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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

Preliminary Application Note

V850E/IF3, V850E/IG3

32-bit Single-Chip Microcontrollers

Sample Programs for Serial Communication (CSIB)

V850E/IF3:
- μPD70F3451
- μPD70F3452

V850E/IG3:
- μPD70F3453
- μPD70F3454

Document No. U18725EJ1V0AN00 (1st edition)
Date Published August 2007 N

[MEMO]

NOTES FOR CMOS DEVICES

① VOLTAGE APPLICATION WAVEFORM AT INPUT PIN

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (MAX) and V_{IH} (MIN) due to noise, etc., the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (MAX) and V_{IH} (MIN).

② HANDLING OF UNUSED INPUT PINS

Unconnected CMOS device inputs can be cause of malfunction. If an input pin is unconnected, it is possible that an internal input level may be generated due to noise, etc., causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND via a resistor if there is a possibility that it will be an output pin. All handling related to unused pins must be judged separately for each device and according to related specifications governing the device.

③ PRECAUTION AGAINST ESD

A strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it when it has occurred. Environmental control must be adequate. When it is dry, a humidifier should be used. It is recommended to avoid using insulators that easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors should be grounded. The operator should be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with mounted semiconductor devices.

④ STATUS BEFORE INITIALIZATION

Power-on does not necessarily define the initial status of a MOS device. Immediately after the power source is turned ON, devices with reset functions have not yet been initialized. Hence, power-on does not guarantee output pin levels, I/O settings or contents of registers. A device is not initialized until the reset signal is received. A reset operation must be executed immediately after power-on for devices with reset functions.

⑤ POWER ON/OFF SEQUENCE

In the case of a device that uses different power supplies for the internal operation and external interface, as a rule, switch on the external power supply after switching on the internal power supply. When switching the power supply off, as a rule, switch off the external power supply and then the internal power supply. Use of the reverse power on/off sequences may result in the application of an overvoltage to the internal elements of the device, causing malfunction and degradation of internal elements due to the passage of an abnormal current.

The correct power on/off sequence must be judged separately for each device and according to related specifications governing the device.

⑥ INPUT OF SIGNAL DURING POWER OFF STATE

Do not input signals or an I/O pull-up power supply while the device is not powered. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements.

Input of signals during the power off state must be judged separately for each device and according to related specifications governing the device.

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M5 02. 11-1

INTRODUCTION

Cautions 1. This Application Note explains a case where the V850E/IG3 is used as a representative microcontroller. Use this Application Note for your reference when using the V850E/IF3.

2. Download the program used in this manual from the page of Programming Examples (http://www.necel.com/micro/en/designsupports/sampleprogram/index.html) in the NEC Electronics Website (http://www.necel.com/).

3. This sample program is provided for reference purposes only and operations are therefore not subject to guarantee by NEC Electronics Corporation. When using sample programs, customers are advised to sufficiently evaluate this product based on their systems, before use.

4. When using sample programs, reference the following startup routine and link directive file and adjust them if necessary.

- **Startup routine: ig3_start.s**
- **Link directive file: ig3_link.dir**

Target Readers

This Application Note is intended for users who understand the functions of the V850E/IF3 (μPD70F3451, 70F3452), and V850E/IG3 (μPD70F3453, 70F3454), and who design application systems that use these microcontrollers.

Purpose

This manual is intended to give users an understanding of the basic functions of the V850E/IF3 and V850E/IG3, using the application programs.

How to Use This Manual

It is assumed that the reader of this Application Note has general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.

For details of hardware functions (especially register functions, setting methods, etc.) and electrical specifications

→ See the **V850E/IF3, V850E/IG3 Hardware User's Manual**.

For details of instruction functions

→ See the **V850E1 Architecture User's Manual**.

Conventions

Data significance:	Higher digits on the left and lower digits on the right
Active low representation:	$\overline{xxx}$ (overscore over pin or signal name)
Memory map address:	Higher addresses on the top and lower addresses on the bottom
Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeric representation:	Binary ... xxxx or xxxxB
	Decimal ... xxxx
	Hexadecimal ... xxxxH
Prefix indicating the power of 2 (address space, memory capacity):	K (kilo): $2^{10} = 1,024$
	M (mega): $2^{20} = 1,024^2$
	G (giga): $2^{30} = 1,024^3$

The function lists are structured as follows.

Hardware name (symbol)

[Function]	Function description
[Function name]	Name of sample function
[Argument(s)]	Type and overview of argument(s)
[Processing content]	Processing content of sample function
[SFR(s) used]	Register name and setting content
[call function(s)]	Name and function of call function(s)
[Variable(s)]	Type, name, and overview of variable(s) used in sample function
[Interrupt(s)]	Name of function
[Interrupt source(s)]	Name
[File name]	Name of corresponding sample program file
[Caution(s)]	Caution(s) upon function usage

Interrupt function

[Function name]	Name of interrupt function
[Servicing content]	Servicing content of interrupt function
[SFR(s) used]	Name of interrupt and conditions for occurrence
[call function(s)]	None
[Variable(s)]	Name of variable, function
[File name]	Name of corresponding sample program file
[Caution(s)]	None

Related Documents

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Documents related to V850E/IF3 and V850E/IG3

Document Name	Document No.
V850E1 Architecture User's Manual	U14559E
V850E/IF3, V850E/IG3 Hardware User's Manual	U18279E
V850E/IF3, V850E/IG3 Sample Programs for Serial Communication (UARTA) Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Serial Communication (UARTB) Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Serial Communication (CSIB) Application Note	This manual
V850E/IF3, V850E/IG3 Sample Programs for Serial Communication (I^2C) Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for DMA Function Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Timer M Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Watchdog Timer Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Timer AA Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Timer AB Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Timer T Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Port Function Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Clock Generator Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Standby Function Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Interrupt Function Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for A/D Converters 0 and 1 Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for A/D Converter 2 Application Note	To be prepared
V850E/IF3, V850E/IG3 Sample Programs for Low-Voltage Detector (LVI) Function Application Note	To be prepared
V850E/IF3, V850E/IG3 6-Phase PWM Output Control by Timer AB, Timer Q Option, Timer AA, A/D Converters 0 and 1 Application Note	U18717E

CONTENTS

CHAPTER 1 CONTINUOUS TRANSFER MODE

1.1 Continuous Transfer Mode (Master Mode, Transmission Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs data transmission for ten times in continuous transfer mode. Validates communication start trigger and sets communication clock to fxx/256, and transfer data length to 8 bits.
[Function name]	csib1_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Starts transmission after calling each setting function.
[SFRs used]	CB0TIC: 0x07 (Clears CSIB0 transmission enable interrupt request signal (INTCB0T), releases mask, sets to priority level 7.) CB0STR.CB0TSF Communication status flag
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable unsigned char count: Transmit data generating variable
[Interrupt]	csib_int_send
[Interrupt source]	INTCB0T
[File name]	csib1.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib1.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to fxx/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x43 (Enables CSIB0 transmission operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib1.c
[Caution]	CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib1.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib1.c
[Caution]	None

Interrupt function

[Function name]	csib_int_send	
[Servicing content]	Sets new data for transmitting next data.	
[SFR used]	CB0TX	Transmit data register
[call function]	None	
[Variables]	unsigned char buf_tx[ ]:	Transmit data storing buffer
	volatile unsigned char count_tx:	Transmission count variable
[File name]	csib1.c	
[Caution]	None	

Figure 1-1. Continuous Transfer Mode (Master Mode, Transmission Mode) (1/2)

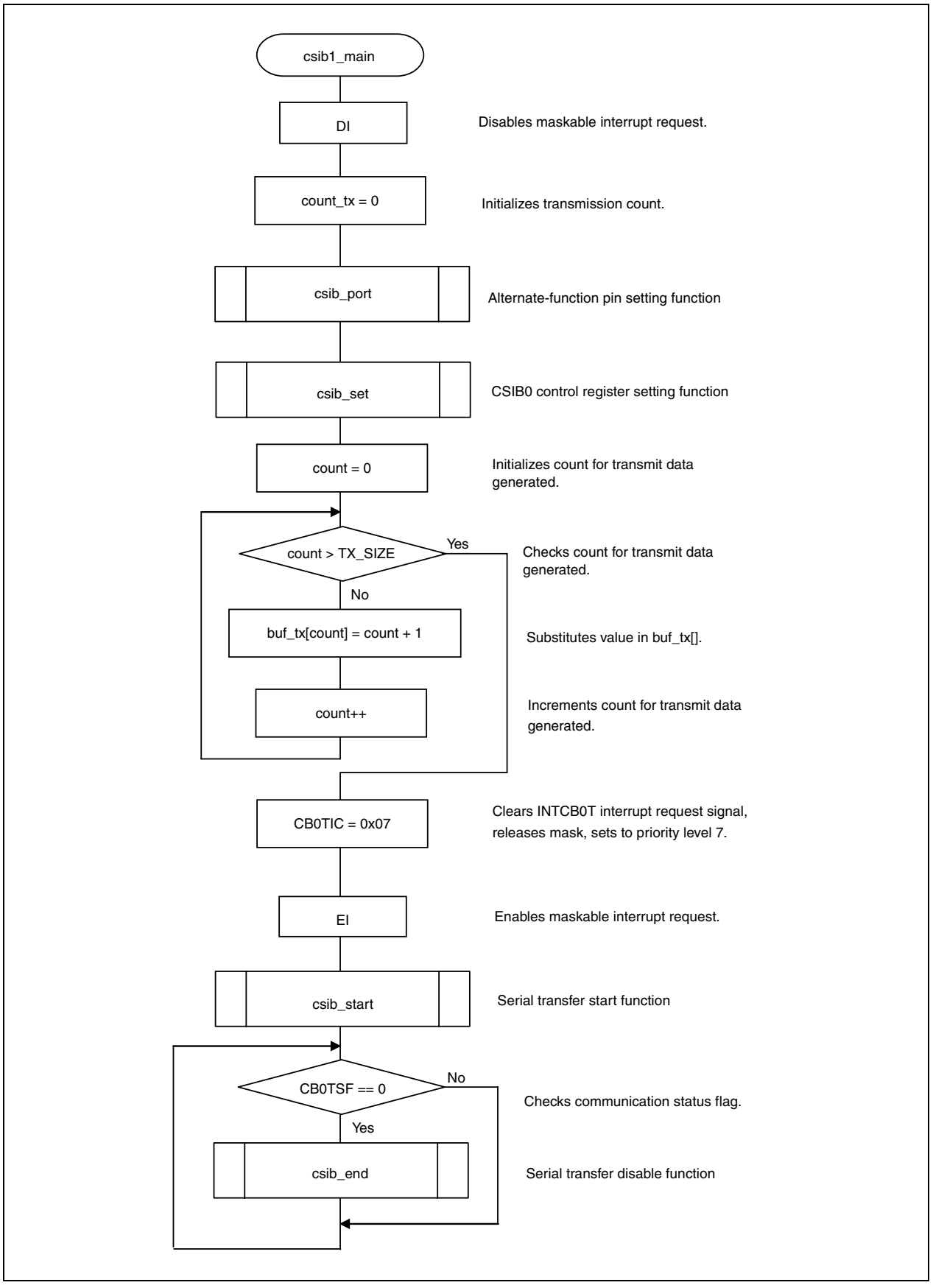
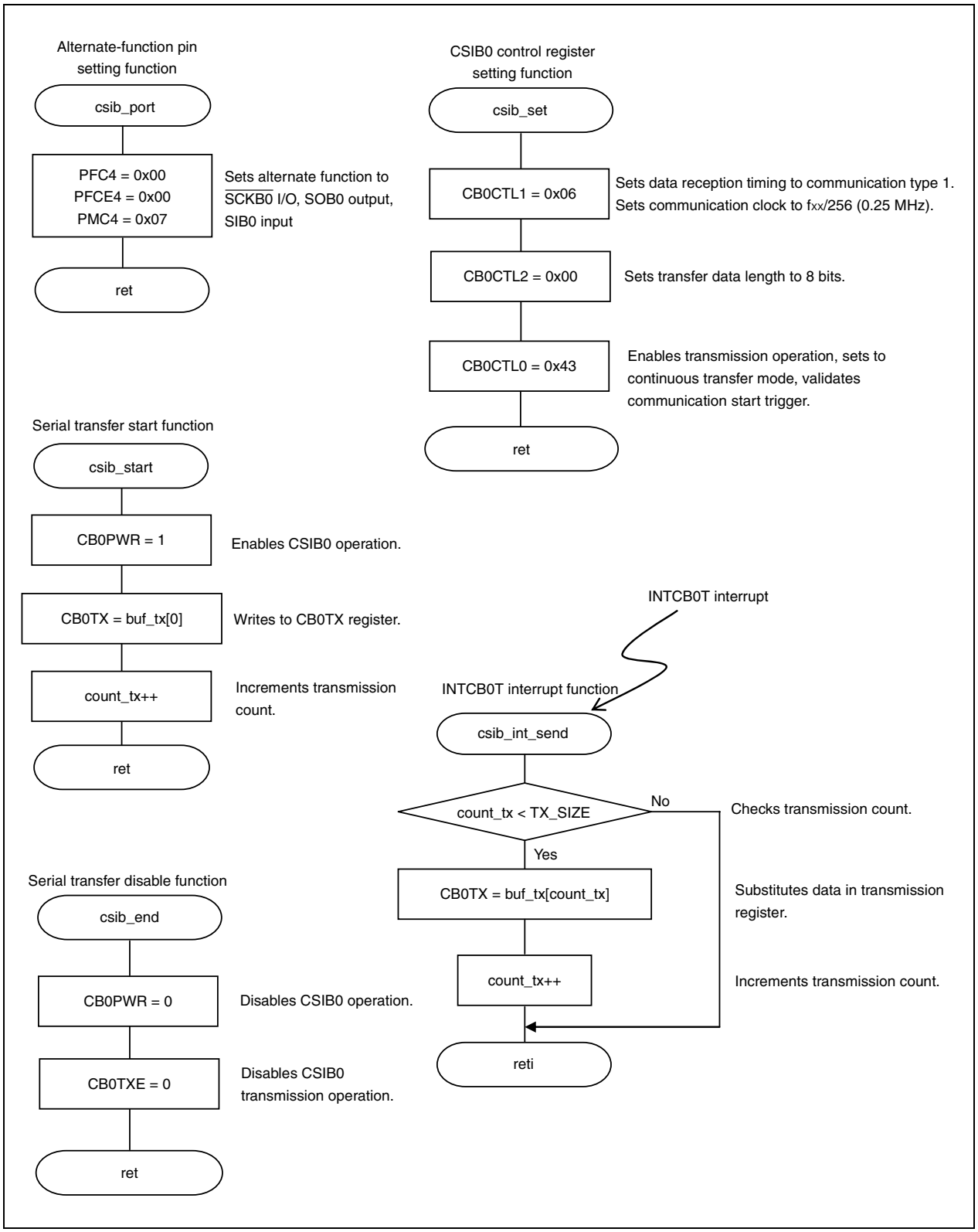


Figure 1-1. Continuous Transfer Mode (Master Mode, Transmission Mode) (2/2)



1.2 Continuous Transfer Mode (Master Mode, Reception Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs data reception for ten times in continuous transfer mode. Validates communication start trigger and sets communication clock to fxx/256, and transfer data length to 8 bits.
[Function name]	csib2_main
[Argument]	None
[Processing content]	Sets reception count (count_rx) to initial value 0. Starts reception after calling each setting function.
[SFRs used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.) CB0STR.CB0TSF Communication status flag
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[Interrupts]	csib_int_receive, csib_error
[Interrupt sources]	INTCB0R, INTCB0RE
[File name]	csib2.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib2.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to f_{XX}/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x23 (Enables CSIB0 reception operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib2.c
[Caution]	CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and performs dummy read on receive data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0RX Receive data register
[call function]	None
[Variable]	unsigned char buf_rx[ ]: Receive data storing buffer
[File name]	csib2.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.)
[call function]	None
[Variable]	None
[File name]	csib2.c
[Caution]	None

Interrupt functions

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFRs used]	CB0RX	Receive data register
	CB0CTL0.CB0SCE:	0 (Invalidates communication start trigger.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib2.c	
[Caution]	None	

[Function name]	csib_error	
[Servicing content]	Clears reception error flag.	
[SFRs used]	CB0RX	Receive data register
	CB0STR.CB0OVE:	0 (Clears overrun error flag.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib2.c	
[Caution]	None	

Figure 1-2. Continuous Transfer Mode (Master Mode, Reception Mode) (1/2)

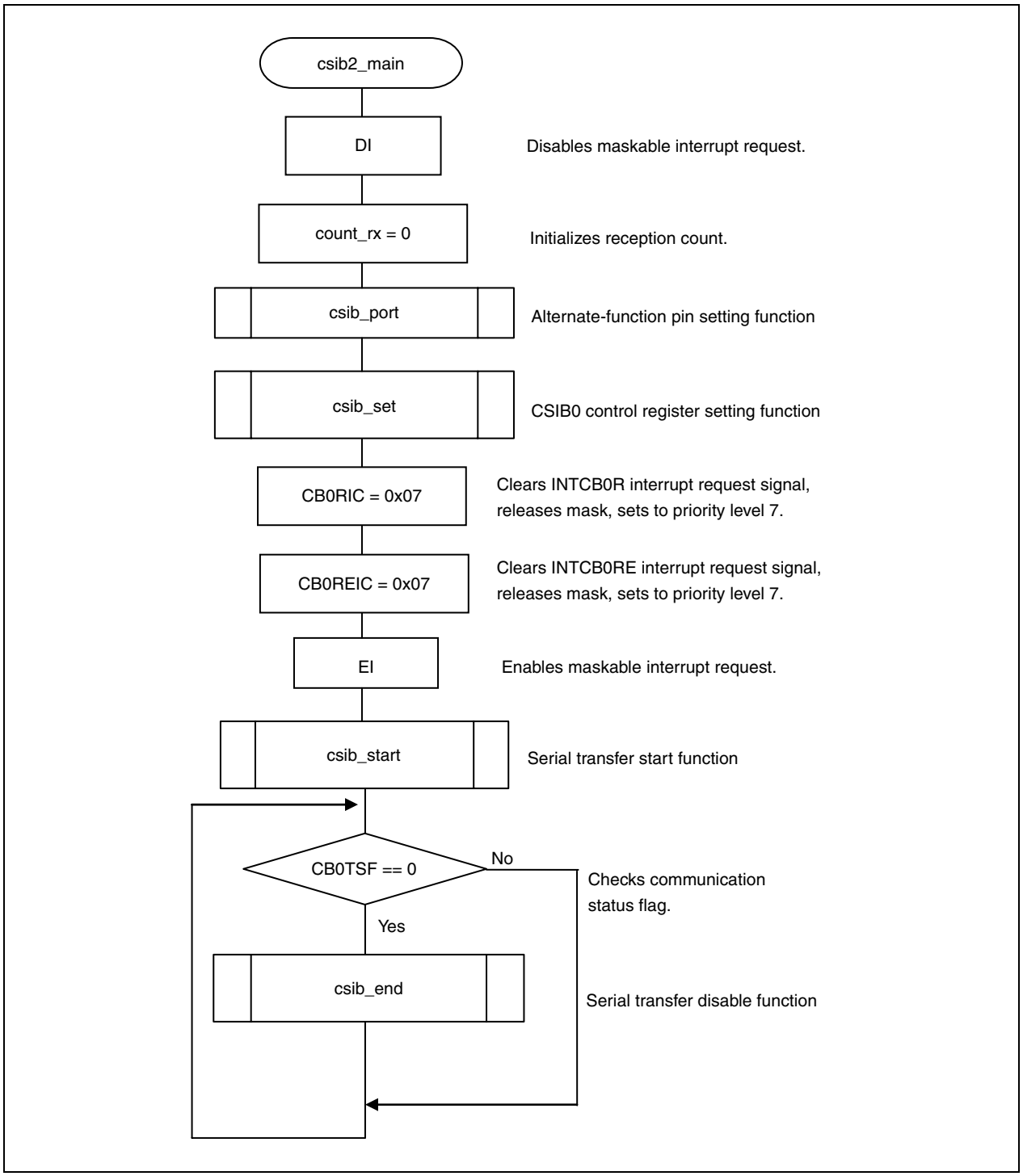
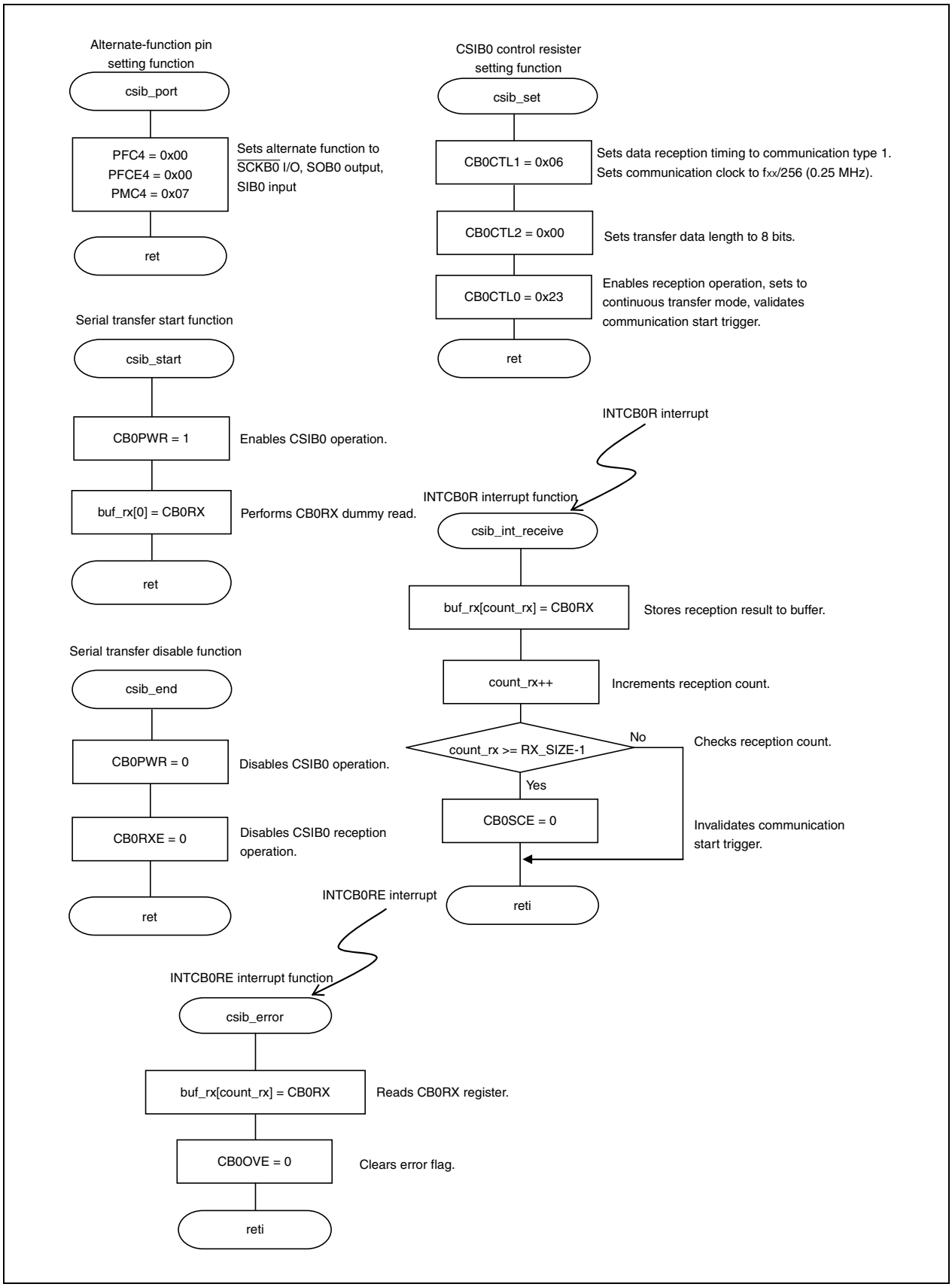


Figure 1-2. Continuous Transfer Mode (Master Mode, Reception Mode) (2/2)



1.3 Continuous Transfer Mode (Master Mode, Transmission/Reception Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs transmission/reception for ten times each in continuous transfer mode. Validates communication start trigger and sets communication clock to fxx/256, and transfer data length to 8 bits.
[Function name]	csib3_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Sets reception count (count_rx) to initial value 0 and starts transmission/reception after calling each setting function.
[SFRs used]	CB0REIC: 0x07 (Enables CSIB0 reception error interrupt (INTCB0RE) servicing.) CB0RIC: 0x07 (Enables CSIB0 reception end interrupt (INTCB0R) servicing.) CB0TIC: 0x07 (Enables CSIB0 transmission enable interrupt (INTCB0T) servicing.) CB0STR.CB0TSF Communication status flag
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_tx: Transmission count variable volatile unsigned char count_rx: Reception count variable unsigned char count: Transmit data generating variable
[Interrupts]	csib_error, csib_int_send, csib_int_receive
[Interrupt sources]	INTCB0RE, INTCB0R, INTCB0T
[File name]	csib3.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib3.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to fxx/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x63 (Enables CSIB0 transmission/reception operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib3.c
[Caution]	CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib3.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission/reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib3.c
[Caution]	None

Interrupt functions

[Function name]	csib_error
[Servicing content]	Clears reception error flag.
[SFRs used]	CB0RX Receive data register CB0STR.CB0OVE: 0 (Clears overrun error flag.)
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib3.c
[Caution]	None

[Function name]	csib_int_send
[Servicing content]	Sets new data for transmitting next data.
[SFR used]	CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib3.c
[Caution]	None

[Function name]	csib_int_receive
[Servicing content]	Stores receive data to buffer.
[SFR used]	CB0RX Receive data register
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib3.c
[Caution]	None

Figure 1-3. Continuous Transfer Mode (Master Mode, Transmission/Reception Mode) (1/3)

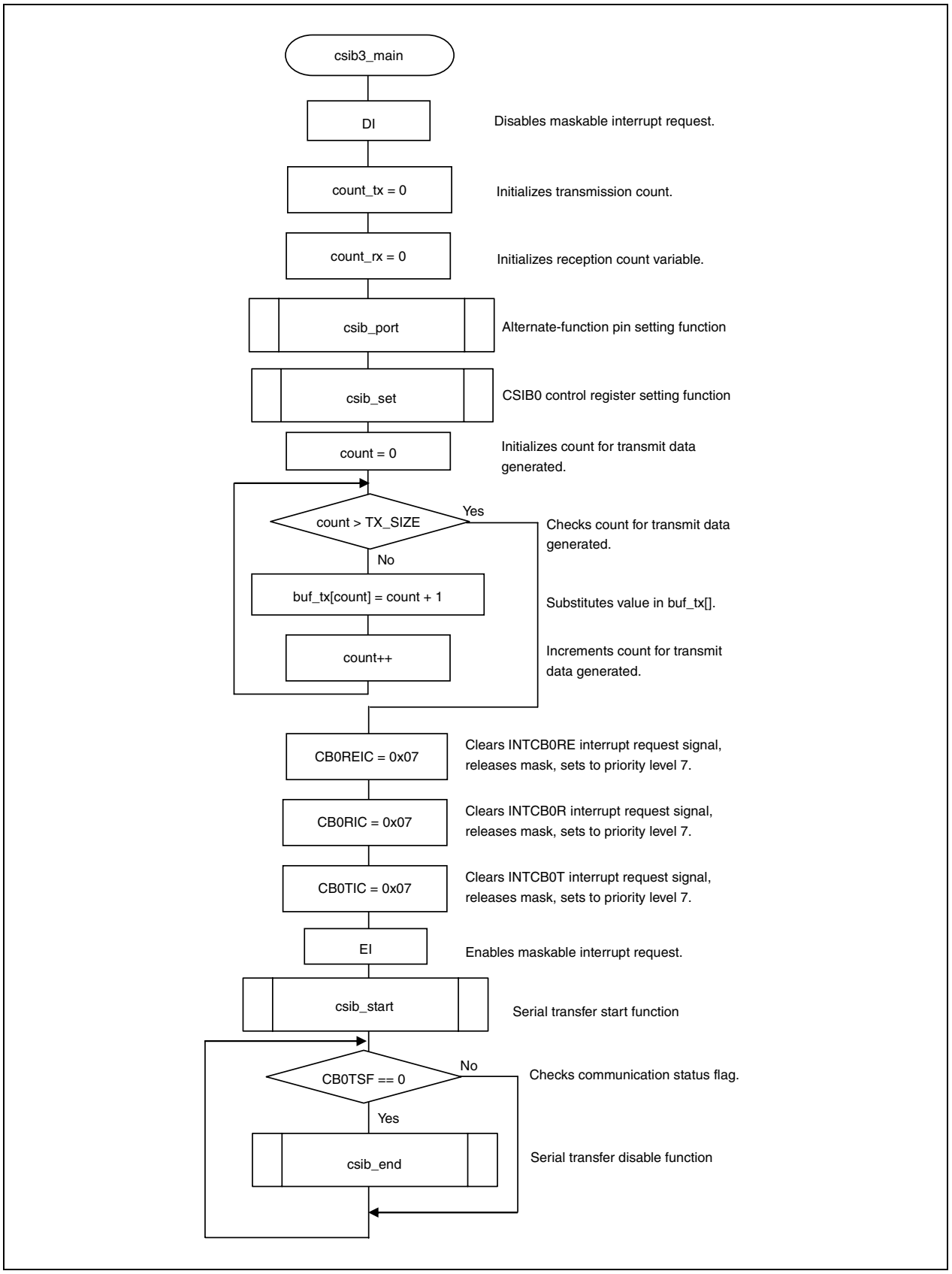


Figure 1-3. Continuous Transfer Mode (Master Mode, Transmission/Reception Mode) (2/3)

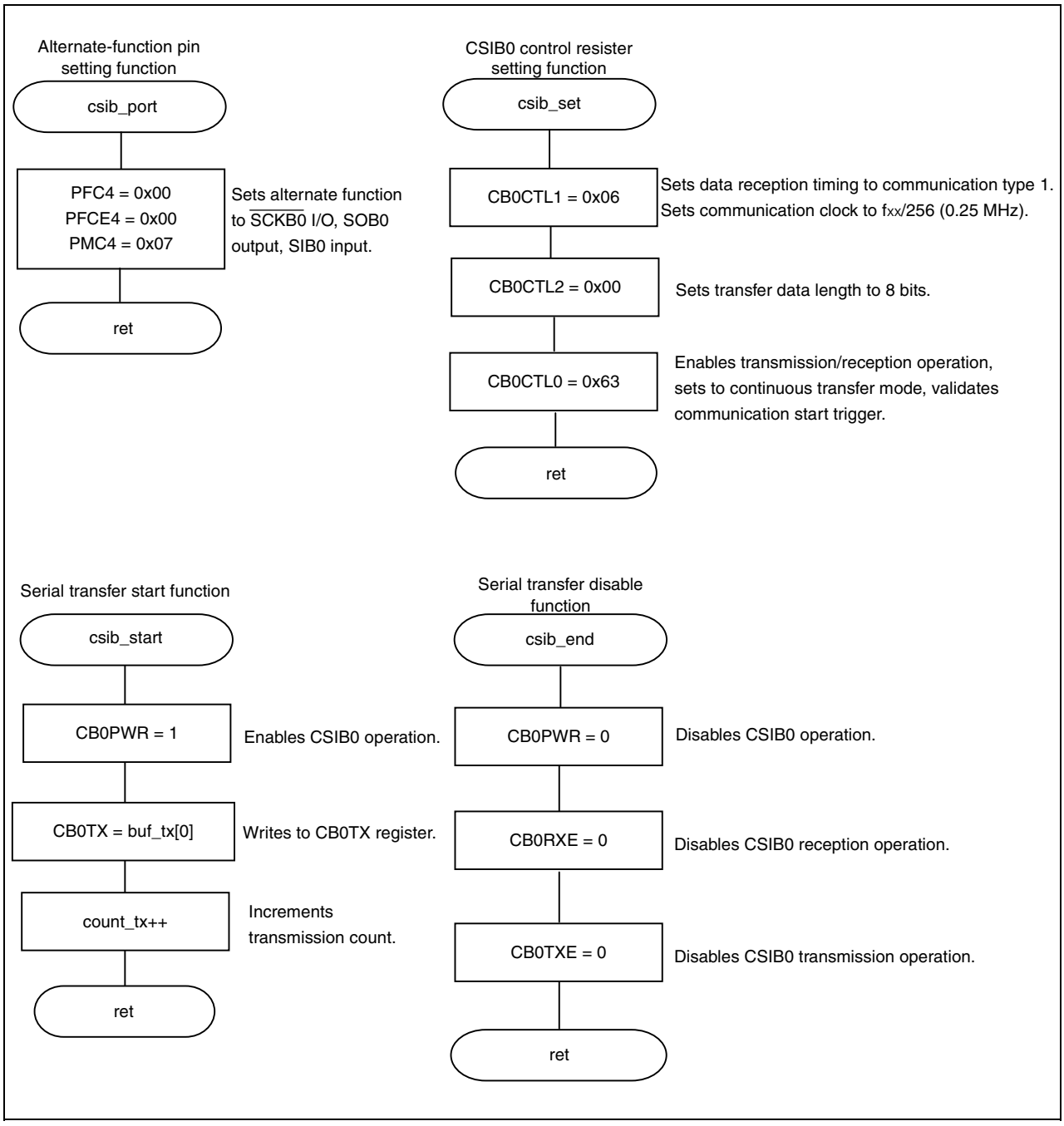
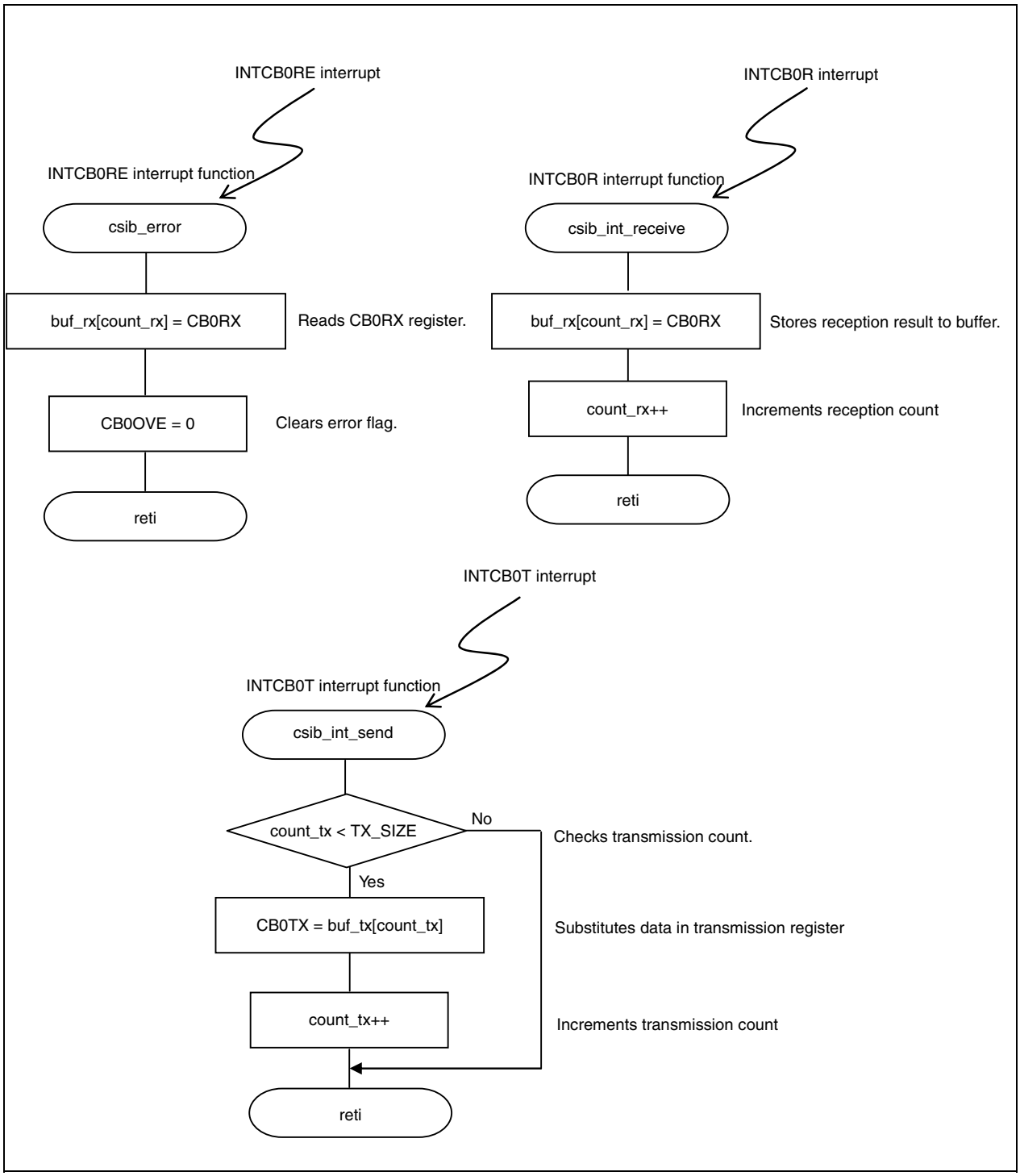


Figure 1-3. Continuous Transfer Mode (Master Mode, Transmission/Reception Mode) (3/3)



1.4 Continuous Transfer Mode (Slave Mode, Transmission Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs transmission for ten times in continuous transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib4_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Starts transmission after calling each setting function.
[SFRs used]	CB0TIC: 0x07 (Clears CSIB0 transmission enable interrupt request signal (INTCB0T), releases mask, sets to priority level 7.) CB0STR.CB0TSF Communication status flag
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable unsigned char count: Transfer data generating variable
[Interrupt]	csib_int_send
[Interrupt source]	INTCB0T
[File name]	csib4.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib4.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x43 (Enables CSIB0 transmission operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib4.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib4.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib4.c
[Caution]	None

Interrupt function

[Function name]	csib_int_send	
[Servicing content]	Sets new data for transmitting next data.	
[SFR used]	CB0TX	Transmit data register
[call function]	None	
[Variables]	unsigned char buf_tx[ ]:	Transmit data storing buffer
	volatile unsigned char count_tx:	Transmission count variable
[File name]	csib4.c	
[Caution]	None	

Figure 1-4. Continuous Transfer Mode (Slave Mode, Transmission Mode) (1/2)

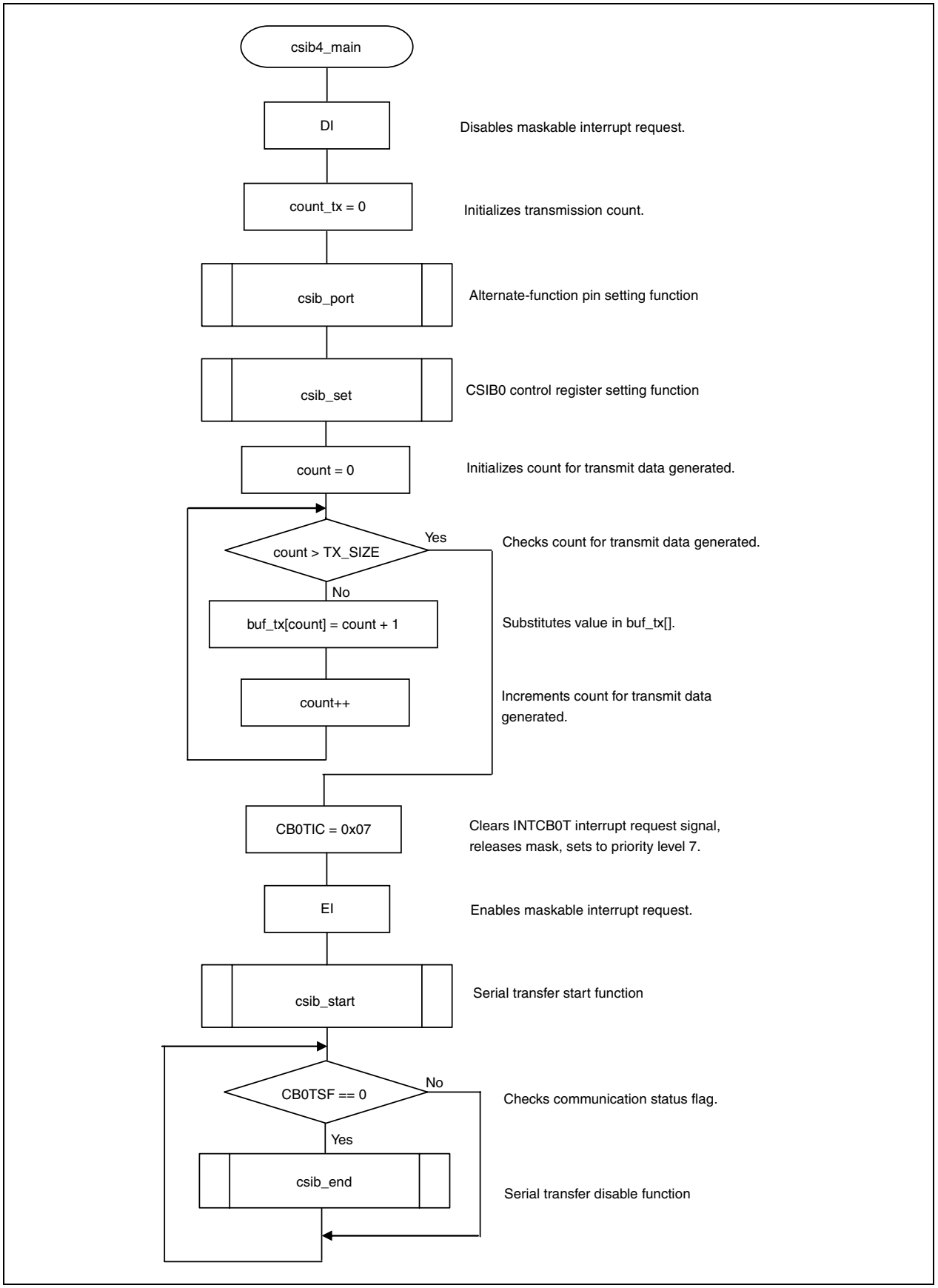
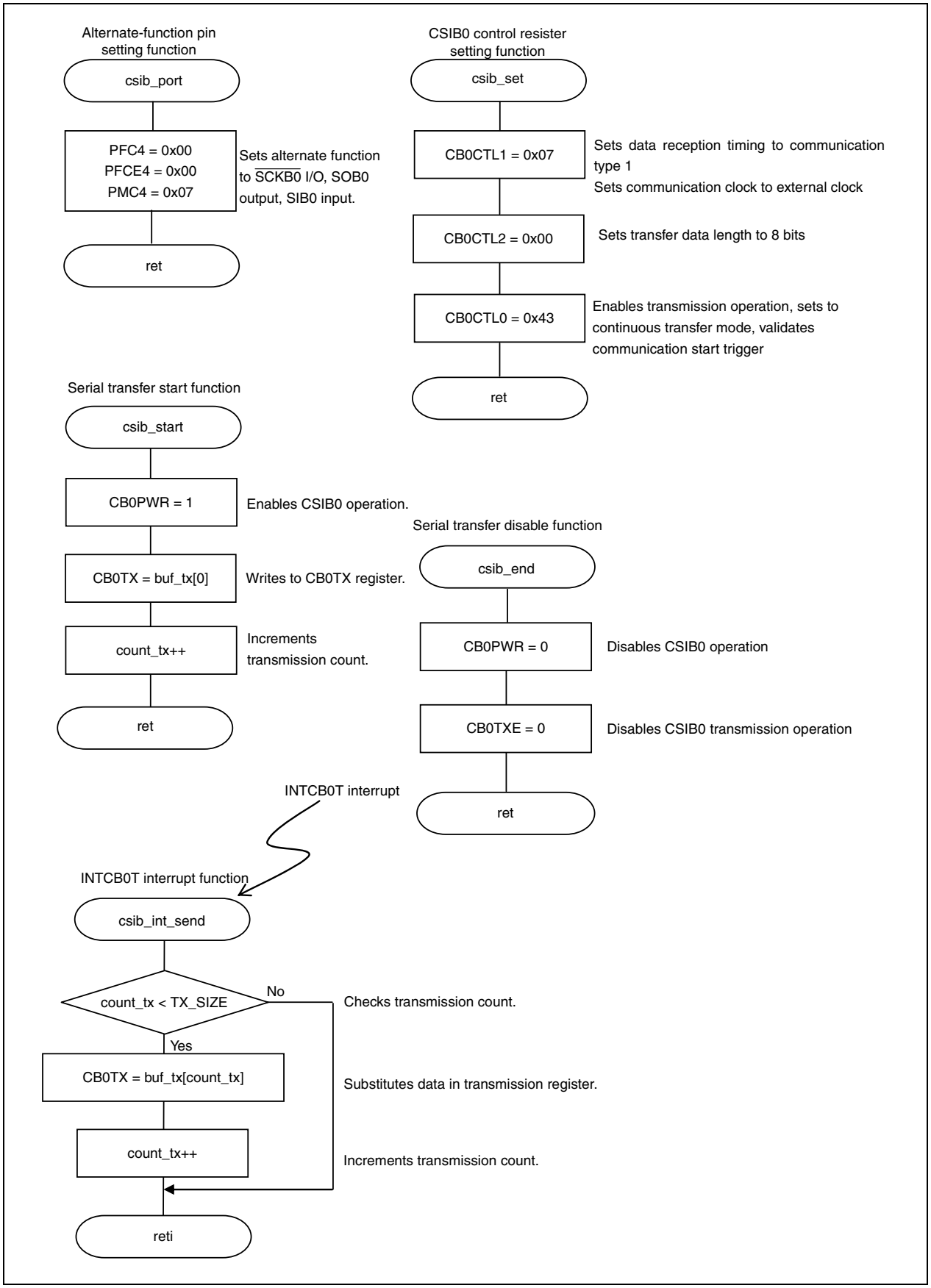


Figure 1-4. Continuous Transfer Mode (Slave Mode, Transmission Mode) (2/2)



1.5 Continuous Transfer Mode (Slave Mode, Reception Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs reception for ten times in continuous transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib5_main
[Argument]	None
[Processing content]	Sets reception count (count_rx) to initial value 0. Starts reception after calling each setting function.
[SFRs used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.) CB0STR.CB0TSF Checks communication status flag
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[Interrupts]	csib_int_receive, csib_error
[Interrupt sources]	INTCB0R, INTCB0RE
[File name]	csib5.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib5.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and sets communication clock to external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x23 (Enables CSIB0 reception operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib5.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and performs dummy read on receive data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0RX Receive data register
[call function]	None
[Variable]	unsigned char buf_rx[ ]: Receive data storing buffer
[File name]	csib5.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.)
[call function]	None
[Variable]	None
[File name]	csib5.c
[Caution]	None

Interrupt functions

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFRs used]	CB0RX	Receive data register
	CB0CTL0.CB0SCE:	0 (Invalidates communication start trigger.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib5.c	
[Caution]	None	

[Function name]	csib_error	
[Servicing content]	Clears reception error flag.	
[SFRs used]	CB0RX	Receive data register
	CB0STR.CB0OVE:	0 (Clears overrun error flag.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib5.c	
[Caution]	None	

Figure 1-5. Continuous Transfer Mode (Slave Mode, Reception Mode) (1/3)

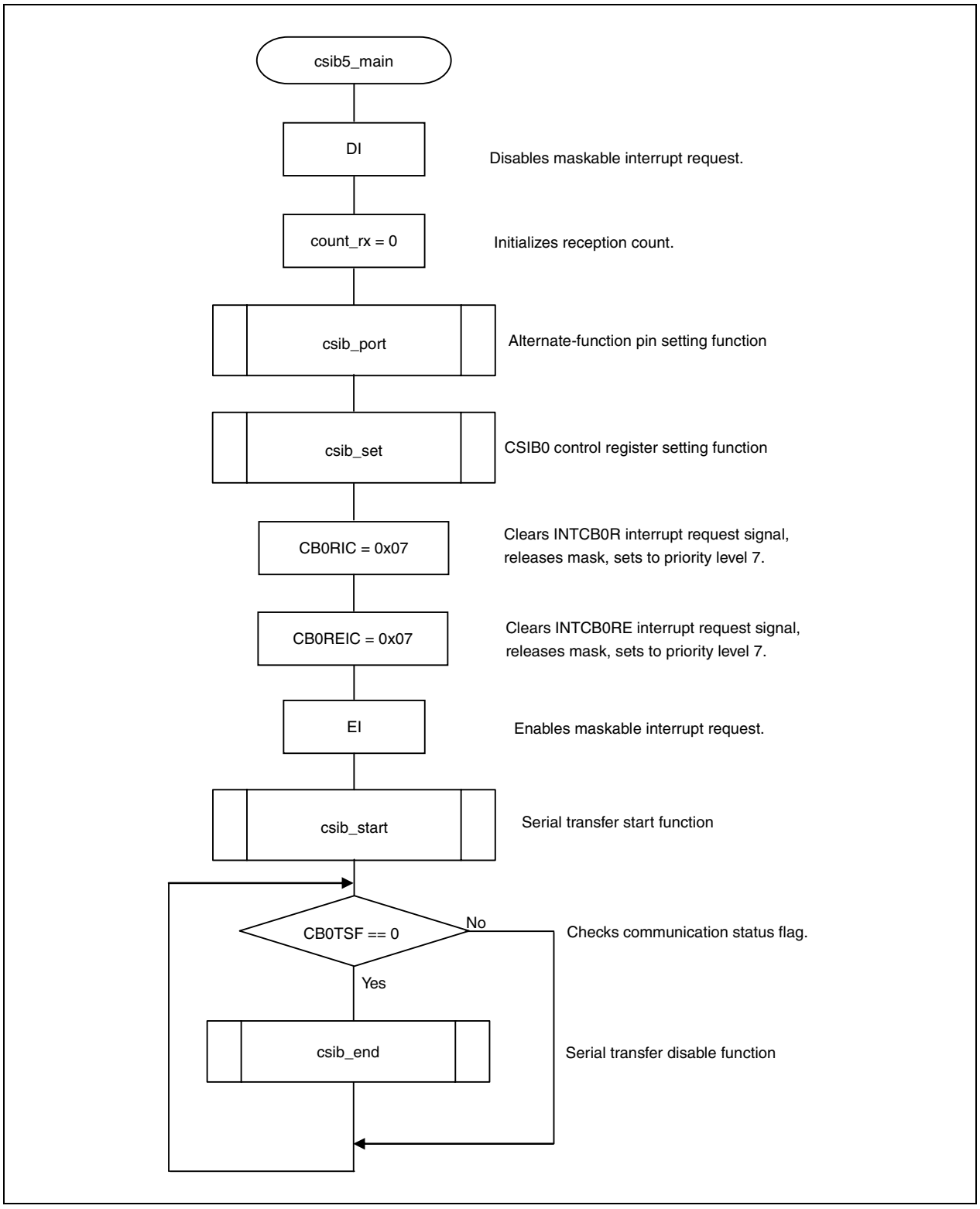


Figure 1-5. Continuous Transfer Mode (Slave Mode, Reception Mode) (2/3)

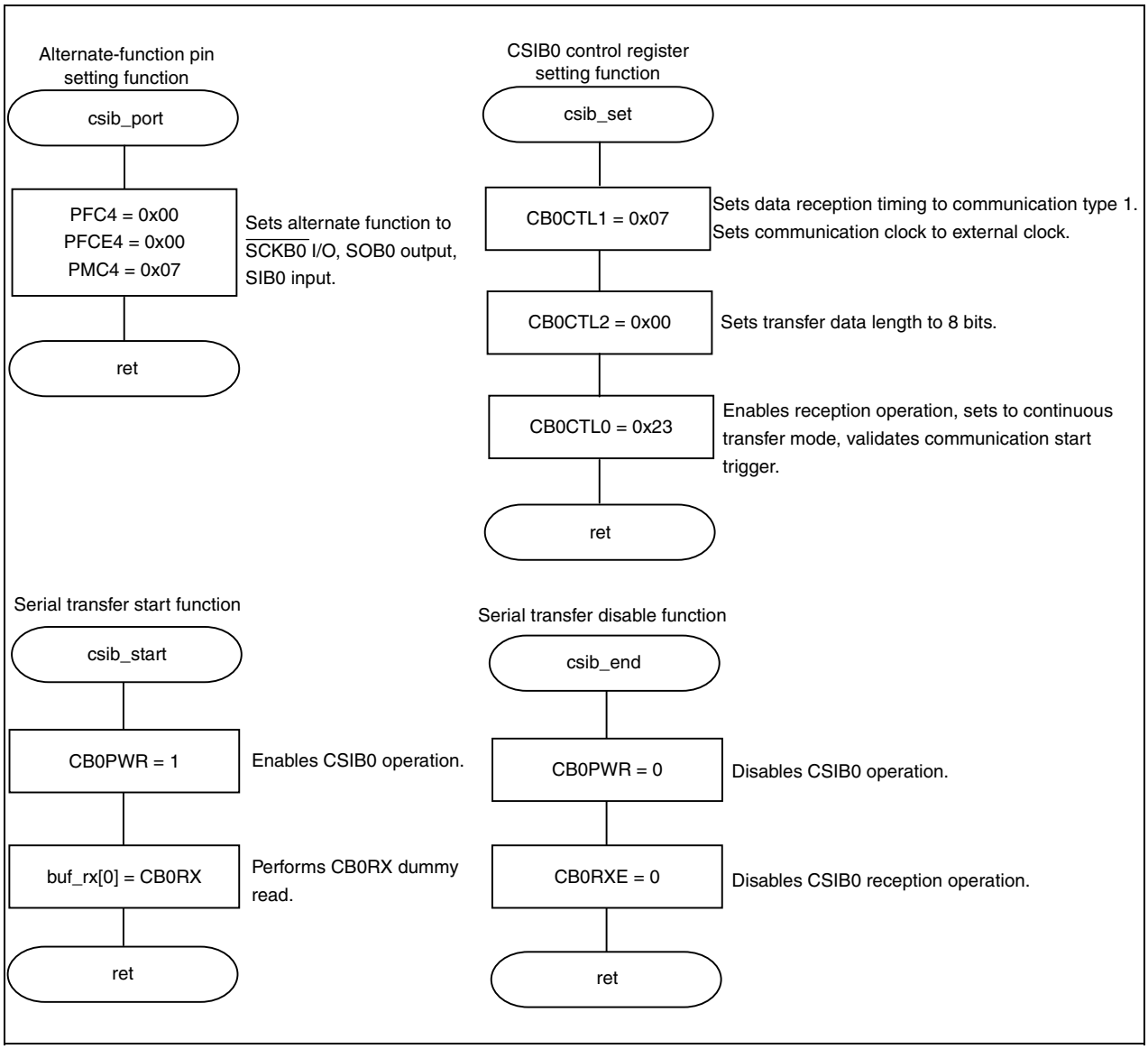
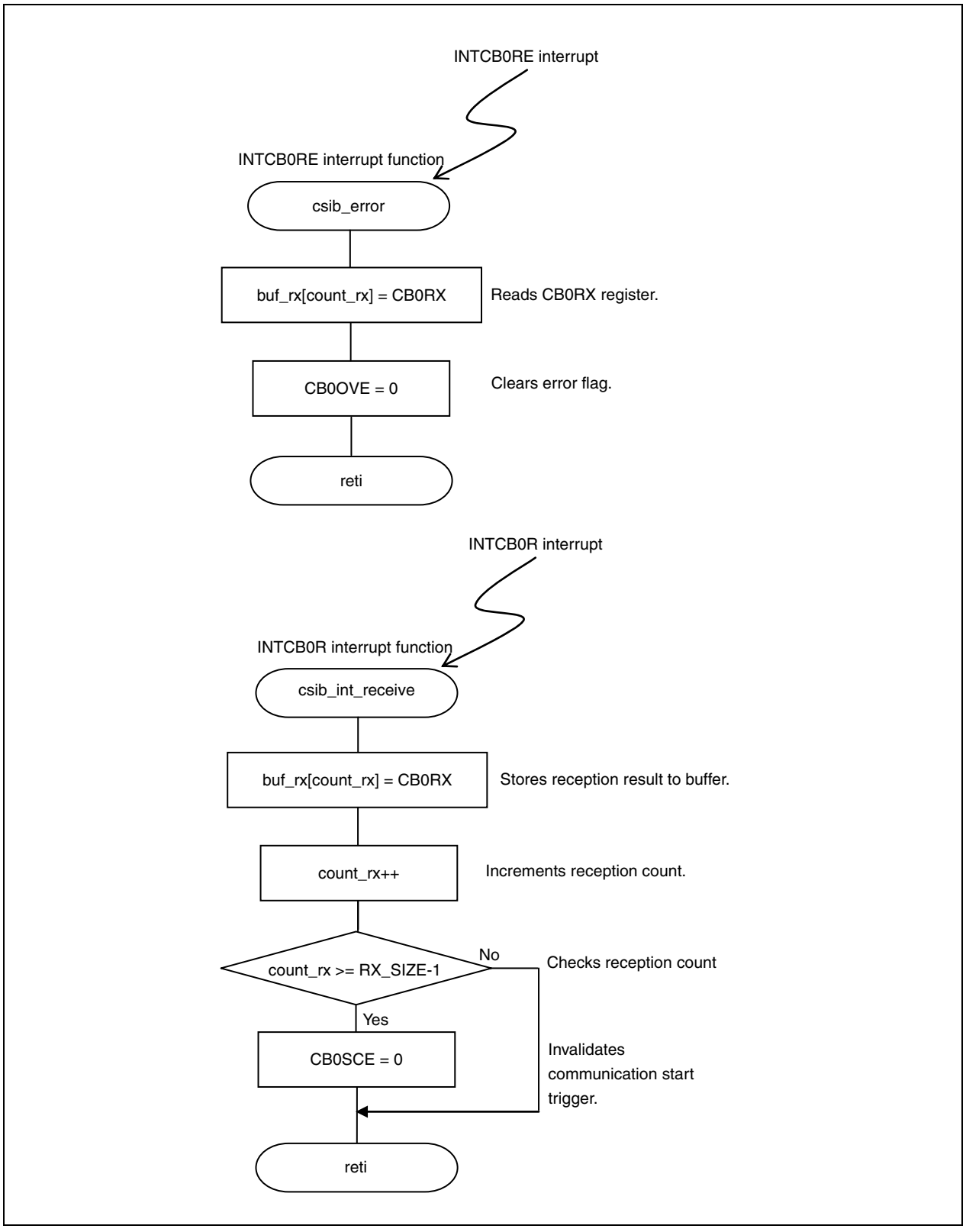


Figure 1-5. Continuous Transfer Mode (Slave Mode, Reception Mode) (3/3)



1.6 Continuous Transfer Mode (Slave Mode, Transmission/Reception Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs data transmission/reception for ten times each in continuous transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib6_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Sets reception count (count_rx) to initial value 0 and starts transmission/reception after calling each setting function.
[SFRs used]	CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.) CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0TIC: 0x07 (Clears CSIB0 transmission enable interrupt request signal (INTCB0T), releases mask, sets to priority level 7.) CB0STR.CB0TSF Communication status flag
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_tx: Transmission count variable volatile unsigned char count_rx: Reception count variable unsigned char count: Transfer data generating variable
[Interrupts]	csib_error, csib_int_send, csib_int_receive
[Interrupt sources]	INTCB0RE, INTCB0T, INTCB0R
[File name]	csib6.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib6.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and sets communication clock to external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x63 (Enables CSIB0 transmission and reception operation, sets to MSB first and continuous transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib6.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib6.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission/reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib6.c
[Caution]	None

Interrupt functions

[Function name]	csib_error
[Servicing content]	Clears reception error flag.
[SFRs used]	CB0RX Receive data register CB0STR.CB0OVE: 0 (Clears overrun error flag.)
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib6.c
[Caution]	None

[Function name]	csib_int_send
[Servicing content]	Sets new data for transmitting next data.
[SFR used]	CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib6.c
[Caution]	None

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFR used]	CB0RX	Receive data register
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib6.c	
[Caution]	None	

Figure 1-6. Continuous Transfer Mode (Slave Mode, Transmission/Reception Mode) (1/3)

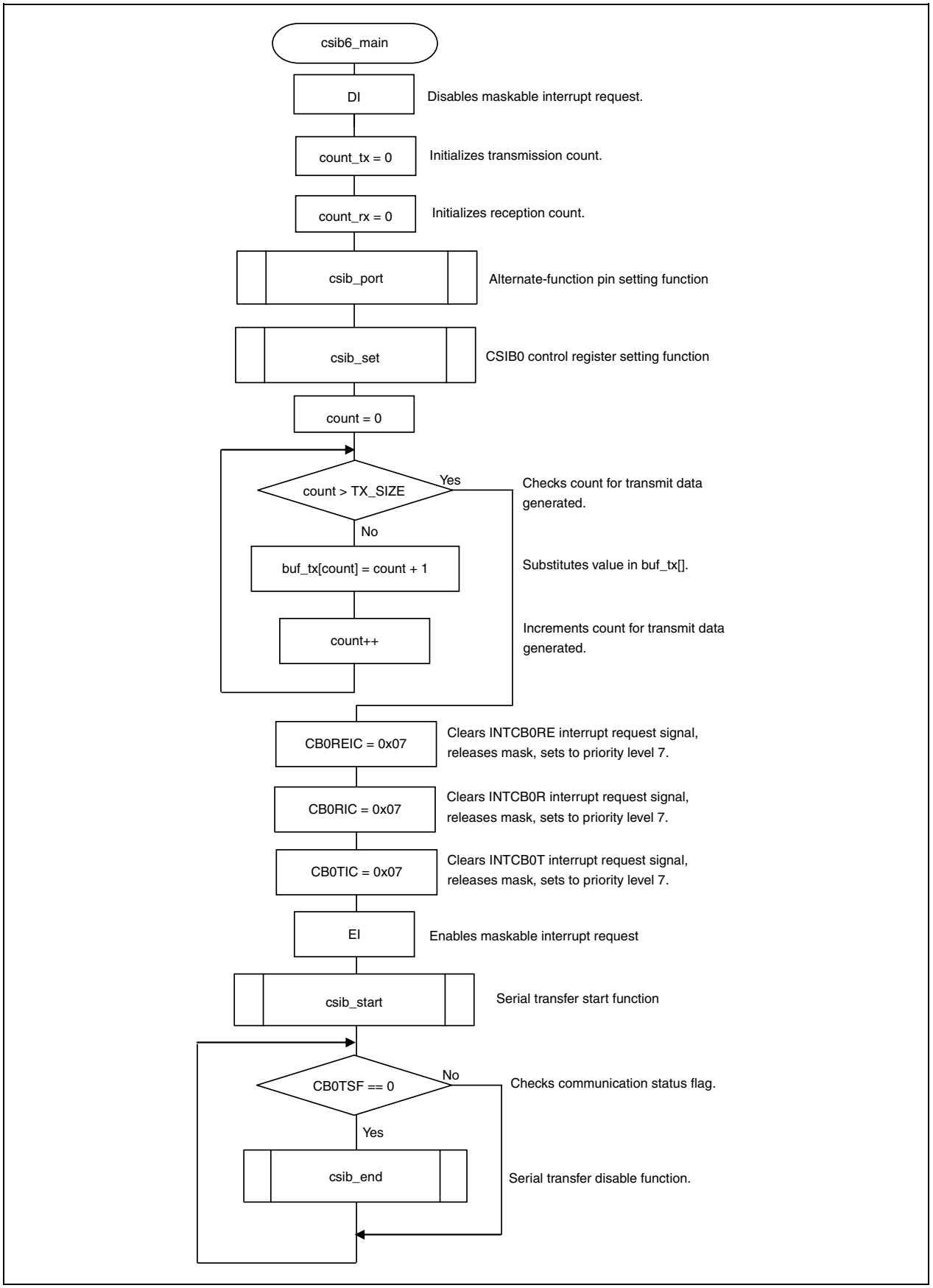


Figure 1-6. Continuous Transfer Mode (Slave Mode, Transmission/Reception Mode) (2/3)

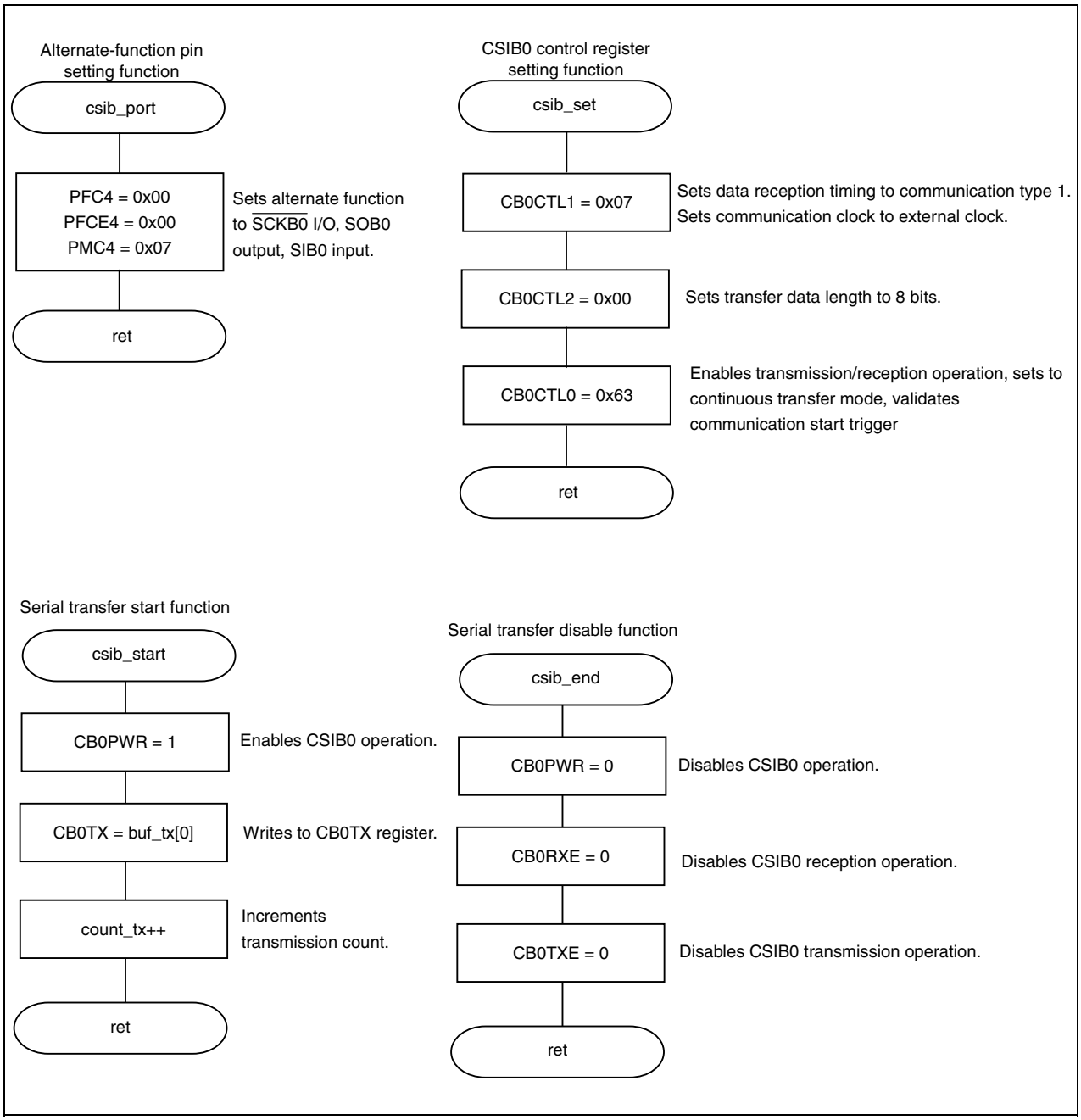
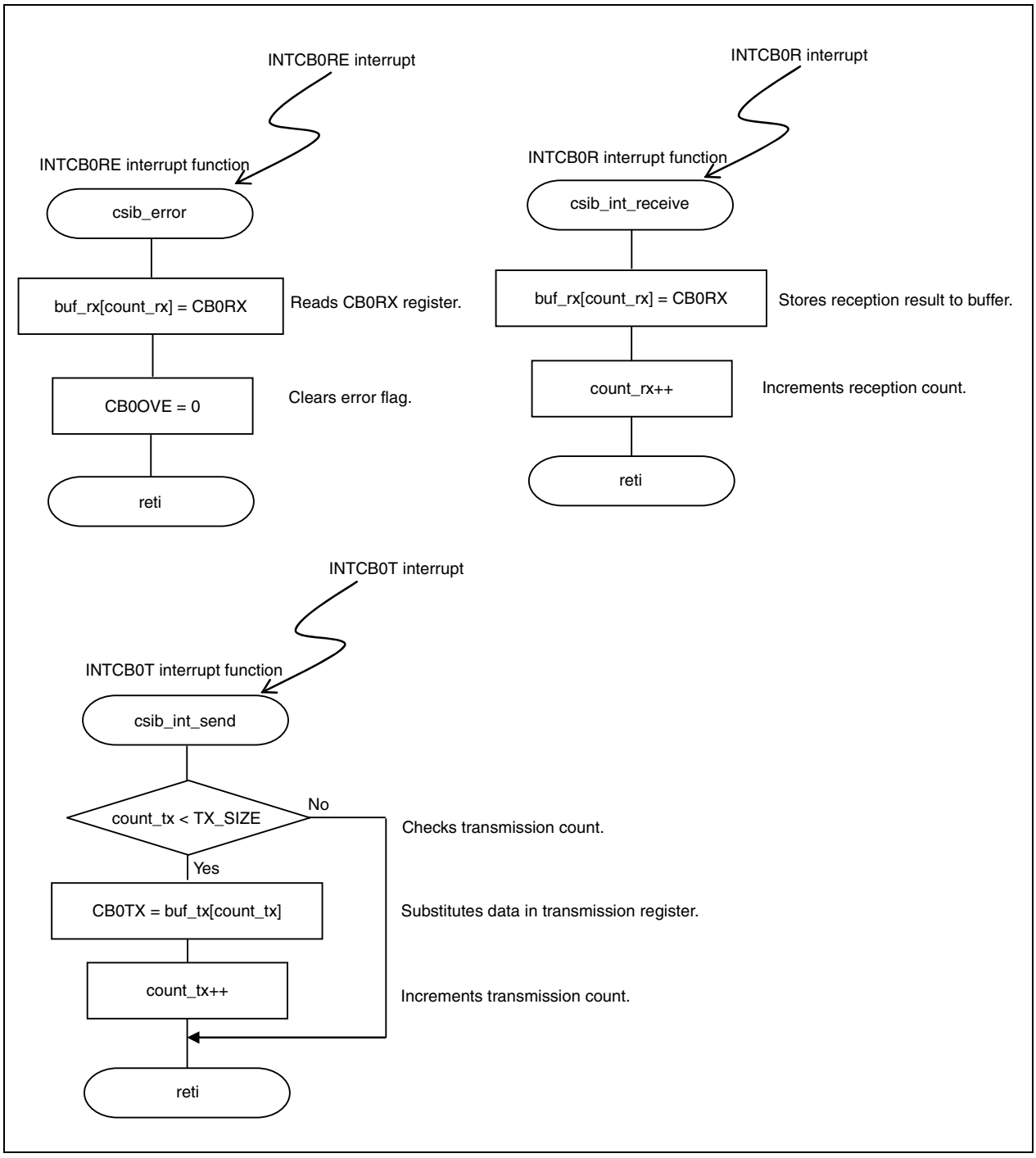


Figure 1-6. Continuous Transfer Mode (Slave Mode, Transmission/Reception Mode) (3/3)



CHAPTER 2 SINGLE TRANSFER MODE

2.1 Single Transfer Mode (Master Mode, Transmission Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs data transmission for ten times in single transfer mode. Validates communication start trigger, and sets communication clock to fxx/256 and transfer data length to 8 bits.
[Function name]	csib7_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Starts transmission after calling each setting function.
[SFR used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.)
[call function]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable unsigned char count: Transfer data generating variable
[Interrupt]	csib_int_send
[Interrupt source]	INTCB0R
[File name]	csib7.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib7.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to fxx/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x41 (Enables CSIB0 transmission operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib7.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib7.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib7.c
[Caution]	None

Interrupt function

[Function name]	csib_int_send	
[Servicing content]	Sets new data for transmitting next data.	
[SFR used]	CB0TX	Transmit data register
[call function]	None	
[Variables]	unsigned char buf_tx[ ]:	Transmit data storing buffer
	volatile unsigned char count_tx:	Transmission count variable
[File name]	csib7.c	
[Caution]	None	

Figure 2-1. Single Transfer Mode (Master Mode, Transmission Mode) (1/2)

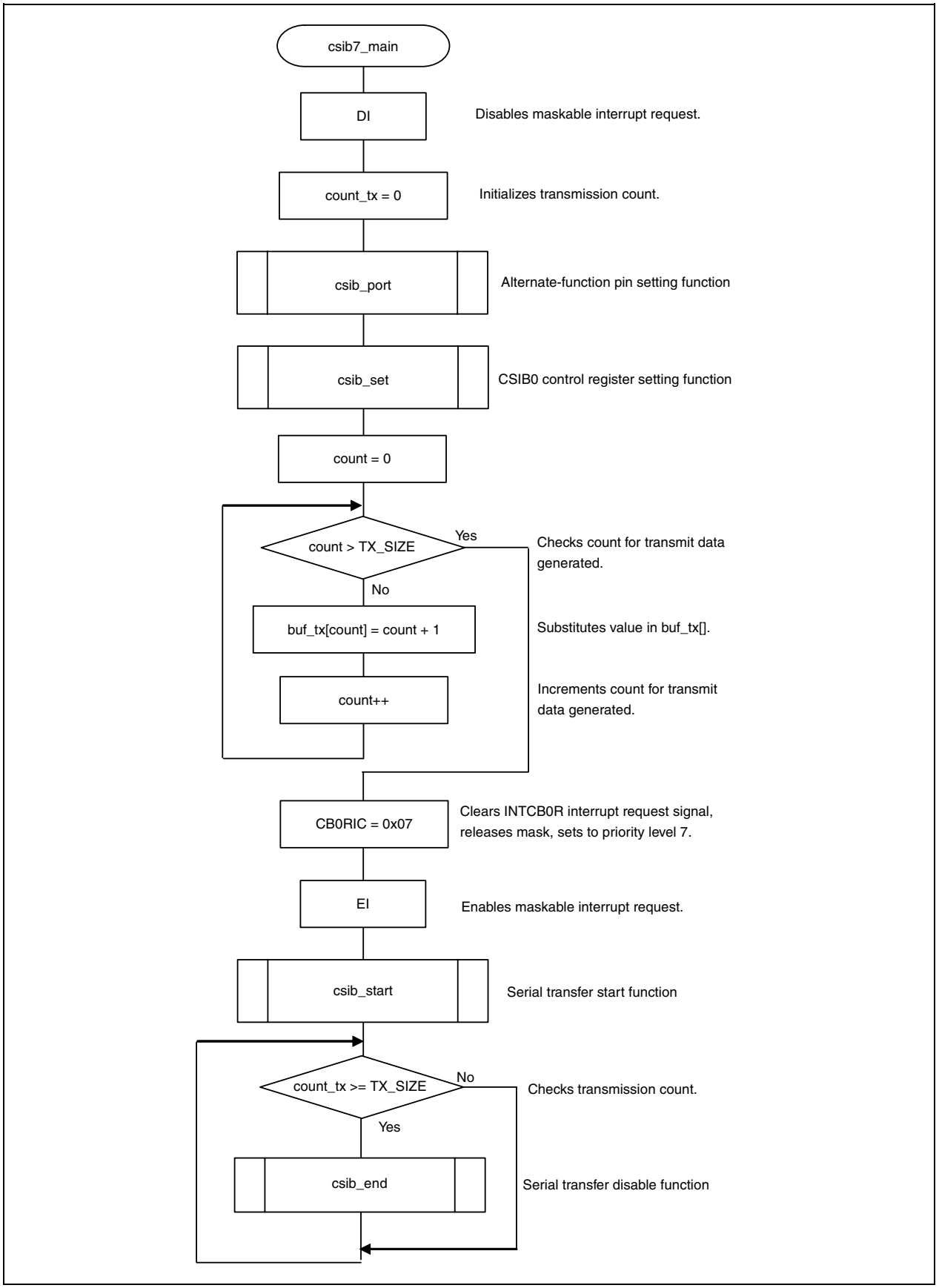
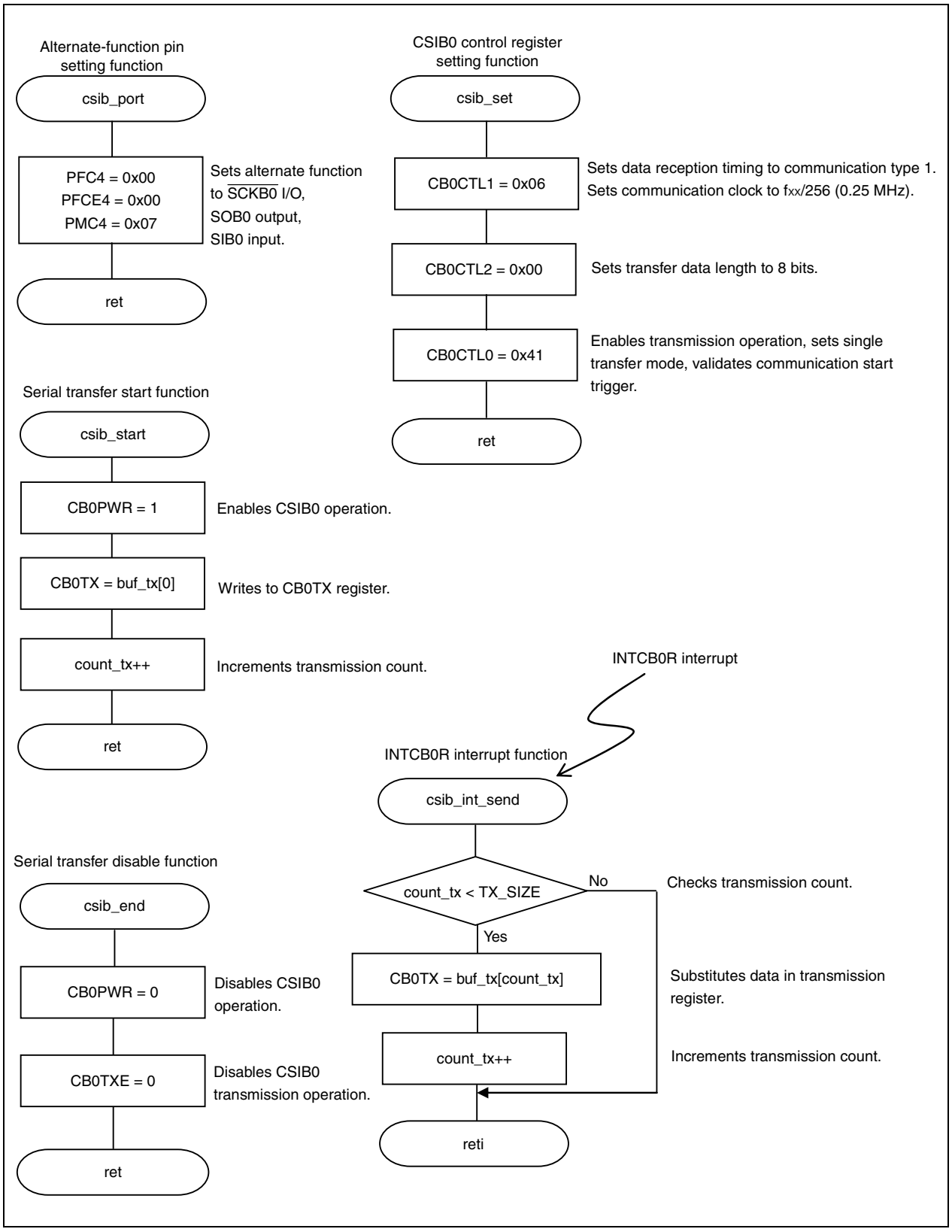


Figure 2-1. Single Transfer Mode (Master Mode, Transmission Mode) (2/2)



2.2 Single Transfer Mode (Master Mode, Reception Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs data reception for ten times in single transfer mode. Validates communication start trigger and sets communication clock to fxx/256, and transfer data length to 8 bits.
[Function name]	csib8_main
[Argument]	None
[Processing content]	Sets reception count (count_rx) to initial value 0. Starts reception after calling each setting function.
[SFRs used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.)
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[Interrupts]	csib_int_receive, csib_error
[Interrupt sources]	INTCB0R, INTCB0RE
[File name]	csib8.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib8.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to fxx/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x21 (Enables CSIB0 reception operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib8.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and performs dummy read on receive data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0RX Receive data register
[call function]	None
[Variable]	unsigned char buf_rx[ ]: Receive data storing buffer
[File name]	csib8.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.)
[call function]	None
[Variable]	None
[File name]	csib8.c
[Caution]	None

Interrupt functions

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFRs used]	CB0RX	Receive data register
	CB0CTL0.CB0SCE:	0 (Invalidates communication start trigger.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib8.c	
[Caution]	None	

[Function name]	csib_error	
[Servicing content]	Clears reception error flag.	
[SFRs used]	CB0RX	Receive data register
	CB0STR.CB0OVE:	0 (Clears overrun error flag.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib8.c	
[Caution]	None	

Figure 2-2. Single Transfer Mode (Master Mode, Reception Mode) (1/3)

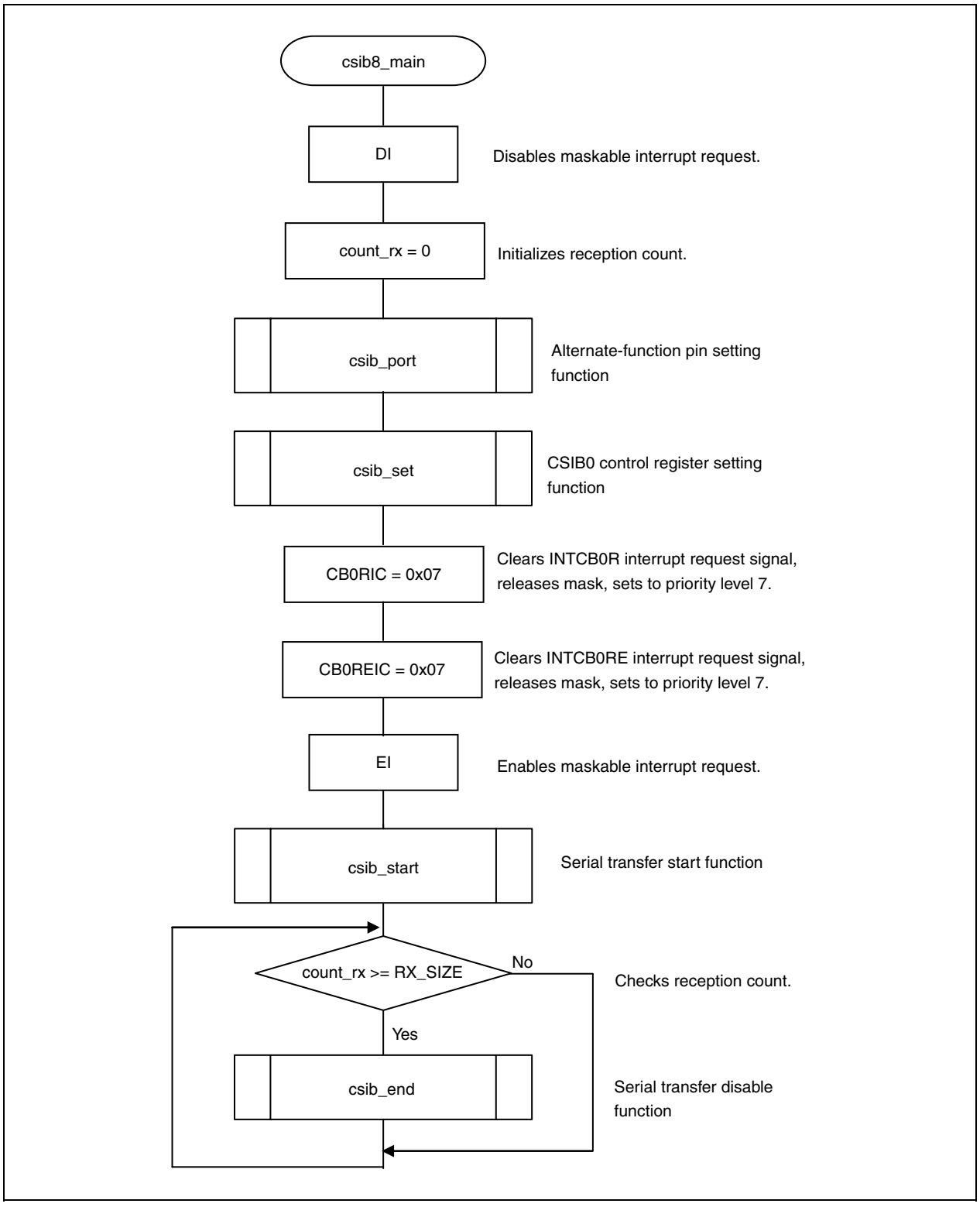


Figure 2-2. Single Transfer Mode (Master Mode, Reception Mode) (2/3)

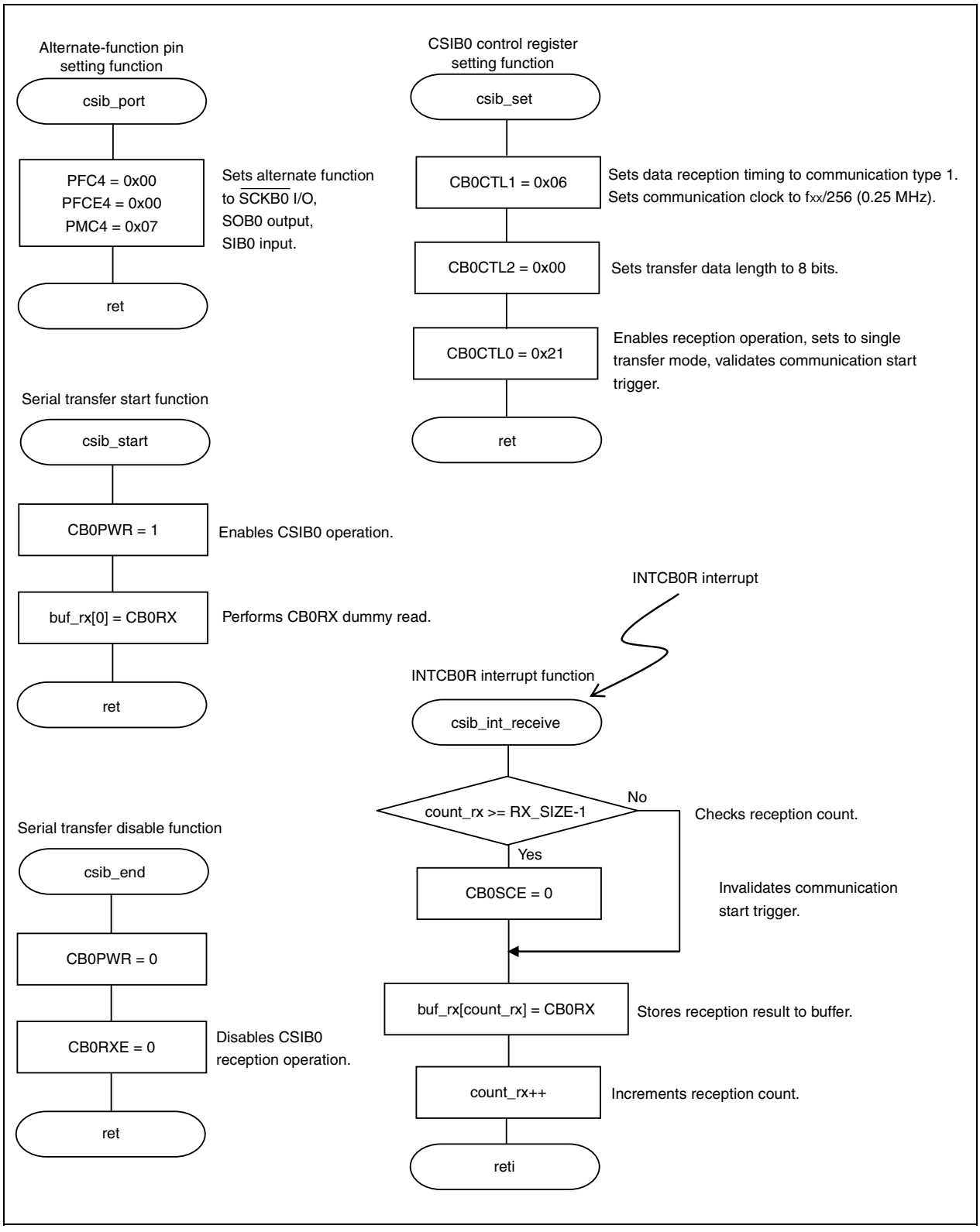
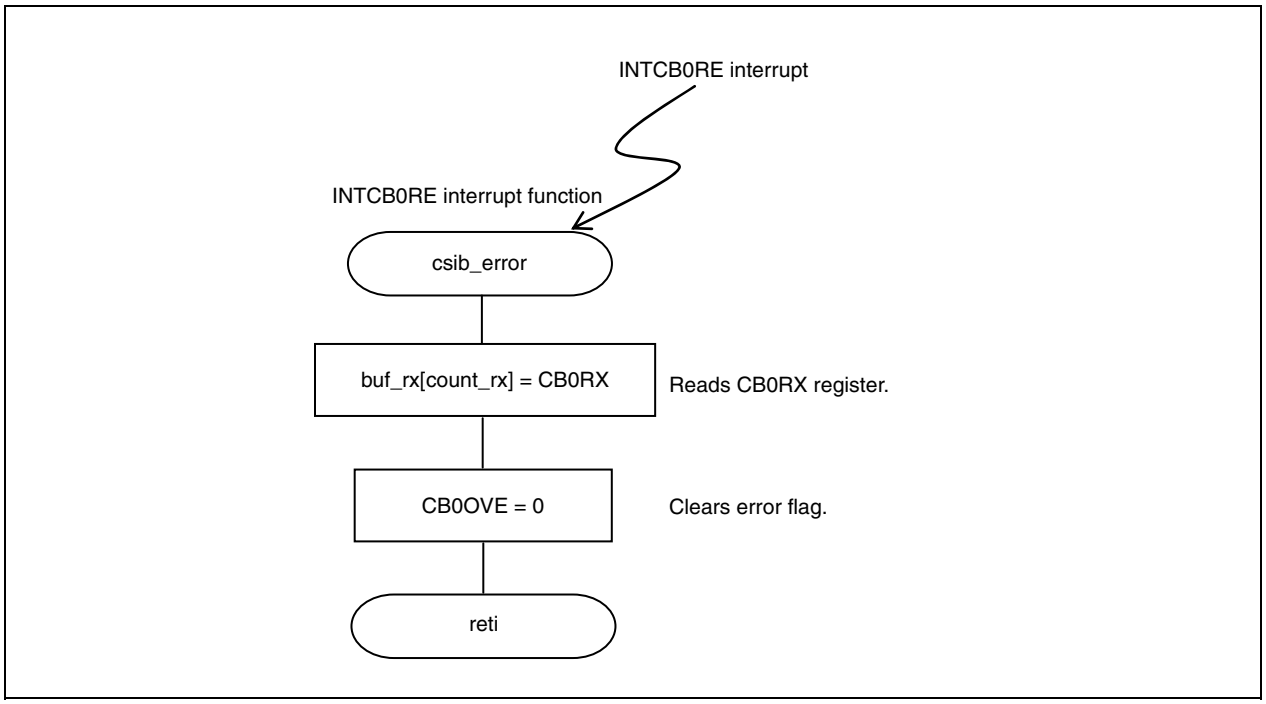


Figure 2-2. Single Transfer Mode (Master Mode, Reception Mode) (3/3)



2.3 Single Transfer Mode (Master Mode, Transmission/Reception Mode)

[Function]	Sets communication mode to master mode and transfer direction mode to MSB first, and performs transmission/reception for ten times each in single transfer mode. Validates communication start trigger and sets communication clock to fxx/256, and transfer data length to 8 bits.
[Function name]	csib9_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Sets reception count (count_rx) to initial value 0 and starts transmission/reception after calling each setting function.
[SFRs used]	CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.) CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0TIC: 0x07 (Clears CSIB0 transmission enable interrupt request signal (INTCB0T), releases mask, sets to priority level 7.)
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_tx: Transmission count variable volatile unsigned char count_rx: Reception count variable unsigned char count: Transmit data generating variable
[Interrupts]	csib_error, csib_int_send, csib_int_receive
[Interrupt sources]	INTCB0RE, INTCB0T, INTCB0R
[File name]	csib9.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib9.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x06 (Sets to communication type 1 and sets communication clock to fxx/256 (0.25 MHz).) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x61 (Enables CSIB0 transmission and reception operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib9.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib9.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission/reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib9.c
[Caution]	None

Interrupt functions

[Function name]	csib_error
[Servicing content]	Clears reception error flag.
[SFRs used]	CB0RX Transmit data register CB0STR.CB0OVE: 0 (Clears overrun error flag.)
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib9.c
[Caution]	None

[Function name]	csib_int_send
[Servicing content]	Sets new data for transmitting next data.
[SFR used]	CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib9.c
[Caution]	None

[Function name]	csib_int_receive
[Servicing content]	Stores receive data to buffer.
[SFR used]	CB0RX Receive data register
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib9.c
[Caution]	None

Figure 2-3. Single Transfer Mode (Master Mode, Transmission/Reception Mode) (1/3)

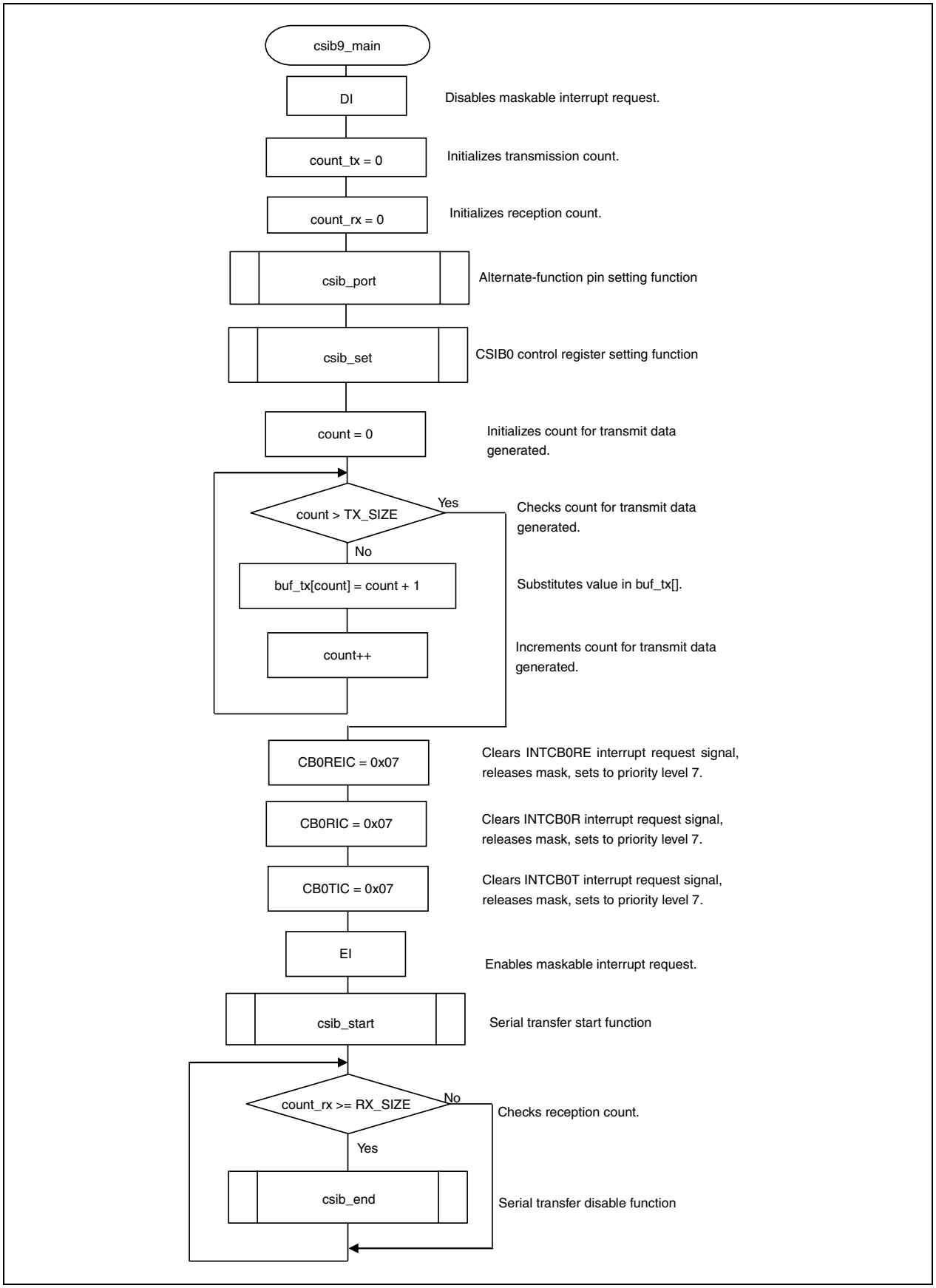


Figure 2-3. Single Transfer Mode (Master Mode, Transmission/Reception Mode) (2/3)

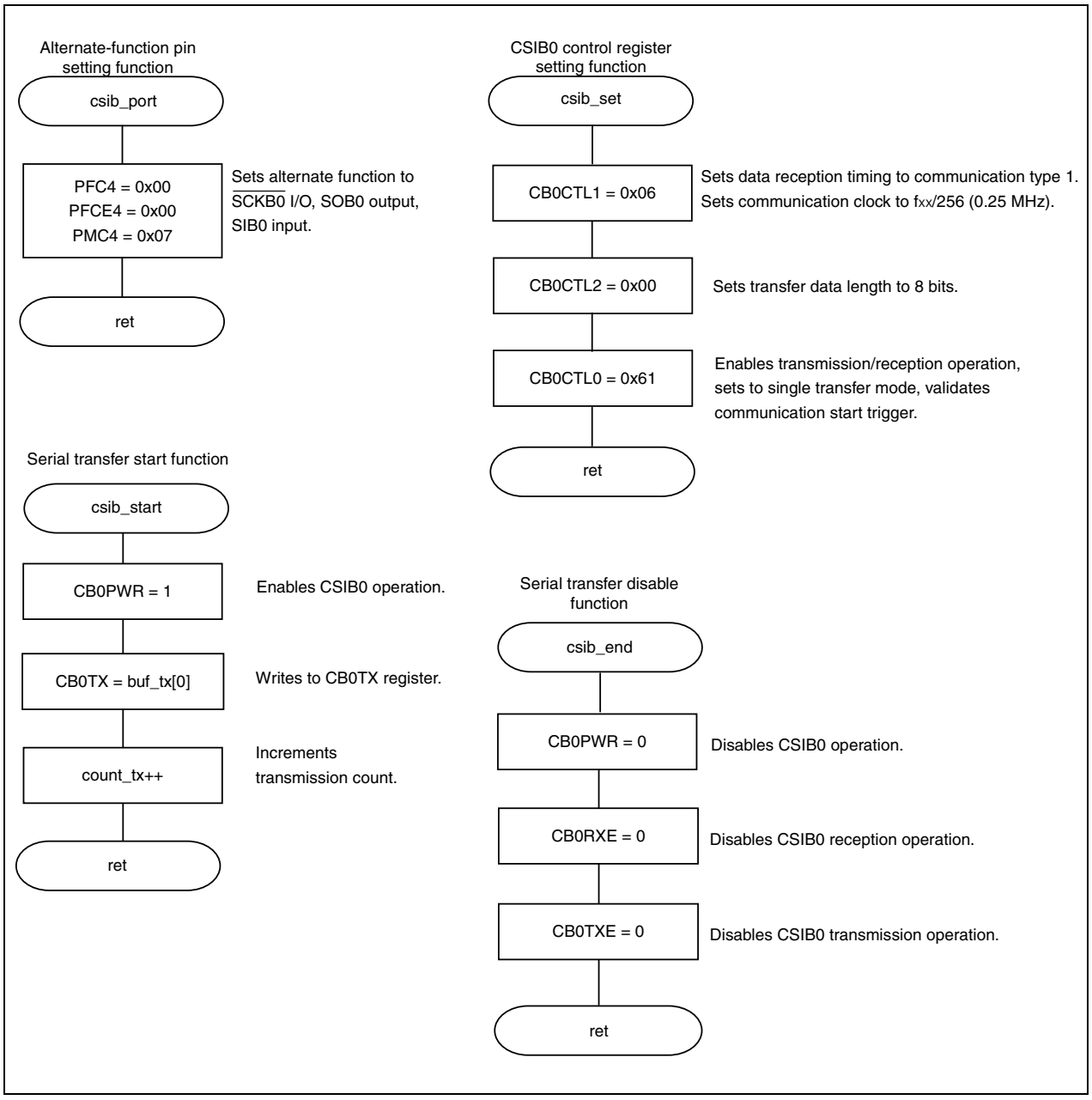
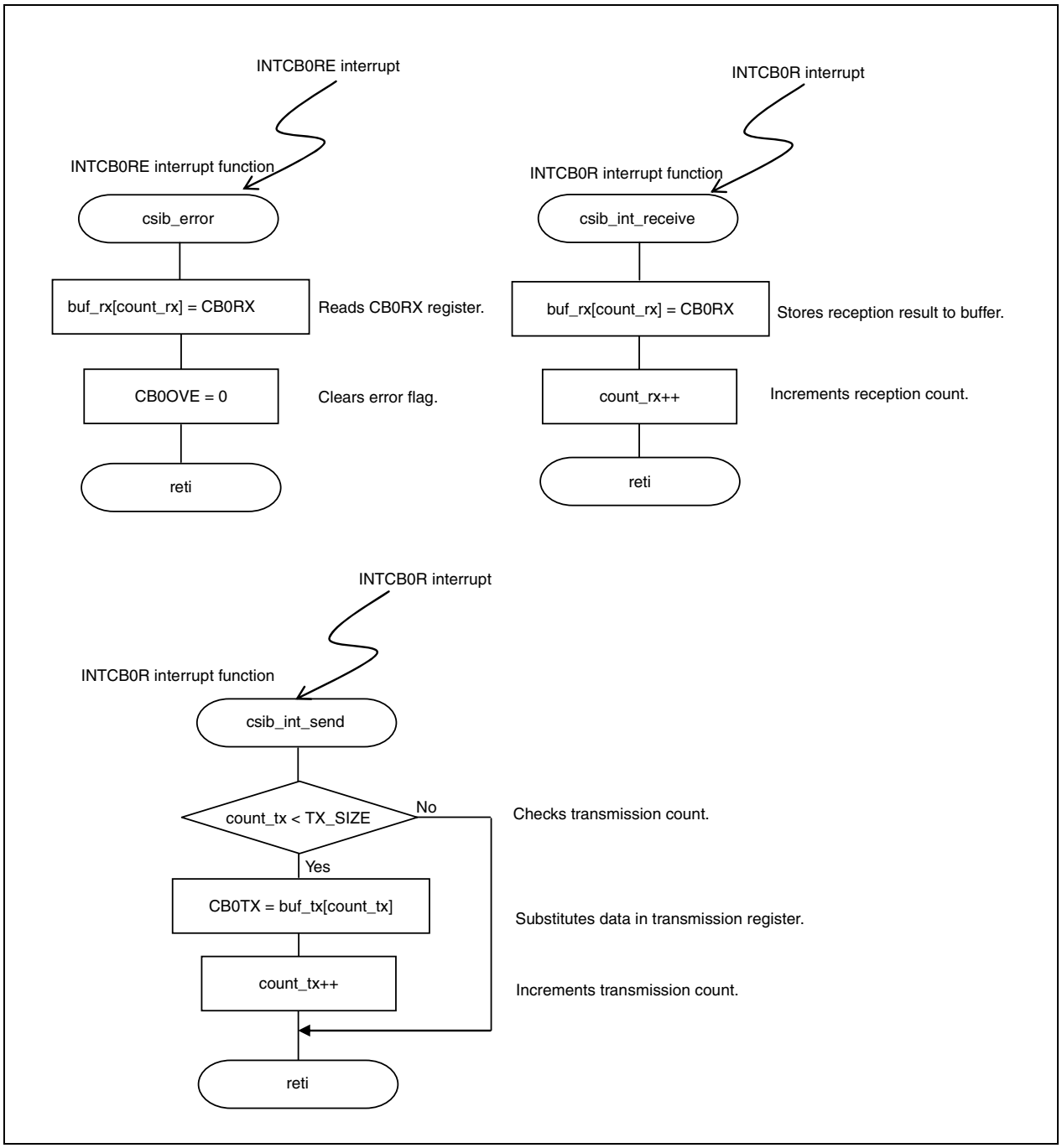


Figure 2-3. Single Transfer Mode (Master Mode, Transmission/Reception Mode) (3/3)



2.4 Single Transfer Mode (Slave Mode, Transmission Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs transmission for ten times in single transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib10_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Starts transmission after calling each setting function.
[SFR used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.)
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable unsigned char count: Transfer data generating variable
[Interrupt]	csib_int_send
[Interrupt source]	INTCB0R
[File name]	csib10.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib10.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x41 (Enables CSIB0 transmission operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib10.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and writes a value to transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib10.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib10.c
[Caution]	None

Interrupt function

[Function name]	csib_int_send	
[Servicing content]	Sets new data for transmitting next data.	
[SFR used]	CB0TX	Transmit data register
[call function]	None	
[Variables]	unsigned char buf_tx[ ]:	Transmit data storing buffer
	volatile unsigned char count_tx:	Transmission count variable
[File name]	csib10.c	
[Caution]	None	

Figure 2-4. Single Transfer Mode (Slave Mode, Transmission Mode) (1/2)

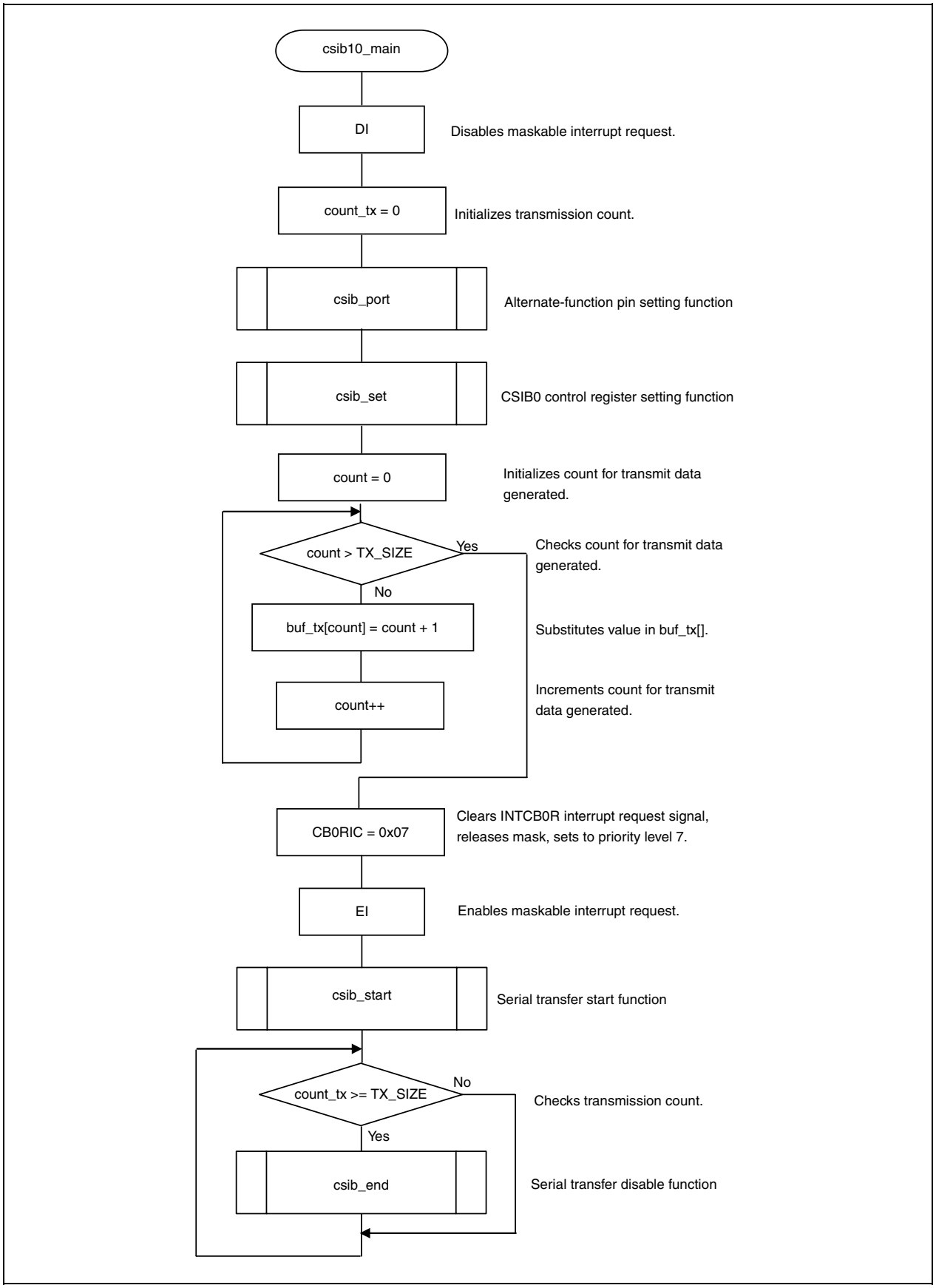
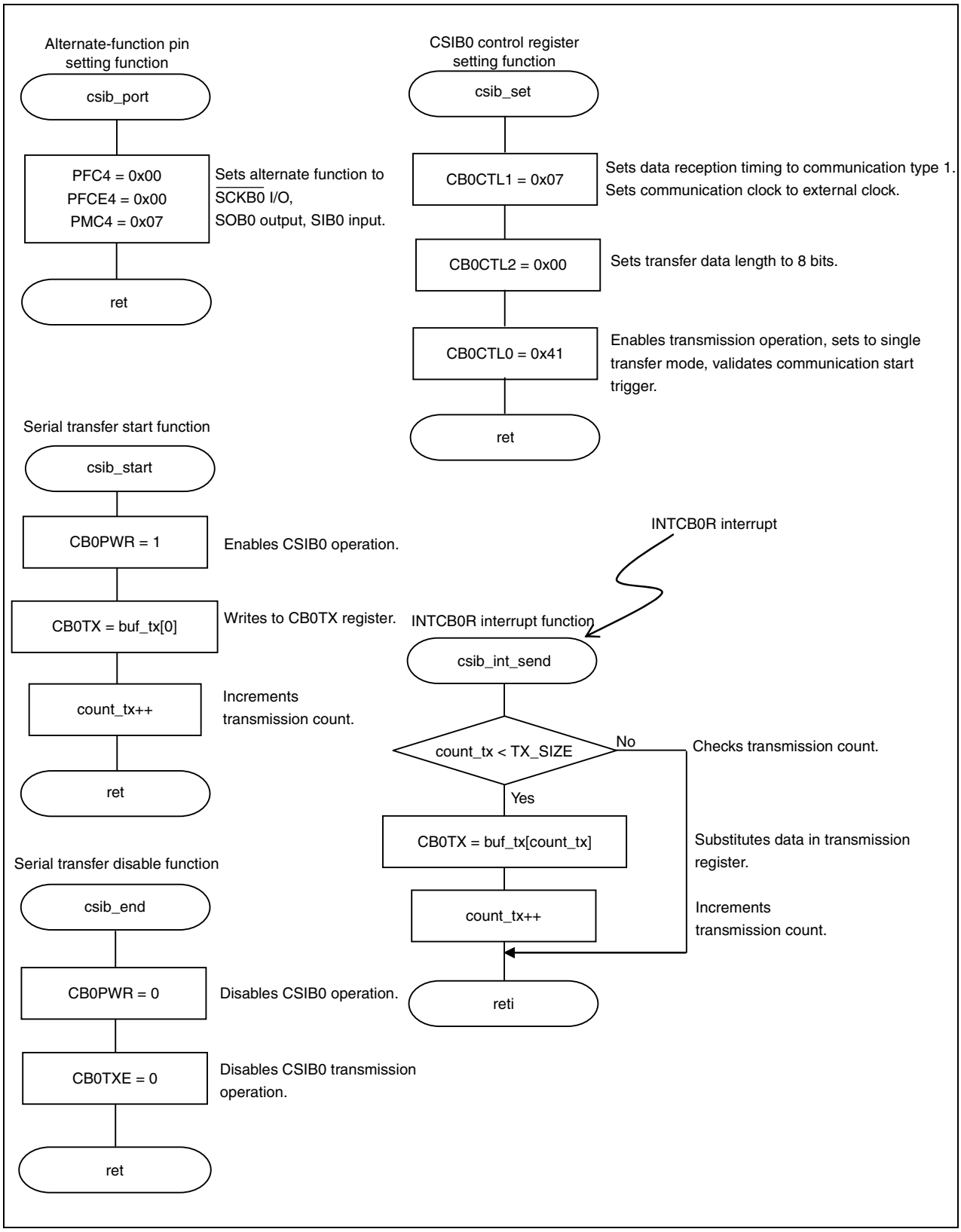


Figure 2-4. Single Transfer Mode (Slave Mode, Transmission Mode) (2/2)



2.5 Single Transfer Mode (Slave Mode, Reception Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs reception for ten times in single transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib11_main
[Argument]	None
[Processing content]	Sets reception count (count_rx) to initial value 0. Starts reception after calling each setting function.
[SFRs used]	CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.)
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[Interrupts]	csib_int_receive, csib_error
[Interrupt sources]	INTCB0R, INTCB0RE
[File name]	csib11.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output, and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib11.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and sets communication clock to external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x21 (Enables CSIB0 reception operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib11.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables CSIB0 operation and performs dummy read on receive data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0RX Receive data register
[call function]	None
[Variable]	unsigned char buf_rx[ ]: Receive data storing buffer
[File name]	csib11.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.)
[call function]	None
[Variable]	None
[File name]	csib11.c
[Caution]	None

Interrupt functions

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFRs used]	CB0RX	Receive data register
	CB0CTL0.CB0SCE:	0 (Invalidates communication start trigger.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib11.c	
[Caution]	None	

[Function name]	csib_error	
[Servicing content]	Clears reception error flag.	
[SFRs used]	CB0RX	Receive data register
	CB0STR.CB0OVE:	0 (Clears overrun error flag.)
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib11.c	
[Caution]	None	

Figure 2-5. Single Transfer Mode (Slave Mode, Reception Mode) (1/3)

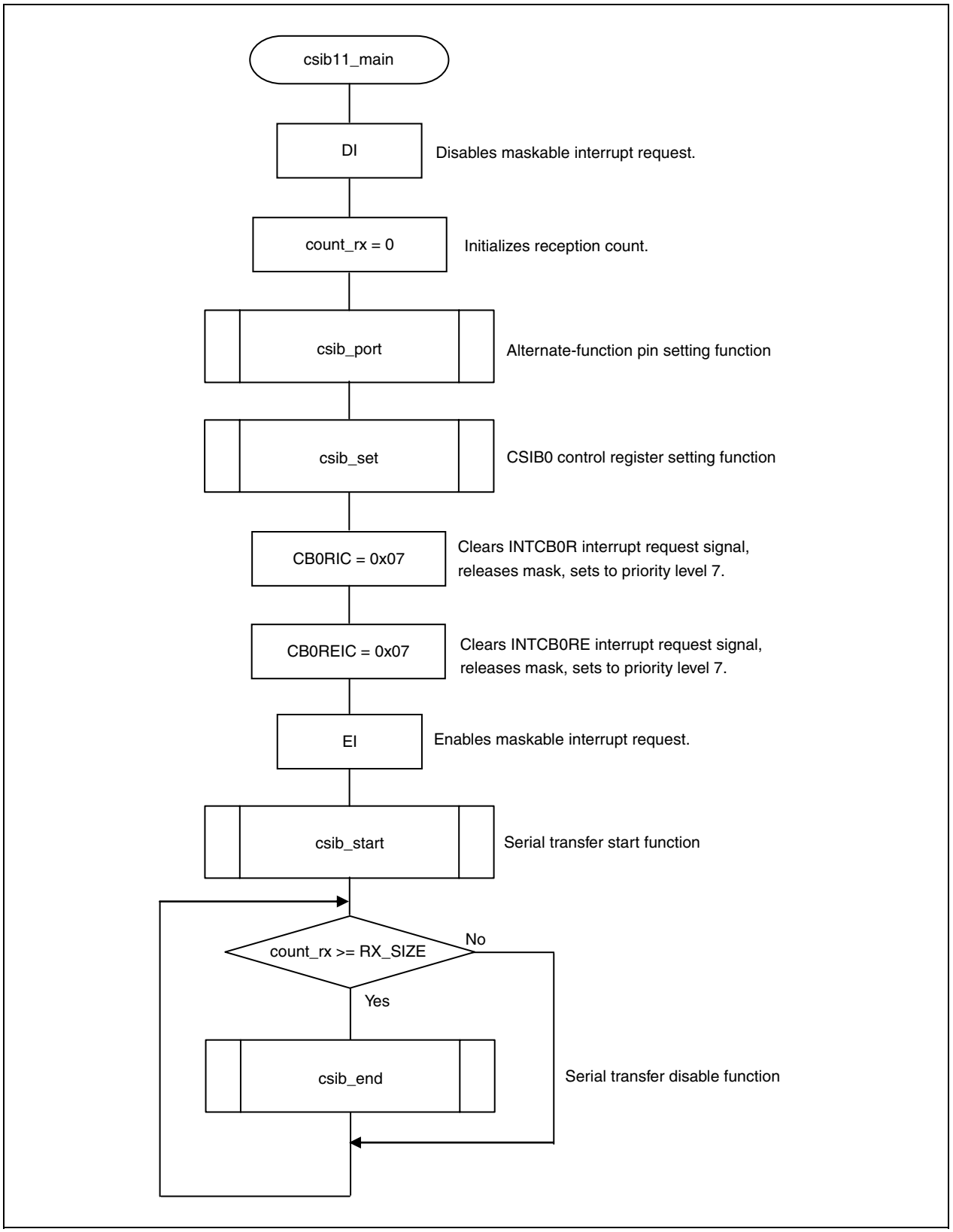


Figure 2-5. Single Transfer Mode (Slave Mode, Reception Mode) (2/3)

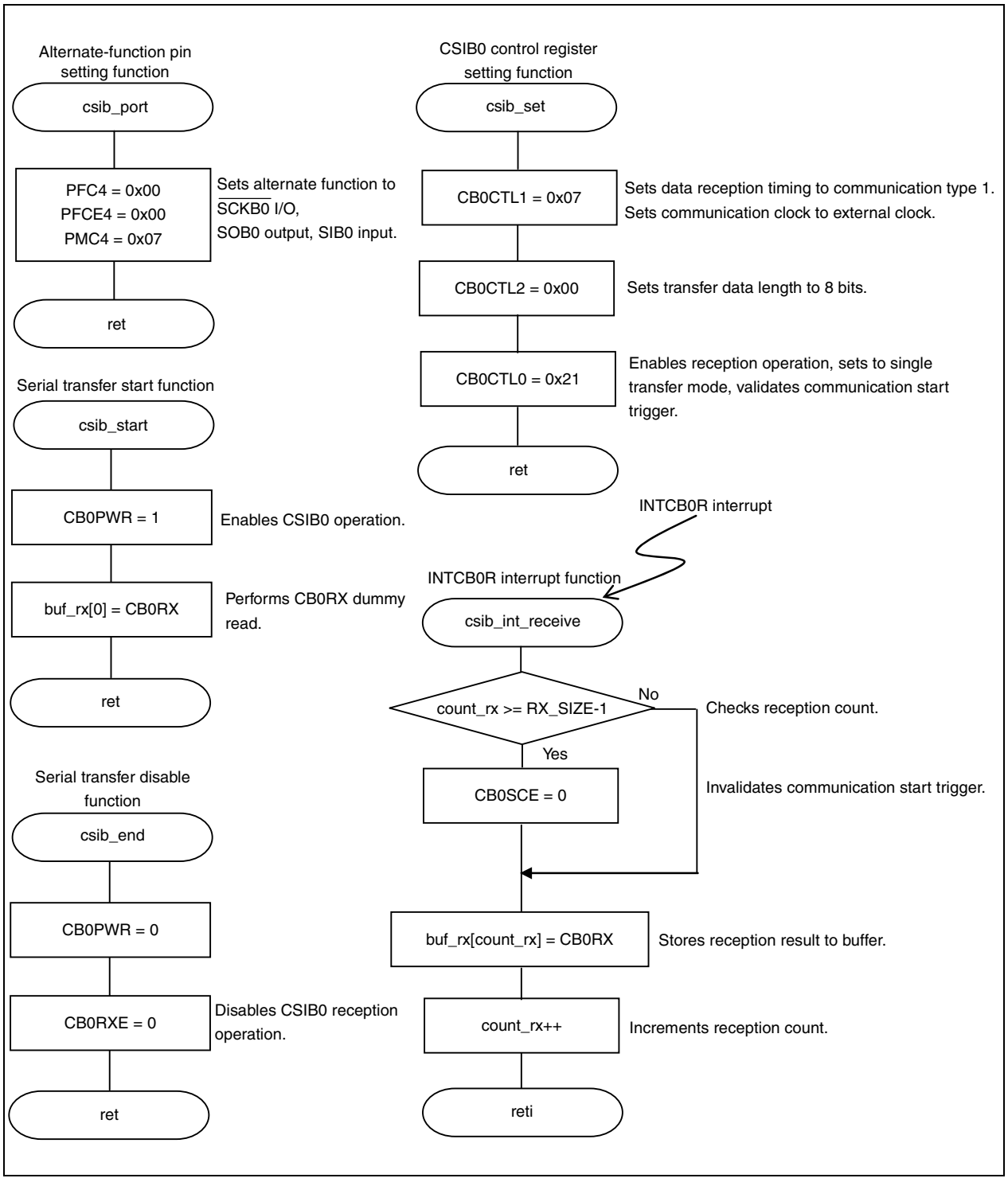
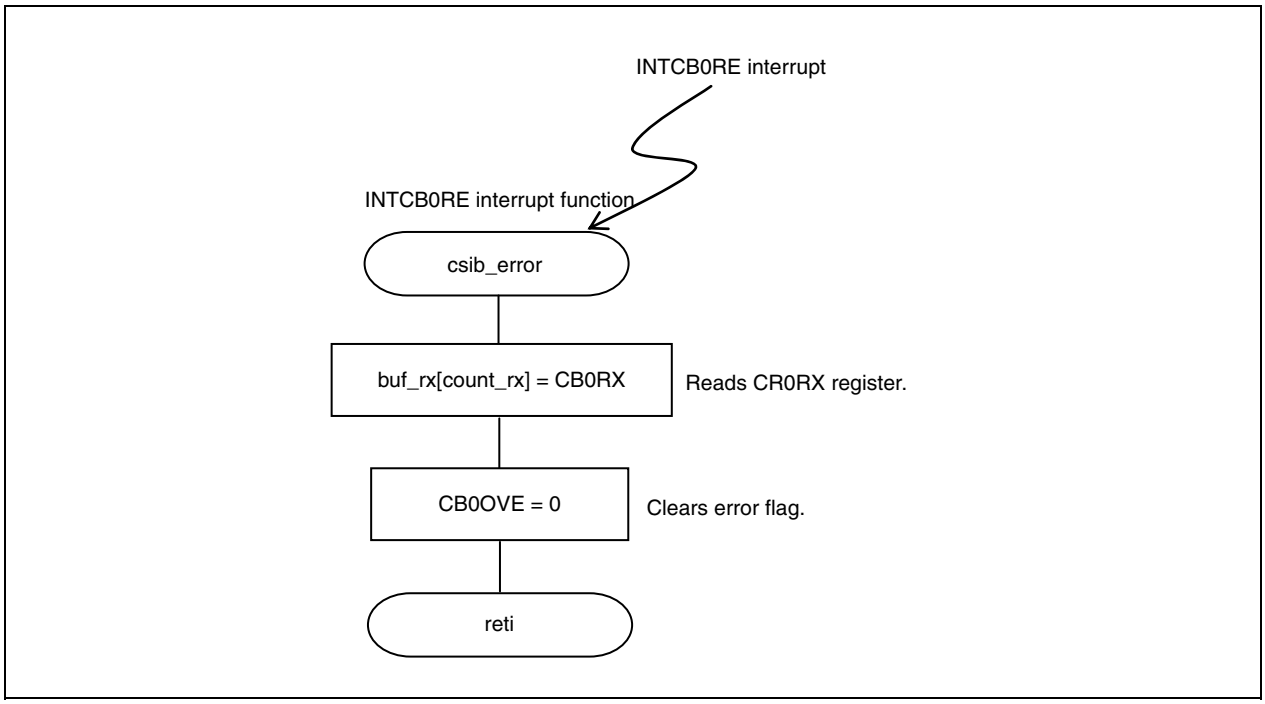


Figure 2-5. Single Transfer Mode (Slave Mode, Reception Mode) (3/3)



2.6 Single Transfer Mode (Slave Mode, Transmission/Reception Mode)

[Function]	Sets communication mode to slave mode and transfer direction mode to MSB first, and performs data transmission/reception for ten times each in single transfer mode. Validates communication start trigger and sets communication clock to external clock, and transfer data length to 8 bits.
[Function name]	csib12_main
[Argument]	None
[Processing content]	Sets transmission count (count_tx) to initial value 0. Sets reception count (count_rx) to initial value 0 and starts transmission/reception after calling each setting function.
[SFRs used]	CB0REIC: 0x07 (Clears CSIB0 reception error interrupt request signal (INTCB0RE), releases mask, sets to priority level 7.) CB0RIC: 0x07 (Clears CSIB0 reception end interrupt request signal (INTCB0R), releases mask, sets to priority level 7.) CB0TIC: 0x07 (Clears CSIB0 transmission enable interrupt request signal (INTCB0T), releases mask, sets to priority level 7.)
[call functions]	csib_port, csib_set, csib_start, csib_end
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_tx: Transmission count variable volatile unsigned char count_rx: Reception count variable unsigned char count: Transfer data generating variable
[Interrupts]	csib_error, csib_int_send, csib_int_receive
[Interrupt sources]	INTCB0RE, INTCB0T, INTCB0R
[File name]	csib12.c
[Caution]	None

[Function name]	csib_port
[Processing content]	Sets port 4 as CSIB0 I/O pin.
[SFRs used]	PFC4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output and SIB0 input.) PFCE4: 0x00 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output and SIB0 input.) PMC4: 0x07 (Sets $\overline{\text{SCKB0}}$ I/O, SOB0 output and SIB0 input.)
[call function]	None
[Variable]	None
[File name]	csib12.c
[Caution]	None

[Function name]	csib_set
[Processing content]	Sets CSIB0 control register.
[SFRs used]	CB0CTL1: 0x07 (Sets to communication type 1 and external clock.) CB0CTL2: 0x00 (Sets transfer data length to 8 bits.) CB0CTL0: 0x61 (Enables CSIB0 transmission and reception operation, sets to MSB first and single transfer mode, and validates communication start trigger.)
[call function]	None
[Variable]	None
[File name]	csib12.c
[Caution]	The CB0TXE, CB0RXE, CB0DIR, and CB0TMS bits of the CB0CTL0 register are rewritable only when the CB0PWR bit is 0. However, the CB0PWR bit can be set to 1 simultaneously.

[Function name]	csib_start
[Processing content]	Enables the CSIB0 operation and writes a value to the transmit data register.
[SFRs used]	CB0CTL0.CB0PWR: 1 (Enables CSIB0 operation.) CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib12.c
[Caution]	None

[Function name]	csib_end
[Processing content]	Disables CSIB0 operation and transmission/reception operation.
[SFRs used]	CB0CTL0.CB0PWR: 0 (Disables CSIB0 operation.) CB0CTL0.CB0RXE: 0 (Disables CSIB0 reception operation.) CB0CTL0.CB0TXE: 0 (Disables CSIB0 transmission operation.)
[call function]	None
[Variable]	None
[File name]	csib12.c
[Caution]	None

Interrupt functions

[Function name]	csib_error
[Servicing content]	Clears reception error flag.
[SFRs used]	CB0RX Receive data register CB0STR.CB0OVE: 0 (Clears overrun error flag.)
[call function]	None
[Variables]	unsigned char buf_rx[ ]: Receive data storing buffer volatile unsigned char count_rx: Reception count variable
[File name]	csib12.c
[Caution]	None

[Function name]	csib_int_send
[Servicing content]	Sets new data for transmitting next data.
[SFR used]	CB0TX Transmit data register
[call function]	None
[Variables]	unsigned char buf_tx[ ]: Transmit data storing buffer volatile unsigned char count_tx: Transmission count variable
[File name]	csib12.c
[Caution]	None

[Function name]	csib_int_receive	
[Servicing content]	Stores receive data to buffer.	
[SFR used]	CB0RX	Receive data register
[call function]	None	
[Variables]	unsigned char buf_rx[ ]:	Receive data storing buffer
	volatile unsigned char count_rx:	Reception count variable
[File name]	csib12.c	
[Caution]	None	

Figure 2-6. Single Transfer Mode (Slave Mode, Transmission/Reception Mode) (1/3)

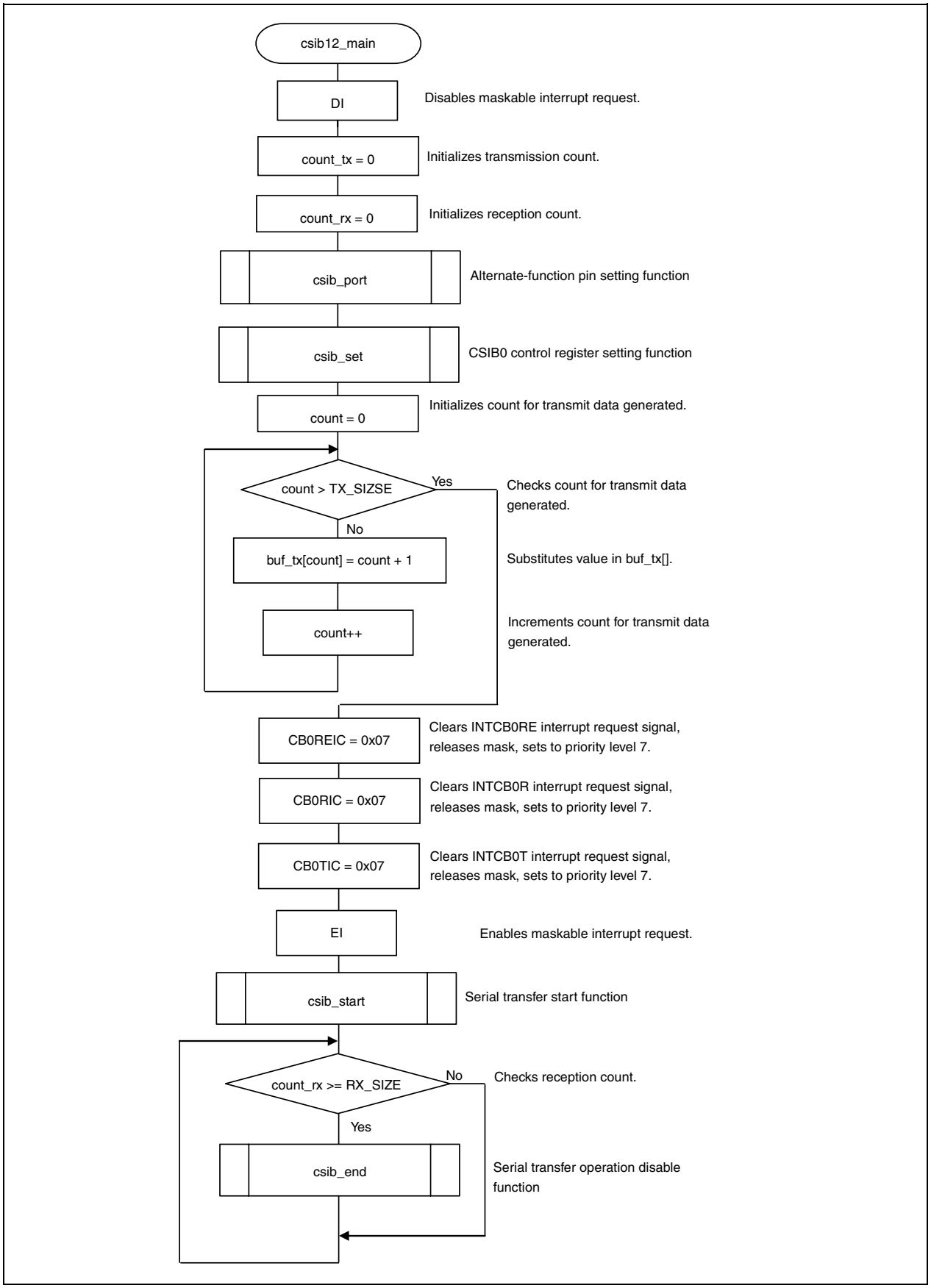


Figure 2-6. Single Transfer Mode (Slave Mode, Transmission/Reception Mode) (2/3)

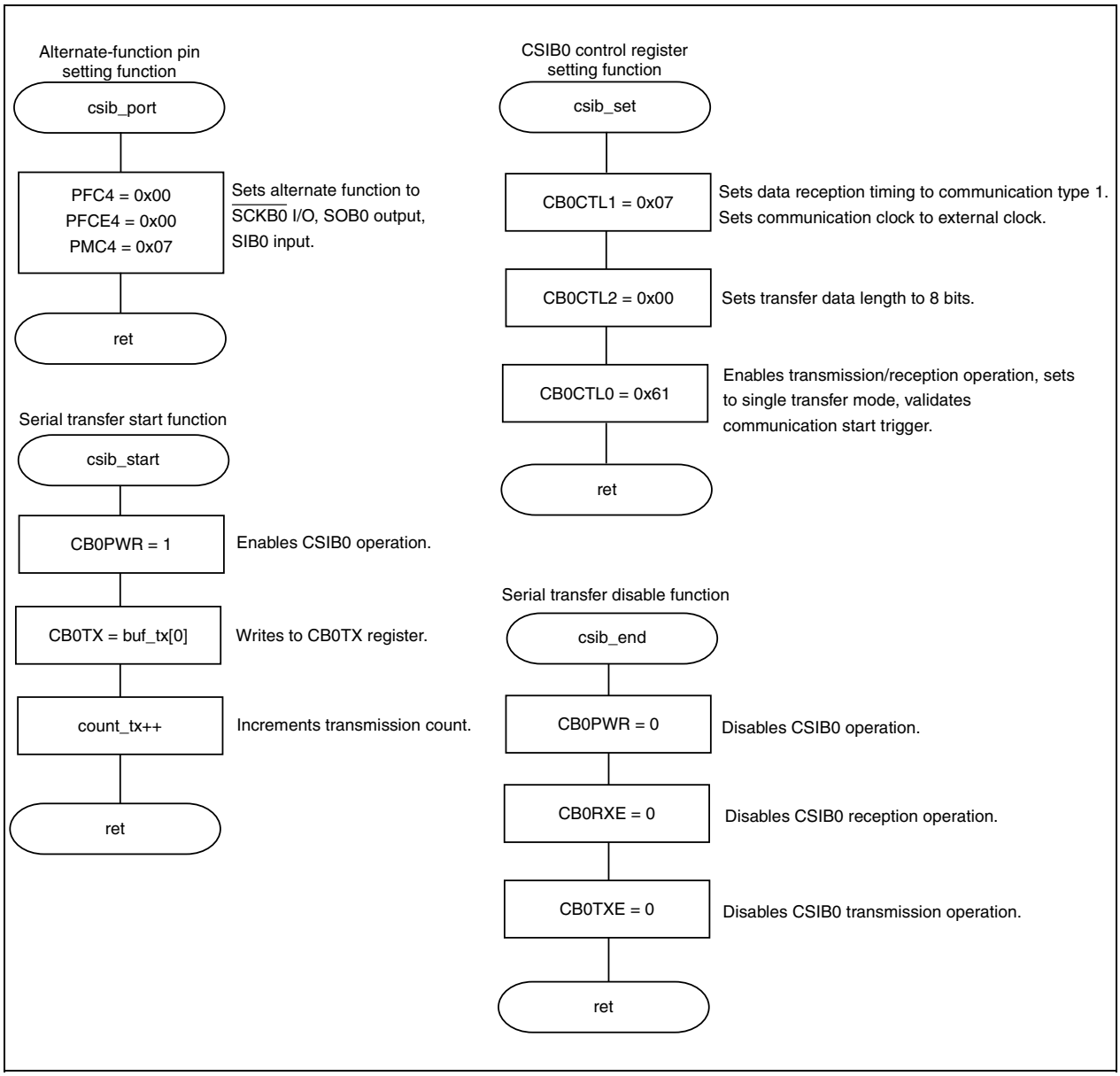
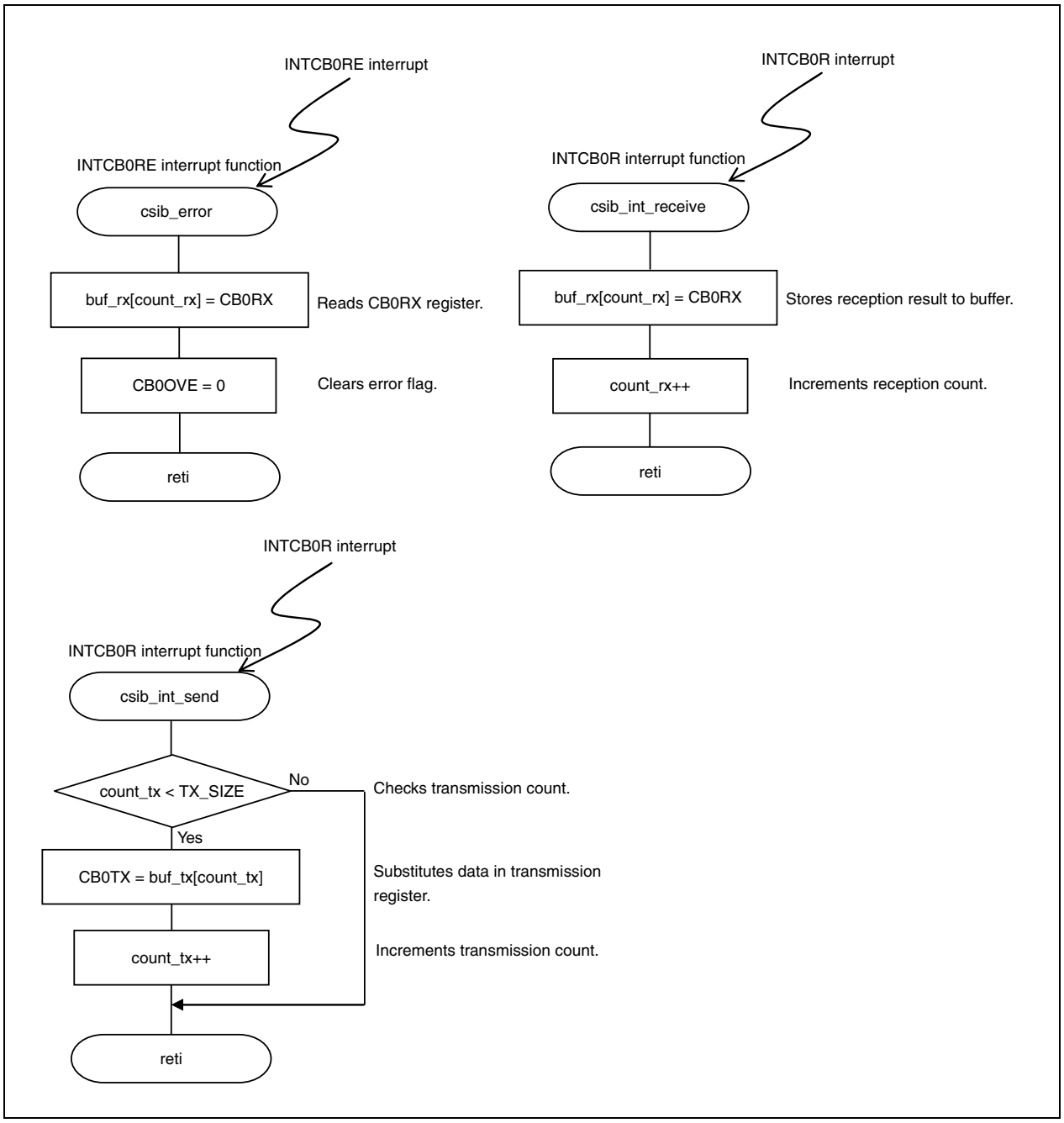


Figure 2-6. Single Transfer Mode (Slave Mode, Transmission/Reception Mode) (3/3)



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