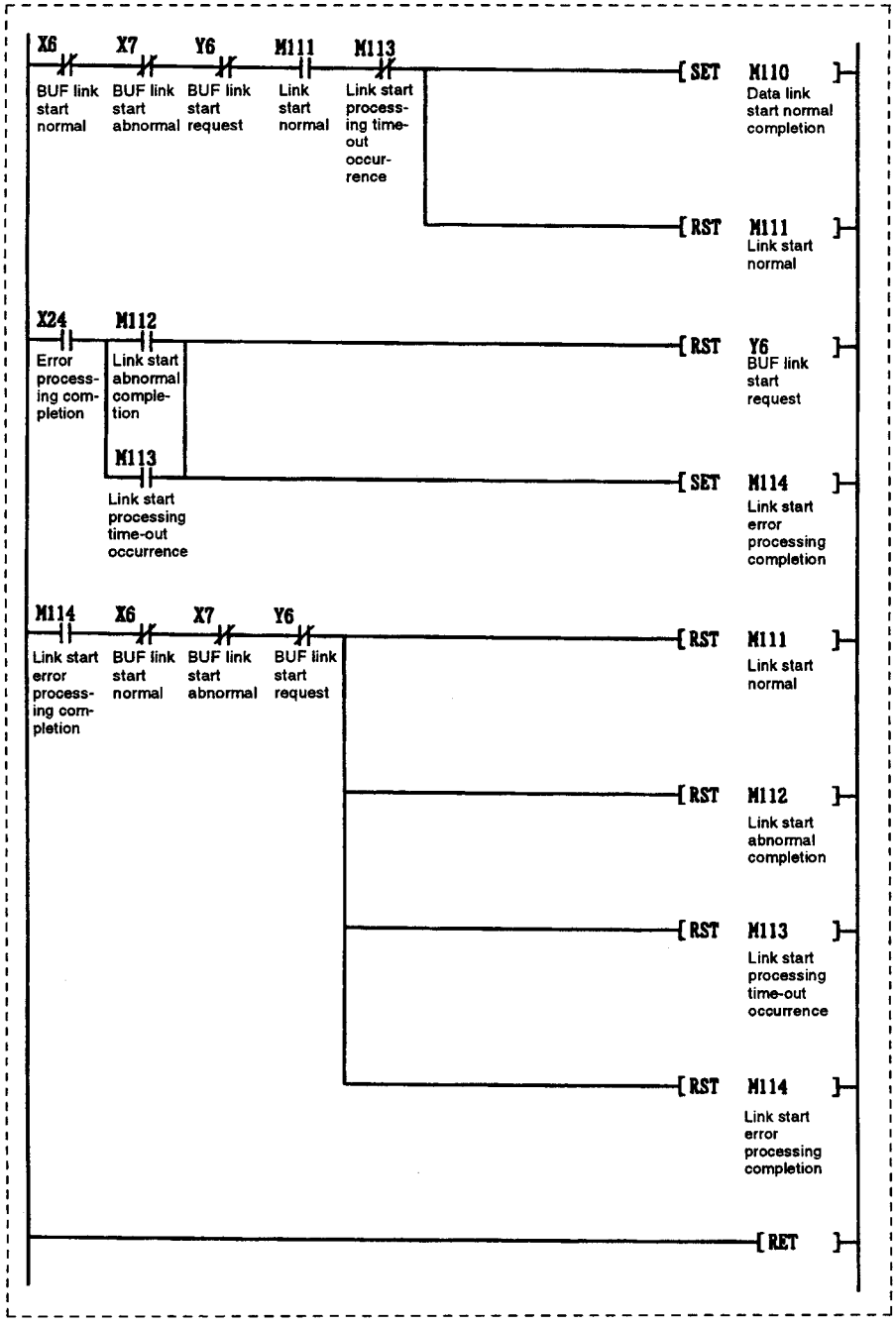
When an error occurs
The AJ65BT-R2 error is cleared when X27 of the master station AX42 comes ON.

[Sub-routine program for master station parameter setting]



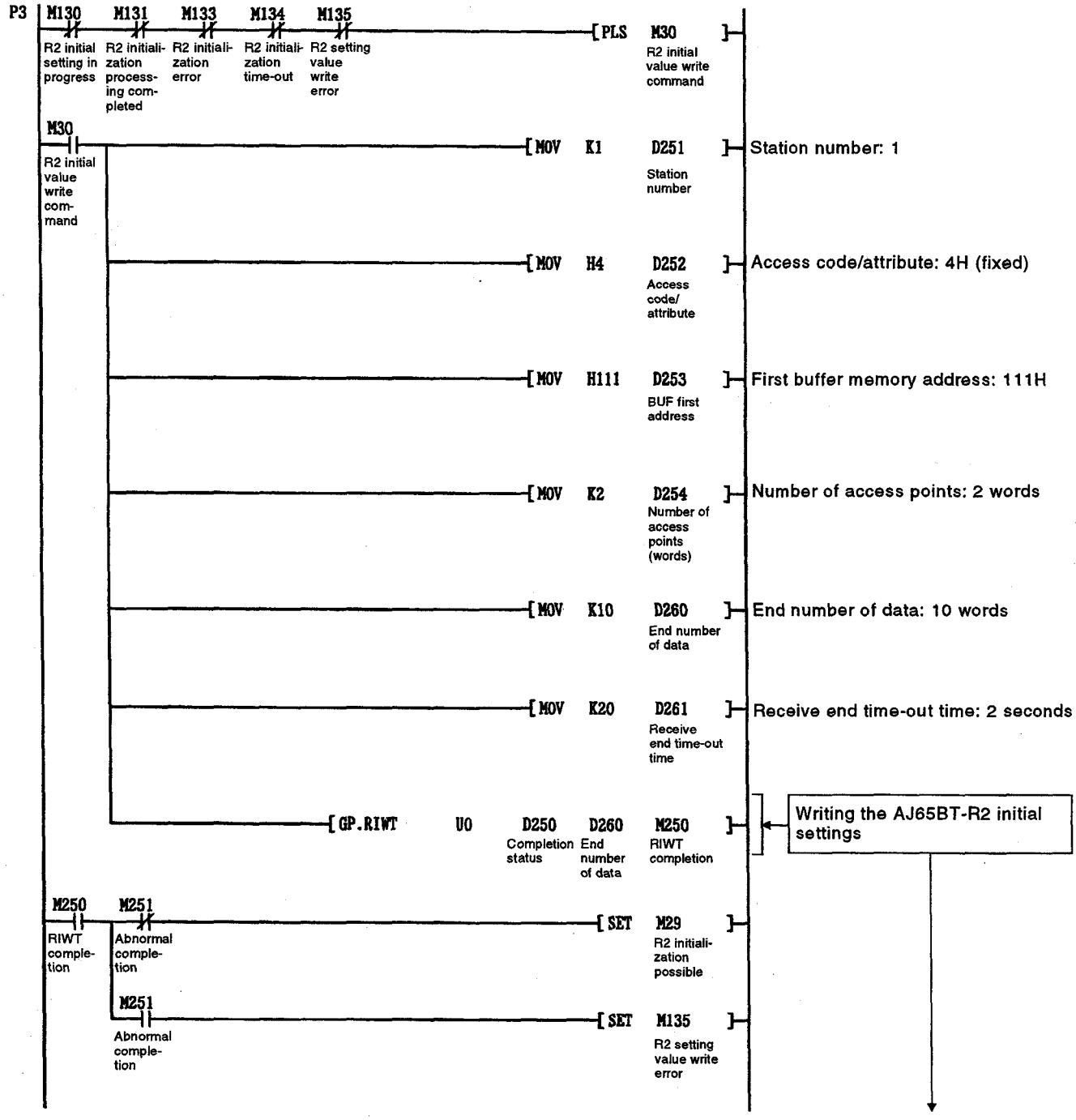
[Sub-routine program for starting data link in accordance with master module parameters]

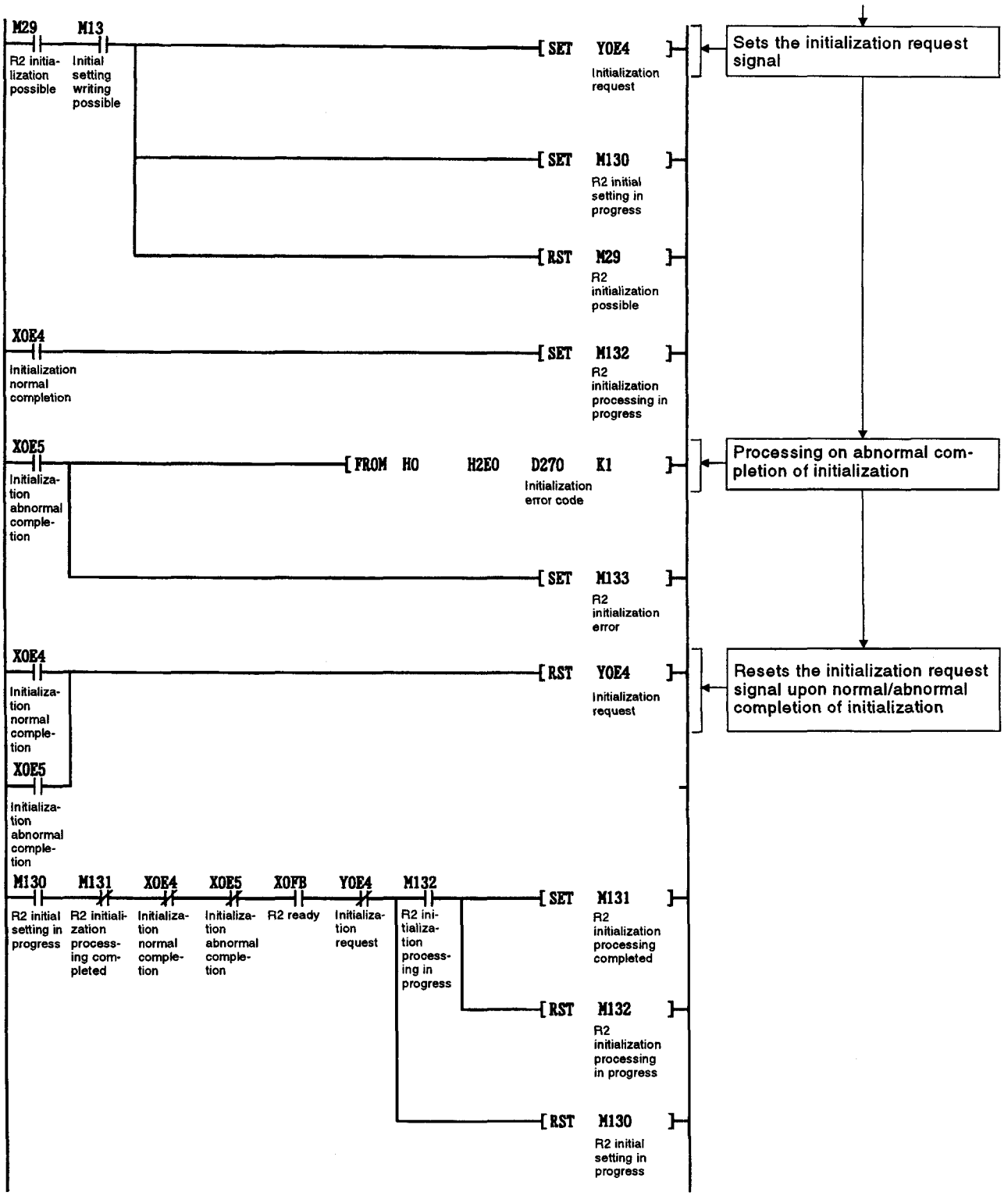


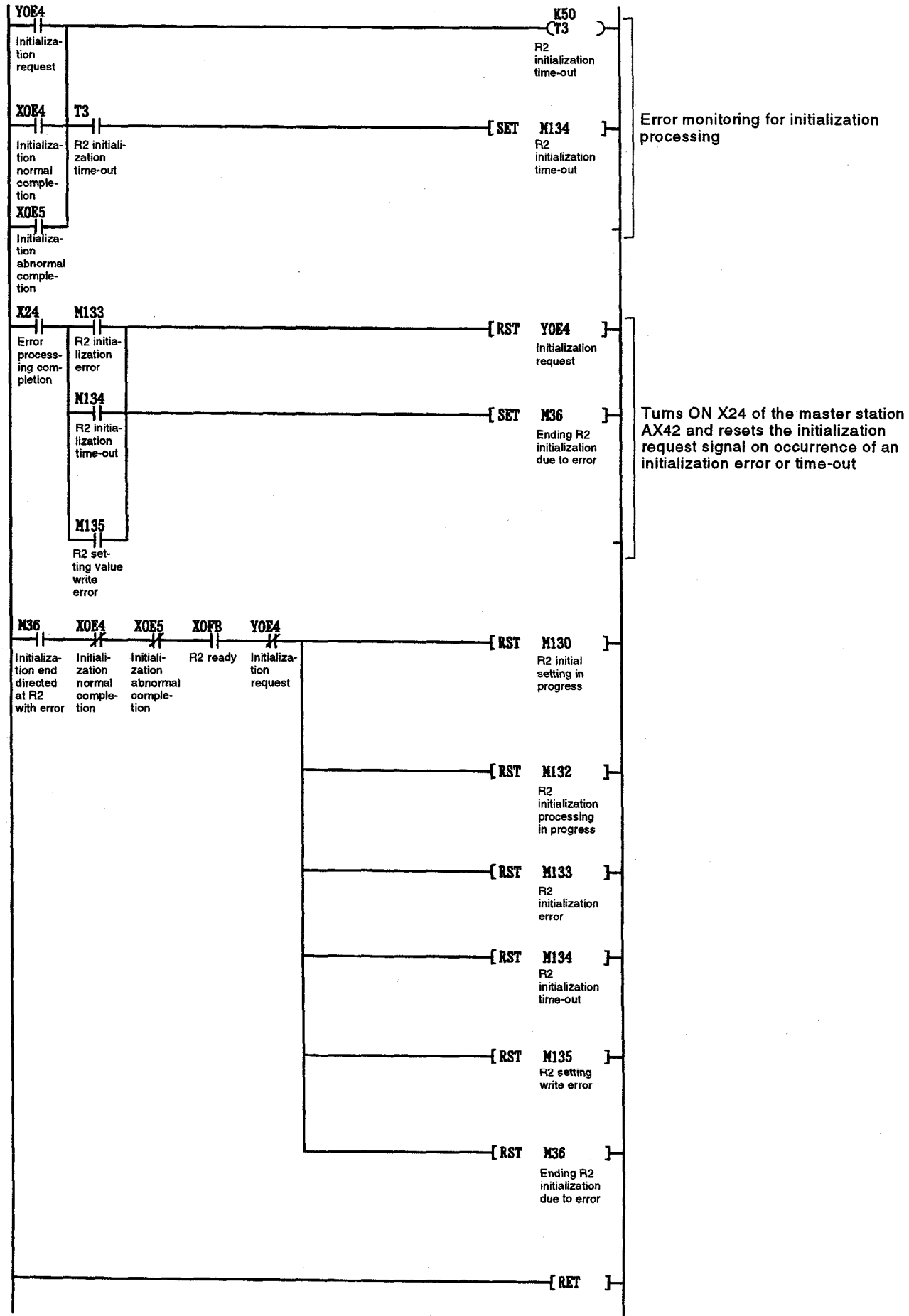


Resets the data link start request signal when X24 of the master station AX42 comes ON on occurrence of a time-out.

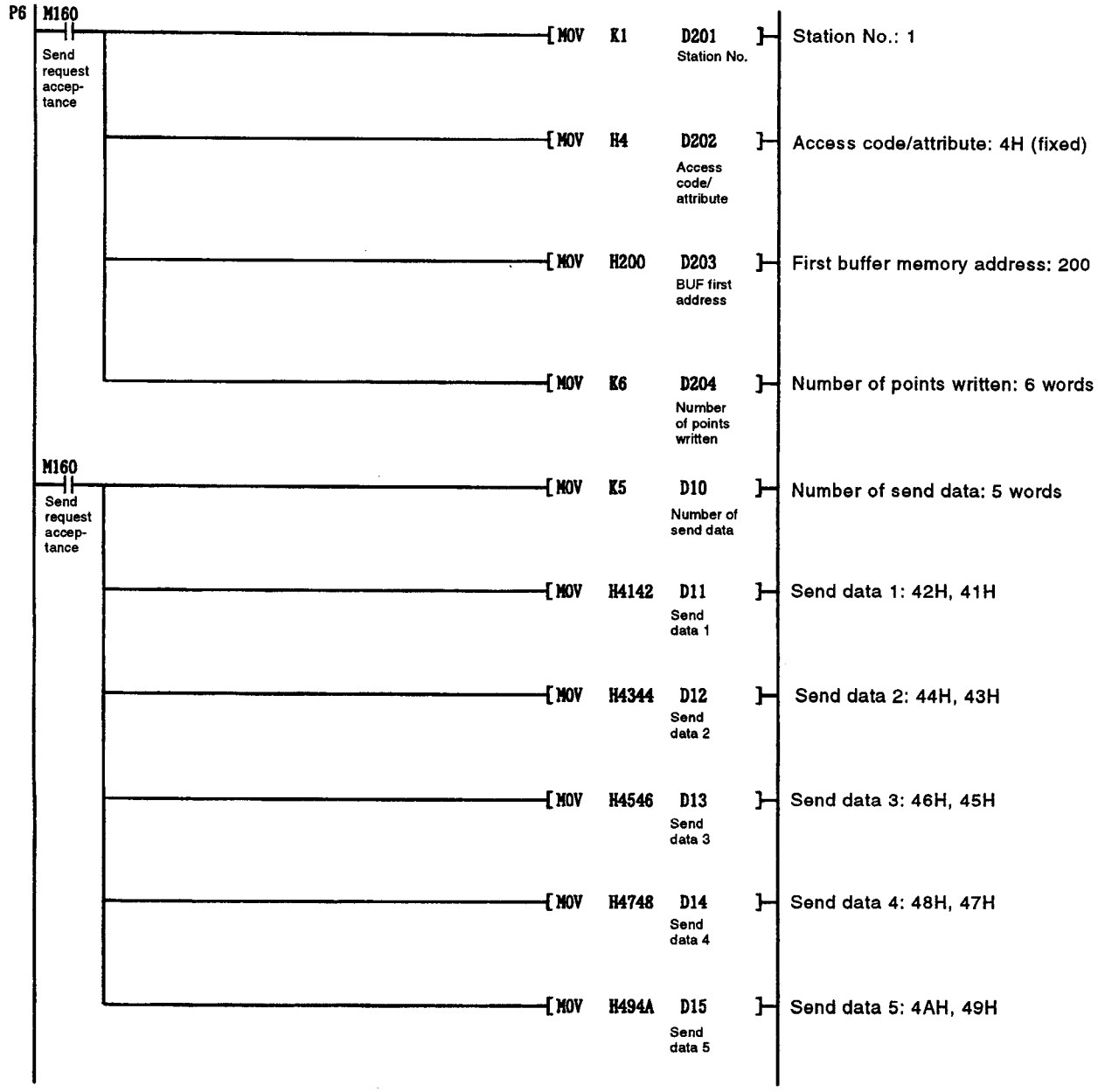
[Sub-routine program for AJ65BT-R2 initial setting]

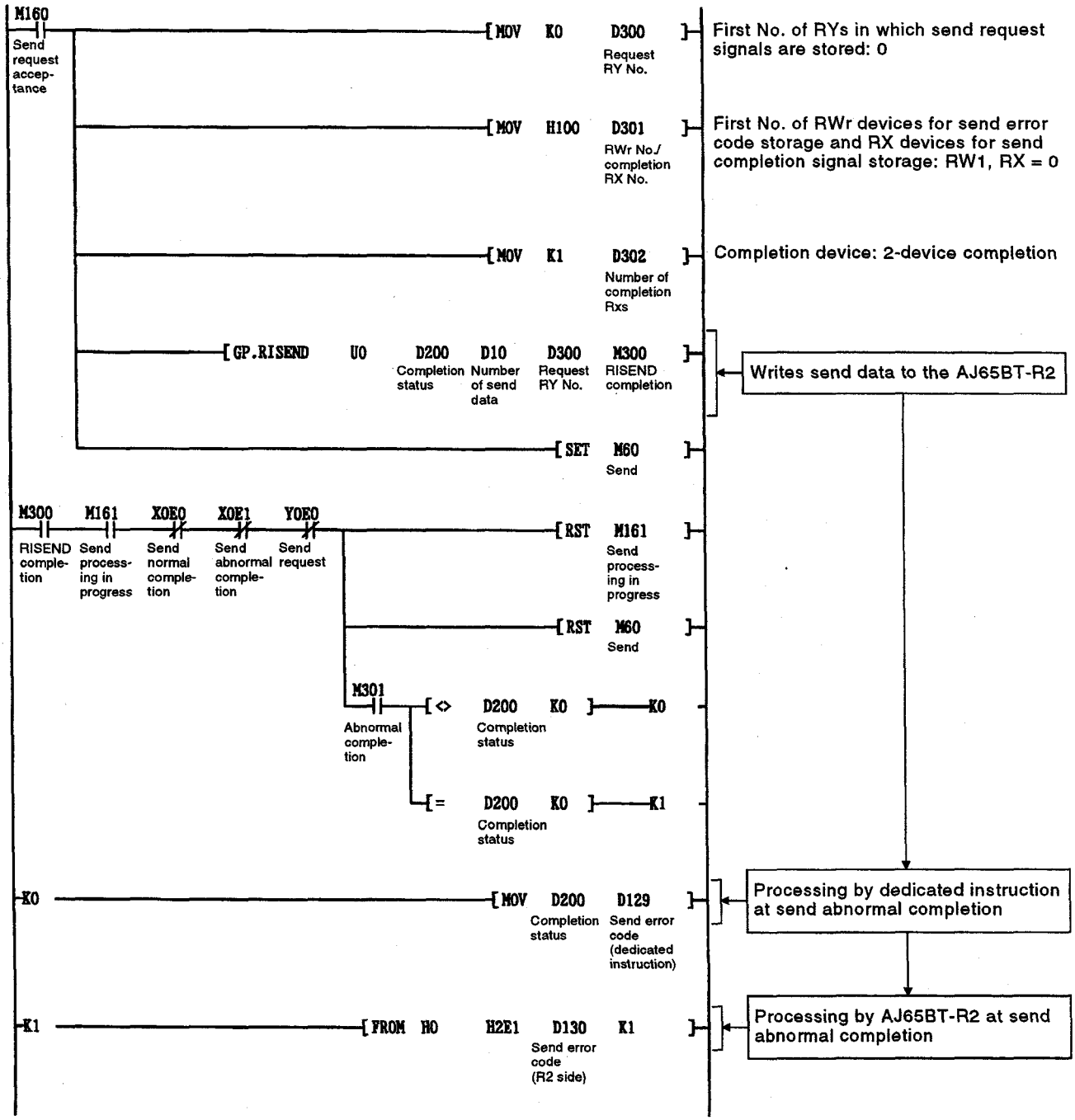


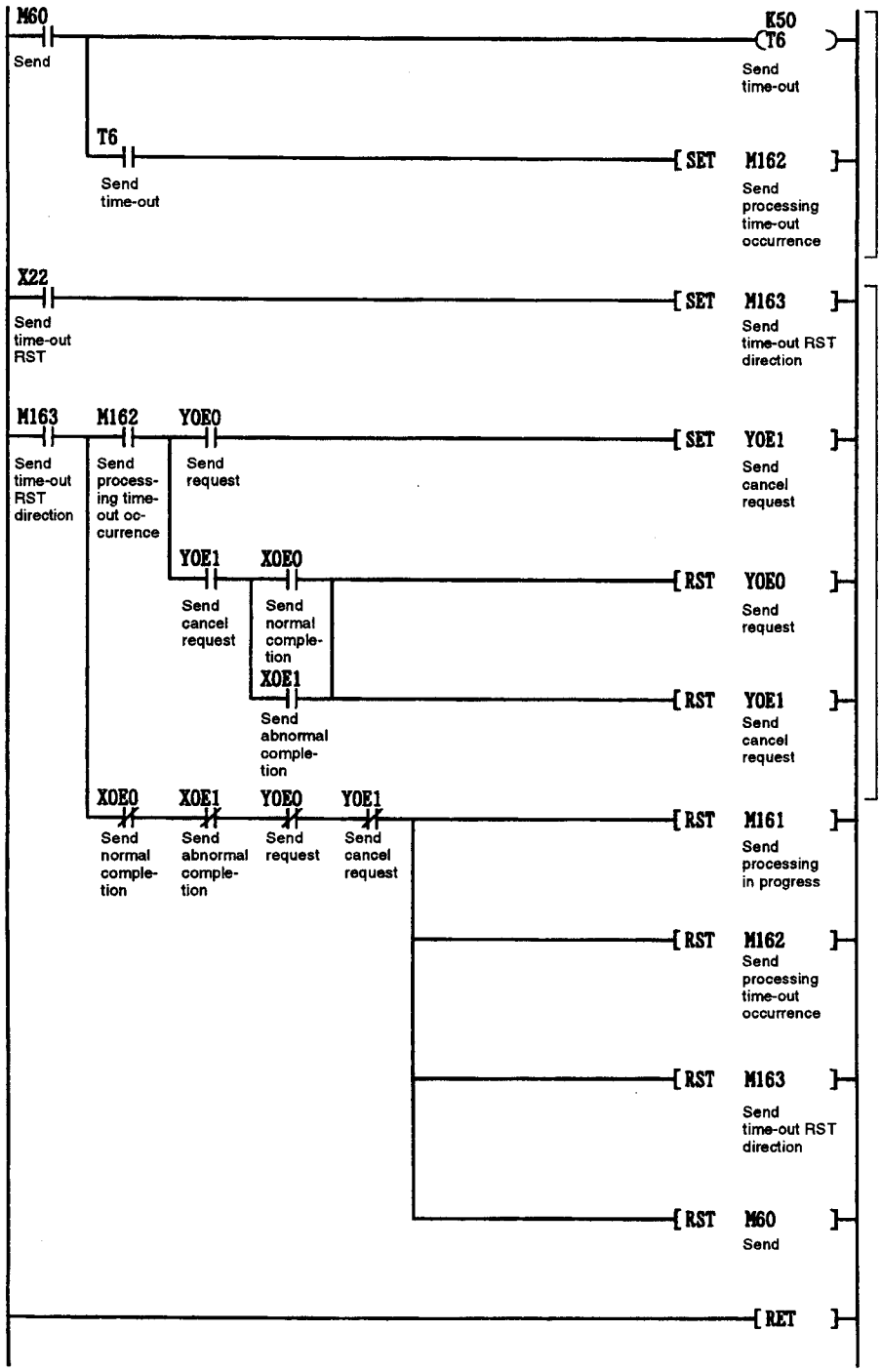

M29
R2 initialization possible
M13
Initial setting writing possible
SET Y0E4
Initialization request
SET M130
R2 initial setting in progress
RST M29
R2 initialization possible
Sets the initialization request signal
X0E4
Initialization normal completion
SET M132
R2 initialization processing in progress
X0E5
Initialization abnormal completion
FROM H0 H2E0 D270 K1
Initialization error code
SET M133
R2 initialization error
Processing on abnormal completion of initialization
X0E4
Initialization normal completion
RST Y0E4
Initialization request
X0E5
Initialization abnormal completion
Resets the initialization request signal upon normal/abnormal completion of initialization
M130
R2 initial setting in progress
M131
R2 initialization processing completed
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
X0FB
R2 ready
Y0E4
Initialization request
M132
R2 initialization processing in progress
SET M131
R2 initialization processing completed
RST M132
R2 initialization processing in progress
RST M130
R2 initial setting in progress


Y0E4
Initialization request
K50
T3
R2 initialization time-out
X0E4
Initialization normal completion
T3
R2 initialization time-out
SET
M134
R2 initialization time-out
X0E5
Initialization abnormal completion
Error monitoring for initialization processing
X24
Error processing completion
M133
R2 initialization error
RST
Y0E4
Initialization request
M134
R2 initialization time-out
SET
M36
Ending R2 initialization due to error
M135
R2 setting value write error
Turns ON X24 of the master station AX42 and resets the initialization request signal on occurrence of an initialization error or time-out
M36
Initialization end directed at R2 with error
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
X0FB
R2 ready
Y0E4
Initialization request
RST
M130
R2 initial setting in progress
RST
M132
R2 initialization processing in progress
RST
M133
R2 initialization error
RST
M134
R2 initialization time-out
RST
M135
R2 setting write error
RST
M36
Ending R2 initialization due to error
RET

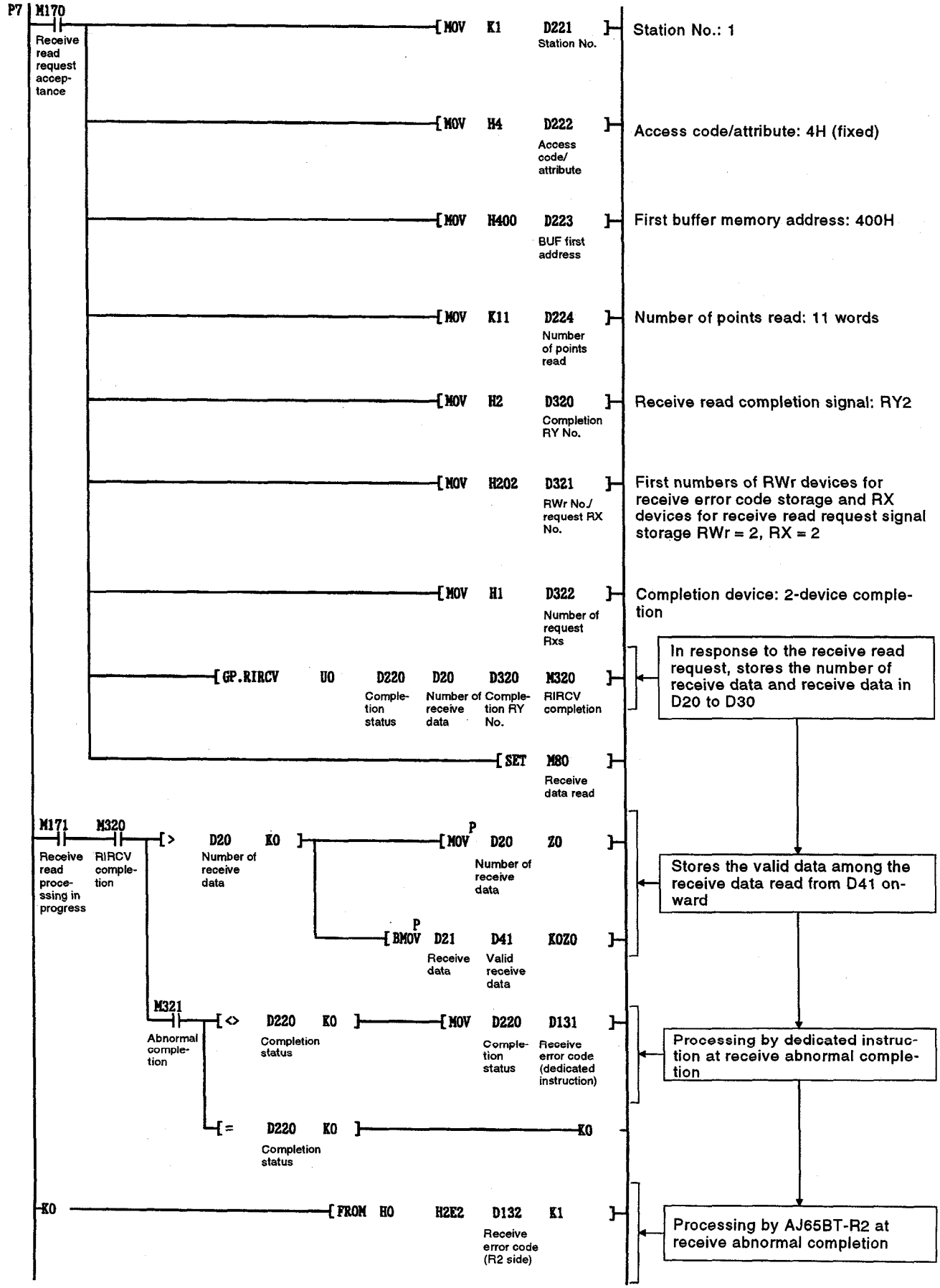
[Sub-routine program for sending data to an external device]

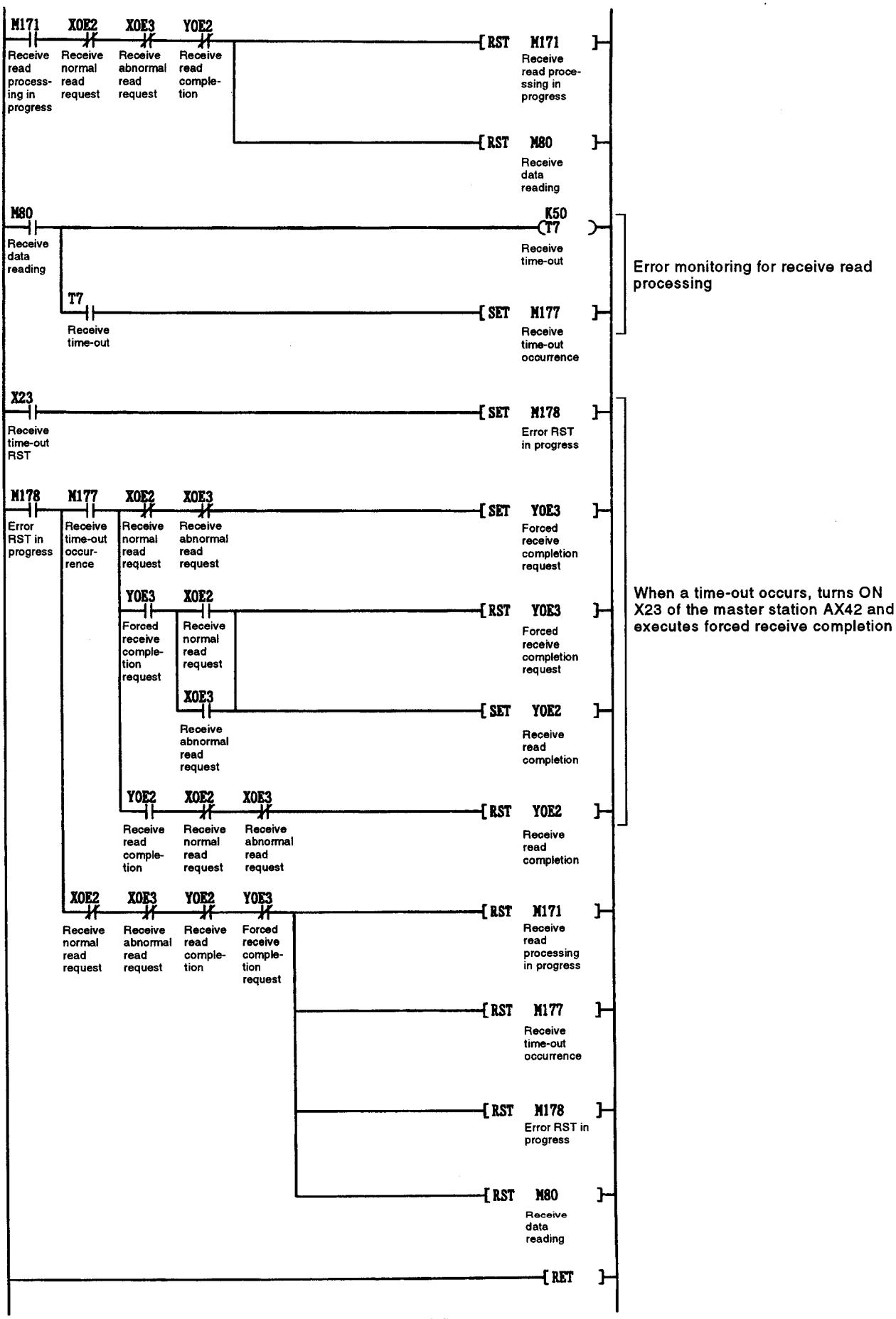



M160
Send request acceptance
[MOV K0 D300]
Request RY No.
First No. of RYs in which send request signals are stored: 0
[MOV H100 D301]
RWr No./ completion RX No.
First No. of RWr devices for send error code storage and RX devices for send completion signal storage: RW1, RX = 0
[MOV K1 D302]
Number of completion Rxs
Completion device: 2-device completion
[GP.RISEND U0 D200 D10 D300 M300]
Completion status
Number of send data
Request RY No.
RISEND completion
Writes send data to the AJ65BT-R2
[SET M60]
Send
M300
RISEND completion
M161
Send processing in progress
X0E0
Send normal completion
X0E1
Send abnormal completion
Y0E0
Send request
[RST M161]
Send processing in progress
[RST M60]
Send
M301
Abnormal completion
[<> D200 K0] K0
Completion status
[= D200 K0] K1
Completion status
K0
[MOV D200 D129]
Completion status
Send error code (dedicated instruction)
Processing by dedicated instruction at send abnormal completion
K1
[FROM H0 H2E1 D130 K1]
Send error code (R2 side)
Processing by AJ65BT-R2 at send abnormal completion

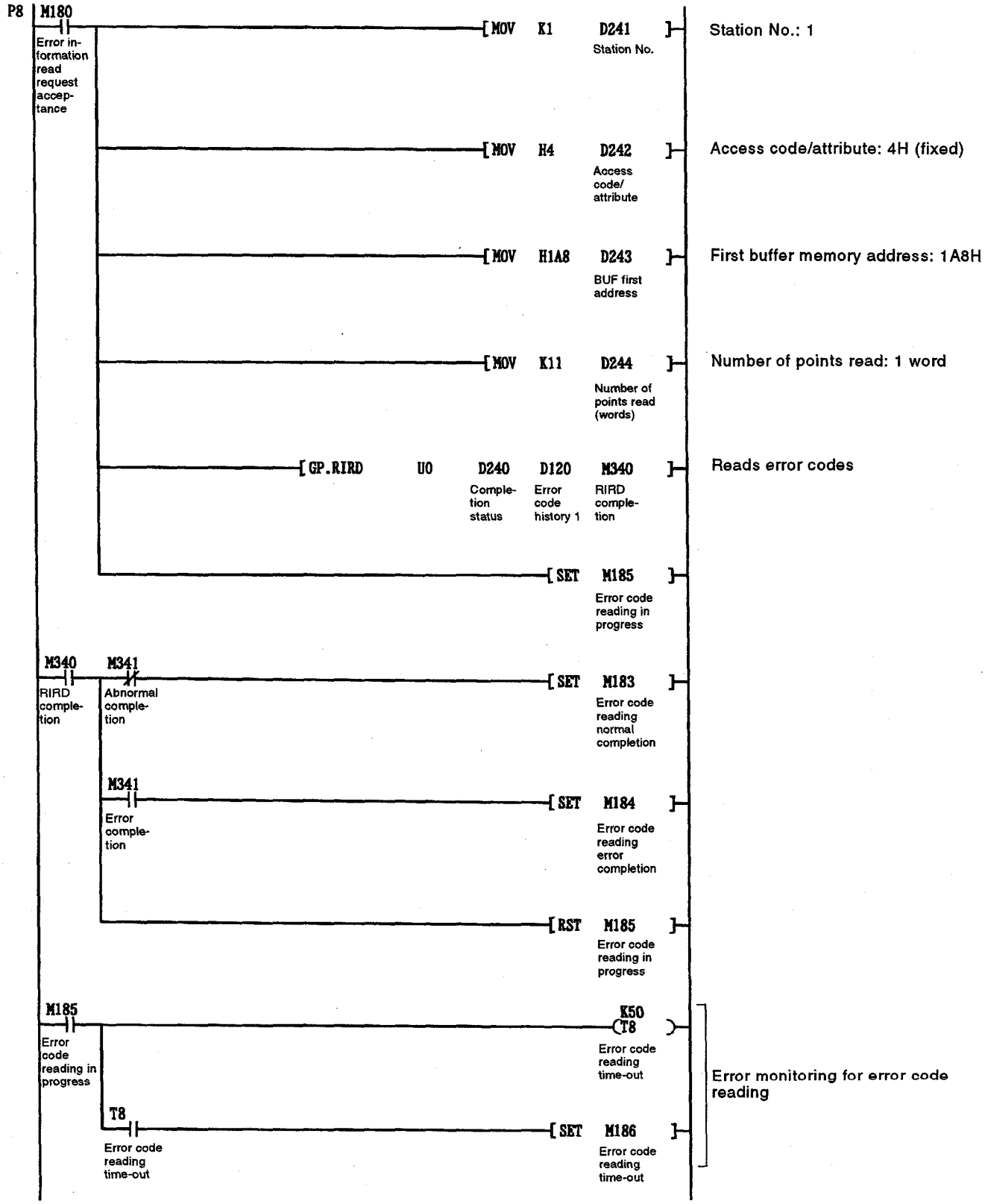

M60
Send
K50
T6
Send time-out
T6
Send time-out
SET M162
Send processing time-out occurrence
Error monitoring for send processing
X22
Send time-out RST
SET M163
Send time-out RST direction
M163
Send time-out RST direction
M162
Send processing time-out occurrence
Y0E0
Send request
SET Y0E1
Send cancel request
Y0E1
Send cancel request
X0E0
Send normal completion
RST Y0E0
Send request
X0E1
Send abnormal completion
RST Y0E1
Send cancel request
Turns X22 of the master station AX42 ON and cancels sending on occurrence of time-out
X0E0
Send normal completion
X0E1
Send abnormal completion
Y0E0
Send request
Y0E1
Send cancel request
RST M161
Send processing in progress
RST M162
Send processing time-out occurrence
RST M163
Send time-out RST direction
RST M60
Send
RET

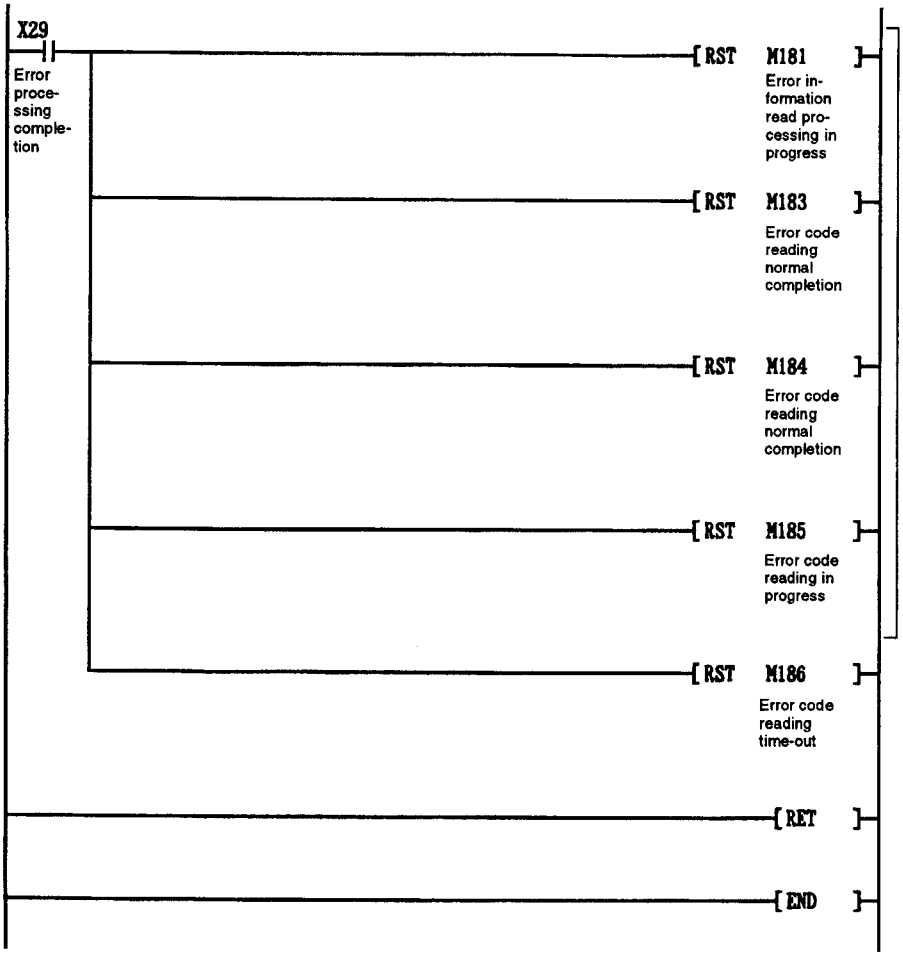
[Sub-routine program for receiving data from an external device]




M171
Receive read processing in progress
X0E2
Receive normal read request
X0E3
Receive abnormal read request
Y0E2
Receive read completion
RST M171
Receive read processing in progress
RST M80
Receive data reading
M80
Receive data reading
K50
T7
Receive time-out
T7
Receive time-out
SET M177
Receive time-out occurrence
Error monitoring for receive read processing
X23
Receive time-out RST
SET M178
Error RST in progress
M178
Error RST in progress
M177
Receive time-out occurrence
X0E2
Receive normal read request
X0E3
Receive abnormal read request
SET Y0E3
Forced receive completion request
Y0E3
Forced receive completion request
X0E2
Receive normal read request
RST Y0E3
Forced receive completion request
X0E3
Receive abnormal read request
SET Y0E2
Receive read completion
When a time-out occurs, turns ON X23 of the master station AX42 and executes forced receive completion
Y0E2
Receive read completion
X0E2
Receive normal read request
X0E3
Receive abnormal read request
RST Y0E2
Receive read completion
X0E2
Receive normal read request
X0E3
Receive abnormal read request
Y0E2
Receive read completion
Y0E3
Forced receive completion request
RST M171
Receive read processing in progress
RST M177
Receive time-out occurrence
RST M178
Error RST in progress
RST M80
Receive data reading
RET

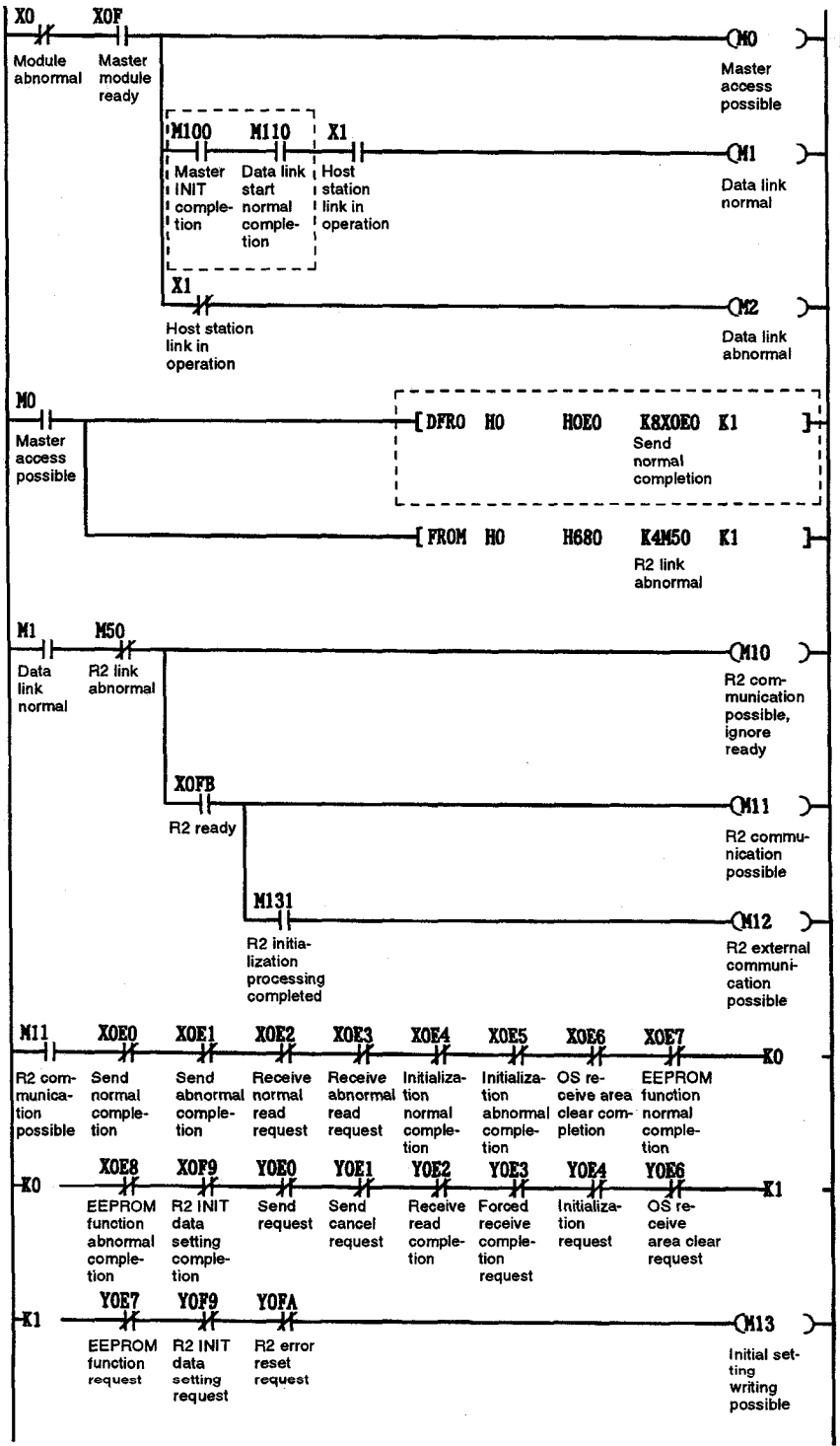
[Sub-routine program for reading AJ65BT-R2 error information]





Turns ON X29 of the master station AX42 and completes error processing

(2) Program using FROM/TO instructions (dedicated instructions) (for QnACPU)
[Main program]



M0 : Access to master station possible/not possible flag (ON: Access possible)

M1 : Data link start normal flag (ON: Normal)

M2 : Data link start abnormal flag (ON: Abnormal)

Reading of remote inputs of remote station (first station)

Reading of link status of 1st to 16th remote stations

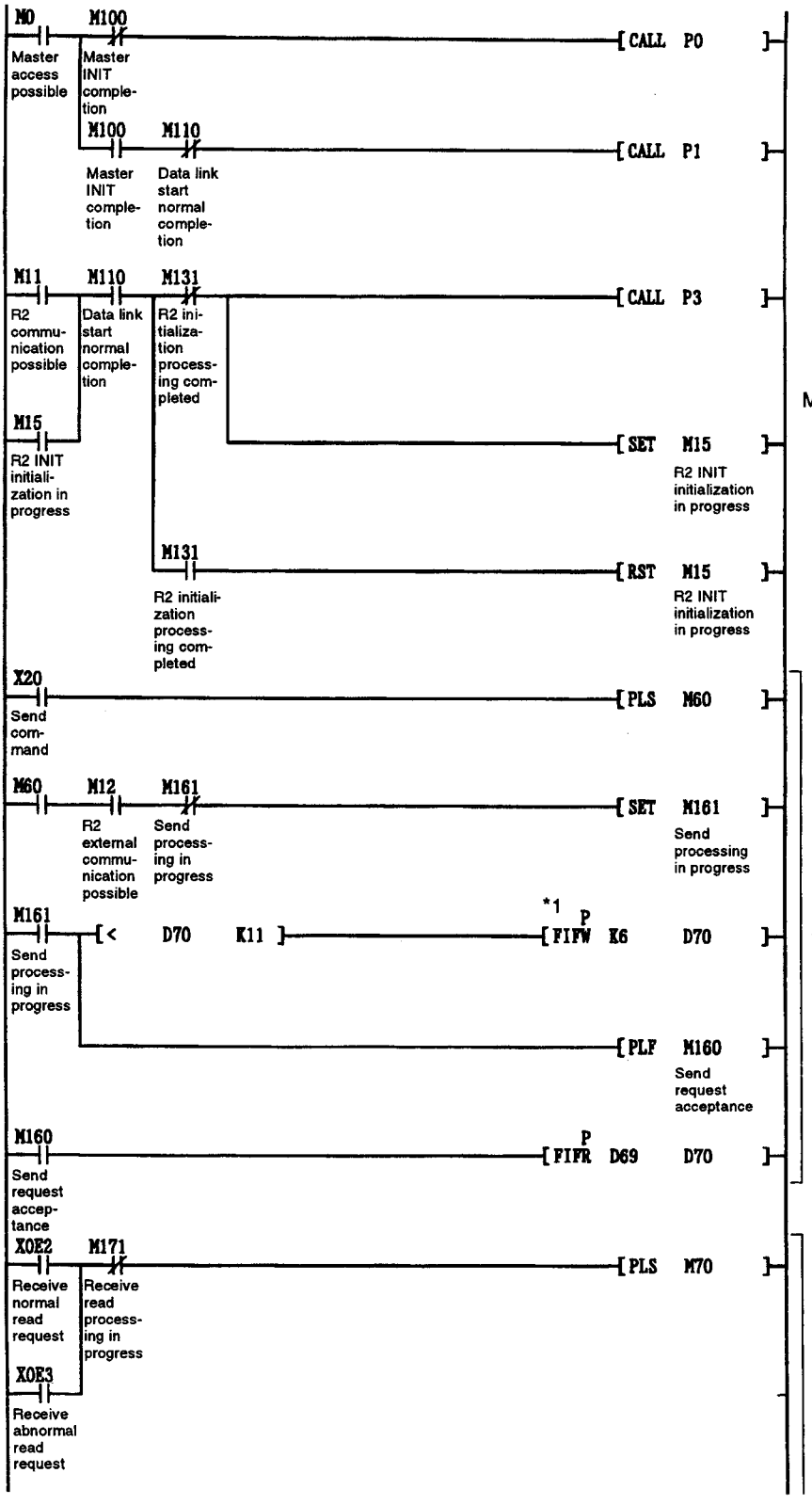
M10 : Communication with AJ65BT-R2 possible/not possible flag (remote station ready signal ignored) (ON: communication possible)

M11 : Communication with AJ65BT-R2 possible/not possible flag (ON: communication possible)

M12 : Communication with external device possible/not possible flag (ON: Communication possible)

*1
M13 : AJ65BT-R2 initialization possible/ not possible flag (ON: Initialization possible) (See Section 9.7.)

*1 If initialization is executed while RX/RY signals are ON, the processing currently under way will be stopped. Turn all RYs except RYn4 OFF before executing initialization.



Calling sub-routine for master station parameter setting

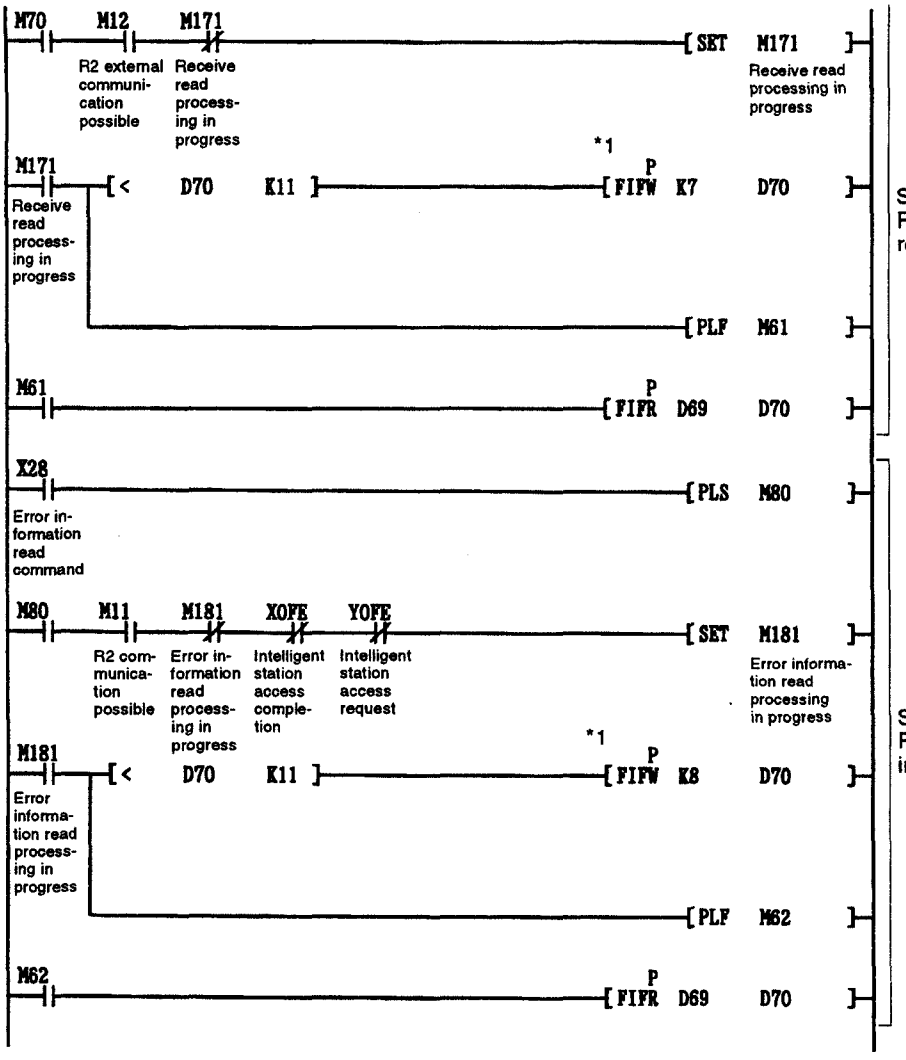
Calling sub-routine for starting data link in accordance with master module parameters

Calling the sub-routine for AJ65BT-R2 initial setting

M15 : AJ65BT-R2 initial data setting/ initialization in progress flag

*2 Since the remote station ready signal goes OFF during initialization processing, M11 is also OFF during initialization processing. M15 is a flag to continue the P3 sub-routine.

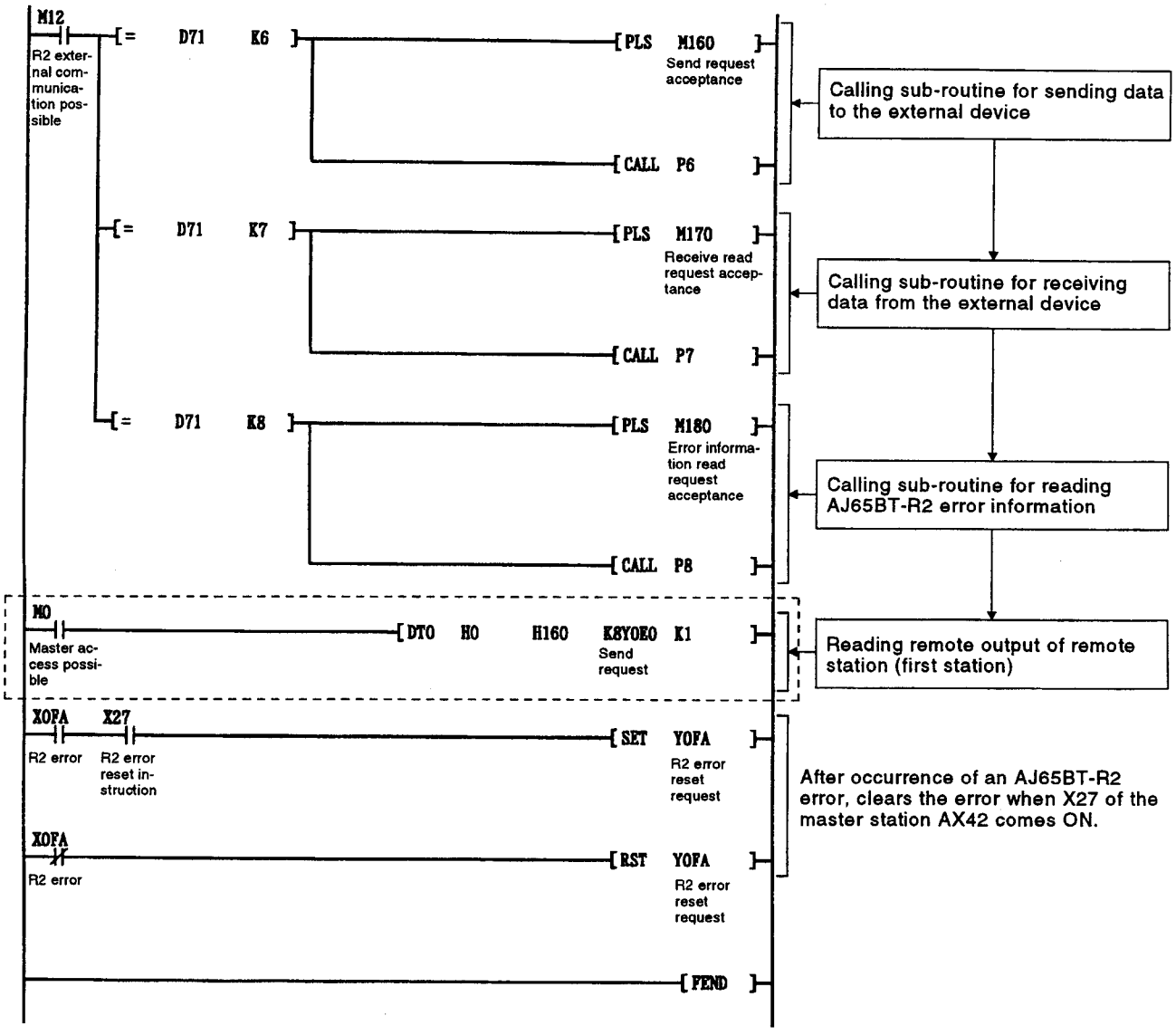
Stores "6" in the data table of the FIFO tables when send request is received



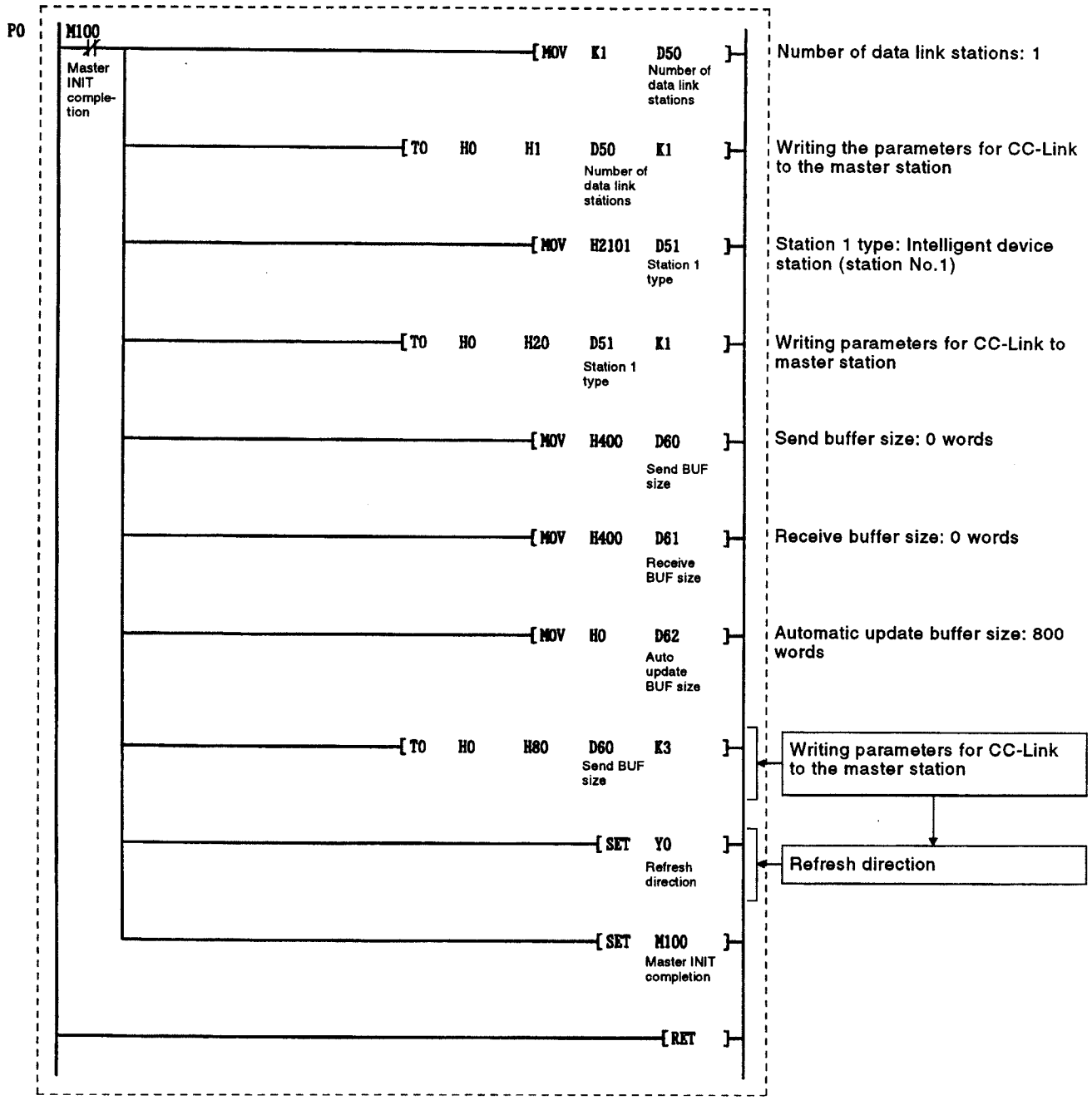
Stores "7" in the data table of the FIFO tables when receive read request is received

Stores "8" in the data table of the FIFO tables when AJ65BT-R2 error information read request is received

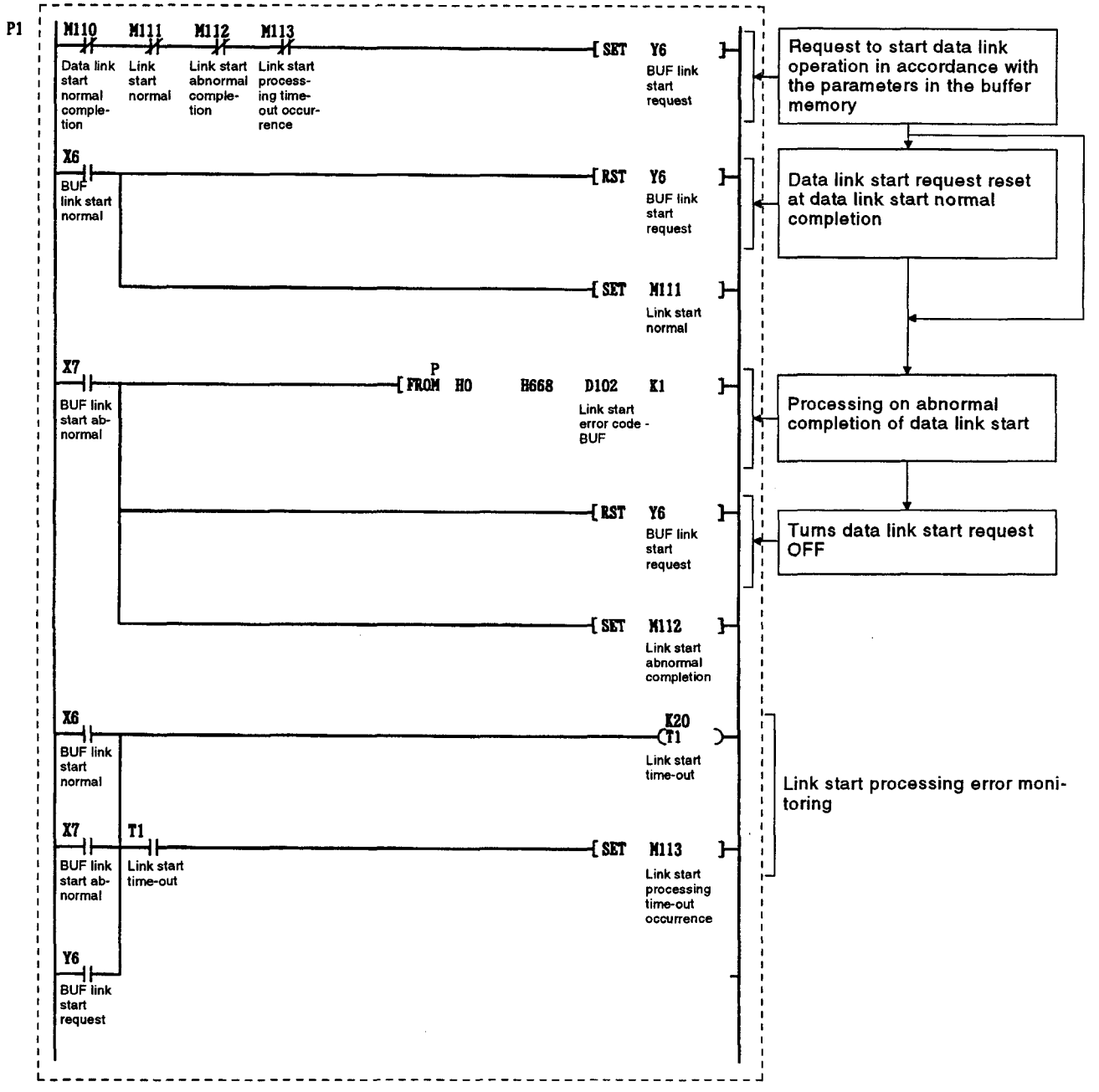
*1 When FROM/TO instructions are used (buffer memory automatic update function not effective), read/write processing cannot be executed at the same time, and the processing is therefore done with FIFO instructions.

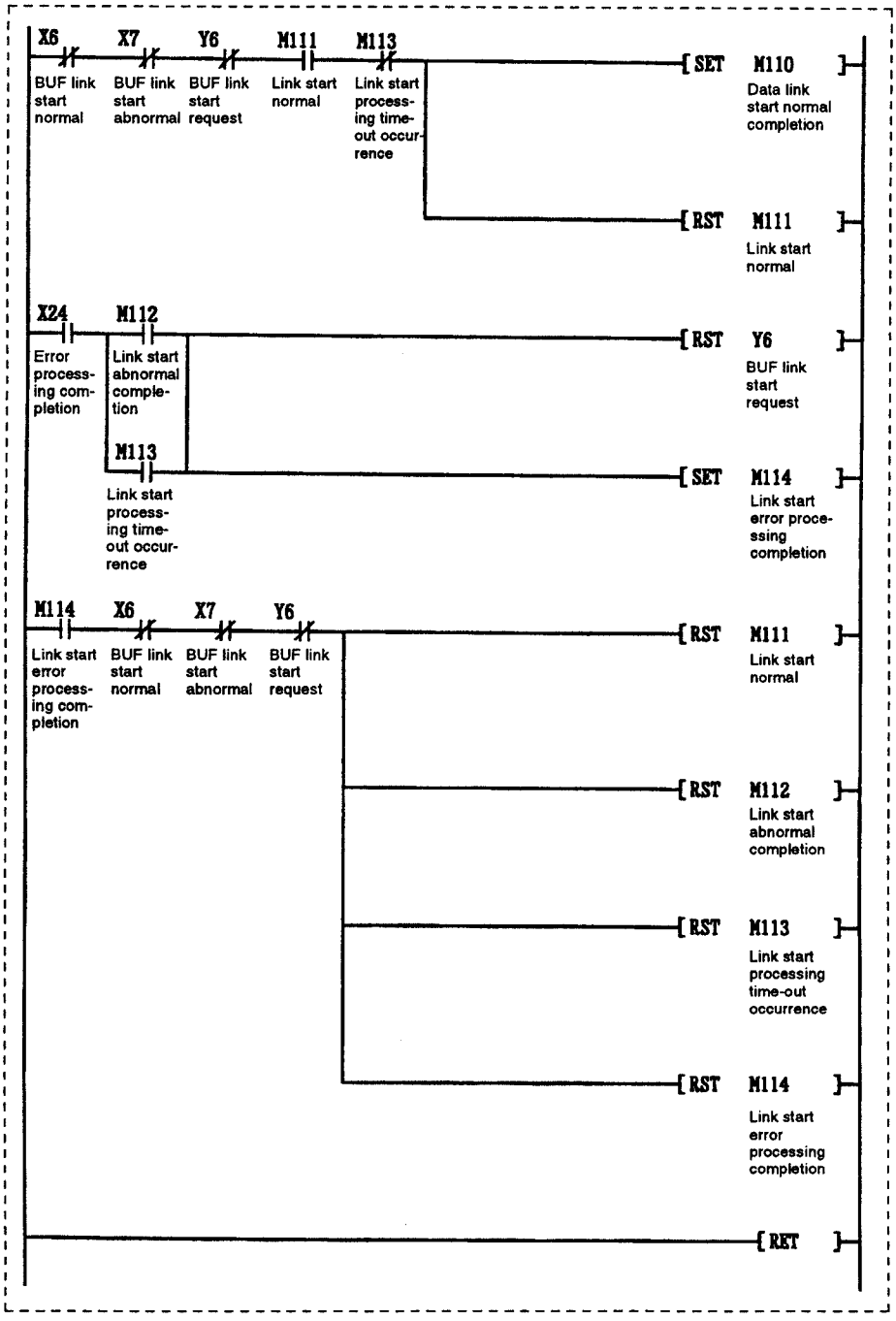

M12
R2 external communication possible
[= D71 K6]
[PLS M160]
Send request acceptance
[CALL P6]
[= D71 K7]
[PLS M170]
Receive read request acceptance
[CALL P7]
[= D71 K8]
[PLS M180]
Error information read request acceptance
[CALL P8]
M0
Master access possible
[DTO H0 H160 K8Y0E0 K1]
Send request
XOFA
R2 error
X27
R2 error reset instruction
[SET YOFA]
R2 error reset request
XOFA
R2 error
[RST YOFA]
R2 error reset request
[FEND]
Calling sub-routine for sending data to the external device
Calling sub-routine for receiving data from the external device
Calling sub-routine for reading AJ65BT-R2 error information
Reading remote output of remote station (first station)
After occurrence of an AJ65BT-R2 error, clears the error when X27 of the master station AX42 comes ON.

[Sub-routine program for master station parameter setting]



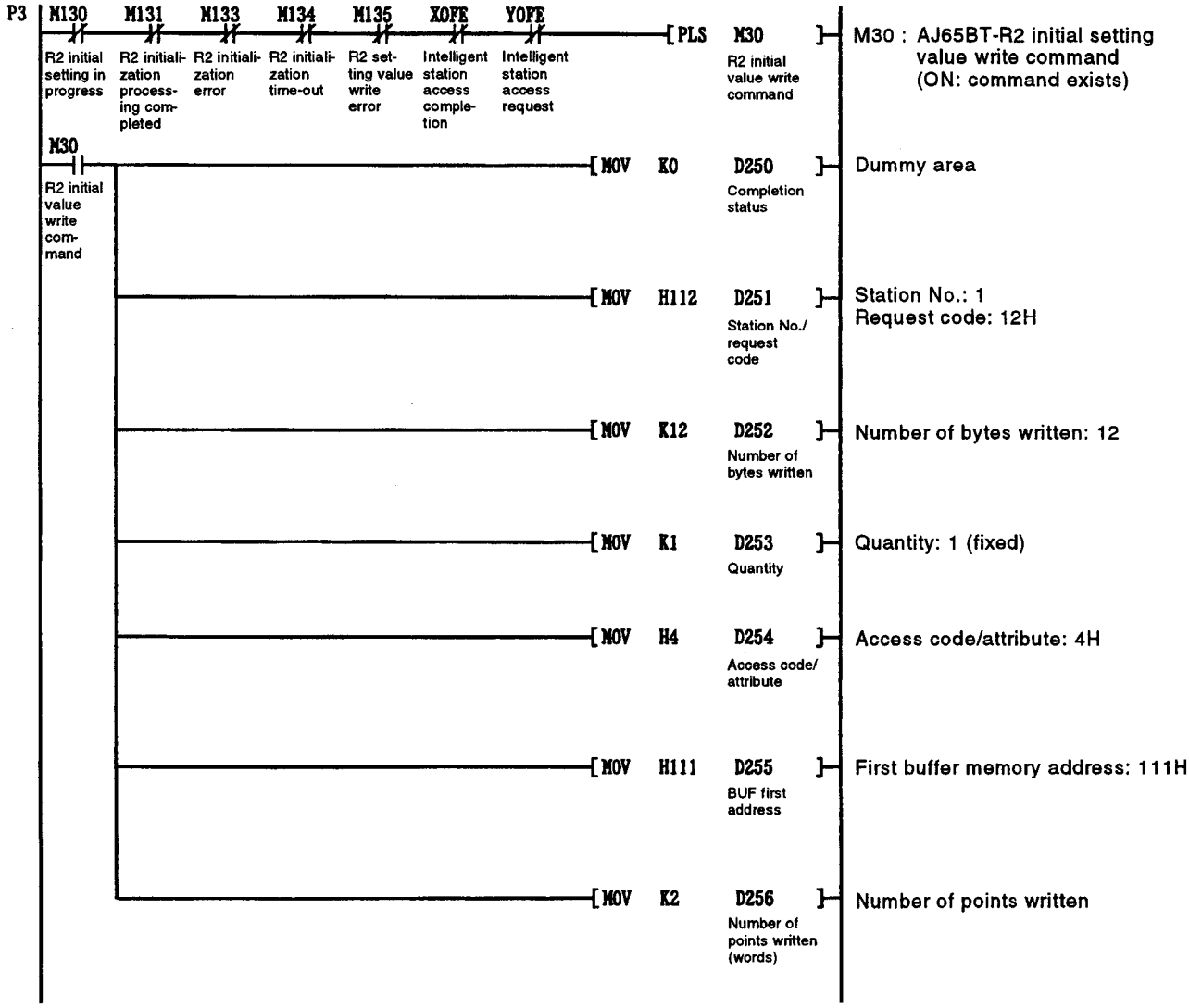
[Sub-routine program for starting data link in accordance with master module parameters]

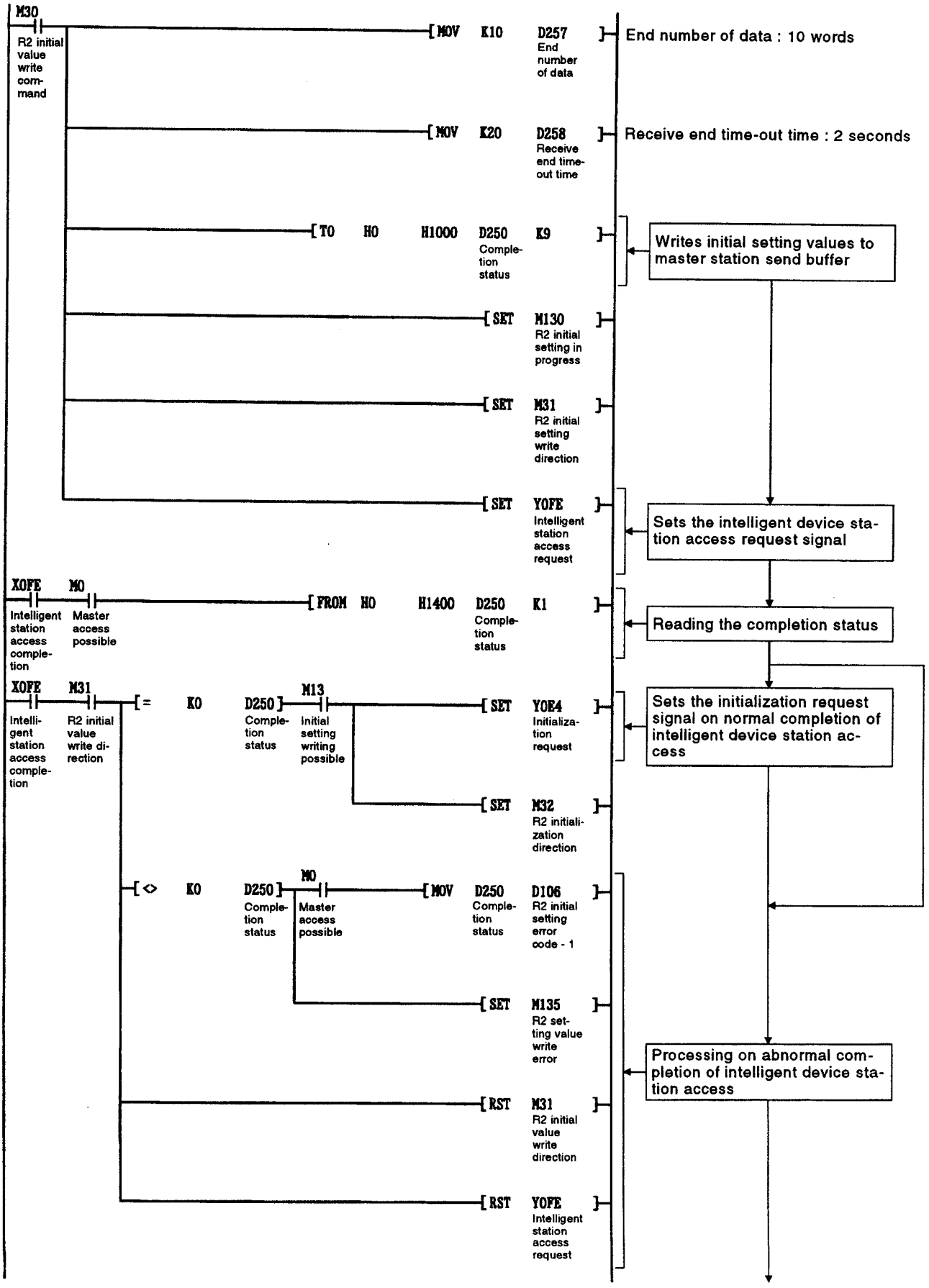


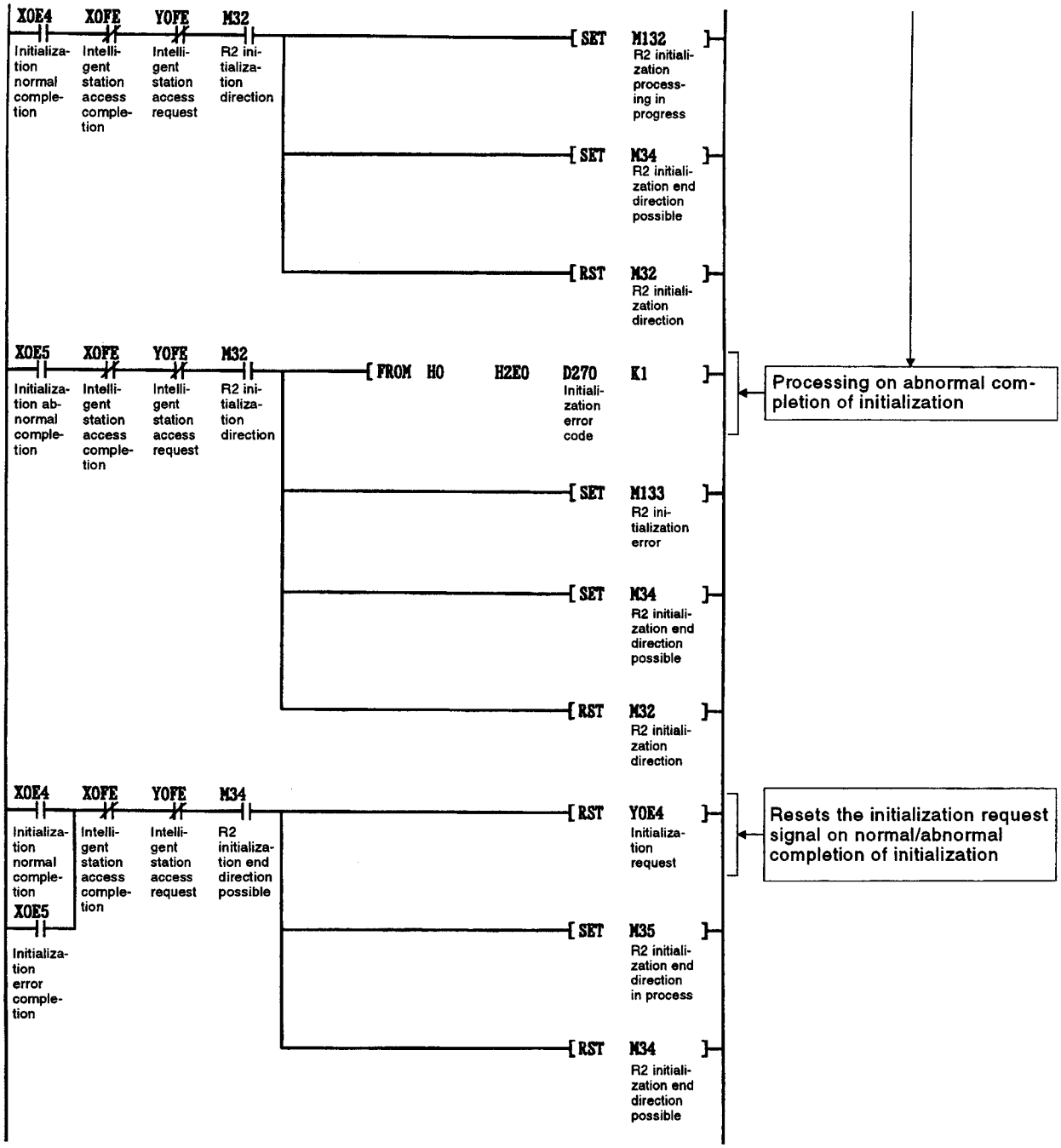


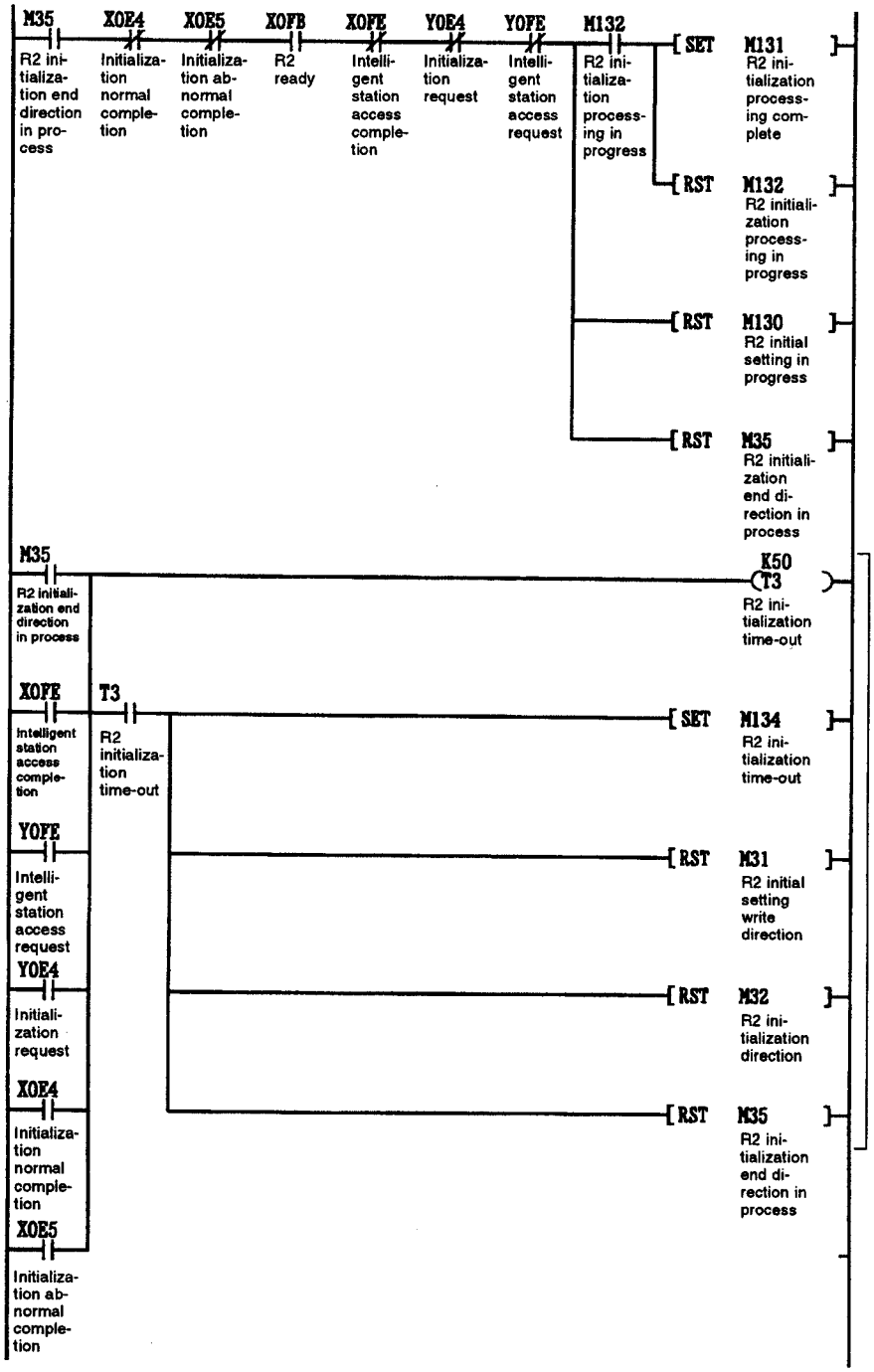
Resets the data link start request signal when X24 of the master station AX42 comes ON on occurrence of a time-out.

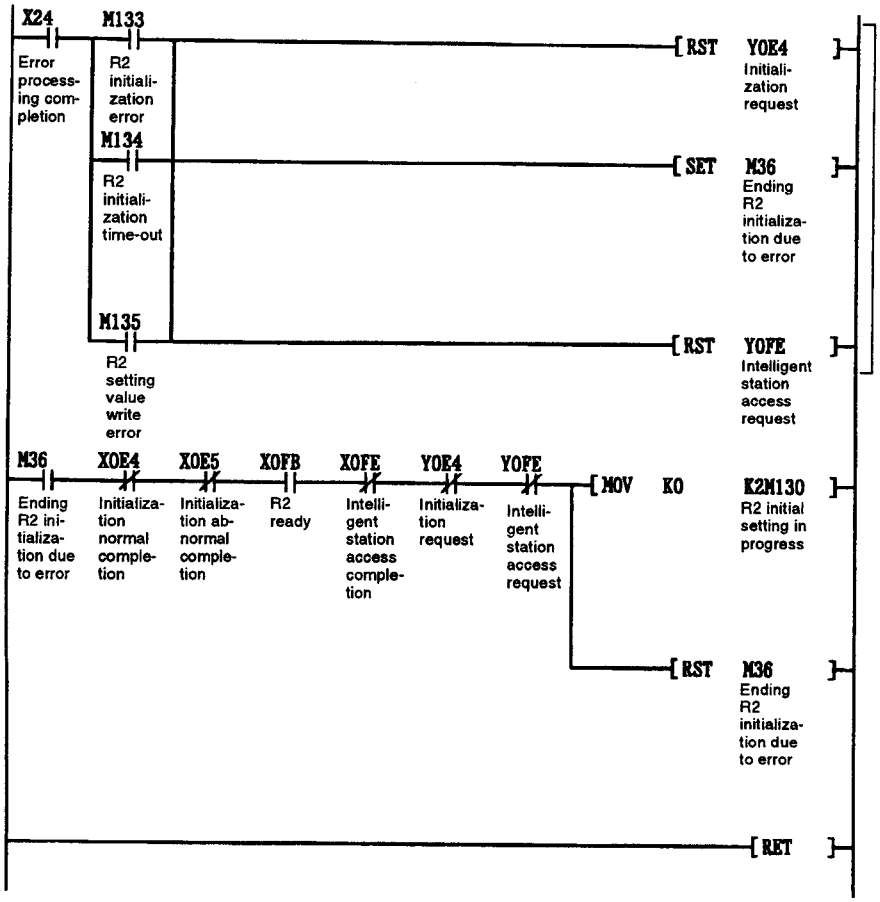
[Sub-routine program for AJ65BT-R2 initial setting]




M30
R2 initial value write command
MOV K10 D257
End number of data
End number of data : 10 words
MOV K20 D258
Receive end time-out time
Receive end time-out time : 2 seconds
TO H0 H1000 D250 K9
Completion status
Writes initial setting values to master station send buffer
SET M130
R2 initial setting in progress
SET M31
R2 initial setting write direction
SET YOFE
Intelligent station access request
Sets the intelligent device station access request signal
XOFE M0
Intelligent station access completion
Master access possible
FROM H0 H1400 D250 K1
Completion status
Reading the completion status
XOFE M31
Intelligent station access completion
R2 initial value write direction
= K0 D250 M13
Completion status
Initial setting writing possible
SET YOE4
Initialization request
Sets the initialization request signal on normal completion of intelligent device station access
SET M32
R2 initialization direction
<> K0 D250 M0
Completion status
Master access possible
MOV D250 D106
Completion status
R2 initial setting error code - 1
SET M135
R2 setting value write error
Processing on abnormal completion of intelligent device station access
RST M31
R2 initial value write direction
RST YOFE
Intelligent station access request

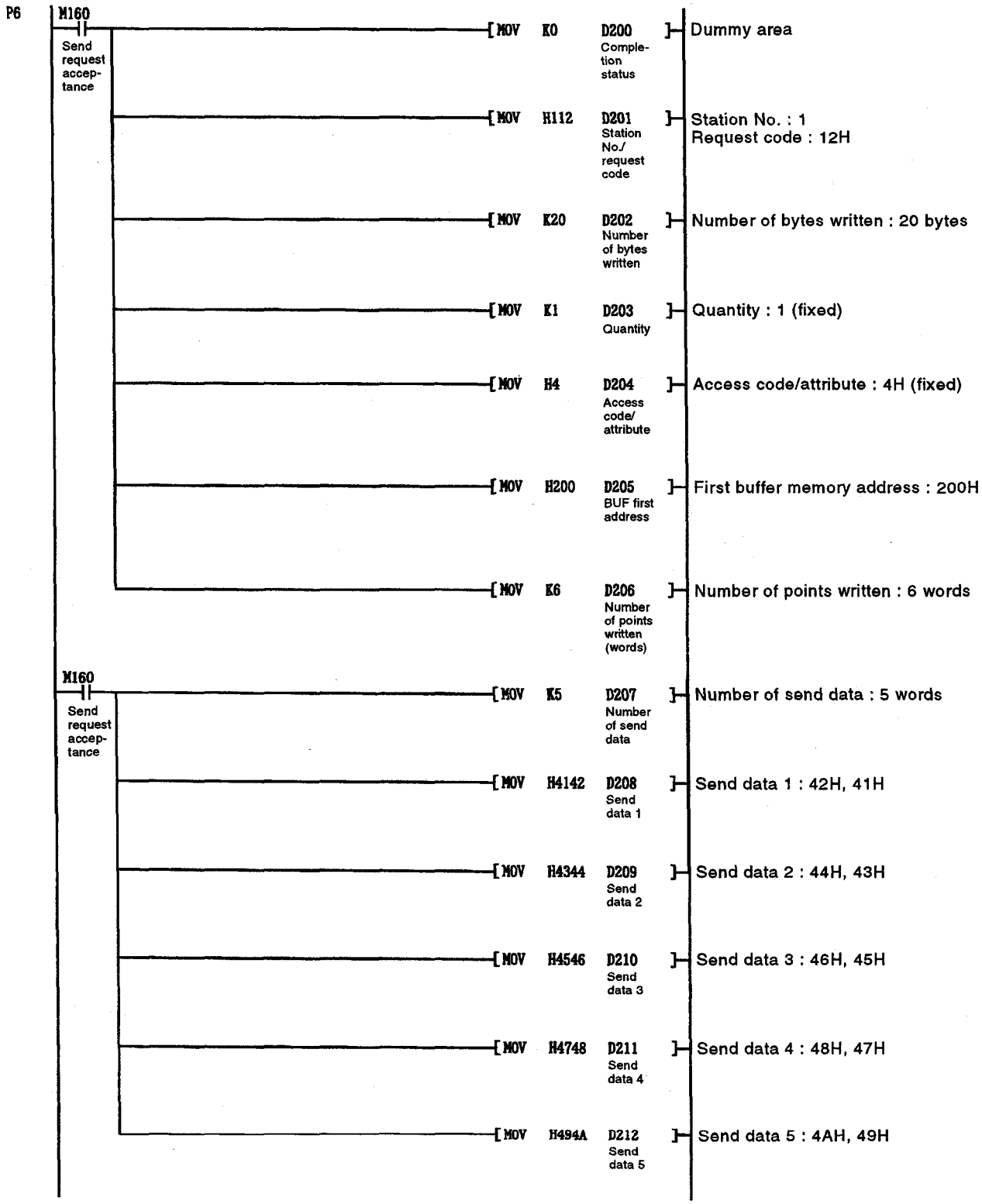

X0E4
Initialization normal completion
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
M32
R2 initialization direction
SET M132
R2 initialization processing in progress
SET M34
R2 initialization end direction possible
RST M32
R2 initialization direction
X0E5
Initialization abnormal completion
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
M32
R2 initialization direction
FROM H0 H2E0 D270 K1
D270
Initialization error code
Processing on abnormal completion of initialization
SET M133
R2 initialization error
SET M34
R2 initialization end direction possible
RST M32
R2 initialization direction
X0E4
Initialization normal completion
X0E5
Initialization error completion
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
M34
R2 initialization end direction possible
RST Y0E4
Initialization request
Resets the initialization request signal on normal/abnormal completion of initialization
SET M35
R2 initialization end direction in process
RST M34
R2 initialization end direction possible

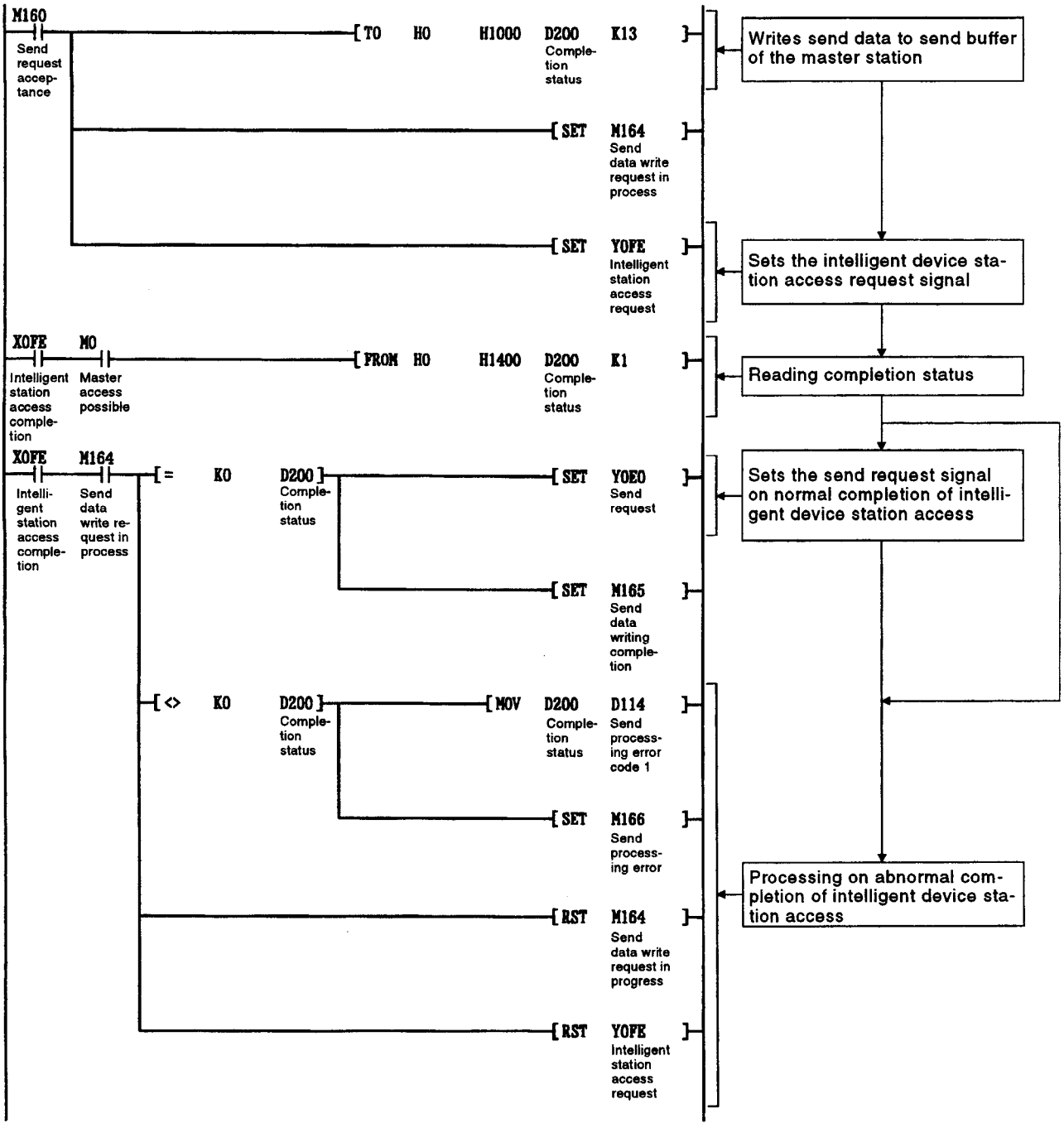

M35
R2 initialization end direction in process
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
X0FB
R2 ready
X0FE
Intelligent station access completion
Y0E4
Initialization request
Y0FE
Intelligent station access request
M132
R2 initialization processing in progress
SET
M131
R2 initialization processing complete
RST
M132
R2 initialization processing in progress
RST
M130
R2 initial setting in progress
RST
M35
R2 initialization end direction in process
M35
R2 initialization end direction in process
K50
T3
R2 initialization time-out
X0FE
Intelligent station access completion
T3
R2 initialization time-out
SET
M134
R2 initialization time-out
Y0FE
Intelligent station access request
RST
M31
R2 initial setting write direction
Y0E4
Initialization request
RST
M32
R2 initialization direction
X0E4
Initialization normal completion
X0E5
Initialization abnormal completion
RST
M35
R2 initialization end direction in process
Error monitoring for initialization processing

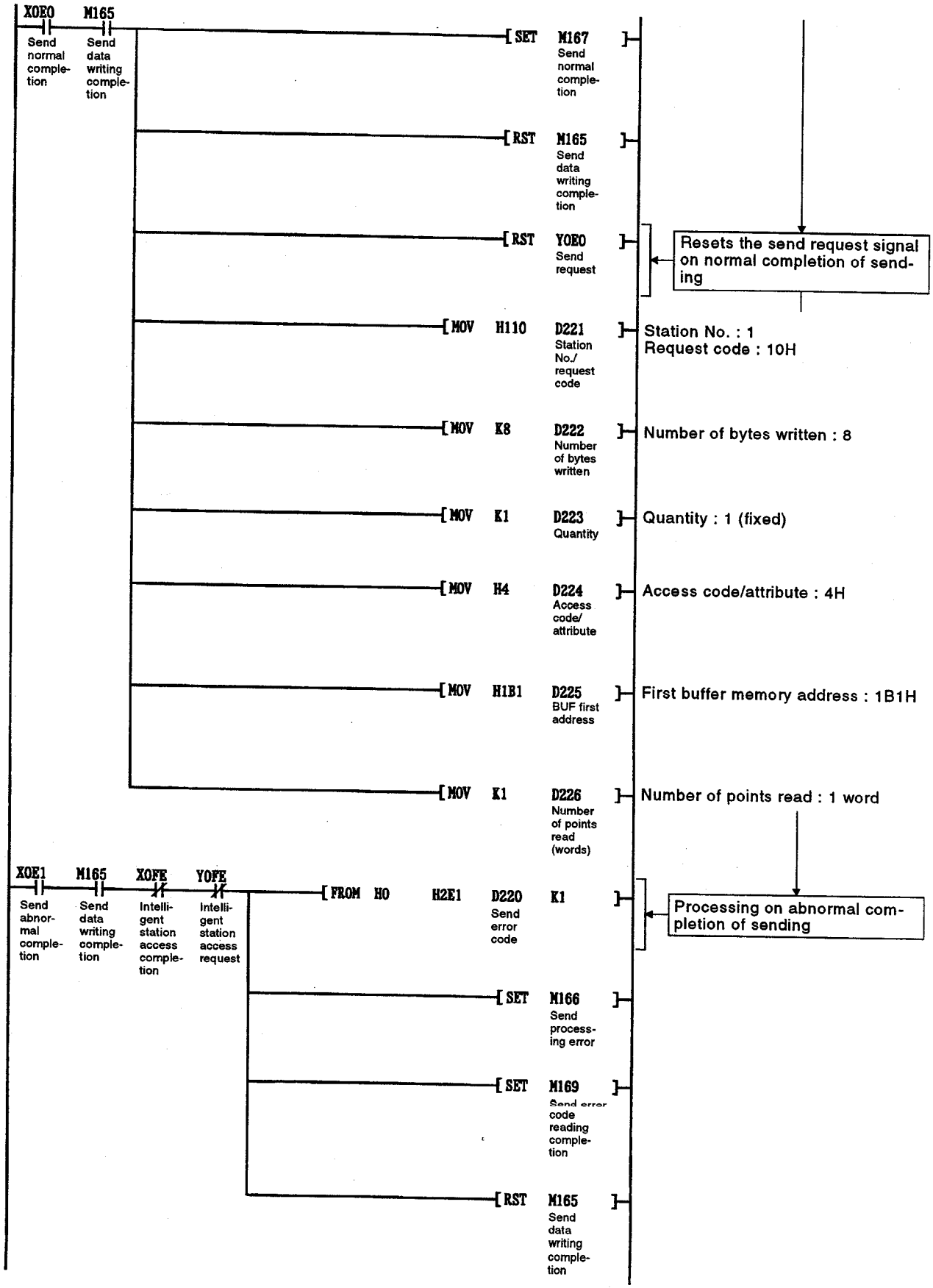


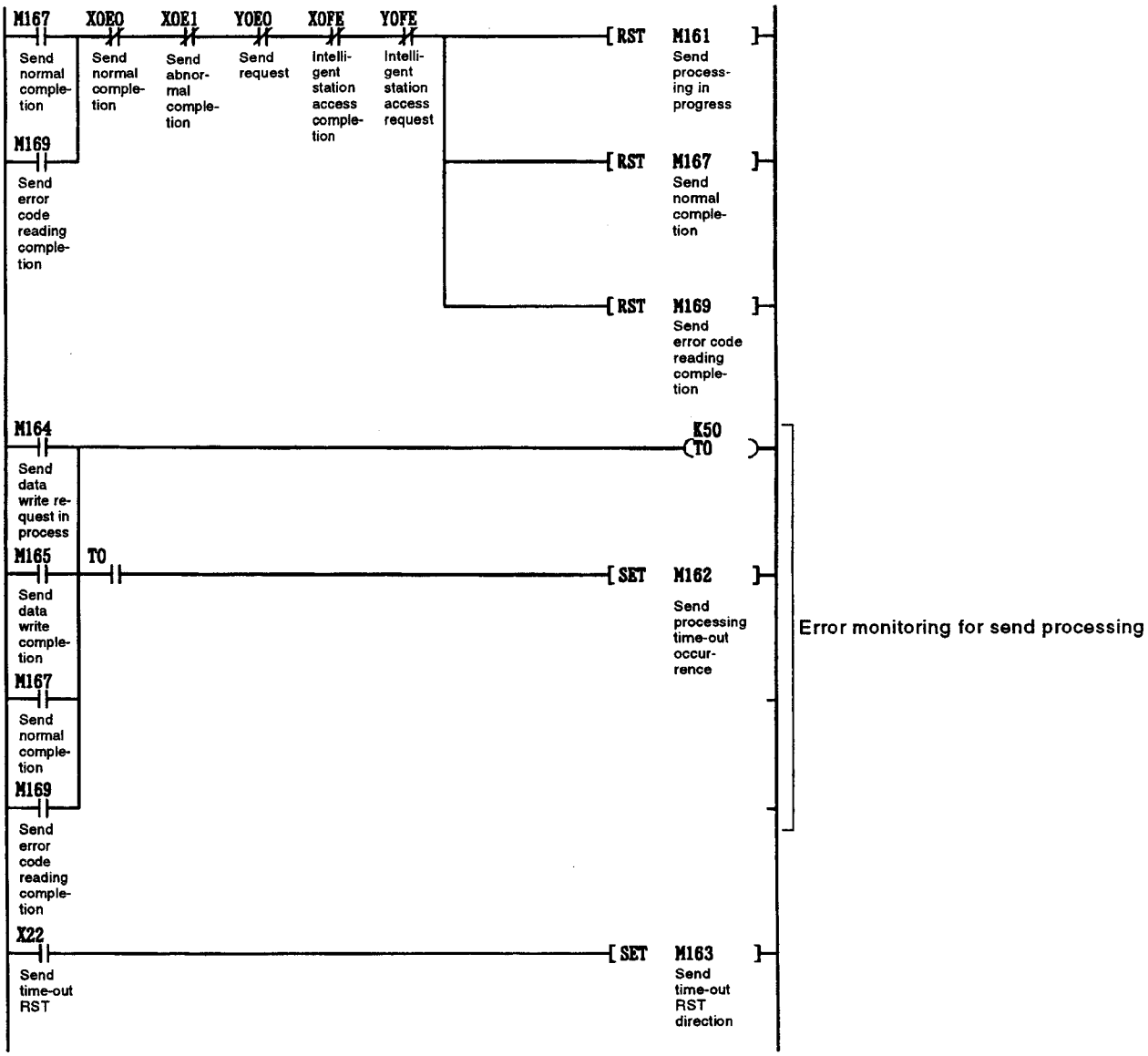
When an error or time-out occurs, or on completion of error code reading, turns X24 of the master station AX24 ON and resets the initialization request signal and intelligent device station access request signal.

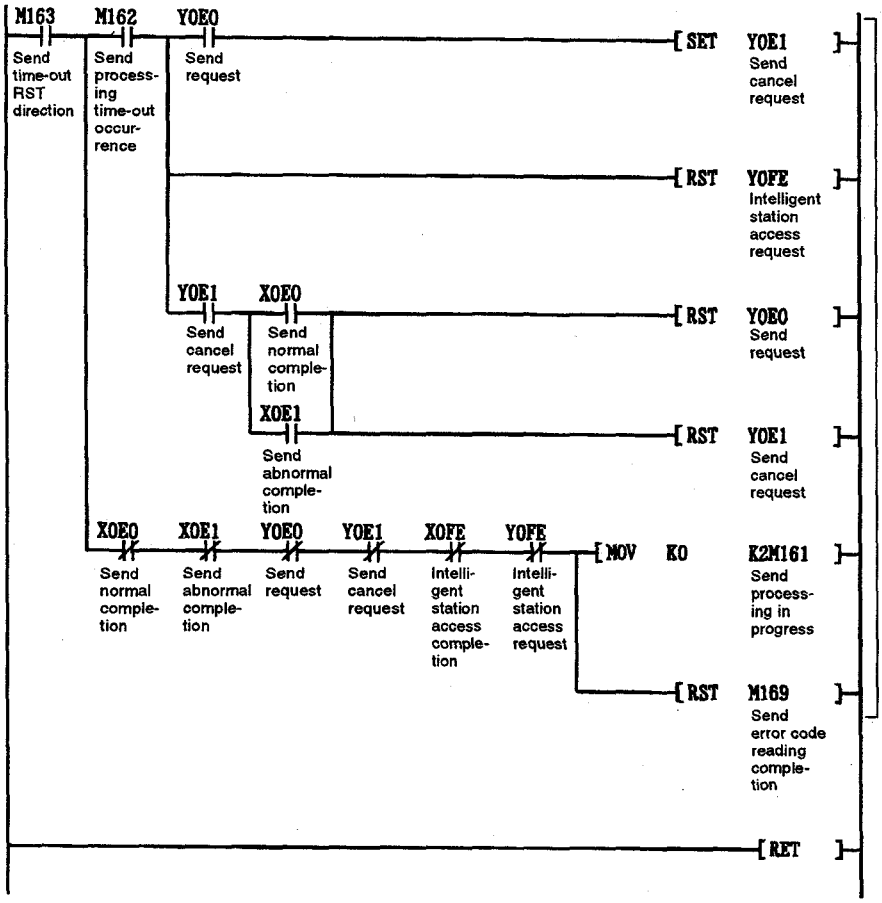
[Sub-routine program for sending data to an external device]




M160
Send request acceptance
TO H0 H1000 D200 K13
Completion status
Writes send data to send buffer of the master station
SET M164
Send data write request in process
SET Y0FE
Intelligent station access request
Sets the intelligent device station access request signal
X0FE M0
Intelligent station access completion
Master access possible
FROM H0 H1400 D200 K1
Completion status
Reading completion status
X0FE M164
Intelligent station access completion
Send data write request in process
= K0 D200
Completion status
SET Y0E0
Send request
Sets the send request signal on normal completion of intelligent device station access
SET M165
Send data writing completion
<> K0 D200
Completion status
MOV D200 D114
Completion status
Send processing error code 1
SET M166
Send processing error
Processing on abnormal completion of intelligent device station access
RST M164
Send data write request in progress
RST Y0FE
Intelligent station access request

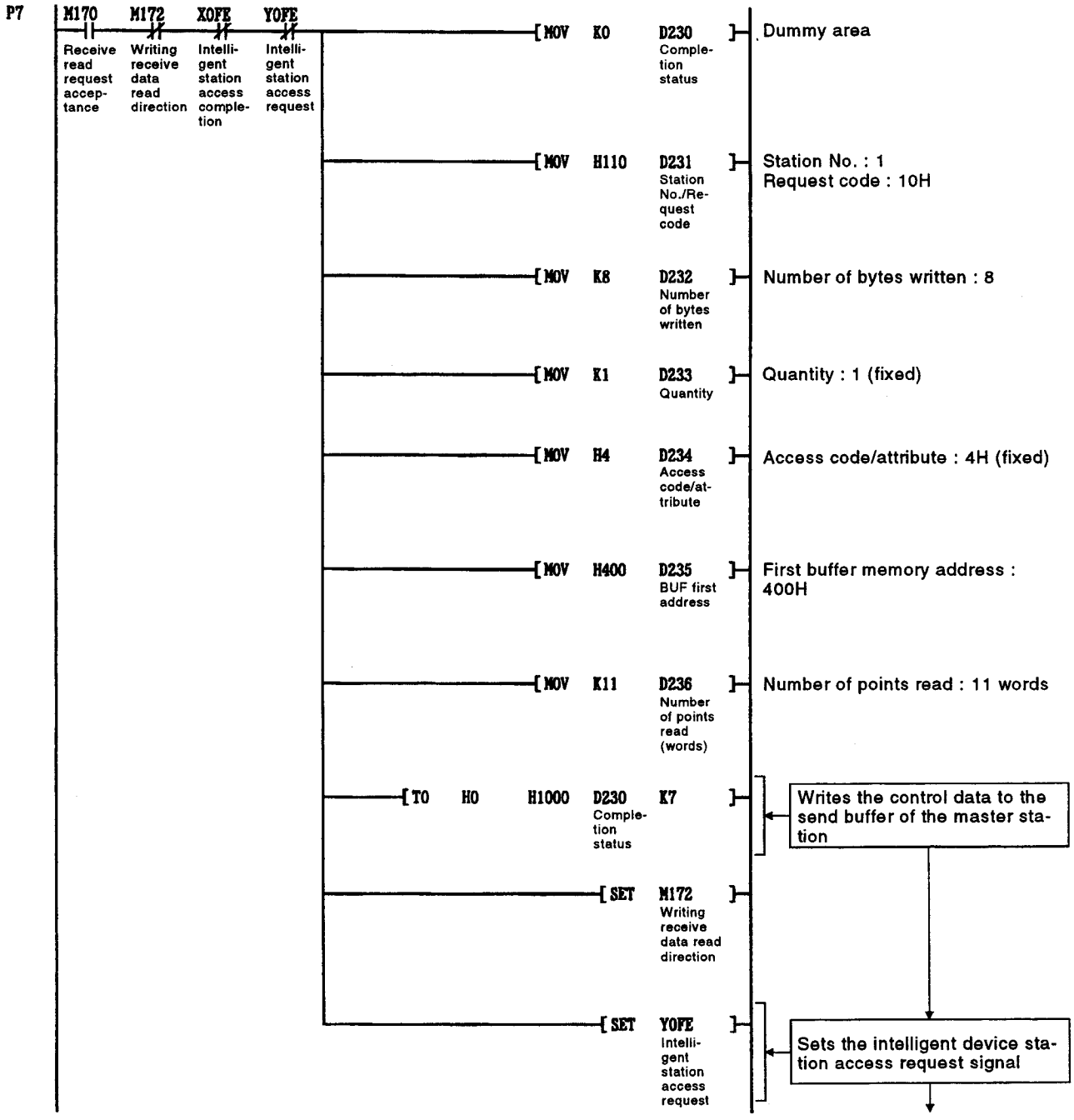

X0E0
Send normal completion
M165
Send data writing completion
SET M167 Send normal completion
RST M165 Send data writing completion
RST Y0E0 Send request
Resets the send request signal on normal completion of sending
MOV H110 D221 Station No./ request code
Station No. : 1
Request code : 10H
MOV K8 D222 Number of bytes written
Number of bytes written : 8
MOV K1 D223 Quantity
Quantity : 1 (fixed)
MOV H4 D224 Access code/ attribute
Access code/attribute : 4H
MOV H1B1 D225 BUF first address
First buffer memory address : 1B1H
MOV K1 D226 Number of points read (words)
Number of points read : 1 word
X0E1
Send abnormal completion
M165
Send data writing completion
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
FROM H0 H2E1 D220 Send error code K1
Processing on abnormal completion of sending
SET M166 Send processing error
SET M169 Send error code reading completion
RST M165 Send data writing completion

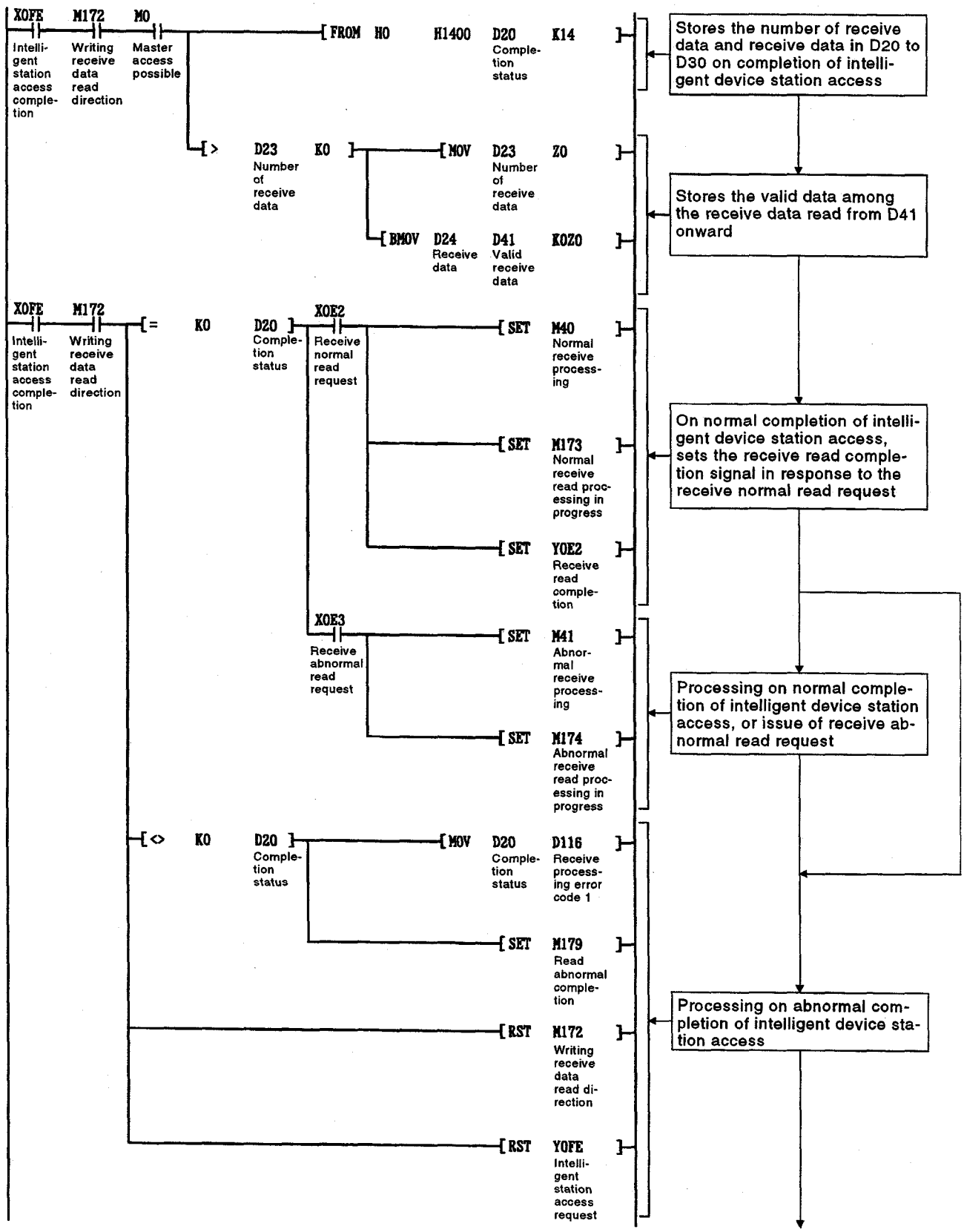

M167
Send normal completion
X0E0
Send normal completion
X0E1
Send abnormal completion
Y0E0
Send request
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
RST M161
Send processing in progress
M169
Send error code reading completion
RST M167
Send normal completion
RST M169
Send error code reading completion
M164
Send data write request in process
K50
T0
M165
Send data write completion
T0
SET M162
Send processing time-out occurrence
M167
Send normal completion
M169
Send error code reading completion
X22
Send time-out RST
SET M163
Send time-out RST direction
Error monitoring for send processing

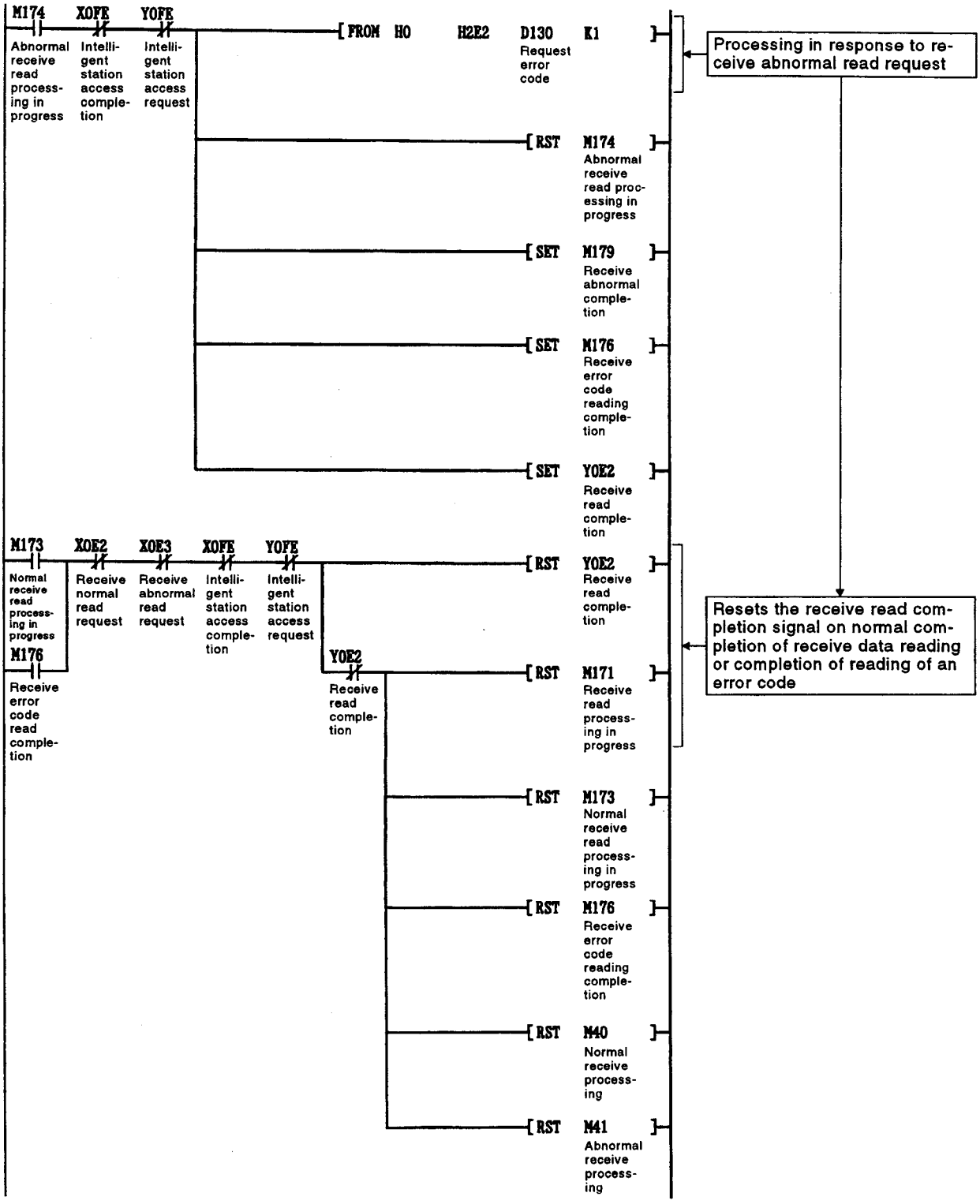


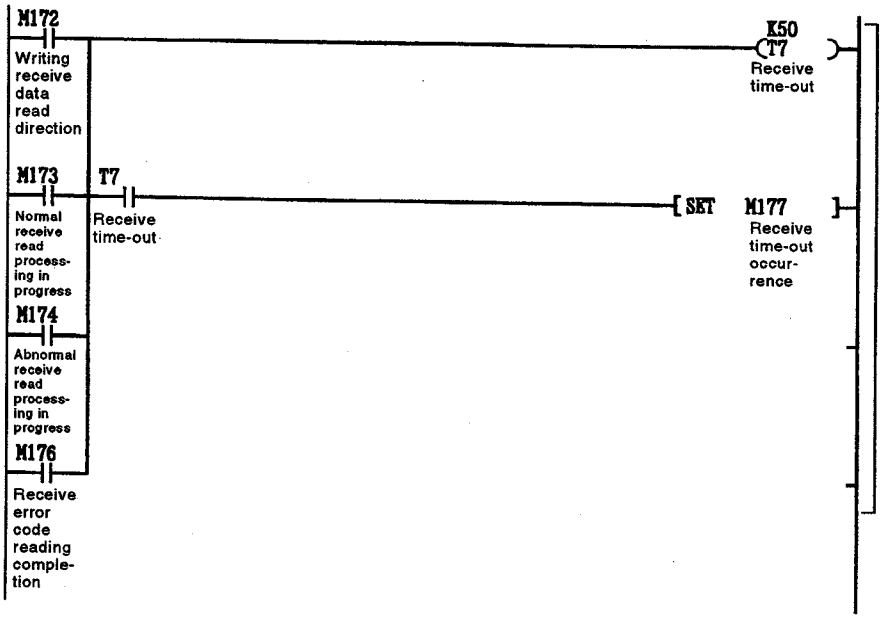
When a time-out occurs, turns ON X22 of the master station AX42 and cancels sending

[Sub-routine for receiving data from the external device]

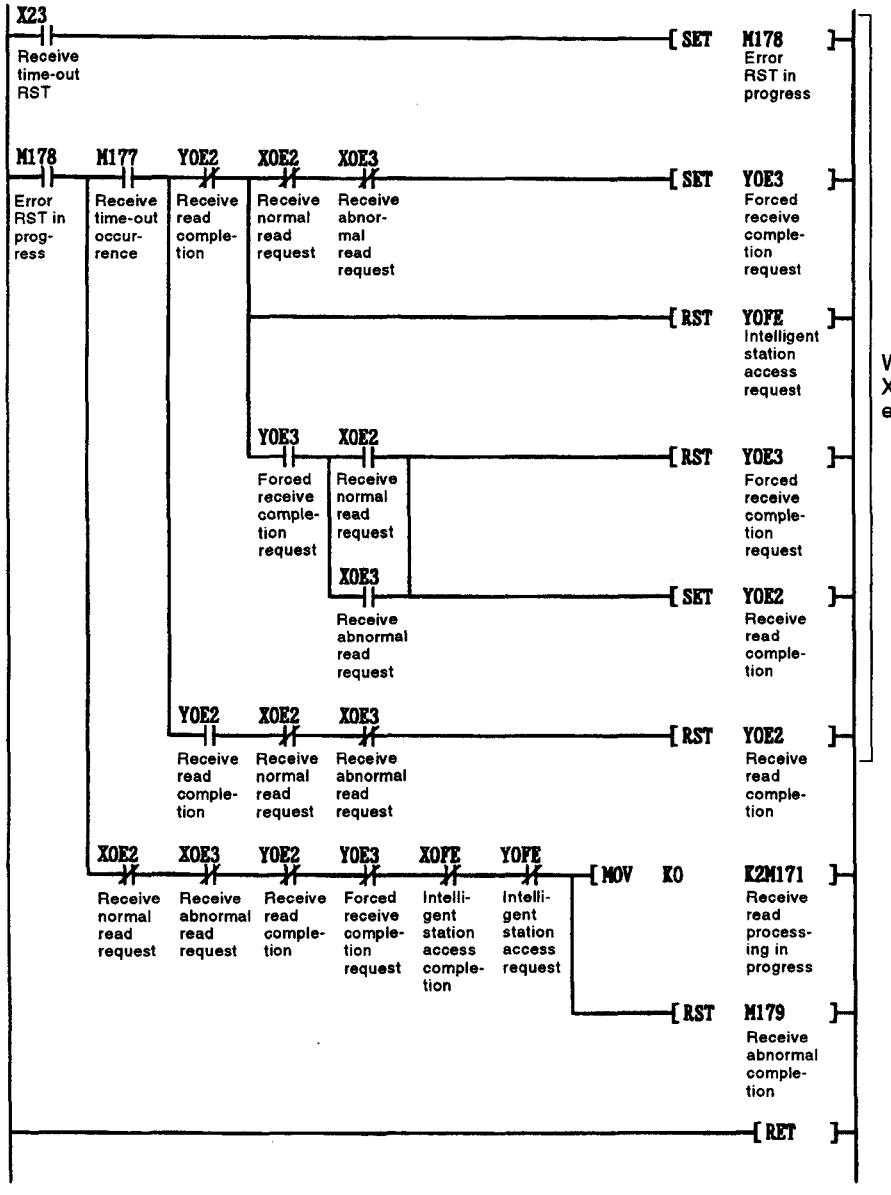



X0FE
Intelligent station access completion
M172
Writing receive data read direction
M0
Master access possible
FROM H0 H1400 D20 K14
D20 Completion status
Stores the number of receive data and receive data in D20 to D30 on completion of intelligent device station access
> D23 K0
D23 Number of receive data
MOV D23 Z0
D23 Number of receive data
BMOV D24 D41 K0Z0
D24 Receive data
D41 Valid receive data
Stores the valid data among the receive data read from D41 onward
X0FE
Intelligent station access completion
M172
Writing receive data read direction
= K0 D20
D20 Completion status
X0E2
Receive normal read request
SET M40
M40 Normal receive processing
SET M173
M173 Normal receive read processing in progress
SET Y0E2
Y0E2 Receive read completion
On normal completion of intelligent device station access, sets the receive read completion signal in response to the receive normal read request
X0E3
Receive abnormal read request
SET M41
M41 Abnormal receive processing
SET M174
M174 Abnormal receive read processing in progress
Processing on normal completion of intelligent device station access, or issue of receive abnormal read request
<> K0 D20
D20 Completion status
MOV D20 D116
D20 Completion status
D116 Receive processing error code 1
SET M179
M179 Read abnormal completion
RST M172
M172 Writing receive data read direction
RST Y0FE
Y0FE Intelligent station access request
Processing on abnormal completion of intelligent device station access


M174
Abnormal receive read processing in progress
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
FROM H0 H2E2 D130 K1
Request error code
Processing in response to receive abnormal read request
RST M174
Abnormal receive read processing in progress
SET M179
Receive abnormal completion
SET M176
Receive error code reading completion
SET Y0E2
Receive read completion
M173
Normal receive read processing in progress
X0E2
Receive normal read request
X0E3
Receive abnormal read request
X0FE
Intelligent station access completion
Y0FE
Intelligent station access request
M176
Receive error code read completion
RST Y0E2
Receive read completion
Y0E2
Receive read completion
RST M171
Receive read processing in progress
Resets the receive read completion signal on normal completion of receive data reading or completion of reading of an error code
RST M173
Normal receive read processing in progress
RST M176
Receive error code reading completion
RST M40
Normal receive processing
RST M41
Abnormal receive processing

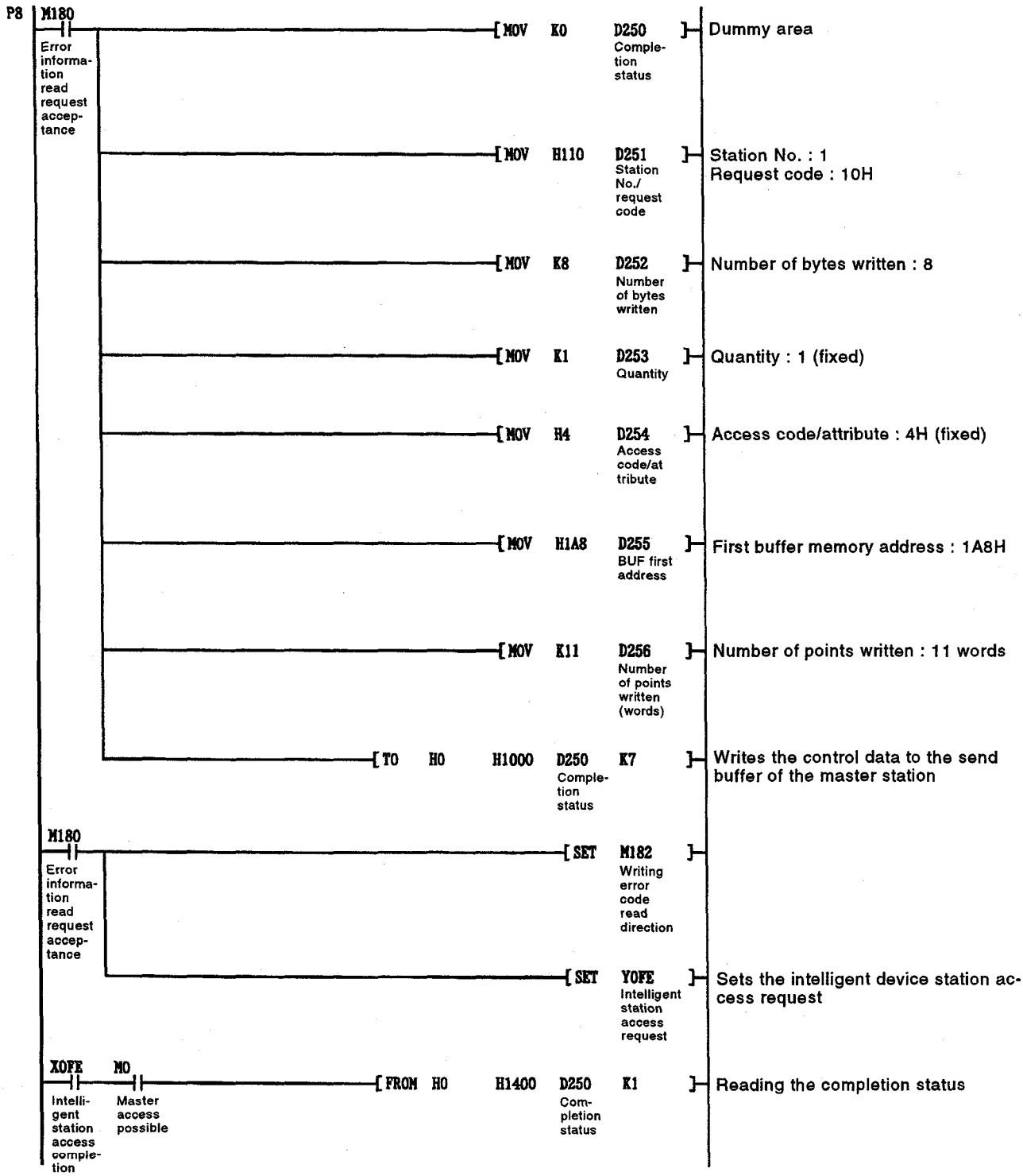


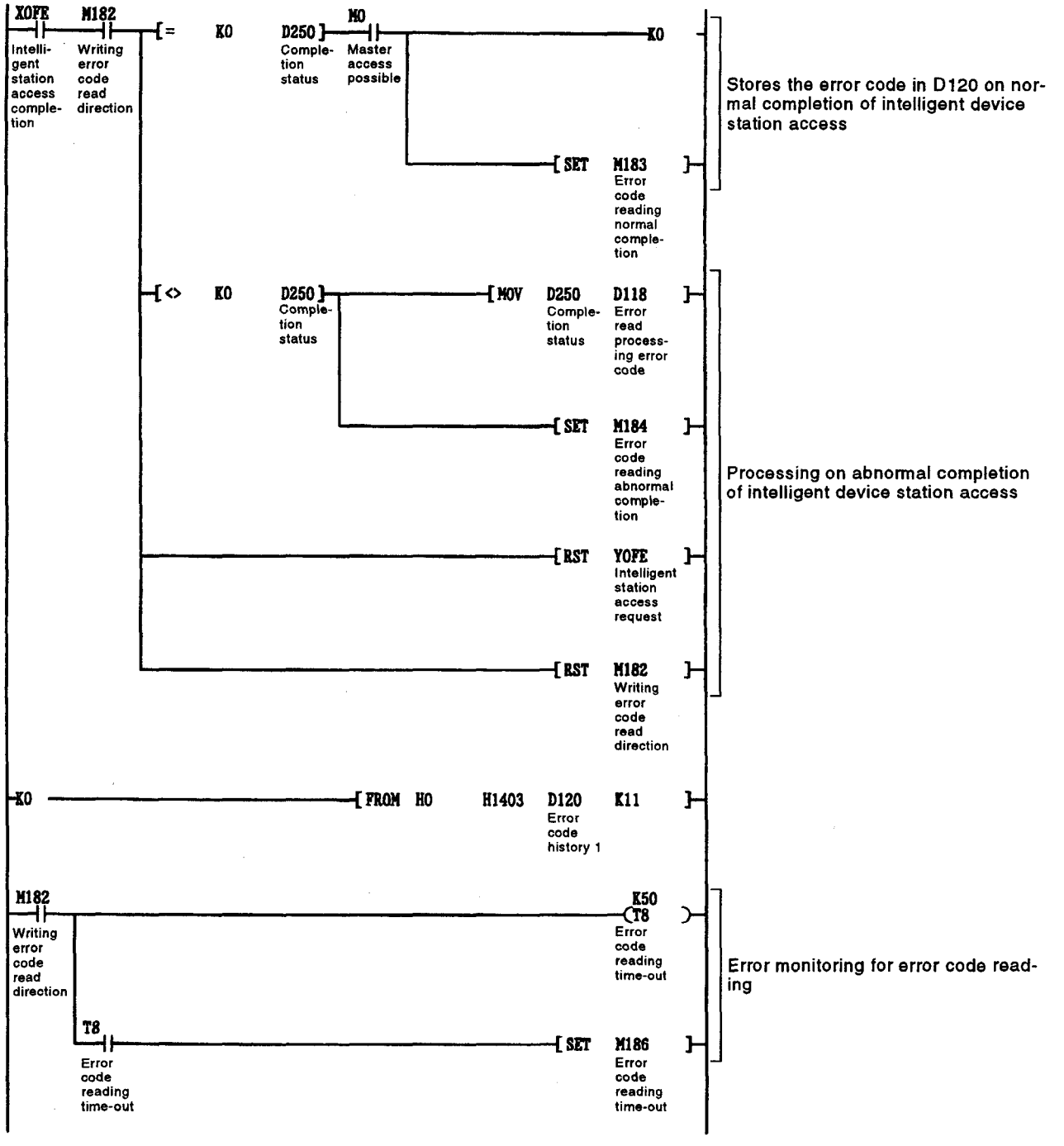
Error monitoring for receive data read processing

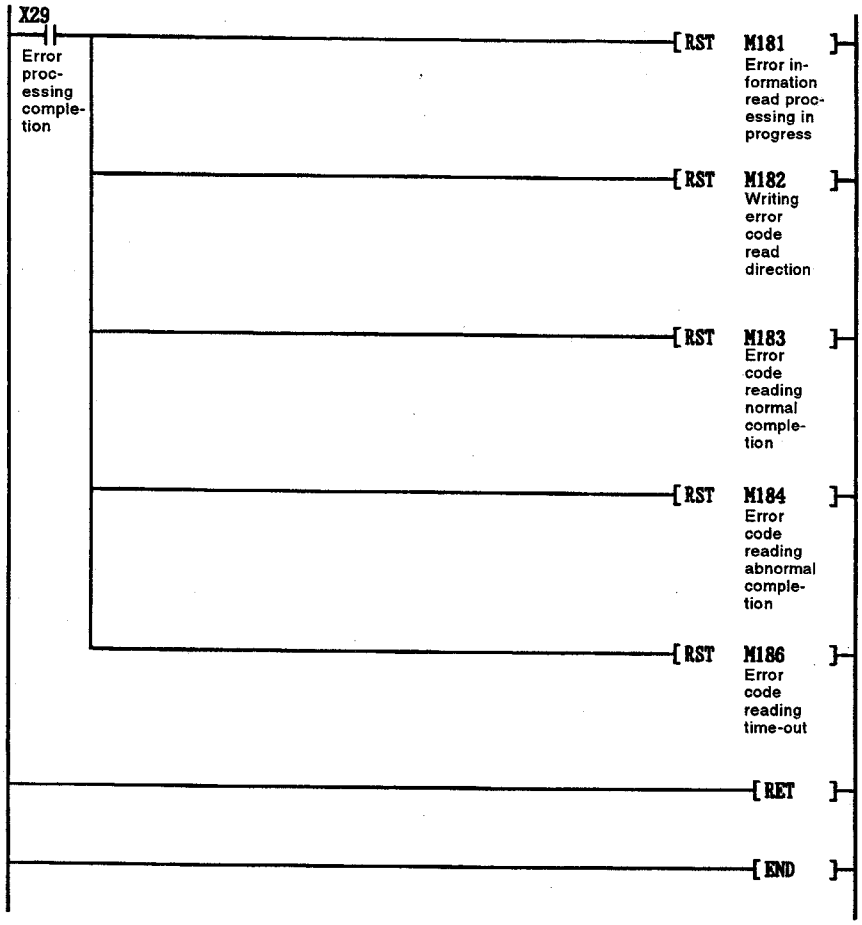


When a time-out occurs, turns ON X23 of the master station AX42 and executes forced receive completion

[Sub-routine program for reading AJ65BT-R2 error information]



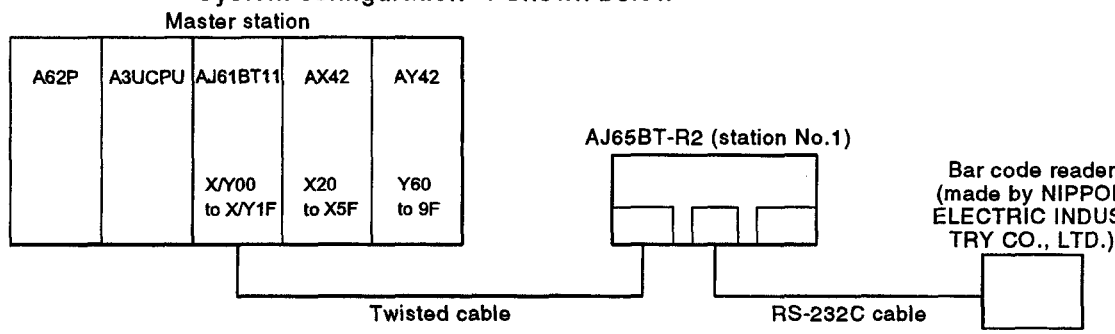

X0FE
Intelligent station access completion
M182
Writing error code read direction
[= K0 D250
Completion status
M0
Master access possible
K0
[SET M183
Error code reading normal completion
Stores the error code in D120 on normal completion of intelligent device station access
[<> K0 D250
Completion status
[MOV D250 D118
Completion status
Error read processing error code
[SET M184
Error code reading abnormal completion
[RST Y0FE
Intelligent station access request
[RST M182
Writing error code read direction
Processing on abnormal completion of intelligent device station access
K0
[FROM H0 H1403 D120 K11
Error code history 1
M182
Writing error code read direction
K50
T8
Error code reading time-out
T8
Error code reading time-out
[SET M186
Error code reading time-out
Error monitoring for error code reading


X29
Error processing completion
[RST M181]
Error information read processing in progress
[RST M182]
Writing error code read direction
[RST M183]
Error code reading normal completion
[RST M184]
Error code reading abnormal completion
[RST M186]
Error code reading time-out
[RET]
[END]
Turns X29 of the master station AX42 ON and completes error code read processing

3.5 Example Program for Connection to Bar Code Reader Made by NIPPON ELECTRIC INDUSTRY CO., LTD.

An example of a program in which macro instructions are used, for use when connecting a bar code reader, is presented below.
This example program reads the receive data from the receive area of the AJ65BT-R2 to the receive area of the bar code reader, and executes receive completion processing, after AJ65BT-R2 (station No.1) initialization processing.
The buffer memory automatic update function is not used in this example.
For details on instructions, refer to the SW□IVD-MSPQ Macro/Library Software Package Operating Manual.

Bar code reader used : 2600 series, compatible with BCR2530
System configuration : Shown below



(1) Setting data
Setting data for ABARINI0

Macro Name	Function	Macro Instruction	Setting Data	Library (Actual Sequence Program)
ABARINI0	Executes initialization processing at the designated AJ65BT-R2 which enables use of the AJ65BT-R2 with a bar code reader	U	First I/O No. of mounting slot	0
		VD0	"Execute initialization" command	M1321
		VD1	Control data storage origin	D1300
		VD2	Send buffer	H0
		VD3	Receive buffer	H200
		VD4	Designated quantity (1)	H1
		VD5	Initialization data storage destination	D1500
		VD6	First RX device	X400
		VD7	First RY device	Y400
		VD8	"Execution completed" notification	M1322

Setting data for ABARRD0

Macro Name	Function	Macro Instruction	Setting Data	Library (Actual Sequence Program)
ABARRD0	Executes read processing for a bar code reader at the designated AJ65BT-R2	U	First I/O No. of mounting slot	0
		VD0	Read processing command	M1324
		VD1	Control data storage origin	D1300
		VD2	Send buffer	H0
		VD3	Receive buffer	H200
		VD4	Send data storage origin	D1500
		VD5	Receive data storage destination	D2000
		VD6	First RX device	X400
		VD7	First RY device	Y400
		VD8	"Execution completed" notification	M1325

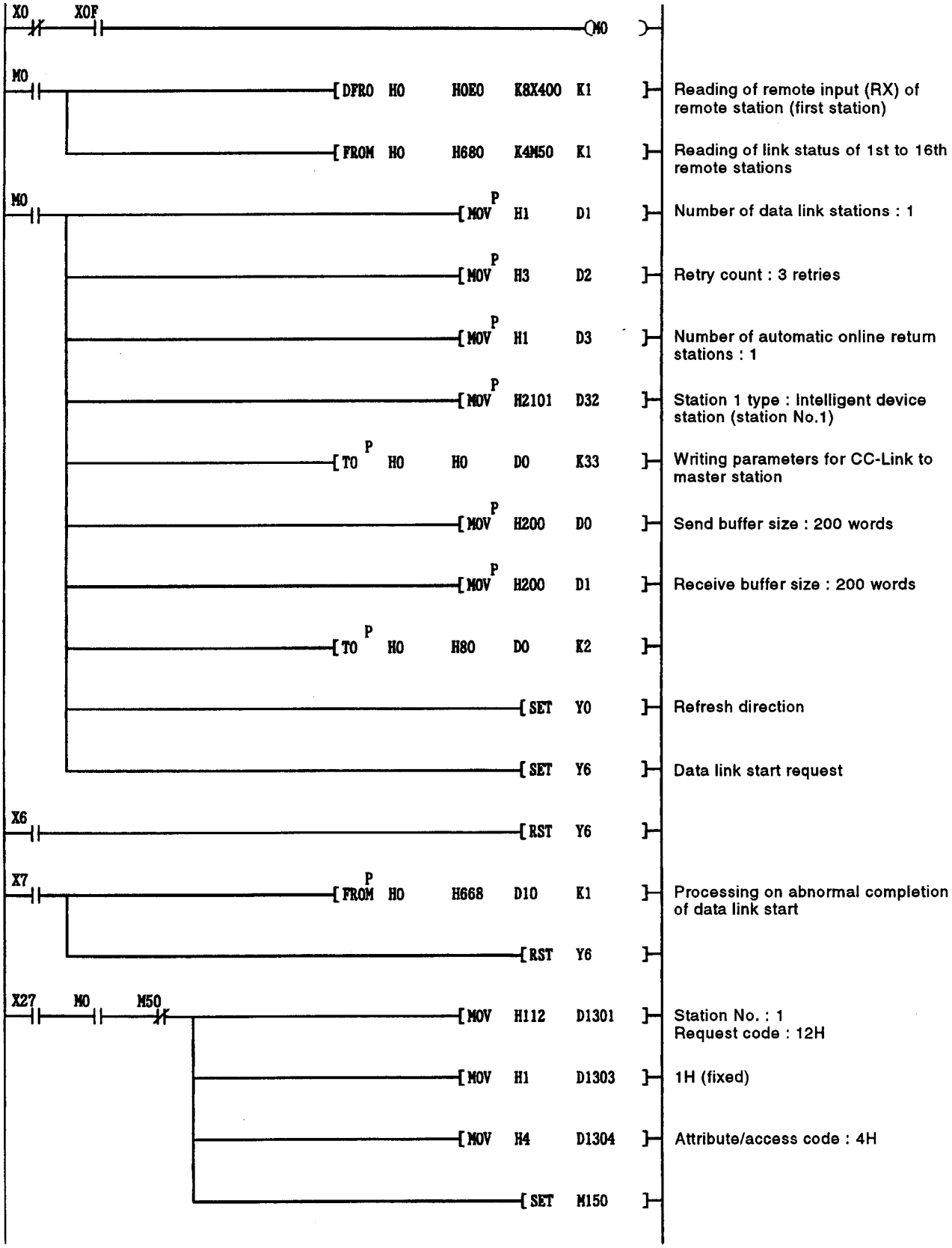
(2) Names of macro files referred to
A : GPPQ\USER\LIBA_G(E)\J65R2\MAC\ABARINIT0.GPG
A : GPPQ\USER\LIBA_G(E)\J65R2\MAC\ABARRD0.GPG

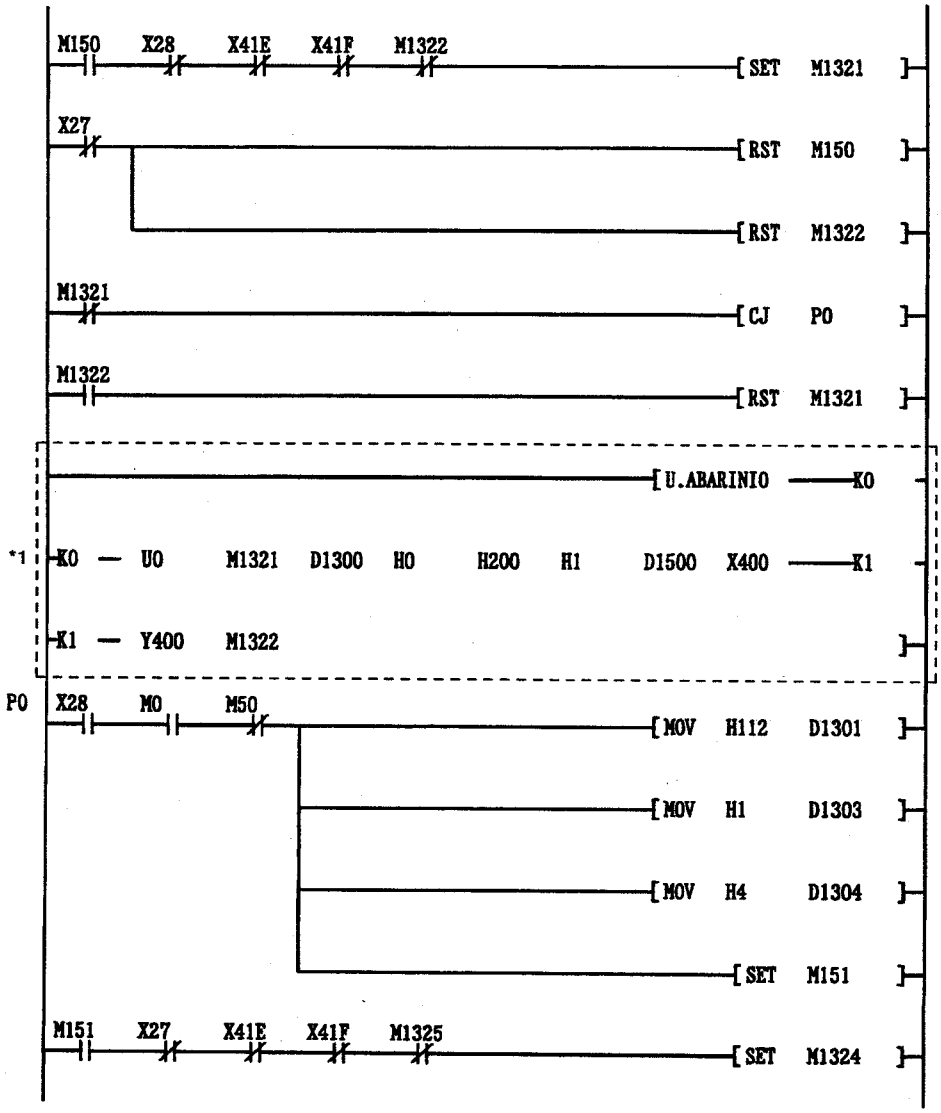
(3) Switch settings

Switch	Application
X27	Initialization command for bar code reader
X28	Read command for bar code reader

- For the AJ65BT-R2 buffer memory settings, set "STX" as the first receive frame and "ETX" as the final receive frame: other setting values will be regarded as the defaults.
- Use the AJ65BT-R2 general-purpose external output signal (RYnC) as the in-zone signal of the bar code reader in the online mode.

(4) Input program





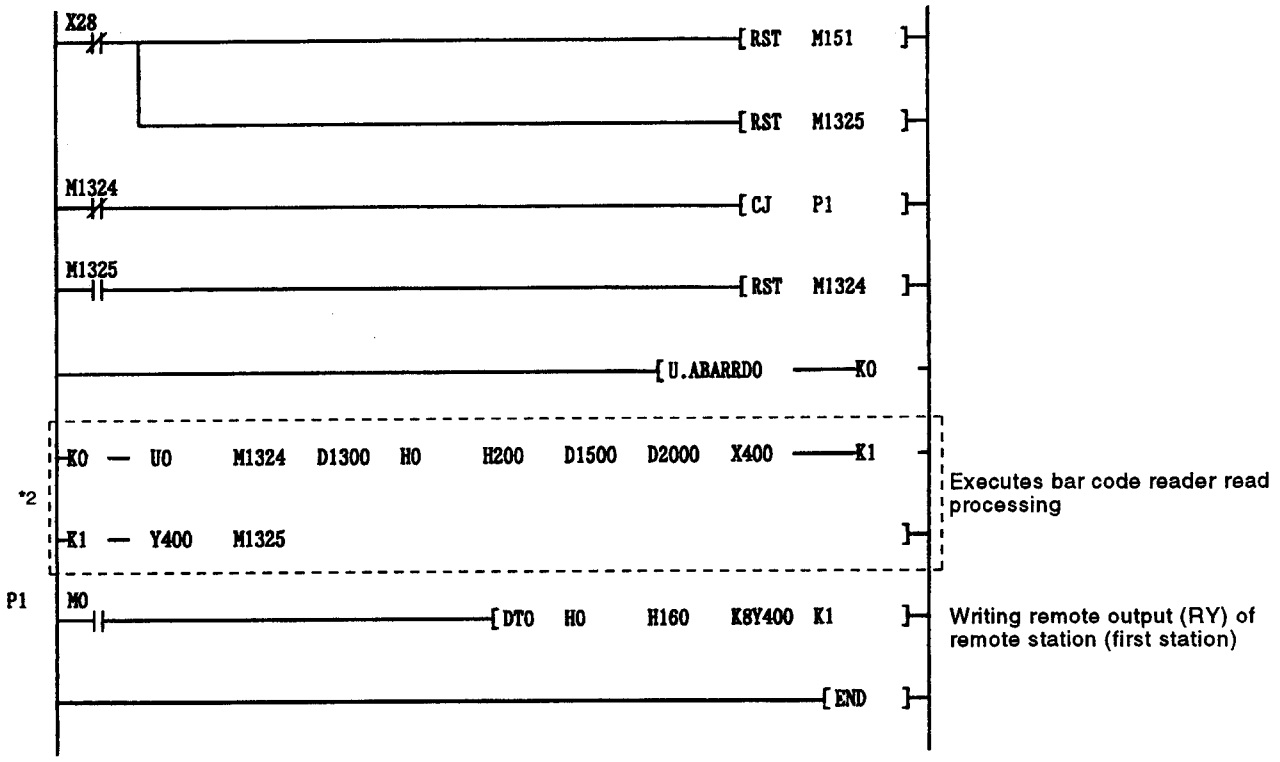
Executes bar code reader initialization processing

Station No. : 1
Request code : 12H

1H (fixed)

Attribute, access code : 4H

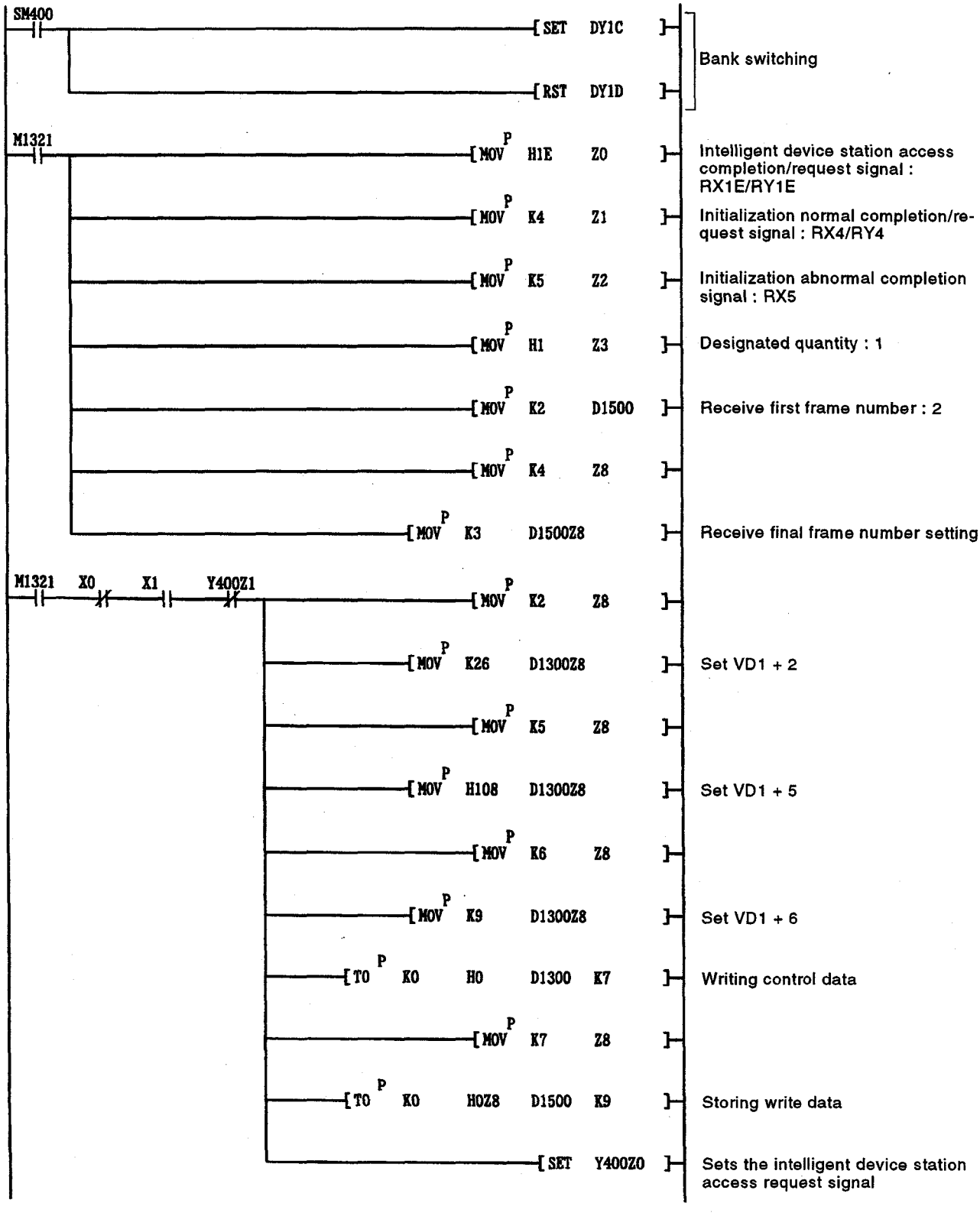
Sets the read processing command

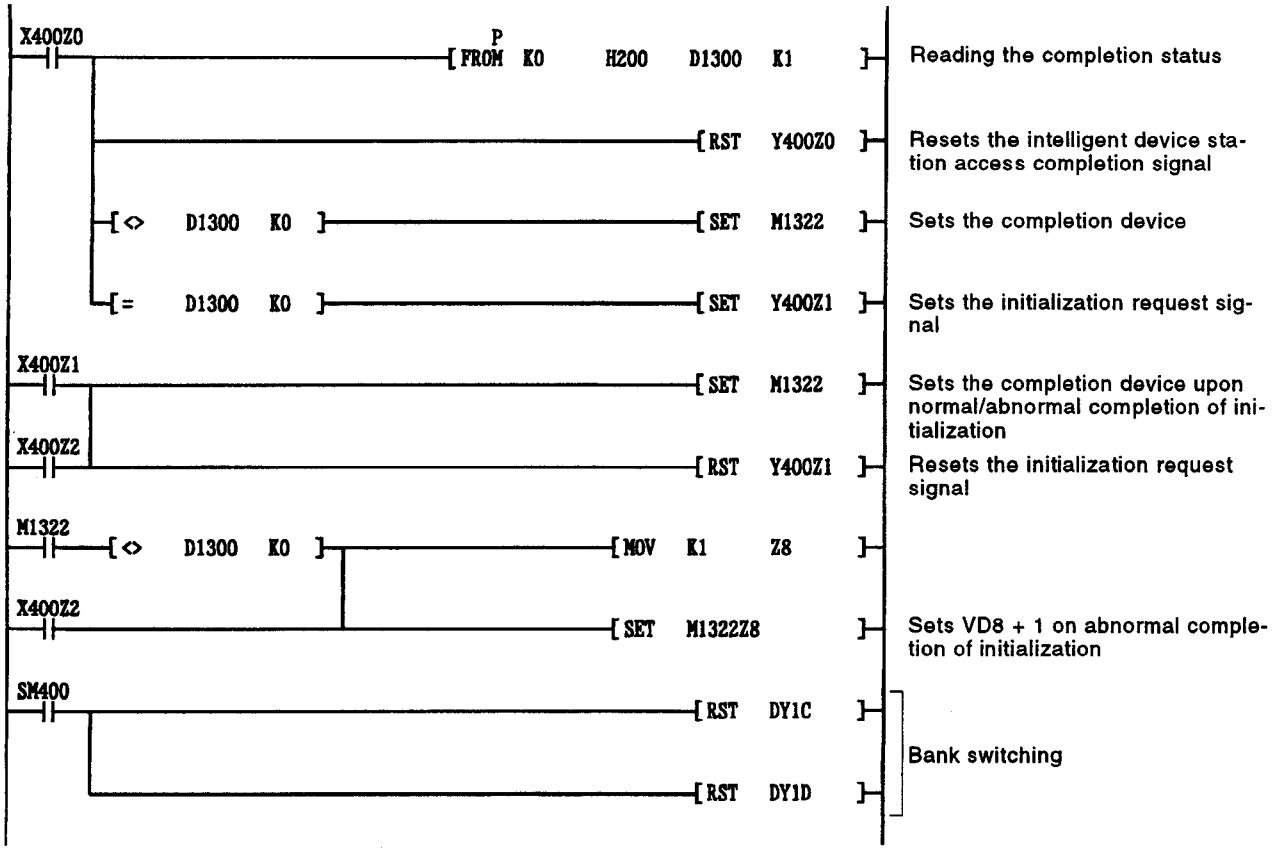


POINTS

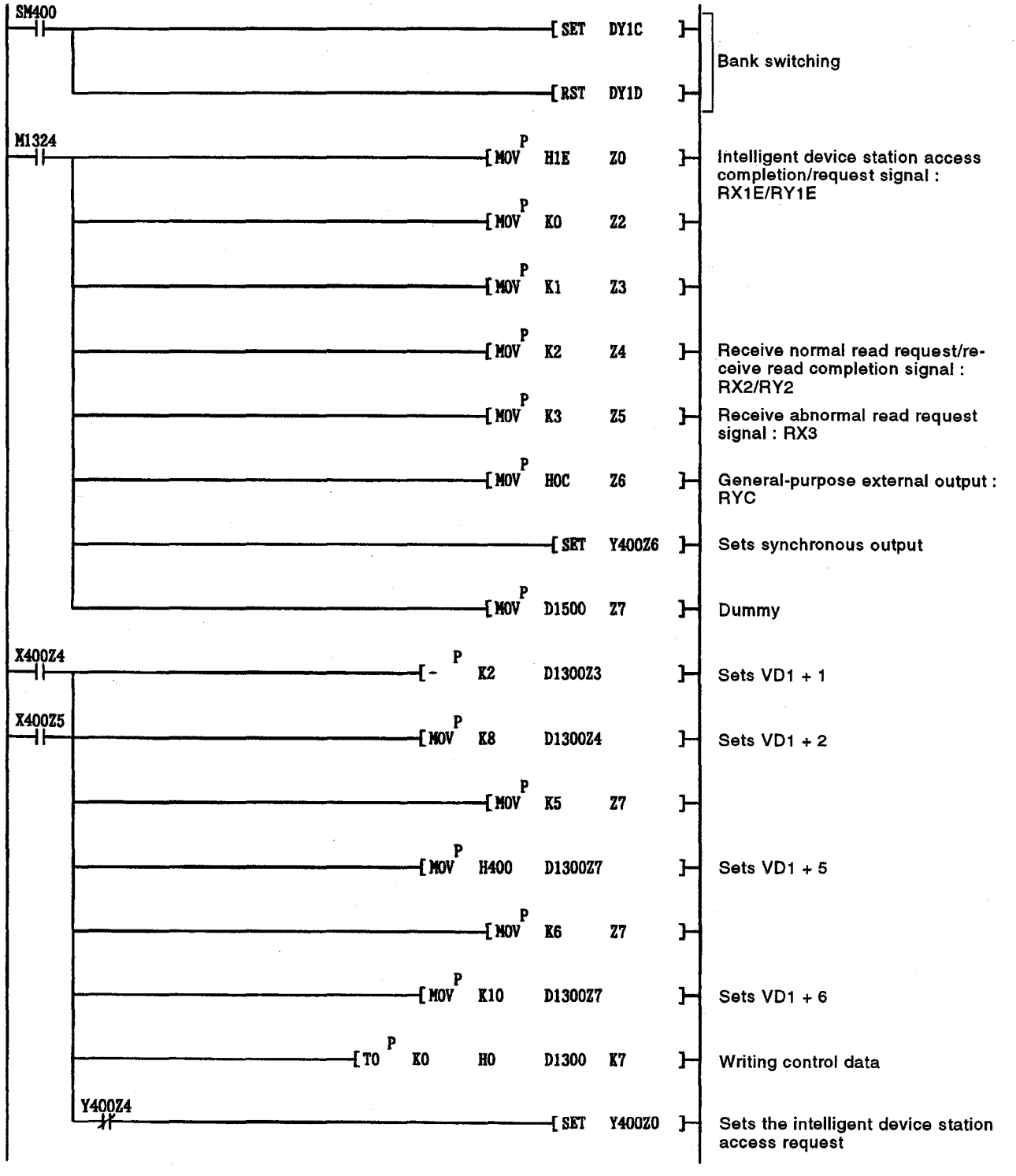
- When using an A-series PC CPU, use the QnA to A conversion function in the GPPQ file maintenance mode to convert the program file (extension: GPG) to an A-series file.
- If using the 2600 series, execute control to monitor the DR(DSR) signal (RXnA) of the AJ65BT-R2 after the bar code reader initialization processing completion device comes ON and execute bar code reading 5 seconds or longer after the DR(DSR) signal comes ON.

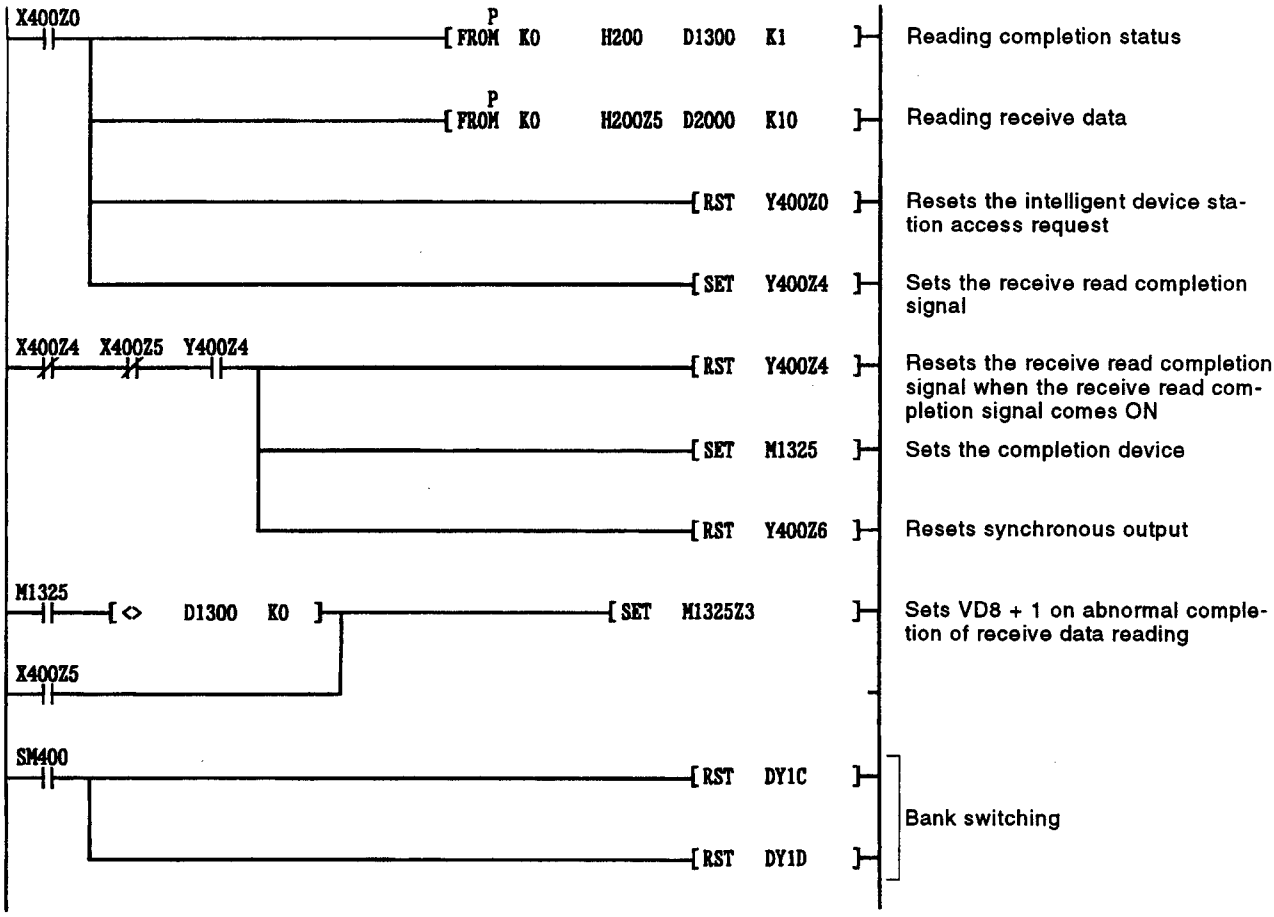
The part of the program marked "*1" is expanded into a sequence program like the one shown below.




X400Z0
P
FROM K0 H200 D1300 K1
Reading the completion status
RST Y400Z0
Resets the intelligent device station access completion signal
<> D1300 K0
SET M1322
Sets the completion device
= D1300 K0
SET Y400Z1
Sets the initialization request signal
X400Z1
SET M1322
Sets the completion device upon normal/abnormal completion of initialization
X400Z2
RST Y400Z1
Resets the initialization request signal
M1322
<> D1300 K0
MOV K1 Z8
X400Z2
SET M1322Z8
Sets VD8 + 1 on abnormal completion of initialization
SM400
RST DY1C
RST DY1D
Bank switching

The part of the program marked "*2" is expanded into a sequence program like the one shown below.




X400Z0
P
FROM K0 H200 D1300 K1
Reading completion status
P
FROM K0 H200Z5 D2000 K10
Reading receive data
RST Y400Z0
Resets the intelligent device station access request
SET Y400Z4
Sets the receive read completion signal
X400Z4 X400Z5 Y400Z4
RST Y400Z4
Resets the receive read completion signal when the receive read completion signal comes ON
SET M1325
Sets the completion device
RST Y400Z6
Resets synchronous output
M1325
<> D1300 K0
SET M1325Z3
Sets VD8 + 1 on abnormal completion of receive data reading
X400Z5
SM400
RST DY1C
RST DY1D
Bank switching

RS-232C Interface Module type AJ65BT-R2

User's Manual

MODEL	AJ65BT-R2-U-E
MODEL CODE	13JL24
IB(NA)66781-A(9709)MEE	

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