



78K0R/Kx3 Microcontroller

Sample Program

Operation Manual

**(3-Wire Serial I/O (Slave Transmission/Reception, Single
Transmission/Reception Mode) (Serial Array Unit), ASM Source)**

This software is for reference only and NEC Electronics does not guarantee its operation.
Thoroughly evaluate this software on your set prior to use.

ZUD-CC-07-0089-E
January, 2008

1st Product Solution Group, Multipurpose Microcomputer Systems Division,
Microcomputer Operations Unit
NEC Electronics Corporation

- **The information in this document is current as of January, 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**

- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

CONTENTS

1. OVERVIEW.....	4
2. RESOURCES USED	5
3. SOFTWARE CONFIGURATION.....	6
4. FUNCTION EXPLANATIONS	7
5. FLOWCHARTS.....	10

1. OVERVIEW

This manual explains the sample program functions of 3-wire serial I/O processing (slave transmission/reception (single transmission/reception mode)).

In this sample program, slave transmission/reception (single transmission/reception mode) operation in 3-wire serial I/O communication is performed.

The communication conditions are as follows.

- $f_{CLK} = 8 \text{ MHz}$
- CSI20 (unit 1, channel 0) is used.
- 9600 bps, 8-bit data
- LSB first
- Number of transmit/receive data: 10
- Transmit data: 3A
- Receive data
- INTCSI20 transfer end interrupt servicing is used.

2. RESOURCES USED

Resource	Description	Remark
Main clock specification	Internal high-speed oscillator used (8 MHz (TYP.))	Supplied to CPU and peripheral hardware
	High-speed system clock used (20 MHz)	Oscillated by initial processing
Subclock	XT1 (32.768 kHz)	Oscillated by initial processing
Related hardware	Peripheral enable register 0 (PER0)	
	Serial clock select register 1 (SPS1)	Clock used: CKm0 ($1/2^4$ of main clock), 0.5 MHz (2 μ s)
	Serial mode register 10 (SMR10)	
	Serial communication operation setting register 10 (SCR10)	Transmission/reception, data length: 8 bits
	Serial data register 10 (SDR10)	Sets the transfer rate.
	Serial flag clear trigger register 10 (SIR10)	Used to clear an error flag.
	Serial channel start register 1 (SS1)	
	Serial channel stop register 1 (ST1)	
	Serial output register 1 (SO1)	
	Serial output enable register 1 (SOE1)	
	Port input mode register 14 (PIM14)	
	Port output mode register 14 (POM14)	
	Port mode register 14 (PM14)	
	Port register 14 (P14)	
	SIO20 register (SIO20)	
I/O	Output: P142 (clock output), P144 (data output)	
Interrupt	Not used	
Others	Not used	

3. SOFTWARE CONFIGURATION

Files

File Name	Processing Outline
K0R_vct.asm	Vector processing
K0R_init.asm	Initialization processing
K0R_main.asm	Main processing
K0R_sfr_set.asm	3-wire serial I/O processing Slave transmission/reception (single transmission/reception mode)

4. FUNCTION EXPLANATIONS

[File name]

K0R_main.asm

Function

Function Name	Processing Outline	Argument	Return Value
MMA_STRT	Main routine	None	None

Function explanations

Function name	MMA_STRT
Processing	Main routine
Argument	–
Return value	–
Description	Executes initialization processing and then starts transmission operation.
Remark	–

[File name]

K0R_sfr_set.asm

Functions

Function Name	Processing Outline	Argument	Return Value
SER_STRIN	Initializes 3-wire serial I/O.	None	None
SER_STRST	Starts 3-wire serial I/O operation.	None	None
SER_STRBK	Aborts 3-wire serial I/O operation.	None	None
SER_STRRE	Resumes 3-wire serial I/O operation.	None	None
SER_STRSP	Stops 3-wire serial I/O operation.	None	None
SER_STRIT	3-wire serial I/O transmission/reception	None	None

Function explanations

Function name	SER_STRIN
Processing	Initializes 3-wire serial I/O.
Argument	–
Return value	–
Description	Executes initialization.
Remark	–

Function name	SER_STRST
Processing	Starts 3-wire serial I/O operation.
Argument	–
Return value	–
Description	Enables clock output.
Remark	–

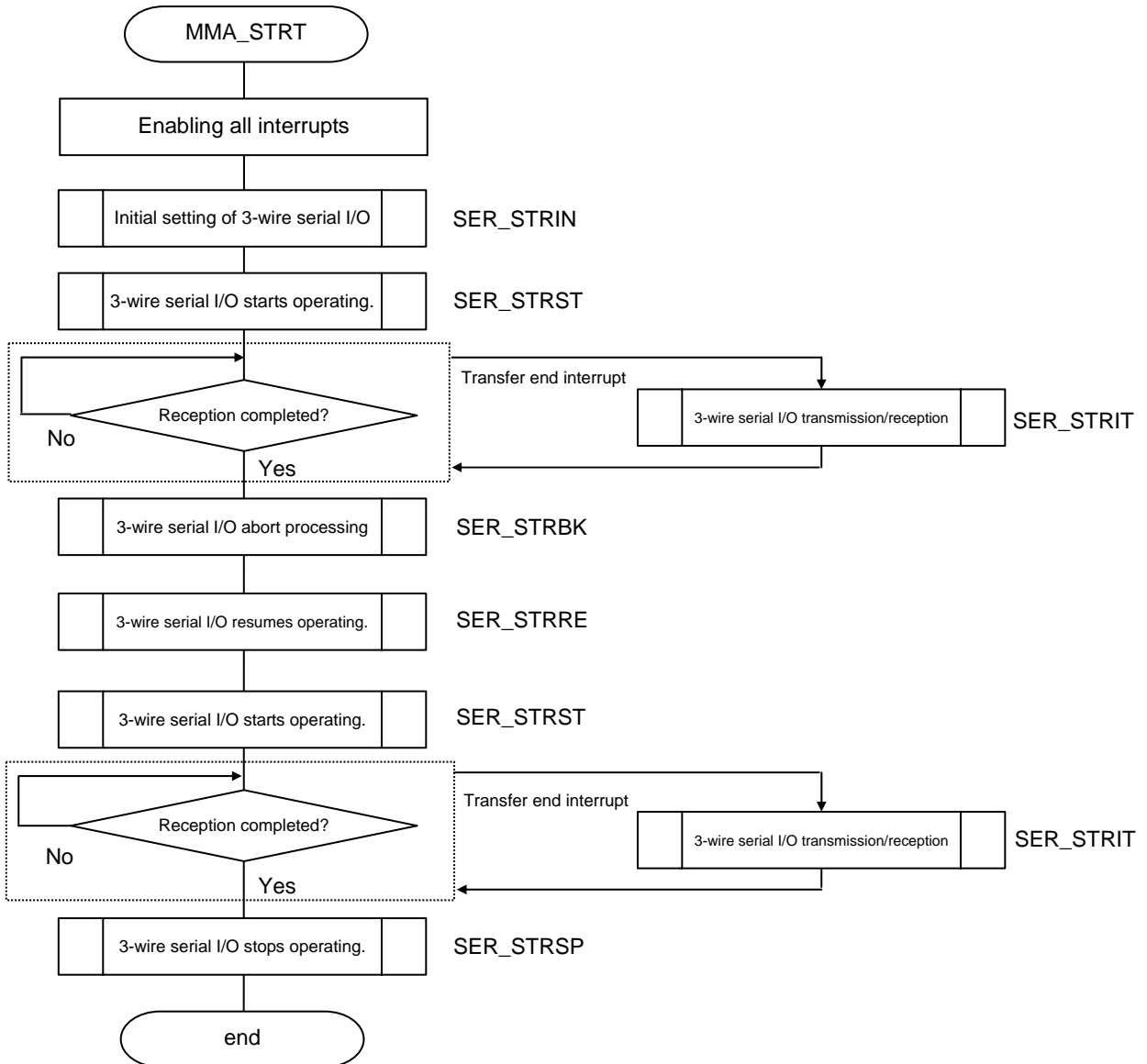
Function name	SER_STRBK
Processing	Aborts 3-wire serial I/O operation.
Argument	–
Return value	–
Description	Performs transmission/reception operation abort processing.
Remark	–

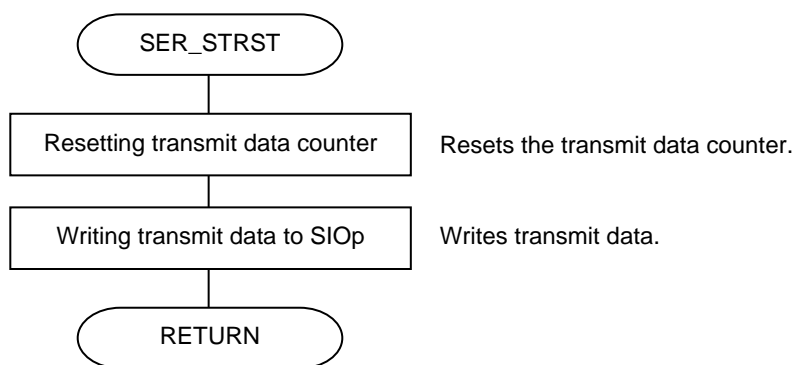
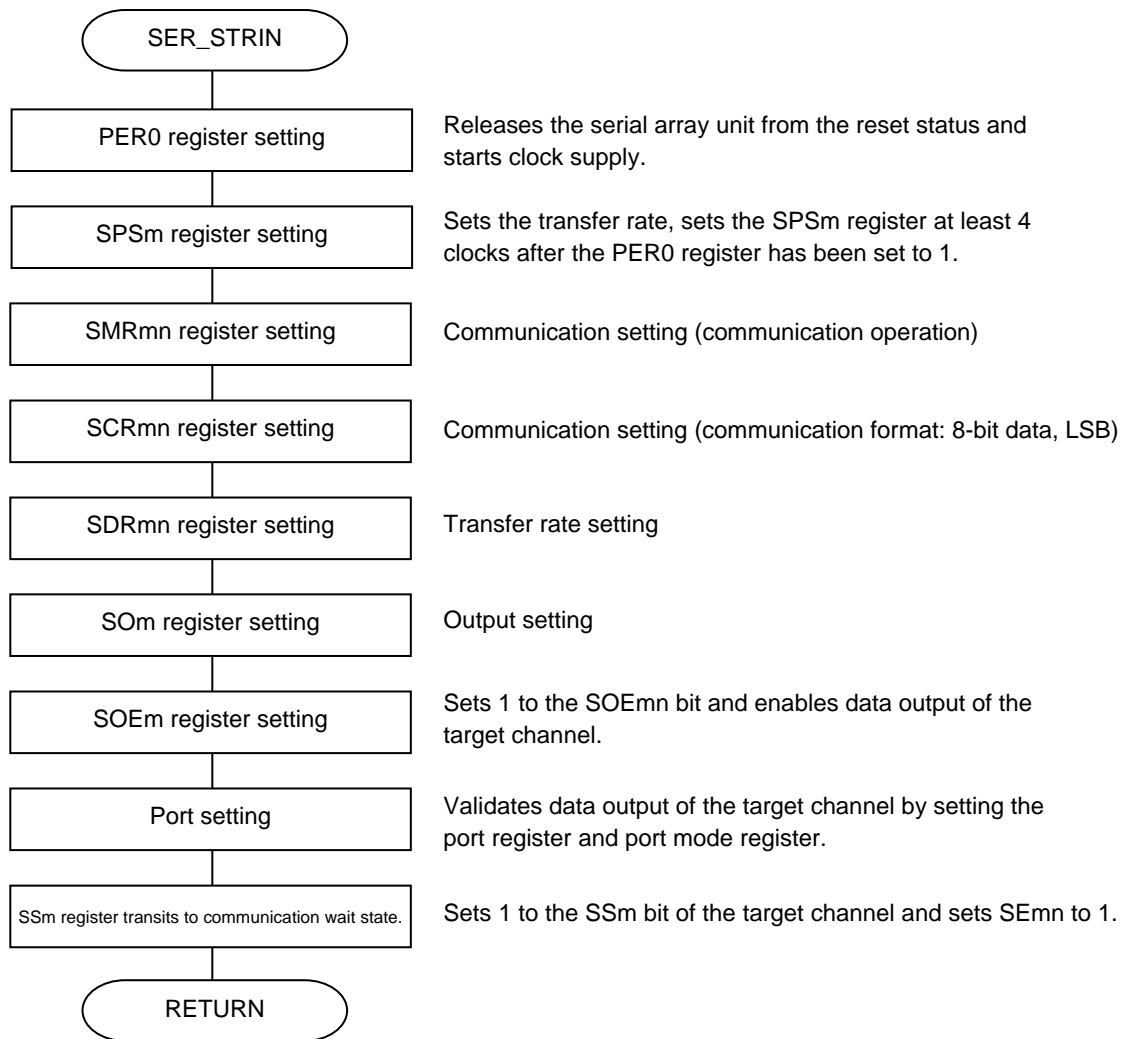
Function name	SER_STRRE
Processing	Resumes 3-wire serial I/O operation.
Argument	–
Return value	–
Description	Performs transmission/reception operation resume processing.
Remark	–

Function name	SER_STRSP
Processing	Stops 3-wire serial I/O operation.
Argument	–
Return value	–
Description	Performs transmission/reception operation stop processing.
Remark	–

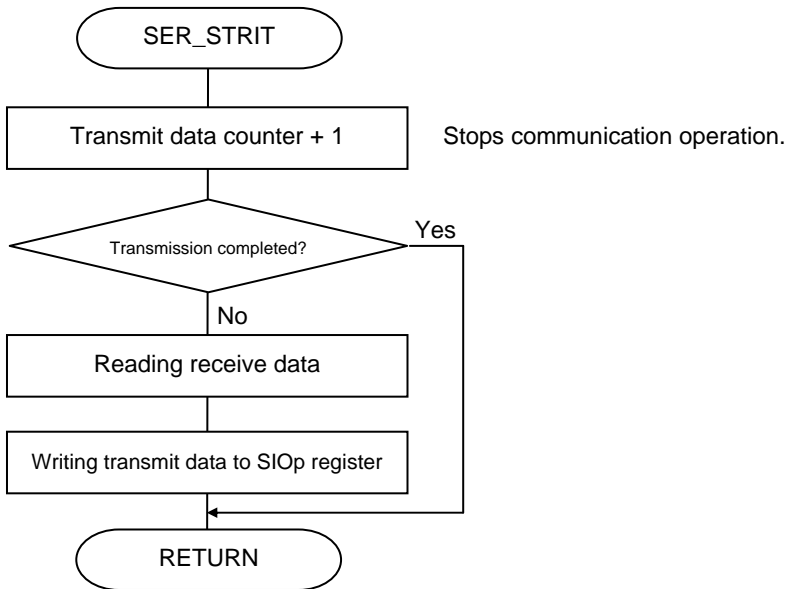
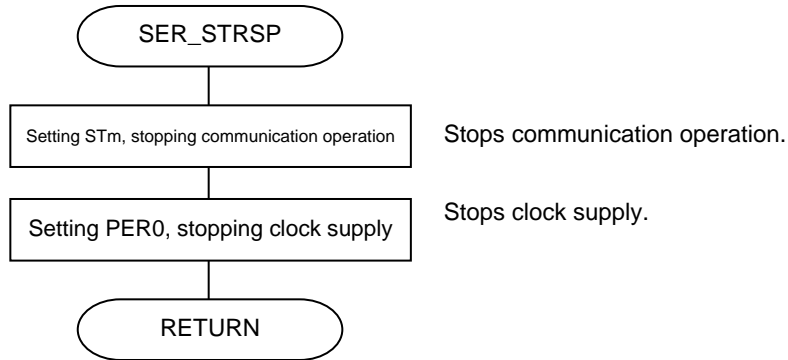
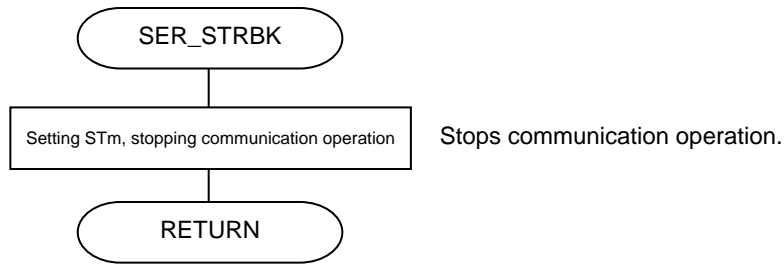
Function name	SER_STRIT
Processing	3-wire serial I/O transmission/reception
Argument	–
Return value	–
Description	<p>INTCSI20 transfer end interrupt servicing</p> <p>An interrupt is generated when transfer has been completed.</p> <p>When this interrupt is generated, receive data of 1 byte is read and then 1-byte data is transmitted.</p> <p>The transmission/reception interrupt ends when processing of the transmit data has been completed.</p>
Remark	–

5. FLOWCHARTS

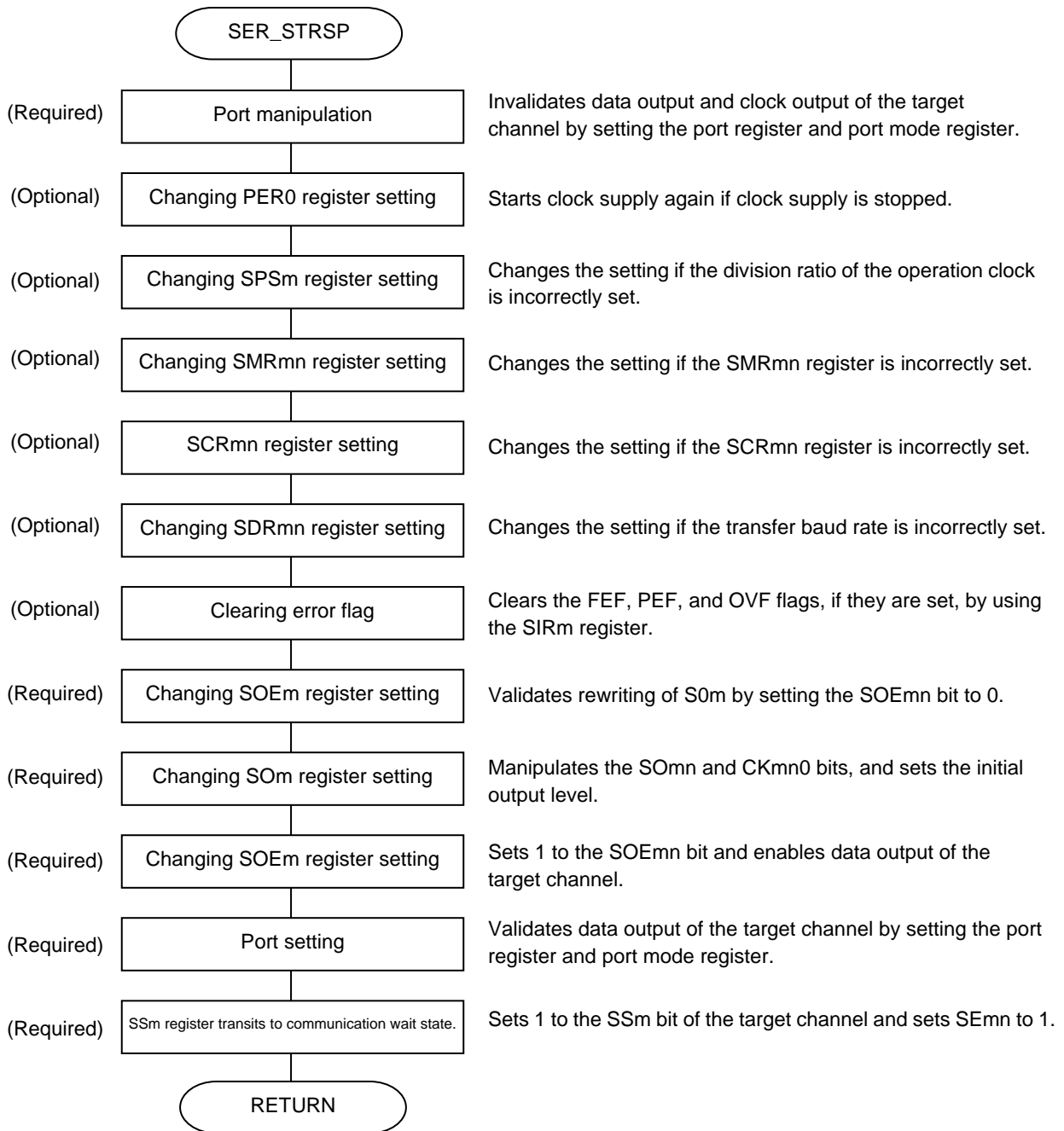




Remark m: Unit number (m = 0, 1), n: Channel number (n = 0 to 3), p: CSI number (p = 00, 01, 10, 20)
 m = 1, n = 0, p = 00 for this sample program.



Remark m: Unit number (m = 0, 1), n: Channel number (n = 0 to 3), p: CSI number (p = 00, 01, 10, 20)
 m = 1, n = 0, p = 00 for this sample program.



Remark m: Unit number (m = 0, 1), n: Channel number (n = 0 to 3), p: CSI number (p = 00, 01, 10, 20)
 m = 1, n = 0, p = 00 for this sample program.