

COMMUNICATION PROTOCOL

BCR BARCODE / CONTACTLESS CARD READER

PRODUCED BY

ADEL S.r.l.

Legal address Via Saffi N. 58

Operative address Via Nonantolana n. 970/1

41122 MODENA

Tel. 059-2550137 Fax. 059-2551207

e-mail: adel@adel2000.it

REVISIONS

DATE	AUTHOR	VER.	CHANGES
12/03/2006	BG	1.0	First edition
27/06/2006	LB	1.1	Modified paragraph 4.10
29/06/2006	LB	1.2	Modified paragraph 4.7
08/05/2008	GB	1.3	Modified paragraph 4.9
01/07/2008	GB	1.4	Modified paragraph 4.3 Added paragraph 4.12
01/04/2009	GB	1.5	Modified paragraph 4, 4.4, 4.6 4.11 4.12
08/04/2009	GB	1.6	Added paragraph 4.13 and 4.14 Mod par 1.1
27/01/2010	GB	1.7	Added paragraph 4.15, 4.16, 4.17 and 4.18 Mod par 4 and 4.06
12/07/2010	GB	1.8	Modified paragraph 4.3, 4.6
02/12/2010	GB	1.9	Modified paragraph 1.2
02/12/2010	GB	1.10	Modified paragraph 4.6 Added paragraph 4.19 and 4.20

INDEX

1	COMMUNICATION PROTOCOL.....	4
1.1	ELECTRICAL INTERFACE	4
1.2	COMMUNICATION MODE	4
2	COMMANDS	4
3	ANSWERS.....	5
4	LIST OF COMMANDS AND ANSWERS.....	6
4.1	RESET COMMAND	7
4.2	FIRMWARE VERSION REQUEST COMMAND	7
4.3	STATUS REQUEST COMMAND.....	7
4.4	ENABLE AUTOMATIC READING COMMAND	8
4.5	DISABLE AUTOMATIC READING COMMAND	9
4.6	TITLE READING COMMAND.....	9
4.7	SEND COMMANDS TO CONTACTLESS CONTROLLER COMMAND	10
4.8	INPUT / OUTPUT STATUS REQUEST COMMAND.....	10
4.9	OUTPUT ACTIVATION COMMAND	11
4.10	TITLE READING POSITION SETTING COMMAND	12
4.11	TITLE READING POSITION STORE COMMAND	12
4.12	DEFAULT PARAMETERS RESTORE COMMAND.....	12
4.13	TITLE LENGHT SETTING COMMAND	13
4.14	TITLE LENGHT STORE COMMAND	13
4.15	LASER BEAM POSITION SETTING COMMAND	13
4.16	LASER BEAM POSITION STORE COMMAND	13
4.17	BARCODE HEIGHT SETTING COMMAND	14
4.18	BARCODE HEIGHT STORE COMMAND	14

1 COMMUNICATION PROTOCOL

1.1 ELECTRICAL INTERFACE

The standard interface supplied is the serial line EIA RS232C with standard electric levels (+/- 12 Volt).

1.2 COMMUNICATION MODE

The serial communication is asynchronous full duplex with the following characteristics

Speed	19200 bauds
Bit per character	7
Stop Bit	1
Parity	Even

2 COMMANDS

The command is the message sent by the host to the module in order to execute a certain operation (for example the reading of a title, request of data read).

The command format is the following:

stx cc data etx

Where:	<i>stx</i>	Beginning of the message (character Hex 02)
	<i>cc</i>	Command code composed by two ascii characters, that define the kind of command.
	<i>data</i>	Data of the command of different length, variable according to kind of command The command can also has no data.
	<i>etx</i>	End of the message (character Hex 03)

In the format indicated the spaces between the fields have been used to make message clear but they are not part of the message. For example the reset command is composed by four characters (Hex 02, Hex 30, Hex 31, Hex 03), and the format is indicated with "*stx 01 etx*".

When the host sends a command, following cases can occur:

1) The module responds with the character **ack** (Hex 06). This case occurs if there have not been communication errors and the command is formally correct. At this point the host waits for the answer message that the module will send after executing the command. Note that the command execution time varies from a few milliseconds to a few seconds according to the operation that must be done.

2) The module responds with the character **nak** (Hex 15). This case occurs when there are communication errors or if the command is not valid. At this point the host must transmit again the command and, if the error repeats, eventually signal the out of order status of the module.

3) The module does not respond within 300 msec. This case occurs if the module is not connected, if it is off or broken. The host can send again the command or send a status request , and eventually signal the out of order service of the module if the error repeats.

3 ANSWERS

The answer is the message sent by the module in order to communicate to the host that command received has been executed, or that a asynchronous event, independent from execution of the command has occurred (for example a reset hardware reset).

The format of the answer is the following:

stx cc rr data etx

Where:	<i>stx</i>	Beginning of the message (character Hex 02)
	<i>cc</i>	Command code executed composed by two ascii characters. If the answer is generated by a asynchronous event, the command code takes "00" value. For example after hardware reset the module send this message: " <i>stx</i> 00 51 <i>all etx</i> ".
	<i>rr</i>	Response code to executed command, the code consists of two ascii characters.
	<i>data</i>	Data associated to the command with variable length according to kind of answer. The answer can also not have data.
	<i>etx</i>	End of the message (character Hex 03)

In the format indicated the spaces between each field have been inserted in order to have a more clear message. For example the answer to the reset command is composed by six characters (Hex 02, Hex 30, Hex 31, Hex 35, Hex 31, Hex 03), and the format is indicated with "*stx* 01 51 *etx*".

When the module receives a valid message from the host, it sends the character ***ack*** (Hex 06), executes the command, and at the end sends the answer. At this point following events can occur:

- 1) The Host receives the answer with communication errors, or the answer is not valid. In this case it can send the character ***nak*** (Hex 15) that requires the repetition of the answer from the module, and if needed signal the out of service status of the module if error repeats.
- 2) The host receives the answer without errors. In this case it analyses the answer and can send another command to the module.
- 3) The host does not receive the answer within 20 seconds. In this case it can send the character ***nak*** (Hex 15) to ask the repetition of the answer from the module, or send a status request, and if the error repeats it can send a out of service signal.

4 LIST OF COMMANDS AND ANSWERS

Following paragraphs describe in detail each command. In the form that follows commands, answers and relevant description are listed.

Command	Answer	Description
stx 01 etx	stx 01 51 al etx	Reset software
stx 02 etx	stx 02 52 ve etx	Version request
stx 03 etx	stx 03 53 al op ar ms tk etx	Status request
stx 04 t etx	stx 04 54 status etx	Enable automatic reading
	stx 00 56 le al [data]etx	Execute automatic reading
stx 05 etx	stx 05 55 status etx	Disable automatic reading
stx 06 t ej etx	stx 06 56 le al [data]etx	Reading
stx 07 com etx	stx 07 57 err ris etx	Send commands to contactless controller
stx 08 etx	stx 08 58 i1 i2 i3 i4 o1 o2 o3 o4 etx	Input and output status request
stx 09 o1 o2 o3 etx	stx 09 59 i1 i2 i3 i4 o1 o2 o3 o4 etx	Output activation command
stx 10 aaa etx	stx 1060 aaa etx	Barcode or contactless card reading position setting
stx 11 etx	stx 1161 x etx	Barcode or contactless card position memorization.
stx 12 etx	stx 1262 x etx	Restore default parameter
stx 13 aaa etx	stx 1363 aaa etx	Ticket length setting
stx 14 etx	stx 1464 x etx	Ticket length memorization.
stx 15 aaa etx	stx 1565 aaaaa etx	Laser beam, position setting
stx 16 etx	stx 1666 x etx	Laser beam position memorization.
stx 17 aaa etx	stx 1767 aaa etx	Barcode height setting
stx 18 etx	stx 1868 x etx	Barcode height memorization.

4.1 RESET COMMAND

This command determines a CPU software reset. During this phase the module is initialized; titles present in the module are ejected from issuing opening.

Command: *stx 01 etx*

Answer: *stx 01 51 al etx*

Where : *al* Character that indicates the alarm code
 "0" No error
 "7" Title jammed

When module is reset pressing the SW1 button or when it is switched on it sends the following message:

stx 00 51 al etx

4.2 FIRMWARE VERSION REQUEST COMMAND

The host can require the FW version installed on the module by sending the following command:

Command: *stx 02 etx*

Answer: *stx 02 52 ve etx*

Where: *ve* alphanumeric string of variable length that contains the firmware version.

4.3 STATUS REQUEST COMMAND

The host can use this command to ask the current status of the module. It can send this message at any time, also during the execution of a previous command.

Command: *stx 03 etx*

Answer: *stx 03 53 al op ar ms tk (ris) etx*

Where: *al* A character that indicates the alarm code

 "0" No error
 "1" Command in execution
 "2" Command not executed for title not present in the module
 "3" Command not executed for title already present in the module
 "4" Command not executed for reading already enabled
 "7" Title jammed

op A character that indicates operation in execution

 "0" No operation
 "1" Reset in execution
 "2" Reading/verifying in execution

"3" Issuing in execution

ar A character that indicates automatic reading status

"0" Automatic reading disabled

"1" Automatic reading enabled

ms A character that indicates front opening status

"0" Front opening free and shutter open

"1" Title in front opening

tk A character that indicates the status of the title in the module

"0" Title not present in the module

"1" Title present in the module

ris A character that indicates the status of the title in the module (only in firmware version with card dispenser installed)

"0" Card not present

"1" Card present not running out

4.4 ENABLE AUTOMATIC READING COMMAND

When automatic reading is enabled, the module reads the title as the title is inserted in the front opening.

Command: ***stx 04 t etx***

Where: *t* A character that advised if a contactless title or a barcode must be read

"C" Read barcode

"M" Read contactless title

"0" Do not read

Answer: ***stx 04 54 status etx***

Where: *status* Check read status command parameters

The module reads the title as it is inserted in the front opening and, at the end of reading, disables automatic reading and sends the following message:

stx 00 56 e al [data] etx

Where: *e* A character that indicates the result of reading made.

"0" Reading not executed

"C" Barcode reading

"M" Place title under contactless reader

<i>al</i>	A character that indicates possible alarms.
"0"	No error
"1"	Command in execution
"2"	Command not executed for title not present in the module
"3"	Command not executed for title already present in the module
"4"	Command not executed for reading already enabled
"7"	Title jammed
<i>data</i>	Data read from barcode. Data will be visualised only if reading has a positive result; if a contactless card reader is connected this parameter is not present

4.5 DISABLE AUTOMATIC READING COMMAND

When reading is disabled, the module does not accept the introduction of the title in the front opening. If title is already inserted, the module ejects the title before sending the answer. Please note that if the host sends the command right after the introduction of the tile, before reading is done, the module will send the reading message before ejecting the title.

Command: **stx 05 etx**

Answer: **stx 05 55 status etx**

Where: *status* Check status reading command parameters

4.6 TITLE READING COMMAND

When the module receives this command, sends the data read from the last executed, eject or swallow a ticket.

Command: **stx 06 t ej etx**

Where: *t* A character that indicates kind of title to read: barcode or contactless

"0"	Do not execute reading
"C"	Read the barcode
"c"	Read the barcode in the second position only in firmware configuration 05
"M"	Position the card under the contactless reader

ej A character that indicates destination of the title

"0"	Stays in the module
"E"	Issuing from front opening
"e"	Partial issuing, the ticket remain under the roller
"B"	Swallowing of the title
"F"	Feed the card from the card dispenser (only in firmware version with the card dispenser installed)

Answer: **stx 06 56 e al [data] etx**

Where:	<i>e</i>	A character that indicates reading result
	"0"	Reading not executed
	"C"	Barcode correctly read
	"c"	Barcode in second position correctly read only in firmware configuration 05
	"M"	Position title under contactless card reader
	<i>al</i>	A character that indicates possible alarms
	"0"	No error
	"1"	Command in execution
	"2"	Command not executed for title not present in the module
	"3"	Command not executed for title already present in the module
	"7"	Title jammed
	<i>data</i>	Data read from barcode. Data will be visualized only if reading gives a positive result; when a contactless card reader is connected this parameter is not present.

4.7 SEND COMMANDS TO CONTACTLESS CONTROLLER COMMAND

When the module receives this message it sends the command specified to the R/W controller of the I/C Card. The Answer of the controller is send to the host via answer message.

Command: **stx 07 com etx**

Where:*com* Command to be sent to the controller without final crc

Answer: **stx 07 57 err [ris] etx**

Where:*err* A character that indicates error code

"0"	The controller has received the command correctly
"1"	The controller has received a command that has not been executed yet
"2"	Command not executed for title not present in the module
"3"	The controller does not respond or is not installed
"4"	The data sent from the controller contain of the errors
"5"	The command sent is too long and is ignored

ris Answer sent from the controller without final crc. This parameter is present only if the error code is "0".

4.8 INPUT / OUTPUT STATUS REQUEST COMMAND

This command is used to read input and output status

Command: **stx 08 etx**

Answer: **stx 08 58 i1 i2 i3 i4 o1 o2 o3 o4 etx**

Where: *i1* A character that indicates input 1 status

"0"	Input status not active
"1"	Input status active

- i2* A character that indicated input 2 status
 - “0” Input status not active
 - “1” Input status active
- i3* A character that indicates the input 3 status
 - “0” Input status not active
 - “1” Input status active
- i4* A character that indicates the input 4 status
 - “0” Input status not active
 - “1” Input status active

- o1* A character that indicates output 1 status
 - “0” Output status not active
 - “1” Output status active
- o2* A character that indicates output 2 status
 - “0” Output status not active
 - “1” Output status active
- o3* A character that indicates output 3 status
 - “0” Output status not active
 - “1” Output status active
- o4* A character that indicates output 4 status
 - “0” Output status not active
 - “1” Output status active

4.9 OUTPUT ACTIVATION COMMAND

This command is used to activate or deactivate the output.

Command: **stx 09 o1 o2 o3 o4 etx**

- Dove: *o1* A character to modify output 1 status
 - “0” Deactivate output 1
 - “1” Activate output 1
- o2* A character to modify output 2 status
 - “0” Deactivate output 2
 - “1” Activate output 2
- o3* A character to modify output 3 status
 - “0” Deactivate output 3
 - “1” Activate output 3
- O4* A character to modify output 4 status
 - “0” Deactivate output 4
 - “1” Activate output 4

Answer: **stx 09 59 i1 i2 i3 i4 o1 o2 o3 o4 etx**

- Where: *i1* A character that indicates input 1 status
 - “0” Input status not active
 - “1” Input status active
- i2* A character that indicated input 2 status
 - “0” Input status not active
 - “1” Input status active
- i3* A character that indicates the input 3 status
 - “0” Input status not active

	“1”	Input status active
<i>I4</i>	A character that indicates the input 4 status	
	“0”	Input status not active
	“1”	Input status active
<i>o1</i>	A character that indicates output 1 status	
	“0”	Output status not active
	“1”	Output status active
<i>o2</i>	A character that indicates output 2 status	
	“0”	Output status not active
	“1”	Output status active
<i>o3</i>	A character that indicates output 3 status	
	“0”	Output status not active
	“1”	Output status active
<i>o4</i>	A character that indicates output 4 status	
	“0”	Output status not active
	“1”	Output status active

4.10 TITLE READING POSITION SETTING COMMAND

This command allows to set up the barcode or contactless reading position. The reading position is relative to the lower border of the title.

Command: **stx 10 aaa etx**

Where: *aaa* 3 characters that indicate reading position in tenths of millimetres

Answer: **stx 10 60 aaa etx**

Where: *aaa* 3 Characters that indicate reading position in tenths of millimetres

4.11 TITLE READING POSITION STORE COMMAND

This command allows to store permanently on the EEPROM the position set with the command 10

Command: **stx 11 etx**

Answer: **stx 11 61 x etx**

Where: *x* A character that indicates result of the command
0 = memorization OK
E = memorization failed

4.12 DEFAULT PARAMETERS RESTORE COMMAND

This command restore the default values of the BCR parameters

Command: **stx 12 etx**

Answer: **stx 12 62 x stx**

Where: *x* A character that indicates result of the command
0 = memorization OK
E = memorization failed

4.13 TITLE LENGHT SETTING COMMAND

This command allows to set up the title length, Values are show in tenths of millimetres, the module could manage title with length between 845 dmm and 999 dmm. If the value is not valid the command will answer with the actual value.

Command: **stx 13 aaa etx**

Where: *aaa* 3 characters that indicate title length in tenths of millimetres

Answer: **stx 13 63 aaa etx**

Where: *aaa* 3 characters that indicate title length in tenths of millimetres

4.14 TITLE LENGHT STORE COMMAND

This command allows to store permanently on the EEPROM the title length set with the command 13

Command: **stx 14 etx**

Answer: **stx 14 64 x etx**

Where: *x* A character that indicates result of the command
0 = memorization OK
E = memorization failed

4.15 LASER BEAM POSITION SETTING COMMAND

This command allows to set up the laser beam position The value are show in tenths of millimetres between 0 dmm and 2000 dmm, it indicates the distance between the optical sensor under the motor and the laser beam. If the value is not valid the command will answer with the actual value.

Command: **stx 15 aaaaa etx**

Where: *aaaaa* 5 characters that indicate the distance in tenths of millimetres

Answer: **stx 15 65 aaaaa etx**

Where: *aaaaa* 5 characters that indicate the distance in tenths of millimetres

4.16 LASER BEAM POSITION STORE COMMAND

This command allows to store permanently on the EEPROM the laser beam position set with the command 15

Command: **stx 16 etx**

Answer: **stx 16 66 x etx**

Where: *x* A character that indicates result of the command
0 = memorization OK
E = memorization failed

4.17 BARCODE HEIGHT SETTING COMMAND

This command allows to set up the height of the barcode, The value are show in tenths of millimetres the between 40 dmm and 999 dmm. If the value is not valid the command will answer with the actual value.

Command: **stx 17 aaa etx**

Where: *aaa* 3 characters that indicate height of the barcode in tenths of millimetres

Answer: **stx 17 67 aaa etx**

Where: *aaa* 3 characters that indicate height of the barcode in tenths of millimetres

4.18 BARCODE HEIGHT STORE COMMAND

This command allows to store permanently on the EEPROM the barcode height set with the command 17

Command: **stx 18 etx**

Answer: **stx 18 68 x etx**

Where: *x* A character that indicates result of the command
0 = memorization OK
E = memorization failed

4.19 TITLE READING SECOND POSITION SETTING COMMAND

This command allows to se tup the barcode or contactless reading position. The reading position is relative to the lower border of the title. This command is available only in configuration firmware 05

Command: **stx 19 aaa etx**

Where: *aaa* 3 characters that indicate reading position in tenths of millimetres

Answer: **stx 19 69 aaa etx**

Where: *aaa* 3 Characters that indicate reading position in tenths of millimetres

4.20 TITLE READING SECOND POSITION STORE COMMAND

This command allows to store permanently on the EEPROM the position set with the command 10
This command is available only in configuration firmware 05

Command: *stx 20 etx*

Answer: *stx 2080 x etx*

Where: *x* A character that indicates result of the command
 0 = memorization OK
 E = memorization failed