

OPERATION MANUAL

Card Reader Communication Protocol

SCR-9xxF-xR-xxxx

NEURON Corporation

Copying is prohibited without NEURON Corporation's permission
This specification is subject to change without prior notice

Contents

1 INTRODUCTION	1
1-1 PRODUCT DESCRIPTION	1
1-2 FEATURES	1
2 ENVIRONMENT	2
2-1 COMMUNICATION AND POWER CABLES.....	2
2-2 DIP SWITCH.....	2
3 COMMUNICATIONS.....	3
3-1 CONTROL CHARACTERS.....	3
3-2 DATA CHARACTERS	3
3-3 COMMUNICATION PACKET	3
4 OPERATION CONTROL.....	4
4-1 FLOWCHART OF CONTROL TIMING	4
4-2 COMMUNICATION STATUS	5
4-2-1 <i>Normal status</i>	5
4-2-2 <i>Abnormal status</i>	5
4-3 RESPONSE	5
4-3-1 <i>Normal</i>	5
4-3-2 <i>Abnormal</i>	5
5 COMMANDS and MESSAGES	6
5-1 CARD CONTROL.....	6
<i>Command and Message List</i>	6
5-1-2 <i>Read Command</i>	6
5-1-3 <i>Prohibit Command</i>	7
5-1-4 <i>Status Check Command</i>	7
5-1-5 <i>Reset Command</i>	7
5-2 RESPONSE MESSAGES	8
5-2-1 <i>Message for Read command</i>	8
5-2-2 <i>Return Codes for Read Command</i>	9
5-2-3 <i>Status Check Message</i>	9
5-2-4 <i>CPP Sensor Event</i>	9
5-2-5 <i>Error Message</i>	10
5-3 EEPROM CONTROL	10
5-3-1 <i>Command and Message</i>	10
5-3-2 <i>EEPROM Access Enable Command</i>	10
5-3-3 <i>EEPROM Access Disable Command</i>	11
5-3-4 <i>EEPROM Data Read Command</i>	11
5-3-5 <i>EEPROM Write Start Command</i>	11
5-3-6 <i>EEPROM Data Write Command</i>	12
5-3-7 <i>EEPROM End Write Command</i>	12
6 EEPROM DEFAULTS.....	13

1 INTRODUCTION

1-1 Product Description

The SCR-9xxF series is a flush bezel insertion type card reader. Card data can be read in either direction (push-in or pull-out).

1-2 Features

◆ **Dip Switch function**

Two dip switches are located on the PCB – DSW1 and DSW2. DSW2 will be enabled when switch 4 on DSW1 is on. EEPROM functions can be modified by changing the settings of DSW2.

◆ **EEPROM function**

The EEPROM contents can be modified to change the operation of the unit.

◆ **Commands function**

The unit can be controlled using commands from a HOST PC.

2 ENVIRONMENT

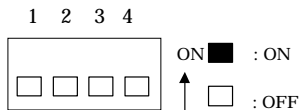
2-1 Communication and Power Cables

- Communication cable
See the hardware specification document for communication pin-out.
- Power cable
See the hardware specification document for power pin-out.

2-2 Dip Switch

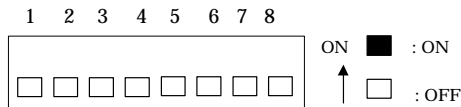
Note : Usually dip-switches are set all off

DSW 1



Switch 4 on will enable DSW2. Switches 1-3 are not used.

DSW 2



DSW2-1

ON Pull Type (Read - way out) CPP On Event
OFF Insertion Type (Read - way in) CPP Off Event

DSW2-2

ON Enable sensor (CPP) send event
OFF Disable sensor (CPP) send event

DSW2-3

ON Reader does not wait after sending data (No Handshaking)
OFF Reader waits for acknowledgement (ACK) after sending data

DSW2-4

ON Enable power on message
OFF Disable power on message

DSW2-5

Reserved

DSW2-6

ON Baud rate 19200 bit/s
OFF Baud rate 9600 bit/s

DSW2-7, 2-8

Reserved

3 COMMUNICATIONS

3-1 Control Characters

Name	Code	Contents
STX	02	Start of text data (Header)
ETX	03	End of text data (End Code)
US	1F	Data separator
ACK	06	Acknowledge
CR	0D	Carriage Return
DLE	10	Data Link Escape
NAK	15	Negative Acknowledge
BCC		Block Check Character

3-2 Data Characters

All ASCII characters, except for the control characters listed in section 3-1, can be used as character string data. Use of control characters in the Character String Data portion of the packet data may cause the unit to malfunction.

3-3 Communication Packet

The Communication Packet consists of five blocks:

< Header > < Control Command > < Parameter > < End Code > < BCC >

Header : 02h
Control command : Refer control command 5-1.
Parameter : Refer control command 5-1.
Terminator : 03h
BCC : 1byte (Be able to select non, 1byte, 2byte+CR.)

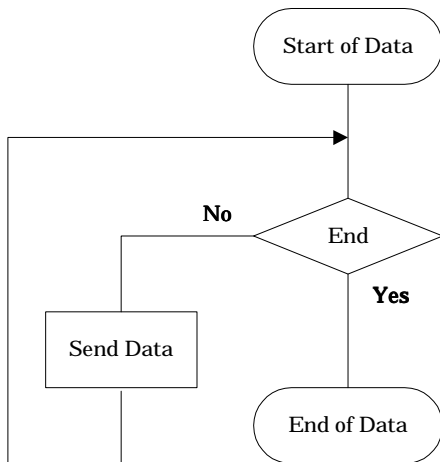
✓ **Note**

BCC (Block Check Character) is calculated by using the XOR Boolean Function from the first byte after STX through and including ETX.

Case of set 2byte BCC, should send CR in addition to ACK, NAK and DLE.

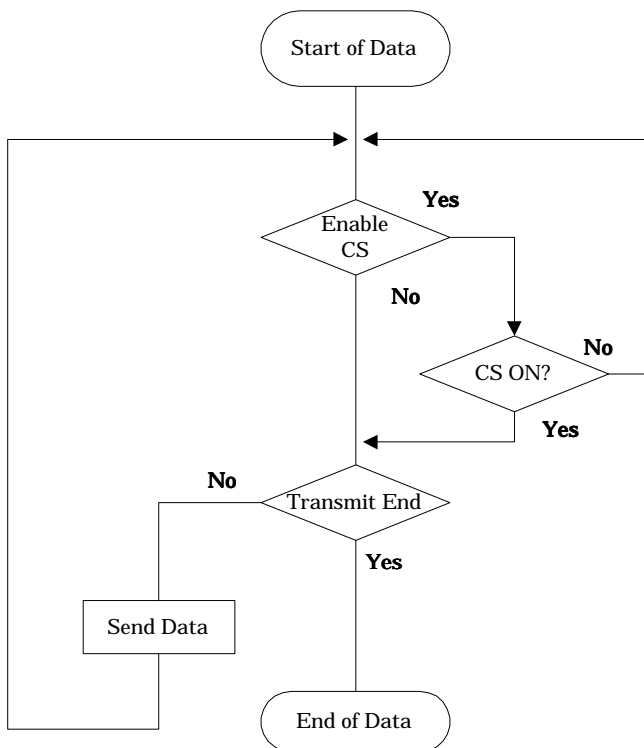
4 OPERATION CONTROL

4-1 Flowchart of Control Timing



- a) Can't receive other command data during card operation or receive command.
- b) When send communication packet after ACK, NAK or DLE, Host should take a interval time more than 150ms.
- c) RS signal is fixed ON while the unit is working.
- d) SCR-9xxF can receive the commands required less CS level.

4-1-1 SCR-9xxF to Host



- a) Host controller should be enable RS signal ON.
- b) SCR-9xxF checks communication status.
- c) SCR-9xxF sends a one byte.
- d) SCR-9xxF repeats that transaction from b) to c) each one byte until all data sending.

SCR-9xxF is able to select "non check signal" on "check CS signal" when send communication.

4-2 Communication status

4-2-1 Normal status

SCR-9xxF returns ACK or response packet when received normal communication packet.

Refer to

- Case of returns ACK, is applied to Read command, and inhibit command or reset command.
- Case of returns response packet, is applied to status information packet.

4-2-2 Abnormal status

- Case of return NAK.
Parity Error, Framing Error, Overrun Error, ETX incorrect, ETX non, BCC incorrect and BCC non. Host should send communication packet again.
- Case of return Error status
Don't detect command and incorrect communication packet formats. Host should confirm sending communication commands.
- Case of return nothing
Don't detect header of communication packet. Host should confirm sending communication packet or communication speeds.

4-3 Response

4-3-1 Normal

- SCR-9xxF send communication packet.
- Host should return ACK, when it received correct communication packet.

4-3-2 Abnormal

Case 1

- Case of invalid (refuse) communication packet from SCR-9xxF, Host send DLE.

Case 2

- When receive communication packet incorrect, Host should send NAK. After received NAK, SCR-9xxF send the communication packet again to the HOST. Return to normal operation mode, when over retry times.
(Default value is 3 times.)

Case 3

- Return normal operation mode, when the Host doesn't send response to SCR-9xxF within setting time. (Default value is 3 times.)

✓ Note

When send communication packet after ACK, NAK or DLE, Host should take an interval time more than 150ms.

5 COMMANDS and MESSAGES

5-1 Card Control

Command and Message List

◆ Command List

Command Name	Identifier	Parameter
Card Data Read	CRC	Read track designation
Prohibit Command	PP	None
Status Check	PSC	None
Reset Command	PR	None

◆ Message List

Message Name	Identifier	Parameter
Card Read Data	CRC	Read data or error information
Status Check Result	PSC	3 digit status information
CPP Sensor Event	AE	2 digit event information
Error Message	NG	3 digit error status information

5-1-2 Read Command

Identifier: <i>CRC (43h 52h 43h)</i>		Message: CRC	
Parameter Syntax: < a > < b > < c >			
Parameter	Length	Code	Description
<a>	1	0(30h)	Specifies the individual track. <a> is track 1 1(31h)=Enable, 0(30h)=Disable
		1(31h)	
	1	0(30h)	Specifies the individual track. <a> is track 2 1(31h)=Enable, 0(30h)=Disable
		1(31h)	
<c>	1	0(30h)	Specifies the individual track. <c> is track3 1(31h)=Enable, 0(30h)=Disable
		1(31h)	

✓ *Example*

'CRC' Read all three tracks
'CRC010' Read track 2 only

✓ *Operation*

If there is no track designation, the unit reads all three tracks.
If illegal characters are used on the card, the unit processes an error.

5-1-3 Prohibit Command

Identifier: <i>PP (50h 50h)</i>	Message: None
Parameter Syntax: None	

- ✓ **Operation**
This command is used to disable the read operation and CPP sensor event.

5-1-4 Status Check Command

Identifier: PSC (50h 53h 43h)	Message: PSC
Parameter Syntax: None	

- ✓ **Operation**
This command is used to retrieve status message PSC (See section 5-2-3).

5-1-5 Reset Command

Identifier: PR (50h 52h)	Message: None
Parameter Syntax: None	

- ✓ **Operation**
This command is used to reset the unit.

Response Messages

5-2-1 Message for Read command

Identifier: CRC (43h 52h 43h)		
Parameter Syntax: <RC><a><US><RC><US><RC><c>		
Parameter	Length	Description
<RC>	1	Return Code
<a>	0-76	Specifies track 1
<US>	1	Unit Separator
<RC>	1	Return Code
	0-37	Specifies track 2
<US>	1	Unit Separator
<RC>	1	Return Code
<c>	0-104	Specifies track 3

✓ **Example**

Message: CRC0ABCDEFGF<US>1<US>2

Track 1 0 = Read OK (Data: ABCDEFG)
Track 2 1 = STX error
Track 3 2 = ETX error

✓ **Operation**

If an error is detected on a track only the return code will be included in the message.

5-2-2 Return Codes for Read Command

Return Code <RC>	
OK Code	Description
0(30h)	Read data is correct
Error Code	Description
1(31h)	Unable to find STX digit on the magnetic card stripe
2(32h)	Unable to find ETX digit on the magnetic card stripe
3(33h)	VRC (Vertical Redundancy Check) data on the magnetic card stripe is incorrect
4(34h)	LRC (Longitudinal Redundancy Check) data on the magnetic card stripe is incorrect
5(35h)	Data format on magnetic strip is incorrect

5-2-3 Status Check Message

Identifier: PSC (50h 53h,43h)			
Parameter Syntax: < Waiting status > < Sensor > < Reserved >			
Parameter	Length	Code	Description
Waiting status	2	00(30h 30h)	Operation Prohibited
		05(30h 35h)	Waiting for insertion
		06(30h 36h)	Waiting for removal
Sensor	3	000(30h 30h 30h)	Off
		100(31h 30h 30h)	On
Reserved	1	0(30h)	Not Used

✓ **Example**

Waiting for insertion and sensor OFF. 'PSC050000'
 Operation prohibited and sensor ON. 'PSC001000'

5-2-4 CPP Sensor Event

Identifier: AE (41h ,45h)		Information of event status	
Parameter Syntax: Information			
Parameter	Length	Code	Description
Information	2	01(30h 31h)	Insert type
		02(30h 32h)	Pull type

5-2-5 Error Message

Identifier: NG (4Eh 47h)			
Parameter Syntax: Command or Parameter			
Parameter	Length	Code	Description
Command	3	001(30h 30h 31h)	Mistaken control commands
Parameter	3	002(30h 30h 32h)	Mistaken control commands Format.

5-3 EEPROM Control

5-3-1 Command and Message

◆ Command List

Command	Description	
EO	EEPROM Access Enable Command	
EC	EEPROM Access Disable Command	
ER	EEPROM Data Read Command	
EE	EEPROM Write Start Command	
EW	EEPROM Data Write Command	
ED	EEPROM Write End Command	

◆ EEPROM Messages

Message Name	Identifier	Parameter
EEPROM Data Read Response	ER	Hi Address, Lo Address, Hi Data, Lo Data

5-3-2 EEPROM Access Enable Command

Identifier: EO (45h 4Fh)	Message: None
Parameter Syntax: < a > < b > < c > < d > < e > < f > < a > - < f > : 6 digit password, characters limited to the range of 20h ~ 7Ah The default password is NEURON (4Eh 45h 55h 52h 4Fh 4Eh)	

✓ *Operation*

- 1) If the password is correct, the Unit sends an ACK to the HOST after receiving EO command.
- 2) If the password is not correct, this command is ignored and the Unit sends a NAK to the HOST.

5-3-3 EEPROM Access Disable Command

Identifier: EC (45h 43h)	Message: None
Parameter Syntax: none	

✓ **Operation**

- 1) At the completion of EEPROM access, the HOST must send this command to the Unit.
- 2) The Unit will send an ACK to the HOST after receiving this command.

5-3-4 EEPROM Data Read Command

Identifier: ER (45h 52h)	Message: ER
Parameter Syntax: < nn > EEPROM Address	
Use n* n(2Ah) to read all addresses with Hi Address n	
Use ** (2Ah)(2Ah) to read all addresses	

✓ **Operation**

- 1) Before using this command, the host must send the EEPROM Access Enable (EO)
- 2) If the HOST sends the Data Read Command before EEPROM Access Enable Command (EO), the Unit will send a NAK to the HOST.
- 3) After receiving the command, the Unit sends the data from the EEPROM that is located at the specified address.

5-3-5 EEPROM Write Start Command

Identifier: EE (45h 45h)	Message: None
Parameter Syntax: none	

✓ **Operation**

- 1) The Unit sends an ACK to the HOST after receiving this command.
- 2) If the HOST sends this command before EEPROM Access Enable Command (EO), the Unit will send a NAK to the HOST.
- 3) After receiving the command, you will be able to change the Unit's EEPROM data.

5-3-6 EEPROM Data Write Command

Identifier: EW (45 57)	Message: None
Parameter Syntax: < aa >< dd > aa = EEPROM Address dd = Write Data	
Use a* a(2Ah) to write all addresses with Hi Address a	
Use ** (2Ah)(2Ah) to write all addresses	

✓ **Operation**

- 1) Before using this command, you must send the EEPROM Access Enable (EO) and EEPROM Write Start (EE) commands.
- 2) If these commands are used before you send the EEPROM Access Enable Command (EO) and the Write Start Command (EE), the Unit will send a NAK to the HOST.
- 3) After receiving the command, the Unit writes the specified data into the EEPROM at the address defined with the parameter.

5-3-7 EEPROM End Write Command

Identifier: ED (45h 44h)	Message: None
Parameter Syntax: None	

✓ **Operation**

- 1) The Unit will send an ACK to the HOST after receiving this command.
- 2) If the HOST sends the command before EEPROM Access Enable Command (EO) or Write Start Command (EE), the Unit will send a NAK to the HOST.
- 3) After sending this command, the EEPROM cannot be changed.

6 EEPROM DEFAULTS

Contents	Default value					
	96xF	97xF	98xF	93xF	91xF	93xF
Track Mode	Tr.1	Tr.2	Tr.3	Tr.1,2	Tr.2,3	Tr.1,2,3
Com speed	9600 bit/s					
Data Bits	7 bits					
Stop Bits	1 bit					
Parity Bits	Even					
BCC	1 byte					
Header	02h					
End Code	03h					
Unit Separator	None	None	None	1Fh	1Fh	1Fh
Control Signal	None					
Retries	3					
Waiting Time	3 s					
Direction of Operation	9x0F			9x2F		
	Read-Way In			Read-way Out		