UM-TS02∗∗∗-E013

PROGRAMMABLE CONTROLLER

PROSEC T2

COMMUNICATION INTERFACE MODULE

CF211

USER'S MANUAL

TOSHIBA CORPORATION

Important Information

Misuse of this equipment can result in property damage or human injury.
Because controlled system applications vary widely, you should satisfy yourself as to the acceptability of this equipment for your intended purpose.
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Safety Precautions

Safety Precautions

- This module (CF211) has been designed for Toshiba's Programmable Controller PROSEC-T2 (hereafter called T2). Use this module only on the T2's rack.
- Read the Safety Precautions described on the T2 User's Manual before using the T2 and this module.
- Follow the instructions described on this manual and on the T2 User's Manual when installing and wiring the T2 and this module.
- Do not touch the connector pins or components on the printed circuit board of this module.
- The maximum number of CF211s that can be controlled by one T2 is limited by internal 5 Vdc power capacity. This module consumes maximum 0.55 A of internal 5 Vdc power. Confirm that the total 5 Vdc consumed current per one power supply module is within the limit (2.5 A).
- The CF211 can work with the T2 CPU version 1.2 or later. Confirm that your T2 CPU is correct verson.

Symbols Used In This Manual

Pay attention to information preceded by the following symbols.

HINT  Refers to helpful suggestions on how to operate effectively.

NOTE  Refers to information considered essential for full understanding of operation. And refers to conditions that could damage the equipment or render it temporarily inoperative.

About This Manual

About This Manual

This manual explains the specifications and operations of the Communication Interface module (CF211) for Programmable Controller T2. Read this manual carefully before using the CF211 module.

Inside This Manual

This manual consists of six sections and an appendix as follows.

Section 1 Overview
Introduces The CF211. Outline of the function, applications and the external features are provided in this section. Read this section at first to understand the general operation of the CF211. The switch settings of this module are also explained in this section.

Section 2 Specifications
Provides the functional and the transmission specifications of the CF211. Refer to this section to confirm the application limitations.

Section 3 Cable Connections
Provides the information for hardware preparations. The transmission cable connection is explained in this section.

Section 4 Register Configuration
Explains the memory contents of the CF211. This information is important to interchange data between T2 and CF211.

Section 5 Operation Procedure
Provides the information to design the T2 program for using the CF211. Some sample programs are provided in this section. Read this section carefully for programming.

Section 6 RAS Information
Provides the helpful information for RAS (Reliability, Availability and Serviceability). Also, lists the check points in case of unexpected operations.

Appendix
The specifications of READ and WRITE instructions are described. These instructions are used for interchanging data between T2 and CF211.

Related Manuals

The following related manuals are available for T2. Besides this manual, read the following manuals for your better understanding.

T2 User's Manual
This manual explains the hardware specifications, installation, wiring and maintenance of the T2 and I/O modules. Also this manual explains the functions of the T2 and how to use them. The necessary information to create user program is covered in this manual.

T-series Instruction Set
This manual provides the detailed specifications of instructions for Toshiba's T-series Programmable Controllers.

T-PDS (Ver. 1.4) Basic Operation Manual
This manual explains how to install the T-series program development system (T-PDS) into your computer and provides basic programming operations.

T-PDS (Ver. 1.4) Command Reference Manual
This manual explains the T-series program development system (T-PDS) in detail.

T-PDS (Ver. 1.6) Expanded Functions
This manual explains the expanded functions on the T-PDS version 1.6. This manual supplements the T-PDS (Ver.1.4) Command Reference Manual.

Handy Programmer (HP911) Operation Manual
This manual explains the functions and the key operations of the T-series Handy Programmer HP911.

T-series Computer Link Function
This manual provides the information for a computer to communicate with T2 through the T-series Programmable Controller's Computer Link function.

Terminology

The following terms and abbreviations are used in this manual.

- ASCII: American Standard Code for Information Interchange
- EIA: Electronic Industries Association
- I/O: Input/Output
- LED: Light Emitting Diode
- RS-232C: An EIA standard for data transmission

Contents

Section 1

CF211 Overview

1. CF211 Overview

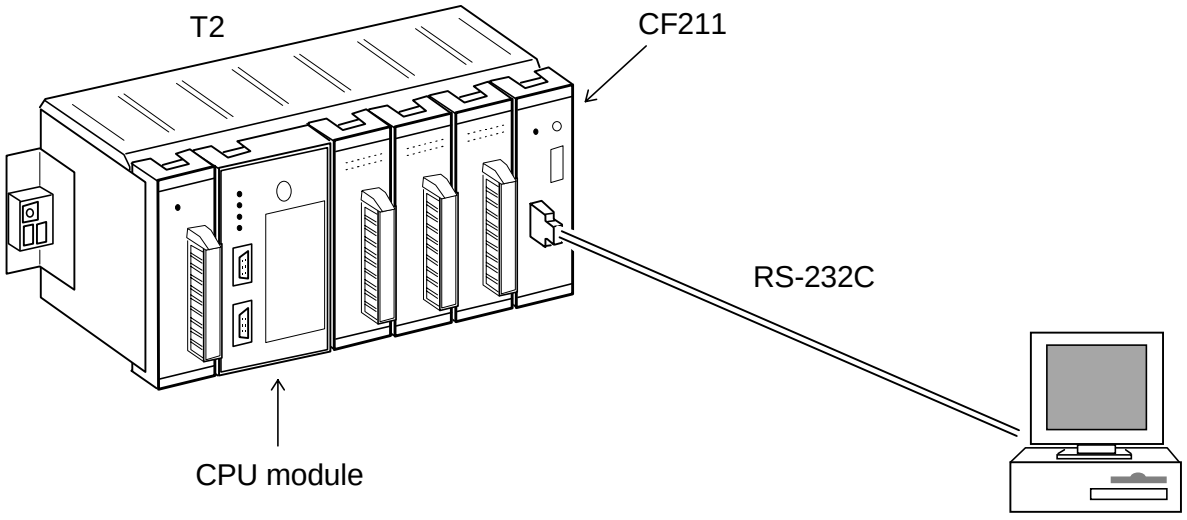
1.1 Introduction

The Communication Interface module CF211 (hereafter called CF211) is a general purpose data communication module for Toshiba's Programmable Controller PROSEC-T2 (hereafter called T2). By using the CF211, T2 can communicate with external devices, such as a micro computer, bar code reader, printer, display device, sensor, etc., through the serial interface RS-232C.

The CF211 has one port of RS-232C serial interface.

The transmission is asynchronous (start-stop system).
ASCII is used as the transmission data code.

The figure below shows the typical system configuration.



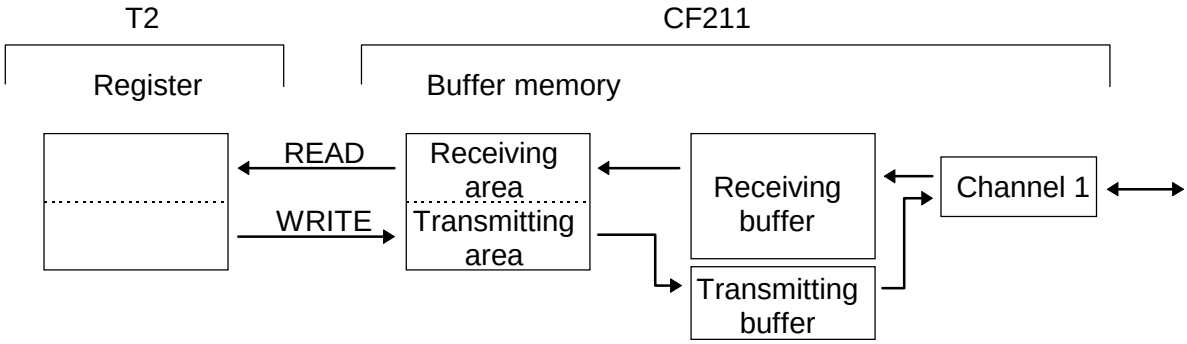
NOTE The maximum number of CF211s that can be controlled by one T2 is limited by internal 5 Vdc power capacity. The CF211 consumes maximum 0.55 A of internal 5 Vdc power. Confirm that the total 5 Vdc consumed current per one power supply module is within the limit (2.5 A).

1.2 CF211 functions

From the point of view of T2, the CF211 works as communications driver. The followings are the simplified explanations for T2 and CF211 functions.

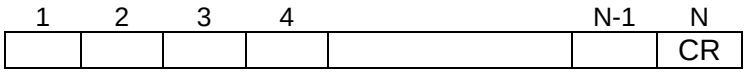
When a message (one set of transmission characters) is received by CF211, the flag which indicates the receiving complete will come ON. T2 can check the flag status then read the message from the CF211 by using the READ instruction.

In case of transmitting a message (one set of transmission characters) from T2 through CF211, T2 writes the message into the CF211 by using the WRITE instruction, then sets the flag which instruct the CF211 to start transmitting the message.



Here, a message (one set of transmission characters) means a string of ASCII characters which is ended by specified trailing code. The default setting of the trailing code is CR (carriage return code = H0D).

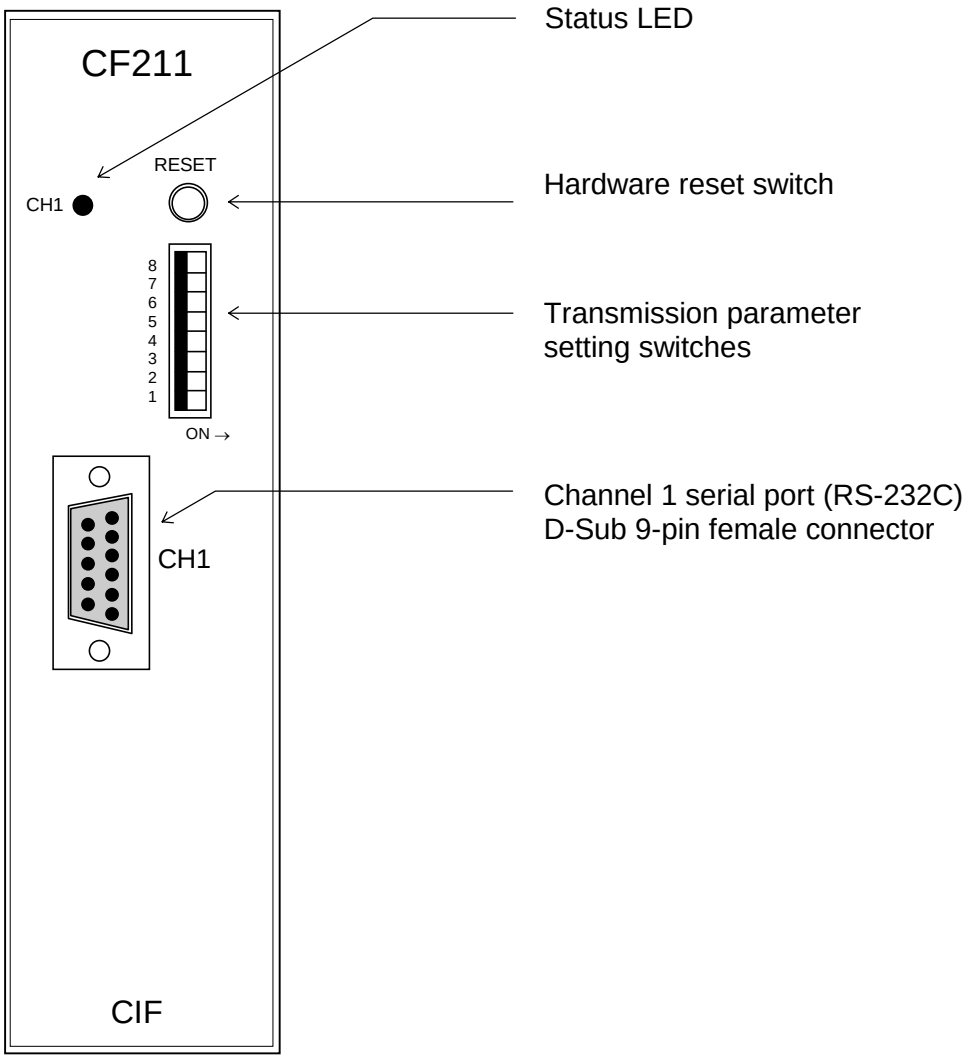
Applicable message format (default trailing code):



N: message length = 320 bytes max.

In other words, the CF211 cannot be used for the data communication in which the transmission message is ended by two or more types of trailing code.

1.3 External features



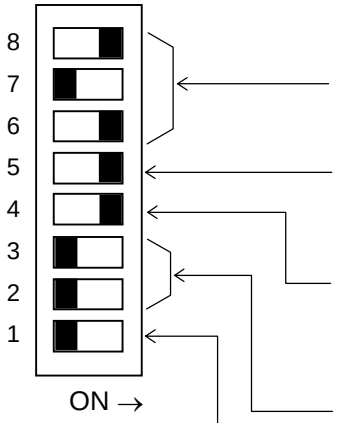
Status LED

Indicates the transmission status.

CH1● Lit while transmitting or receiving data through channel 1

Transmission parameter setting switches

Used to set the transmission parameters.



Baud rate (see table below)

No.5	OFF	ON
Stop bit	2 bit	1 bit

No.4	OFF	ON
Data bit length	7 bit	8 bit

No.3	OFF	ON	ON
No.2	OFF/ON	OFF	ON
Parity	None	Even	Odd

No use

Baud rate

No.8	OFF	OFF	OFF	OFF	ON	ON	ON
No.7	OFF	OFF	ON	ON	OFF	OFF	ON
No.6	OFF	ON	OFF	ON	OFF	ON	OFF
Baud rate	300	600	1200	2400	4800	9600	19200

NOTE

(1) When stop bit is set as 2 bits, the data bit length must be 7 bits.
(2) When none parity is used, the data bit length must be 8 bits.
(3) The factory settings are all OFF. Set these switches as required before using this module.
(4) The switch setting status is recognized at module initialization by turning power on, pressing the hardware reset switch or issuing the software reset command (cold reset).

Hardware reset switch

When this switch is pressed, the CF211 will be reset. Use this switch when you have changed the switch settings.

Channel 1 serial port

Used to connect the serial transmission line (RS-232C). D-Sub 9-pin female connector is provided on the CF211.
The pin assignment is as follows.

Channel 1
(RS-232C)

1		
2	RXD	←
3	TXD	→
4	DTR	→
5	SG	↔
6	DSR	←
7	5 Vdc	→
8		
9		

- The arrow on the above figure shows the signal direction.
- DTR is ON while power is on.
- DSR has no effect for transmission.
- Pin 7 (5 Vdc) can be used to supply 5 Vdc power to external devices. (max. 50 mA)

Section 2

Specifications

2. Specifications

2.1 General specifications

Item	Specifications	Remarks
Power voltage	5 Vdc (supplied from back plane bus)	
Current consumption	0.55 A (5 Vdc) maximum	Note (1)
Environmental conditions	Conforms to T2 specifications	
Insulation	None	Note (2)
Size	T2 I/O module size (1 slot)	
Weight	250 g	

Note (1) The T2's power supply module can supply maximum 2.5 A of internal 5 Vdc. Check that the internal 5 Vdc current consumption per one power supply module does not exceed the limit.

Note (2) Between interface connector pins and internal circuit.

2.2 Functional specifications

Item	Specifications
Module type	Serial communication interface
I/O allocation type	iX+Y 4W
Buffer memory capacity	160 words x 2 (accessed from T2 by READ/WRITE instruction)
Transmission interface	RS-232C, 1 channel
Display	Transmission status LED; CH1 … lit while transmitting or receiving data through the transmission port.
Connectable devices	Computer, bar code reader, display device, sensor, printer, or other serial ASCII device
RAS function	Self diagnosis, watch dog timer, transmission error check, etc.

2.3 Transmission specifications

Item	Specifications
Interface	Conforms to RS-232C
Transmission mode	Full-duplex
Synchronizing	Start-stop method (asynchronous)
Transmission speed	300, 600, 1200, 2400, 4800, 9600, 19200 bps
Frame format	Start bit 1 bit Data 7 or 8 bits Parity even / odd / none Stop bit 1 or 2 bits (Note)
Transmission code	ASCII
Message length	Max. 320 bytes
Configuration	One to one
Transmission distance	Max. 15 m
Connector	D-sub 9-pin female

Note) When none parity is selected, the data bit length must be 8 bits.
When stop bit is selected as 2 bits, the data bit length must be 7 bits.

Section 3

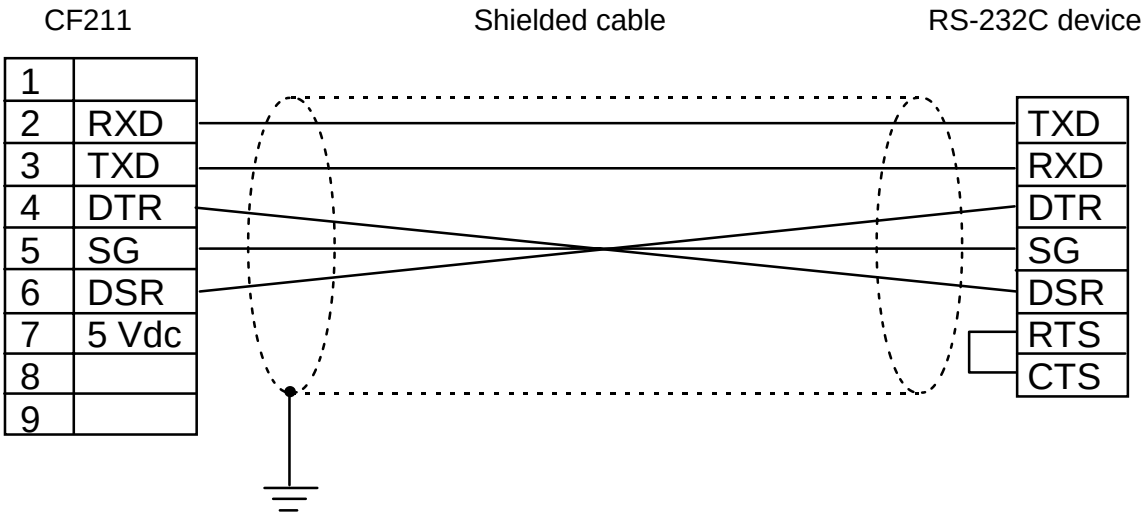
Cable Connections

3.1 RS-232C connection

3. Cable Connections

3.1 RS-232C connection

The following figure shows the RS-232C connection.



(1) Allowable maximum cable length is 15 m.
(2) Use shielded cable. The cable shield should be connected to grounding point at one end.
(3) It is recommended to use twisted cable for noise immunity.
(4) DTR is ON while power is on.
(5) DSR has no effect for transmission. (monitor only)
(6) Connect SG each other.
(7) RTS and CTS signals are not supported by the CF211. If necessary, short these signals at the connected device end.

NOTE Do not connect or remove the connector while the CF211 is powered. Otherwise, it will cause damage to the CF211.

Section 4

Register Configuration

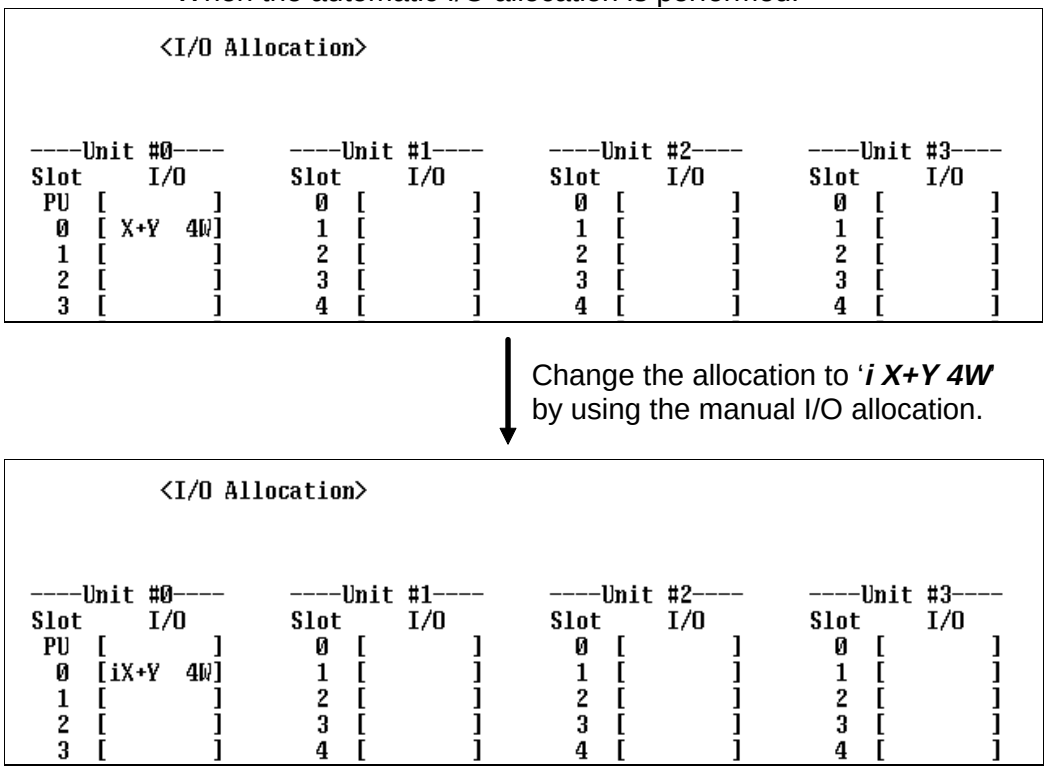
4. Register Configuration

4.1 I/O allocation and I/O registers

The CF211 should be allocated as '**i X+Y 4W**' for I/O allocation.
However, when the automatic I/O allocation is performed with mounting the CF211, the CF211 is allocated as '**X+Y 4W**'. You should change the allocation to '**i X+Y 4W**' by using the manual I/O allocation function.

(T-PDS screen example - in the case that CF211 is mounted on Slot 0 of Unit 0)

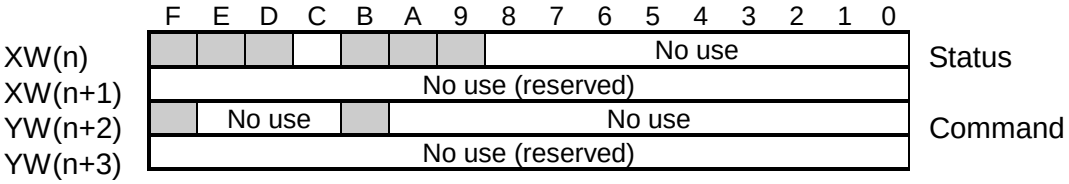
When the automatic I/O allocation is performed.



Then, 4 I/O registers, XW(n), XW(n+1), YW(n+2) and YW(n+3), are assigned to the CF211.
In the above example, XW000, XW001, YW002 and YW003 are assigned.

Note that the I/O type has '**i**' designation. It means that the T2 will not update the assigned I/O registers in the batch I/O processing. To read or write data through the I/O registers, the Direct I/O instruction (FUN235) or the direct I/O designation (I/IW and O/OW instead of X/XW and Y/YW) is necessary.
The reason of that is because the reading and writing timings are important for handshaking between T2 and CF211. Refer to section 5.

The following table shows the functions of I/O registers assigned to the CF211.



Register	Bit	Name	Description
XW(n) (Status)	F	Write ready	1: ready to write data (transmit)
	E	Transmit complete	1: transmitting has been completed normally
	D	Transmit error	1: transmitting has been canceled by error
	C	–	No use (always 0)
	B	Read ready	1: ready to read the received data
	A	Receive complete	1: receiving has been completed
	9	Receive error	1: receiving error has occurred
	8 - 0	–	No use (always 0)
XW(n+1)	–		No use (always 0)
YW(n+2) (Command)	F	Transmit start	Set to 1 to start transmitting
	E - C	–	No use (set to 0)
	B	Read start	Set to 1 to start reading
	A - 0	–	No use (set to 0)
YW(n+3)	–		No use (set to 0)

NOTE

These bits are used for handshaking between T2 and CF211. The detailed function and timing are explained in section 5.

4.2 CF211 buffer memory

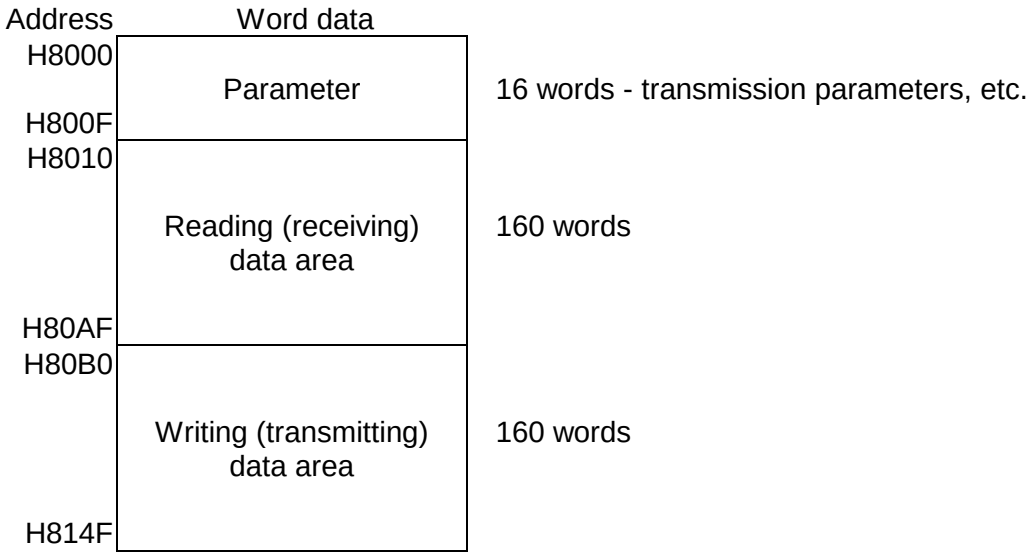
As explained in the previous section, the I/O registers that are assigned to CF211 are used to control the reading and writing timings (handshake) between T2 and CF211.

On the other hand, for exchanging the transmission data between T2 and CF211, the CF211's buffer memory is used.

This section explains the buffer memory contents and how to access the buffer memory.

4.2.1 Memory map

The CF211 has the buffer memory that is used to exchange data with T2. The overall map of the buffer memory is as follows.



4.2.2 Buffer memory access

T2 can read the CF211's buffer memory contents by using READ instruction (FUN237). Also, T2 can write data into the buffer memory by using WRITE instruction (FUN238).

READ instruction (FUN237)

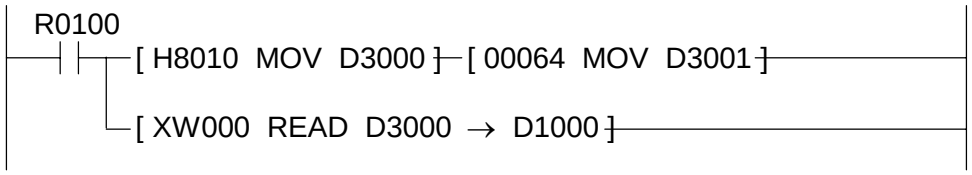
Expression:

—[(A) READ (B) → (C)]—

Operands:

(A): I/O register (XW/YW) assigned to the CF211
(B): Starting address of the buffer memory to be read.
(B)+1: Number of words to be read (max. 160 for CF211)
(C): Starting register of the destination

Example:



When R0100 is ON, 64 words of buffer memory data starting with address H8010 are read from the CF211 which is allocated to XW000. And the data are stored in D1000 and after.

WRITE instruction (FUN238)

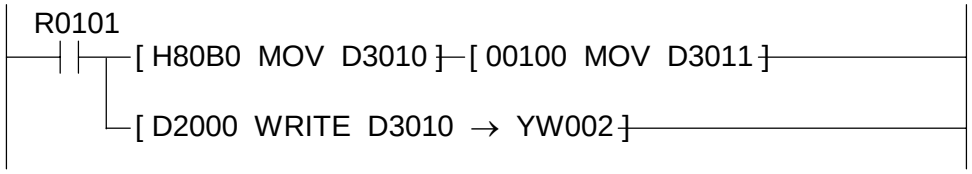
Expression:

—[(A) WRITE (B) → (C)]—

Operands:

(A): Starting register of the source
(B): Starting address of the buffer memory to be written
(B)+1: Number of words to be written (max. 160 for CF211)
(C): I/O register (XW/YW) assigned to the CF211

Example:



When R0101 is ON, 100 words of data starting with D2000 (D2000 to D2099) are written into the buffer memory address H80B0 and after of the CF211 which is allocated to YW002.

4.2.3 Parameter area

The parameter area of the buffer memory contains the following contents.

Address	Word data
H8000	Status 1
01	
02	Switch setting status
03	
04	
05	Command 1
06	
07	Receive error information
08	Transmit error information
09	Channel status
0A	Receive length
0B	
0C	Trailing code
0D	Time-out check time
0E	
0F	

Note: Blanks are for future use. (Reserved)

4. Register Configuration

Status 1 (H8000)

The address H8000 shows the CF211 module status. If an error has occurred in the CF211, the error code is stored here.

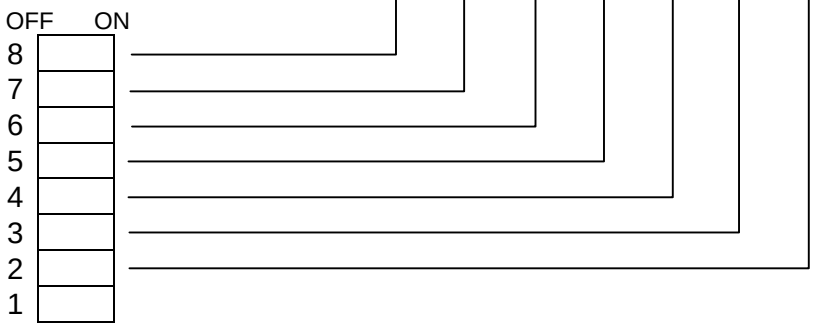
	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8000	RDY	ERR	0	0	0	0	0	0	Error code							

Bit F	RDY (Ready)	1 = operating normally 0 = under initialization or error state
Bit E	ERR (Error)	1 = error state 0 = no error (normal)
Bit 7-0	Error code	Shows the detected error item if ERR is 1. (H00 when normal) See section 6.2.1 for details.

Switch setting status (H8002)

The address H8002 stores the setting status of the transmission parameter setting switches.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8002	0	0	0	0	0	0	0	0	Switch setting status							0



ON: 1 OFF: 0

Command 1 (H8005)

The address H8005 is used to reset the CF211 by T2 program.
Two types of reset commands are available, hot reset and cold reset.
The hot reset is used to change the trailing code and the time-out check time settings.
The cold reset is used to initialize the CF211. The trailing code and the time-out check time will be reset to the default setting. The operation of the cold reset is the same as the hardware reset switch and power on initialization.
Refer to sections 5.5, 5.6 and 5.7 for these functions.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8005	RST	0	0	0	0	0	0	0	Command number							

Bit F	RST (Reset)	1 = reset request 0 = normal (no reset request)
Bit 7-0	Command number	HFE = hot reset HFF = cold reset

Receive error information (H8007)

The address H8007 indicates the error contents if an error has been detected in receiving a message. This information is set during the received message read sequence.
Refer to section 6.2.3 for details.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8007	0	0	0	0	0	PE	0	0	Receive error code							

Bit A	PE (Parity error)	1 = parity error 0 = normal
Bit 7-0	Receive error code	Shows the error code regarding received message. (H00 when normal) See section 6.2.3 for details.

Transmit error information (H8008)

The address H8008 indicates the error contents if an error has occurred during message transmitting. This information is set during the write sequence for message transmitting. Refer to section 6.2.4 for details.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8008	0	0	0	0	0	0	0	0	Transmit error code							

Bit 7-0	Transmit error code	Shows the error code for transmitting. (H00 when normal) See section 6.2.4 for details.

Channel status (H8009)

The address H8009 indicates the control signal status. This information is always updated.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8009	0	0	0	0	0	0	0	0	DSR	0	0	0	0	0	0	0

Bit 7	DSR (Data set ready)	1 = DSR is ON 0 = DSR is OFF

Receive length (H800A)

The address H800A indicates the length of the received message (number of bytes). This information is set during the received message read sequence.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H800A	Received message length															

Bit F-0	Received message length	Shows the received message length (bytes). 0 - 320

Trailing code (H800C)

The address H800C stores the trailing codes. The default setting is H0D (CR code). To change the trailing code, write the desired code into this address then write the hot reset command into the Command 1 (H8005). See section 5.6 for this procedure.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H800C	0	0	0	0	0	0	0	0	Trailing code							

Bit 7-0	Trailing code	Stores the trailing code. Initial value at power on is H0D (carriage return).

Time-out check time (H800D)

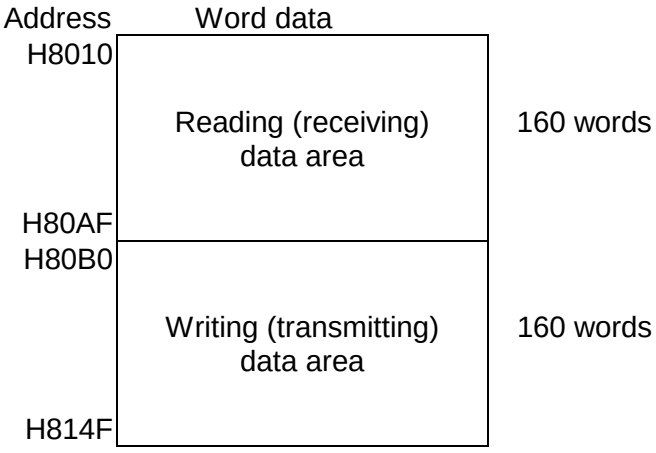
The address H800D stores the time-out check time. If the time between each transmitting or receiving character exceeds the specified time-out check time, it becomes the time-out error. The default setting is 1 second.
To change the setting, write the desired data into this address then write the hot reset command into the Command 1 (H8005). See section 5.7 for this procedure.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H800D	Time-out check time															

Bit F-0	Time-out check time	Stores the time-out check time (0.1 s units). Valid data range is 1 to 600 (0.1 to 60 s). If 0 or more than 600 is specified, the time-out check will not work. Initial value at power on is 10 (1 s).

4.2.4 Receiving and transmitting data area

The receiving and transmitting data area is provided to exchange the communication characters between T2 and CF211. The address ranges in the CF211 buffer memory are as follows.



When CF211 receives a message (one set of transmission characters), CF211 sets the characters into the receiving data area starting with the address H8010. Then T2 can read these characters from the receiving data area by using READ instruction.

When T2 attempts to send a message via CF211, T2 writes the characters into the transmitting data area starting with the address H80B0 by using WRITE instruction, and instructs CF211 to start transmitting. CF211 recognizes from the character stored in the starting address (H80B0) to the trailing code character as the one set of transmitting message.

Refer to section 5 for message receiving/transmitting procedure.

Section 5

Operation Procedure

5. Operation Procedure

5.1 Transmission message format

The transmission message is composed by ASCII characters and a specified trailing code. The default setting of the trailing code is CR (carriage return code = H0D). Refer to section 5.6 for setting the trailing code other than CR.

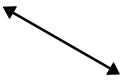
The maximum length of a message is 320 bytes. An example of the message is shown below.

1	2	3	4	5	6	7	8	9
″0″	″1″	″2″	″A″	″B″	″7″	″8″	″9″	CR

In the above figure, ″x″ means an ASCII character. For example, ″0″ is H30.

When the above message is received or transmitted, the data arrangements in the T2 registers are as follows.

Register	F 8	7 0
n	″1″	″0″
n+1	″A″	″2″
n+2	″7″	″B″
n+3	″9″	″8″
n+4		CR



Transmission message

″0″
″1″
″2″
″A″
″B″
″7″
″8″
″9″
CR

5.2 Received message read sequence

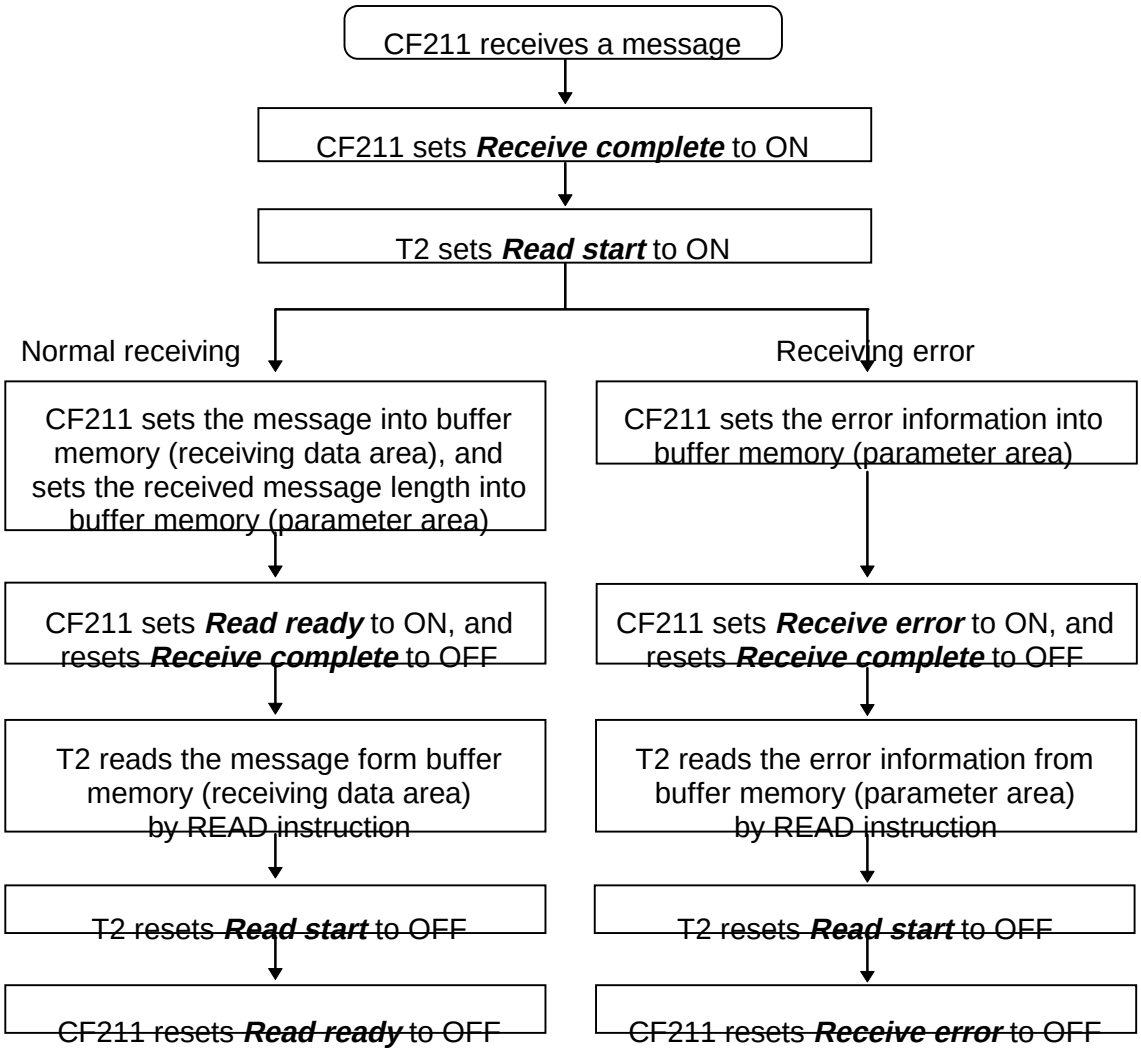
5.2.1 Flag control timing

In case of receiving a message, the following flags are used for handshaking between T2 and CF211. These flags are the bits of the I/O registers assigned to the CF211. Refer to section 4.1.

Read ready	Bit B of XW(n)
Receive complete	Bit A of XW(n)
Receive error	Bit 9 of XW(n)

Read start	Bit B of YW(n+2)

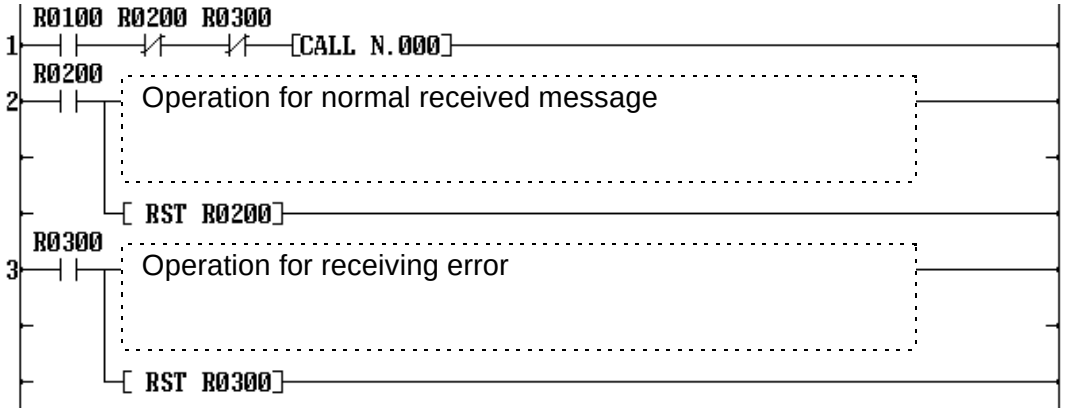
The message receiving procedure is as follows. It is called “received message read sequence”.



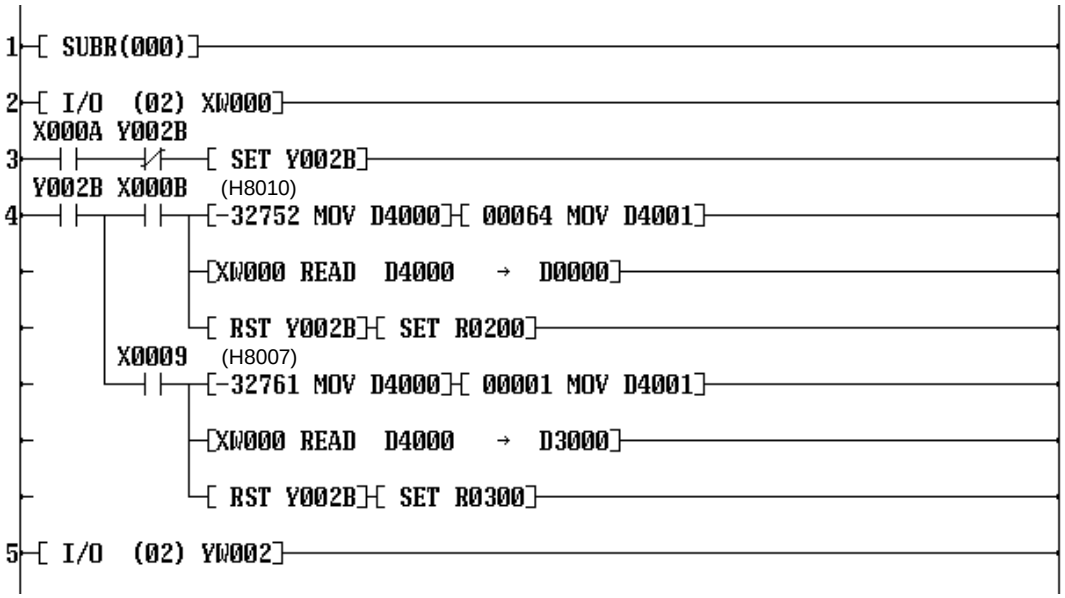
5.2.2 T2 sample program for message receiving

A sample program for the “received message read sequence” is shown below.
This sample program is for the CF211 that is allocated to XW000 - YW003.

(Main program)



(Subroutine No. 0)



In this sample program, the following devices/registers are used.

R0100	CF211 status (ON when ready) - Refer to section 5.4
R0200	Receiving normal complete (comes ON when receiving is complete normally)
R0300	Receiving error complete (comes ON when receiving error has occurred)

X000A	Receive complete flag
X000B	Read ready flag
X0009	Receive error flag
Y002B	Read start flag

D0000 - D0063	Received message is stored here
D3000	Receiving error information is stored here
D4000 - D4001	Parameters for READ instruction

This sample program works as follows.

Main program
- Rung 1: Calls Subroutine No. 0 when the CF211 is normal and both R0200 and R0300 are OFF.
- Rung 2: When R0200 comes ON (normal receiving), performs the necessary operation for the received message, then resets R0200 to OFF.
- Rung 3: When R0300 comes ON (receiving error has occurred), performs the error processing, then resets R0300 to OFF.

Subroutine No. 0
- Rung 1: Indicates the entry of Subroutine No. 0.
- Rung 2: Reads XW000 and XW001 from the CF211 by direct I/O instruction.
- Rung 3: Sets Y002B (Read start flag) to ON if X000A (Receive complete flag) is ON.
- Rung 4: When X000B (Read ready flag) comes ON, reads the received message from the CF211's buffer memory, 64 words starting with address H8010, by READ instruction, and stores it into D0000 and after. Then resets Y002B (Read start flag) to OFF, and sets R0200 to ON.
  When X0009 (Receive error flag) comes ON, reads the error information from the CF211's buffer memory, 1 word of address H8007, by READ instruction, and stores it into D3000. Then resets Y002B (Read start flag) to OFF, and sets R0300 to ON.
- Rung 5: Writes YW002 and YW003 into the CF211 by direct I/O instruction.
- Rung 6: Indicates the return of Subroutine No. 0.

5. Operation Procedure

Explanation for this sample program:

(1) The “received message read sequence” is programmed on Subroutine No. 0.
(2) The Subroutine No. 0 is called from Main program with resetting R0200 and R0300 to OFF.
(3) When a message is received normally, R0200 will come ON and the message (ASCII characters) will be stored in D0000 to D0063. In this sample program, the received message length information (buffer memory address H800A) is not used. The maximum length of a message is 128 bytes (64 words) because the number of read words of the READ instruction is programmed as 64 words.
(4) When an error has occurred in receiving the message, R0300 will come ON and the error information will be stored in D3000. For details of the error information, refer to section 6.2.3.

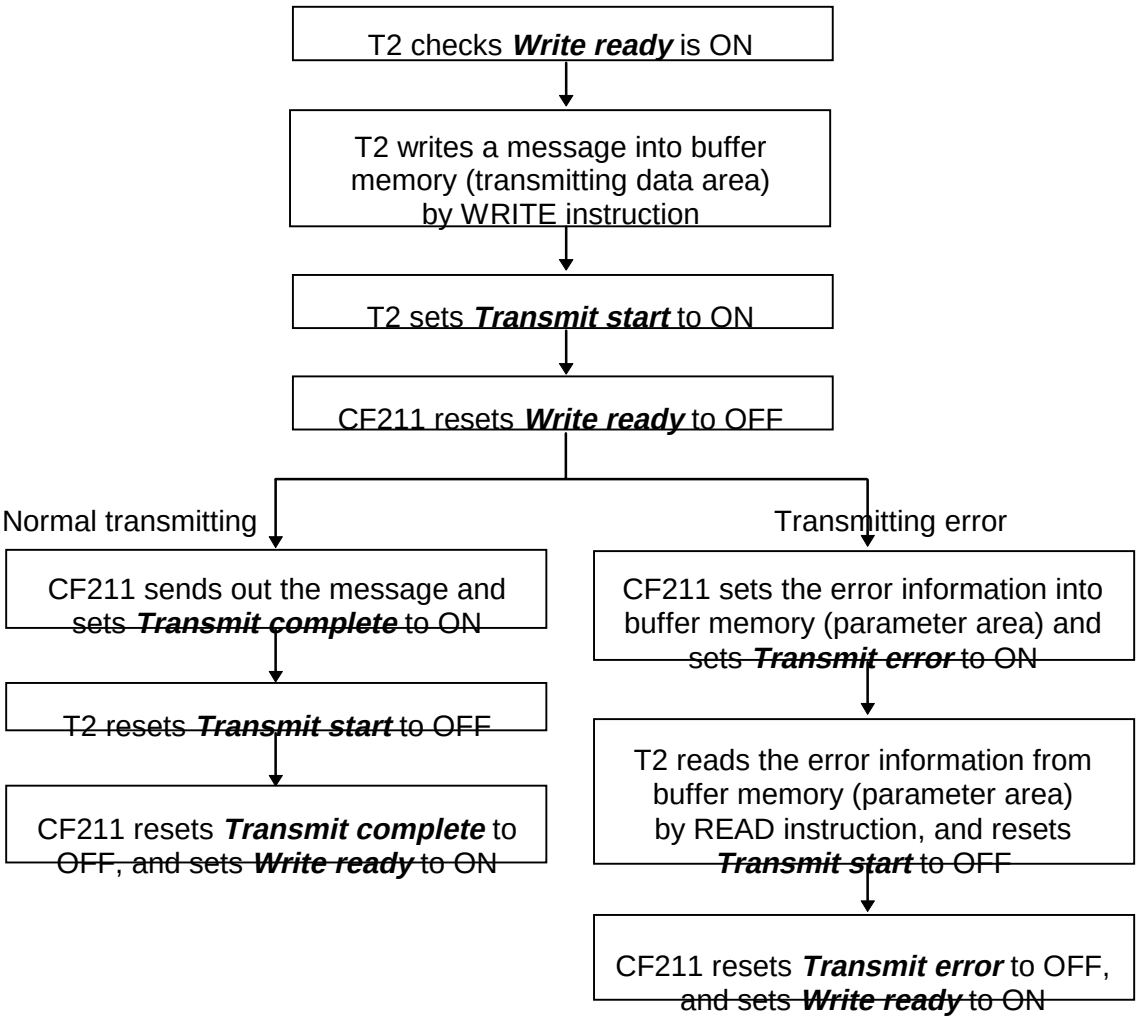
5.3 Write sequence for message transmitting

5.3.1 Flag control timing

In case of transmitting a message, the following flags are used for handshaking between T2 and CF211. These flags are the bits of the I/O registers assigned to the CF211. Refer to section 4.1.

Write ready	Bit F of XW(n)
Transmit complete	Bit E of XW(n)
Transmit error	Bit D of XW(n)
Transmit start	Bit F of YW(n+2)

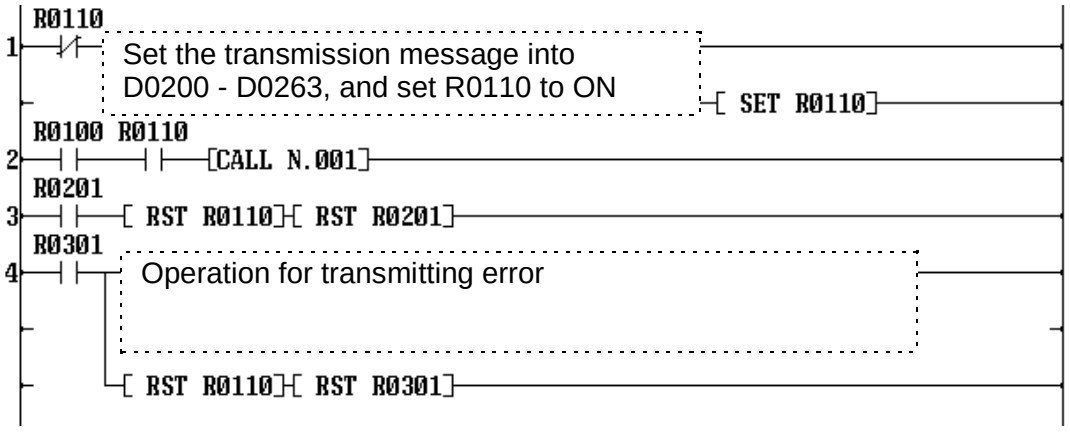
The message transmitting procedure is as follows. It is called “write sequence for message transmitting”.



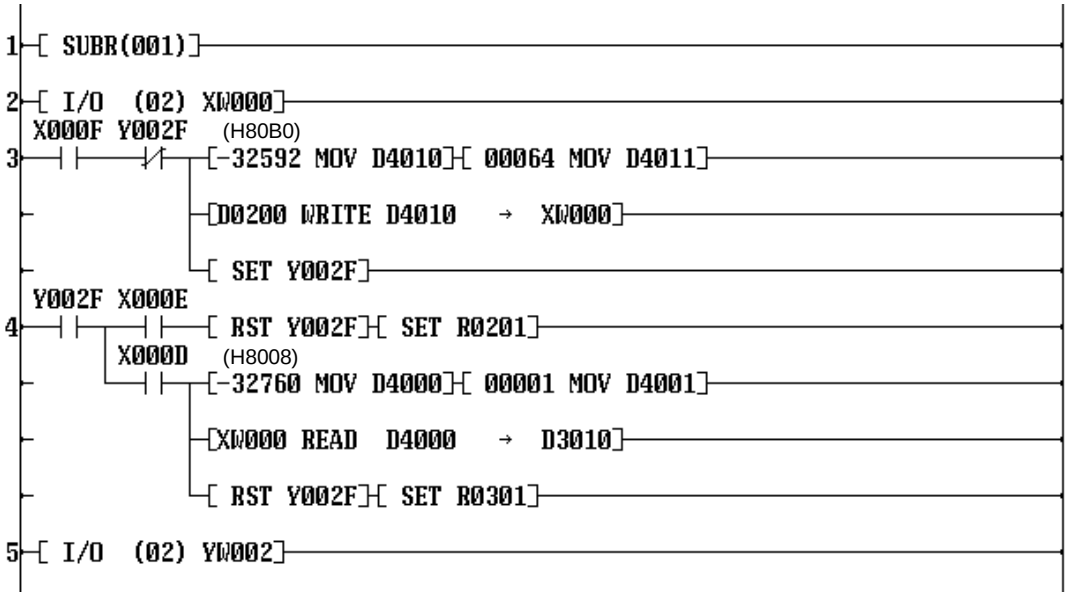
5.3.2 T2 sample program for message transmitting

A sample program for the “write sequence for message transmitting” is shown below. This sample program is for the channel 1 of the CF211 that is allocated to XW000 - YW003.

(Main program)



(Subroutine No. 1)



In this sample program, the following devices/registers are used.

R0100	CF211 status (ON when ready) - Refer to section 5.4
R0110	Internal flag to start transmitting
R0201	Transmitting normal complete (comes ON when transmitting is complete normally)
R0301	Transmitting error complete (comes ON when transmitting error has occurred)

X000F	Write ready flag
X000E	Transmit complete flag
X000D	Transmit error flag
Y002F	Transmit start flag

D0200 - D0263	Transmitting message is set here
D3010	Transmitting error information is stored here
D4010 - D4011	Parameters for WRITE instruction
D4000 - D4001	Parameters for READ instruction

This sample program works as follows.

Main program
- Rung 1: Prepares a transmission message and sets it into D0200 and after (maximum 64 words in this sample). Then sets R0110 to ON.
- Rung 2: Calls Subroutine No. 1 when the CF211 is normal and R0110 is ON.
- Rung 3: When R0201 comes ON (normal transmitting), resets R0110 and R0201 to OFF.
- Rung 4: When R0301 comes ON (transmitting error has occurred), performs the error processing, then resets R0110 and R0301 to OFF.

Subroutine No. 1
- Rung 1: Indicates the entry of Subroutine No. 1.
- Rung 2: Reads XW000 and XW001 from the CF211 by direct I/O instruction.
- Rung 3: When X000F (Write ready flag) is ON, writes the message that is stored in D0200 to D0263 into the CF211's buffer memory, 64 words starting with address H80B0, by WRITE instruction, and sets Y002F (Transmit start flag) to ON.
- Rung 4: When X000E (Transmit complete flag) comes ON, resets Y002F (Transmit start flag) to OFF, and sets R0201 to ON.
  When X000D (Transmit error flag) comes ON, reads the error information from the CF211's buffer memory, 1 word of address H8008, by READ instruction, and stores it into D3010. Then resets Y002F (Transmit start flag) to OFF, and sets R0301 to ON.
- Rung 5: Writes YW002 and YW003 into the CF211 by direct I/O instruction.
- Rung 6: Indicates the return of Subroutine No. 1.

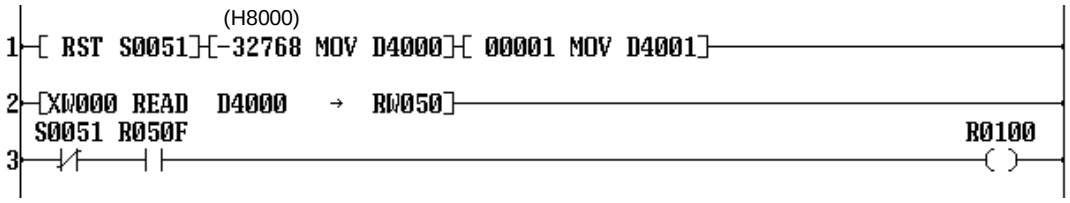
5. Operation Procedure

Explanation for this sample program:

(1) The “write sequence for message transmitting” is programmed on Subroutine No. 1.
(2) To start transmitting, set the message (ASCII characters) into D0200 and after. Then set R0110 to ON.
The message length is maximum 128 bytes (64 words) in this sample program.
(3) When R0110 is set to ON while the CF211 is ready, the Subroutine No. 1 will be called and the message transmitting will be started.
(4) When the message is transmitted normally, R0201 will come ON. Then R0110 will be reset to OFF.
(5) When an error has occurred in transmitting the message, R0301 will come ON and the error information will be stored in D3010. For details of the error information, refer to section 6.2.4.

5.4 Checking the CF211 operation status

CF211 operation status information is stored in the CF211's buffer memory address H8000 (Status 1). T2 can read this information by using READ instruction.
A sample program is shown below. This sample program is for the CF211 that is allocated to XW000 - YW003.



The above sample program works as follows.

- Rung 1: Resets S0051 (Instruction error flag) to OFF, and sets parameters for the READ instruction.
- Rung 2: Reads the operation status information from the CF211's buffer memory address H8000 (Status 1).
- Rung 3: When S0051 (Instruction error flag) is OFF and R050F (Ready) is ON, turns R0100 to ON.

It means that the CF211 is operating normally when R0100 is ON.
If R050E (Error) is ON, the CF211 is in error state. In that case, the error code is stored in the lower 8 bits of RW050. For the error code, refer to section 6.2.1.
If S0051 (Instruction error flag) is ON, it means that an error has occurred during the READ instruction execution.

5.5 Resetting the CF211 by software

CF211 can be reset by T2 program. Two types of resetting are available, cold reset and hot reset.

The cold reset is used to reset the CF211 error state. When the cold reset is executed, the CF211 will be initialized. The trailing code and the time-out check time are also reset to the default settings. This function is the same as pressing the hardware reset switch and power on initialization.

On the other hand, the hot reset is used to change the trailing code and/or the time-out check time.

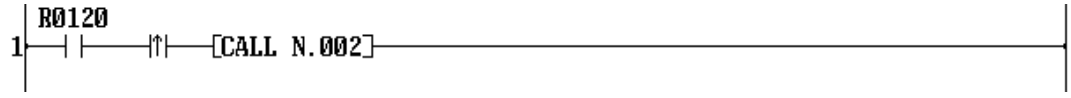
For executing these functions, write the following data into the CF211's buffer memory address H8005 (Command 1). The data writing into this address must be one-shot.

Clod reset: H80FF
Hot reset: H80FE

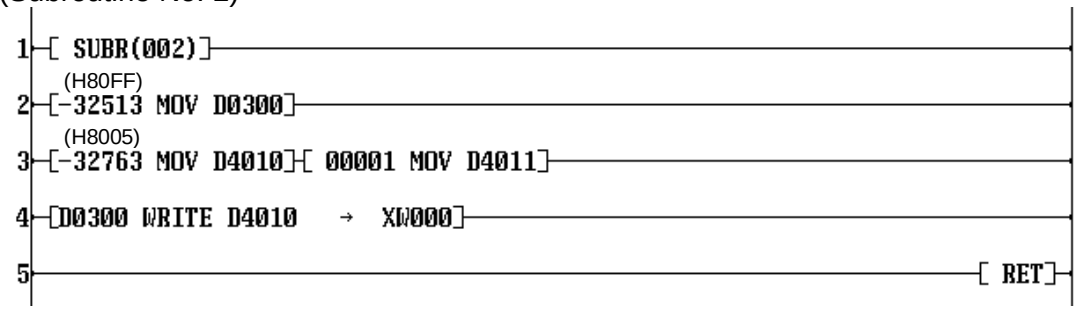
The written data will be cleared to 0 by CF211 when the operation is completed.

A sample program for the cold reset is shown below. This sample program is for the CF211 that is allocated to XW000 - YW003.
In this sample program, the cold reset operation will be started by setting R0120 to ON.

(Main program)



(Subroutine No. 2)



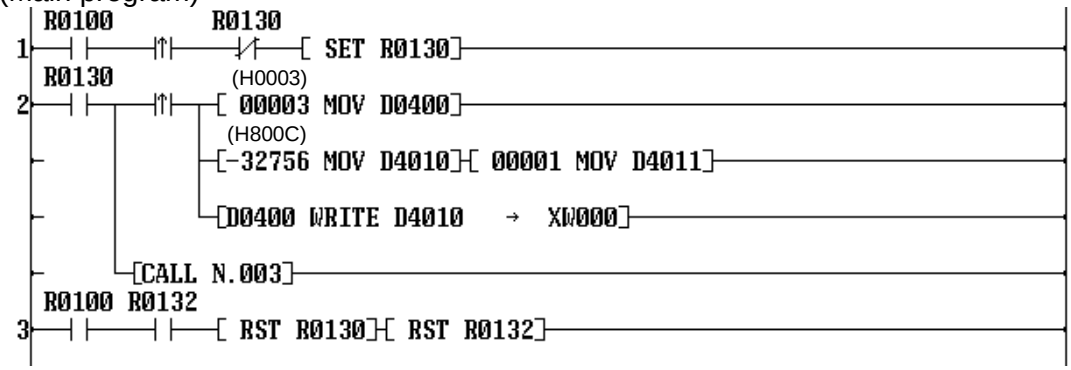
For the hot reset, refer to sections 5.6 and 5.7.

5.6 Setting the trailing code

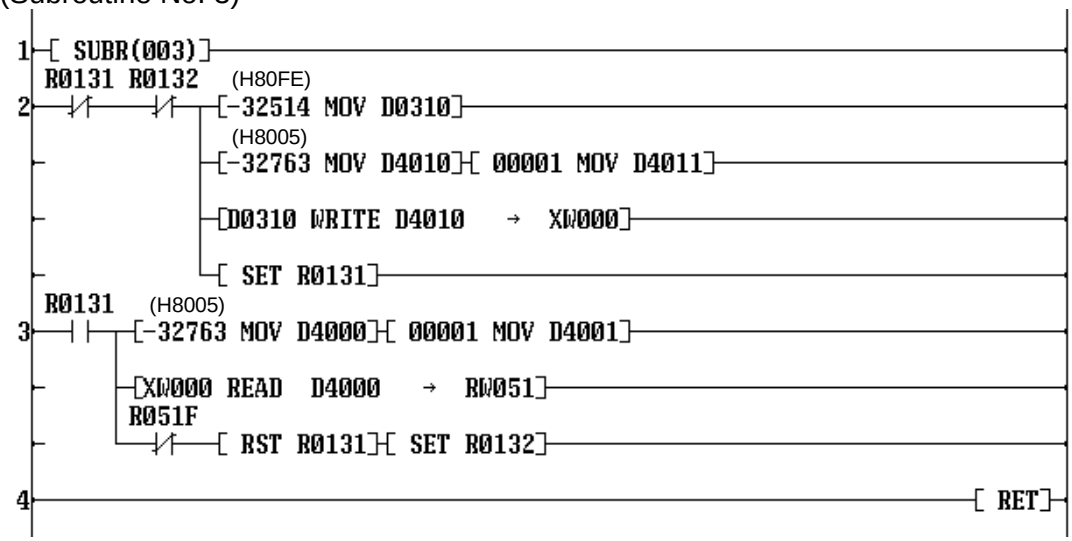
The default setting of the trailing code is CR (carriage return code = H0D). The trailing code can be changed by T2 program.
To do this, write desired trailing code into the CF211's buffer memory address H800C (Trailing code), and execute the hot reset (refer to section 5.5).

A sample program is shown below. This sample program is for the CF211 that is allocated to XW000 - YW003.
In this sample program, the trailing code changing routine will be executed once when the CF211 status is changed to ready (R0100 comes ON - refer to section 5.4), and the trailing code will be changed to H03.
If the time-out check time are also changed, write these data on the Main program Rung 2 before calling Subroutine No. 3 in the same manner.

(Main program)



(Subroutine No. 3)



5.7 Setting the time-out check time

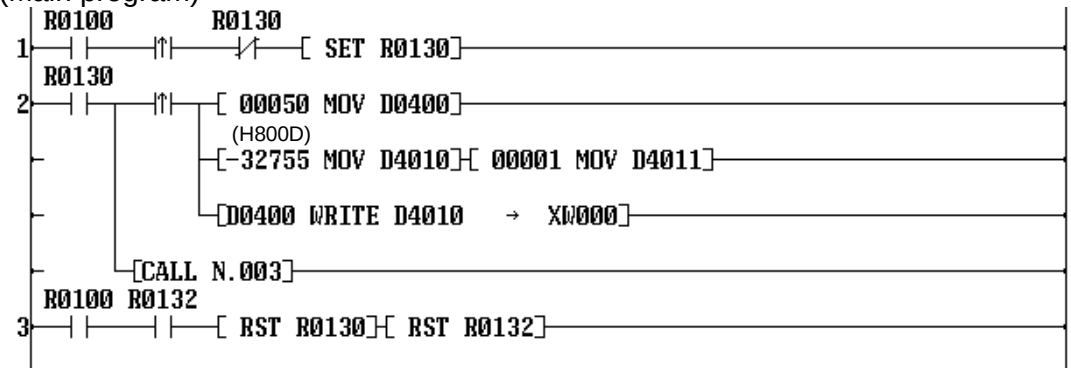
The default setting of the time-out check time is 1 second. The time-out check time can be changed by T2 program. The valid setting range is 0.1 to 60.0 seconds in 0.1 second units. Refer to section 4.2.3.

To change the time-out check time, write desired value into the CF211's buffer memory address H800D (Time-out check time), and execute the hot reset (refer to section 5.5).

T2 program for this purpose is almost same as that for setting the trailing code (refer to section 5.6). Only the difference is writing the time-out check time instead of the trailing code. See Rung 2 of the following sample. In this sample, the time-out check time is changed to 5 seconds.

If the trailing code are also changed, write these data on the Main program Rung 2 before calling Subroutine No. 3 in the same manner.

(Main program)



Section 6

RAS Information

6. RAS Information

6.1 LED indication

On the CF211, a status LED is provided as follows. This LED is useful to check the CF211 communication status.

CH1 ●

CH1	Indicates the serial port communication status. Lit while some data is transmitting from or receiving into the CF211.

6.2 Buffer memory information

Useful RAS information is stored in the CF211's buffer memory. The information can be read by READ instruction. When your CF211 does not work as expected, check the RAS information.

6.2.1 Module status

Address H8000 of the buffer memory stores the CF211 module status.

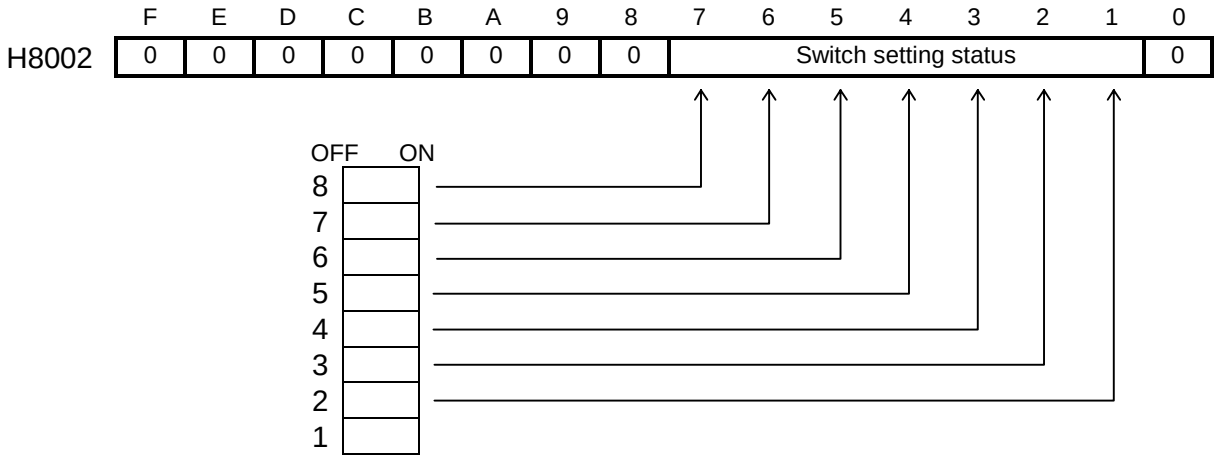
	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8000	RDY	ERR	0	0	0	0	0	0	Error code							

Bit F	RDY (Ready)	1 = operating normally 0 = under initialization or error state
Bit E	ERR (Error)	1 = error state 0 = no error (normal)
Bit 7-0	Error code	Shows the detected error item if ERR is 1. See the table below (H00 when normal)

Error code	Type of error	Description	Status
H01	CPU error	CPU error has been detected during initialization.	Operation is stopped.
H02	ROM error	ROM error has been detected during initialization.	Operation is stopped.
H03	RAM error	Work RAM error has been detected during initialization.	Operation is stopped.
H04	Buffer memory error	Buffer memory error has been detected during initialization.	Operation is stopped.
H05	Switch setting illegal	Illegal switch setting has been detected during initialization.	Operation is stopped.
H10	Watchdog timer error	Watchdog timer error has occurred during operation.	Operation is stopped. Cold reset will be effective.

6.2.2 Switch setting status

Addresses H8002 of the buffer memory store the switch setting status. Check that the information agrees with the physical setting status if CF211 does not work as expected.



ON: 1 OFF: 0

6.2.3 Error information for data receiving

Address H8007 stores the error information for data receiving.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8007	0	0	0	0	0	PE	0	0	Receive error code							

Bit A	PE (Parity error)	1 = parity error 0 = normal When parity error has occurred in a receiving message, the entire message is disabled. The next message can be received.
Bit 7-0	Receive error code	Shows the error code regarding received message. See the table below. (H00 when normal)

Error code	Type of error	Description	Status
H01	Receive time-out error	Specified time-out check time has elapsed between characters.	The rest of the message will be received as the next message.
H02	Message length error	The message length has exceeded the limit. (320 bytes)	The message is disabled. The next message can be received.
H03	Receive buffer overflow	Receive buffer overflow has occurred.	The message is disabled. The next message can be received.

NOTE When T2 is in HALT mode, the T2 cannot read any received message from the CF211. Therefore, if CF211 has received some messages while the T2 is in HALT mode, the receive buffer overflow may occur when the T2 is changed to RUN mode.

6.2.4 Error information for data transmitting

Address H8008 stores the error information for data transmitting.

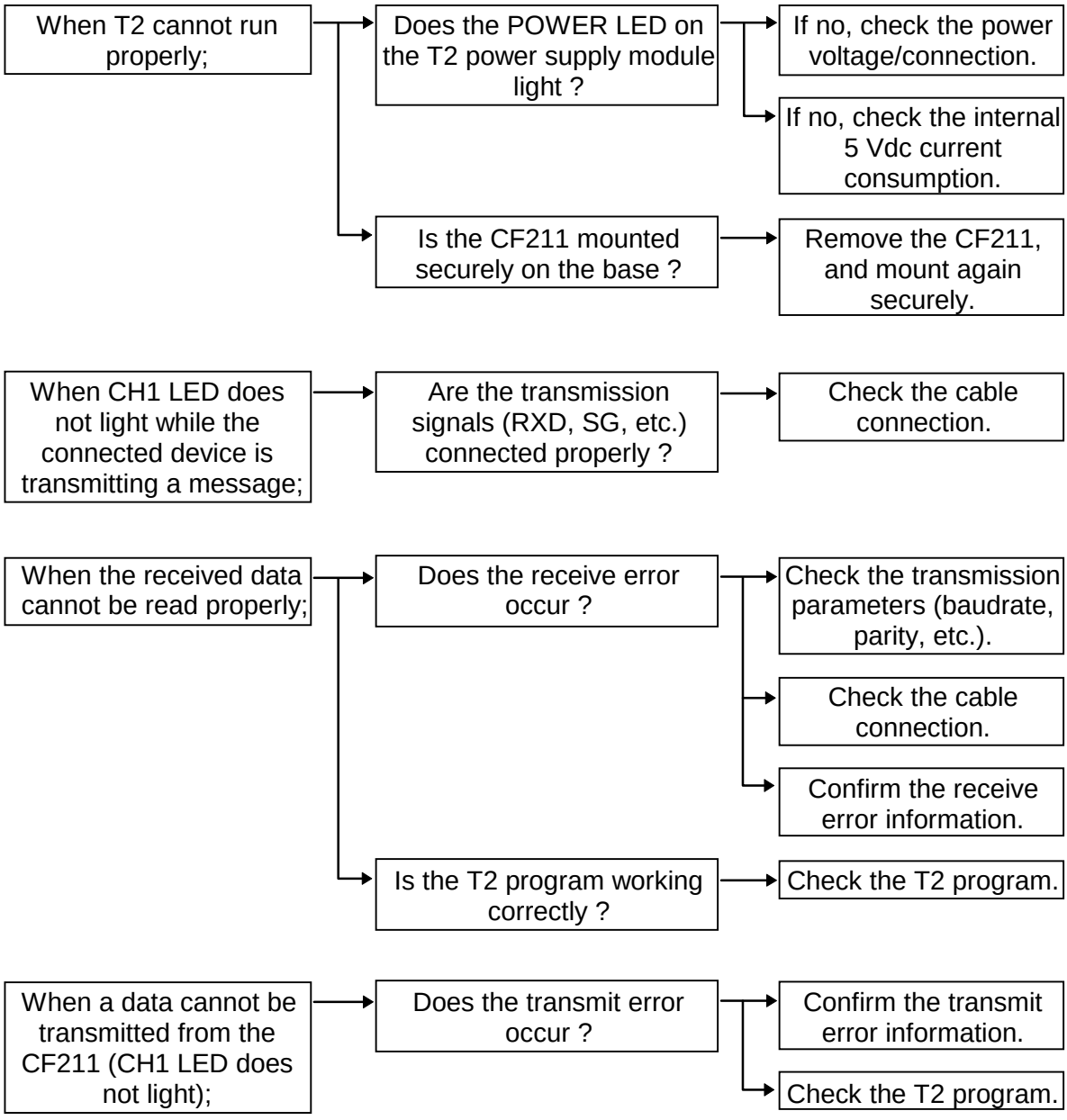
	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8008	0	0	0	0	0	0	0	0	Transmit error code							

Bit 7-0	Transmit error code	Shows the error code for transmitting. See the table below. (H00 when normal)

Error code	Type of error	Description	Status
H01	Transmit time-out error	Specified time-out check time has elapsed between characters.	The next message can be transmitted.
H02	Trailing code missing	The trailing code has not been written into the buffer memory.	The message is disabled. The next message can be transmitted.

6.3 Trouble shooting

When CF211 does not work properly, check the following points.



Appendix

Appendix

A.1 Specification of the READ instruction

FUN 237 Special module data read (READ)
Reads designated range of data from the special module.
Input → [A READ B → C] → Execution output

Function

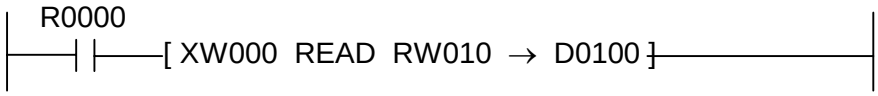
- This instruction reads data from the buffer memory of the special module that is designated by operand A, and stores them in T2's registers starting with operand C.
- The transfer source address (buffer memory address) is designated by operand B.
- The transfer size (number of words) is designated by operand B+1.

Input	Action	Output	ERF
OFF	No execution	OFF	
ON	Normal execution	ON	
	Error (see Note 2)	ON	ON

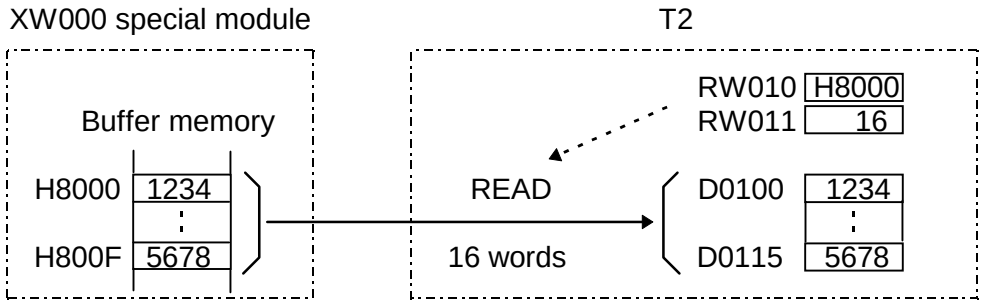
Operand

		Device										Register														Constant	Index
Opr	Name	X	Y	S	L	R	Z	T.	C.	I	O	XW	YW	SW	LW	RW	W	T	C	D	F	IW	OW	I	J	K		
A	Special module											√	√														√	√
B	Transfer parameter											√	√	√	√	√	√	√	√	√	√							
C	Top register of destination												√	√	√	√	√	√	√	√	√							√

Program example

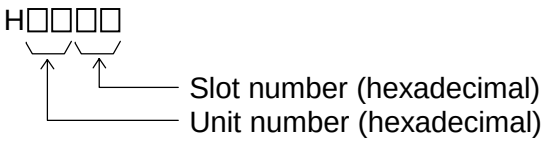


- When R0000 is ON, the buffer memory data of the size indicated by RW011, starting with the address indicated by RW010 of the special module allocated to XW000, are read and stored in D0100 and after.
- The maximum number of words to be read is 160 words. (For CF211)



Note 1) The special module can be designated not only by the assigned register, but also by the mounting position. The mounting position is designated by a constant data for the operand A as follows.

(Unit number) × 256 + (Slot number)



Unit number	Hexadecimal
0	H00
1	H01
2	H02
3	H03

Slot number	Hexadecimal
0	H00
1	H01
2	H02
3	H03
4	H04
5	H05
6	H06
7	H07

For example, if a special module is mounted on Slot-4, Unit-0 (basic unit) and allocated to XW008 - YW011, the following two READ instructions function the same.

——[XW008 READ RW010 → D0100]——

——[H0004 READ RW010 → D0100]——

Note 2) The READ instruction is not executed as error in the following cases. In these cases, ERF (instruction error flag = S0051) is set to ON. If the ERF is set to ON once, it remains ON until resetting to OFF by user program.

- When the operand A is other than a valid constant (see Note 1) or XW/YW register.
- When no answer error occurs with the designated special module.
- When the number of words transferred exceeds 256 words.
- When the source table of transfer is out of the valid range.
- When the destination table of transfer is out of the valid range.

A.2 Specification of the WRITE instruction

FUN 238 Special module data write (WRITE)
Writes designated range of data into the special module.
Input → [A WRITE B → C] → Execution output

Function

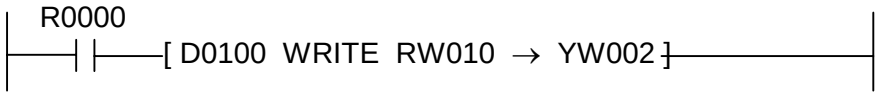
- This instruction transfers data stored in T2's registers starting with operand A into the buffer memory of the special module that is designated by operand C.
- The destination address (buffer memory address) is designated by operand B.
- The transfer size (number of words) is designated by operand B+1.

Input	Action	Output	ERF
OFF	No execution	OFF	
ON	Normal execution	ON	
	Error (see Note 2)	ON	ON

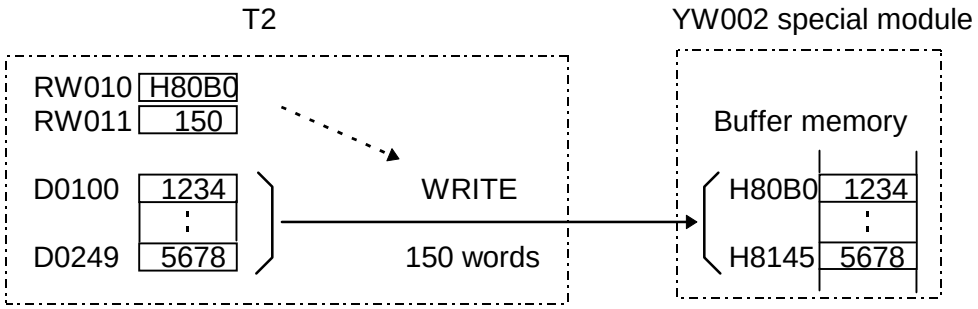
Operand

		Device										Register															Constant	Index
Opr	Name	X	Y	S	L	R	Z	T.	C.	I	O	XW	YW	SW	LW	RW	W	T	C	D	F	IW	OW	I	J	K		
A	Top register of source											√	√	√	√	√	√	√	√	√	√							√
B	Transfer parameter											√	√	√	√	√	√	√	√	√	√							
C	Special module											√	√														√	√

Program example

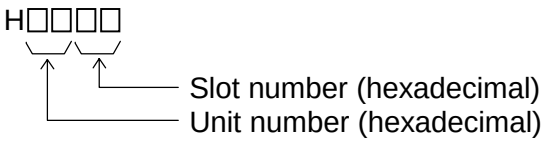


- When R0000 is ON, the register data of the size indicated by RW011, starting with D0100, are transferred to the buffer memory starting with the address indicated by RW010 of the special module allocated to YW002.
- The maximum number of words to be transferred is 160 words. (For CF211)



Note 1) The special module can be designated not only by the assigned register, but also by the mounting position. The mounting position is designated by a constant data for the operand C as follows.

(Unit number) × 256 + (Slot number)



Unit number	Hexadecimal
0	H00
1	H01
2	H02
3	H03

Slot number	Hexadecimal
0	H00
1	H01
2	H02
3	H03
4	H04
5	H05
6	H06
7	H07

For example, if a special module is mounted on Slot-2, Unit-1 (expansion unit #1) and allocated to XW020 - YW023, the following two WRITE instructions function the same.

——[D0100 WRITE RW010 → XW020]——

——[D0100 WRITE RW010 → H0102]——

Note 2) The WRITE instruction is not executed as error in the following cases. In these cases, ERF (instruction error flag = S0051) is set to ON. If the ERF is set to ON once, it remains ON until resetting to OFF by user program.

- When the operand C is other than a valid constant (see Note 1) or XW/YW register.
- When no answer error occurs with the designated special module.
- When the number of words transferred exceeds 256 words.
- When the source table of transfer is out of the valid range.
- When the destination table of transfer is out of the valid range.