WBM-9800 SERIES

MANUAL INSERTION

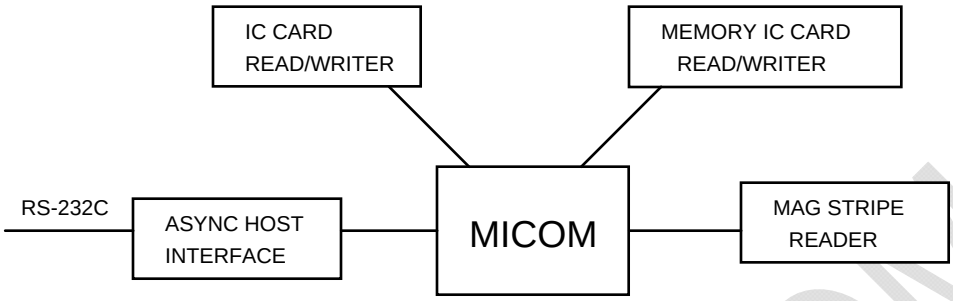
MAGNETIC/IC CARD READER/WRITER

CONTENTS

1. OVERVIEW

WBM-98XX series is a manual insertion type reader with magnetic card reading function, and the IC card reading and writing function.

2. SYSTEM BLOCK DIAGRAM



*MAG = Magnetic

3. CONFIGURATION TABLE

MODEL	TRACK	INTERFACE	IC	SAM
WBM-98	0:NO 7:TrackI&II&III	0:RS232 2:USB	-1:Yes	S: Yes

MODEL	DIMENSION	MODEL(WBM-98XX-X)			
	L*W*H(mm)	With MAG&IC	Without IC	Without MAG	SAM
WBM98X0 (RS232)	118*78*35	WBM-9870-1	WBM-9870	WBM-9800-1	NO
		WBM-9870-1S	WBM-9870-S	WBM-9800-1S	YES
WBM98X2 (USB)		WBM-9872-1	WBM-9872	WBM-9802-1	NO
		WBM-9872-1S	WBM-9872-S	WBM-9802-1S	YES

4. FEATURES

4.1 Magnetic Stripe reading Triple tracks.
4.2 Customized Front Bezel is available at option
4.3 RS-232C interface with a HOST.
4.4 IC Card read and writes.
4.5 SIEMENS & ATMEL Memory IC Card read and writes
4.6 The IC contact is designed to minimize scratch on the IC card.
4.7 Mag. Head and Chip contacts are located on the opposite side.
4.8 The CP_8 location is available.
4.9 The CP_16 location is available at option.
4.10 Support T=0 and T=1 protocol.

5. ENVIRONMENTAL REQUIREMENTS

Operating Temperature and Humidity : 0~ 50℃, 20~ 90% RH
Conservation Temperature and Humidity : -20 ~70℃, 0~95% RH
Vibration : Amplitude 2mm, 10~50Hz/min in x, y, z direction
Shock Resistance : Up to 30 G, 11msec

6. SPECIFICATIONS

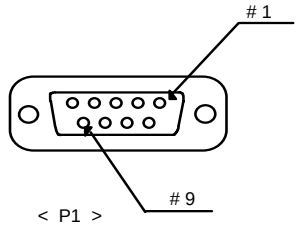
6.1. Card Standard : ISO 7811, ISO 7816, CP-8
6.2. Mag. Track No : I (IATA), II (ABA), III (MINTS)
6.3. Mag. Reading Method : F2F (FM)
6.4. Mag. Recording Density : 210 BPI (I, III), 75 BPI (II)
6.5. Mag. Recording Capacity : I (IATA) - 79 Characters.(data 6 bit + odd parity 1 bit)
: II (ABA) - 40 Characters.(data 4 bit + odd parity 1 bit)
: III (MINTS) – 107 Characters.(data 4 bit + odd parity 1 bit)
6.6. Card Thickness : 0.76 ± 0.08 mm
6.7. Power Consumption
6.7.1. Input voltage : + 5V DC ± 5%
6.7.2. Ripple : Less than 50 mVp-p
6.7.3. Operating : Less than 700 mA
6.8. IC Contact Resistance : Less than 0.5 Ω
6.9. Time for motor Operation : 50 msec (Approx.)
6.10. Operation Locus : Indoors Only
6.11. Mag. Card Feeding Speed : 15 ~80 cm/sec
6.12. Life-time : Head: Min. 500,000 Cycles
IC card contact: Min. 350,000 Cycles.(1Cycle = 2Pass)

7. INTERFACE REQUIREMENTS

7.1 Physical Constructions

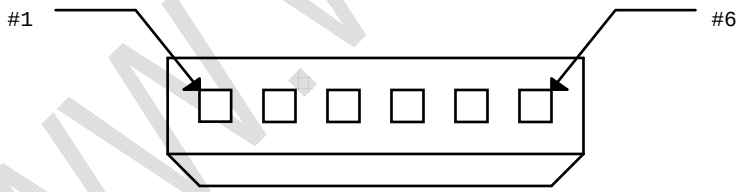
7.1.1 RS-232C Connector.

RS-232C Signal Name	HOST PC (9 pin)	CARD R/W (9 pin)	Function
TXD	2	3	Transmit Data
RXD	3	2	Receive Data
GOUND	5	5	Signal Ground



7.1.2 The opposite side of RS-232C Connector -- MOLEX 5264-06

Pin No.	Signal Name	Function
1	GND	Ground
2	VCC	+5 VDC
3	GND	Ground
4	TXD	Transmit Data
5	RXD	Receive Data Solenoid Vcc
6	GND	Ground



7.2 Logical Constructions

7.2.1 Transmission Control Specifications

(1) Type : Asynchronous, Half duplex.
(2) Baud Rate : 9600 bps
(3) Data Length : 8 bits, None parity
(4) Start bit : 1 bit
(5) Stop bit : 1 bit
(6) Character Code : ASCII

8. COMMUNICATION PROTOCOL SEQUENCE

HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	DATA	LRC
60h	2 byte	1 byte	1 byte	variable	1 byte

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Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	2 byte	1 byte	variable	1 byte

HOST

8.1 Block frame

Prologue field (mandatory) -- The first field of a block. It contains subfields for length (LEN).

Information field (optional) -- The field of a block which contains data (generally application data).

Epilogue field (mandatory) --.The final field of a block. It contains the Error detection code(EDC) byte.

Prologue field		Information field	Epilogue field
HEADER	LEN	INF	LRC
60h	2 byte	1 to 255bytes	1 byte

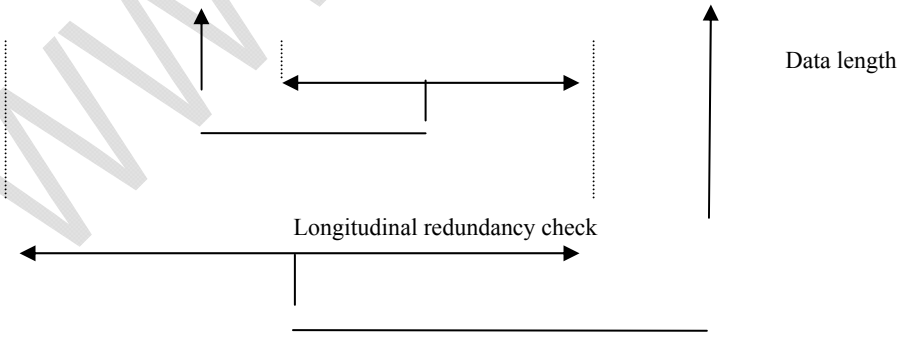

Figure 1 - Block structure

8.2 Basic elements of the block

8.2.1 Prologue field (mandatory)

This field is mandatory and consists of two bytes: the header byte and length.

(1) Header

The header is a byte used to identify the source and the intended destination of the block.

The default value of HEADER is 60h.

(2) Length (LEN)

LEN indicates the number of bytes transmitted in the information field of the block.

See figure 1.

The coding shall be

'00' to 'FF'	codes the number of bytes in the information field from 1 to 255.
'100' ~	is reserved for future use.

8.2.2 Information field (INF)

The presence of INF is optional. When present, INF conveys either application data or Non-application control and status information.

The number of bytes transmitted is indicated by LEN.

(1) Structure of command INF

Command INF consists of a mandatory header of 2 bytes and a conditional body of variable length.

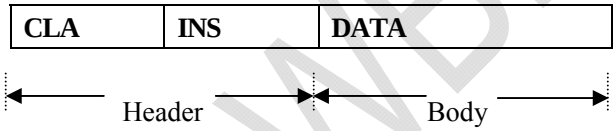

Figure 2 - Structure of command INF

Code	Description	Length
CLA	Class of instruct	1 byte
INS	Instruction code	1 byte
DATA	String of data bytes sent in the command	Variable

Table 1 - Command INF contents

(2) Structure of INF response

Response INF consists of a header of 1 byte and a conditional body of variable length.

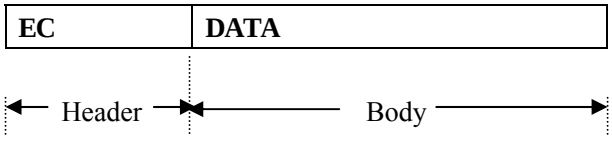

Figure 3 - Structure of INF response

Code	Description	Length
EC	Error Code	1 byte
DATA	String bytes received by command	variable

Table 2 - Response INF contents

8.2.3 Epilogue field (mandatory)

This field is mandatory. It contains the error detection code (EDC) of the transmitted block.

The protocol definition permits this to be an LRC (Longitudinal Redundancy Check)

The LRC is one byte in length. The LRC is calculated as the exclusive OR (XOR) of all bytes starting with the HEADER through the last byte of the information field, and is typically referred to simply as the checksum.

9. COMMUNICATION FORMAT

9.1 Command Code List

Command	CLA	INS	Description
Control	'C' (43h)	'1' (31h)	Card eject
		'2' (32h)	Report the presence and the position of a card in detail(Ph1,Ph2,Ph3)
		'3'(33h)	Initialize command
		'4'(34h)	Get version
MS Card	'M' (4Dh)	'1' (31h)	MS continues fore read mode and MS direct read Triple track
		'2' (32h)	MS continues back read mode and MS direct read Triple track
		'3' (33h)	MS continues read mode clear
Smart Card	'I' (49h)	'1' (31h)	IC Card Power Off
		'2' (32h)	IC Card Power On(ATR)
		'3' (33h)	IC Card Direct
		'4' (34h)	IC Card Select
Memory Card	'R' (52h)	'1' (31h)	Memory IC Card Power Off
(siemens)		'2' (32h)	Siemens memory Card (SLE4418/28/42) -- Power On(ATR)
		'3' (33h)	Siemens memory Card (SLE4418/28) -- Read IC card without protect
		'4' (34h)	Siemens memory Card (SLE4418/28) -- Read IC card with protect
		'5' (35h)	Siemens memory Card (SLE4418/28) -- Write IC card without protect
		'6' (36h)	Siemens memory Card (SLE4418/28) -- Write IC card with protect
		'7' (37h)	Siemens memory Card (SLE4428) ---------- PSC code verify
SLE 4442	'T'(54h)	'1' (31h)	Siemens memory Card (SLE4442) ---------- Read main memory
		'2' (32h)	Siemens memory Card (SLE4442) ---------- Read protect memory
		'3'(33h)	Siemens memory Card (SLE4442) ---------- Write without protect

		‘4’(34h)	Siemens memory Card (SLE4442) ---------- Write with protect
		‘5’(35h)	Siemens memory Card (SLE4442) ---------- PSC compare
		‘6’(36h)	Siemens memory Card (SLE4442) ---------- PSC modify
		‘7’(37h)	Siemens memory Card (SLE4442) ---------- Read security memory
Atmel Card	‘A’(41h)	‘1’ (31h)	Atmel memory card(AT24C01/2/4/8/16/32/64/128/256/512) ------ Power On
		‘2’ (32h)	Atmel memory card(AT24C01/2/4/8/16/32/64/128/256/512) ------ Byte write
		‘3’ (33h)	Atmel memory card(AT24C01/2/4/8/16/32/64/128/256/512) ------ Page write
		‘4’ (34h)	Atmel memory card(AT24C01/2/4/8/16/32/64/128/256/512) ------ Current address/sequential read
		‘5’ (35h)	Atmel memory card(AT24C01/2/4/8/16/32/64/128/256/512) ------Random/Sequential read

9.2 Error Code List

EC(Error Code)	Description
‘0’ (30h)	Normal execution
‘1’ (31h)	Communication LRC error
‘2’ (32h)	Command error
‘3’ (33h)	DATA form error
‘4’ (34h)	Do not execute a locker
‘6’ (36h)	No card in module
‘7’(37h)	Card operate error

9.3 Control Command

9.3.1 Card eject

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	‘C’(43h)	‘1’(31h)	10h
1 byte	2 byte	1 byte	1 byte	1 byte

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* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.3.2 Report the presence and the position of a card in detail (Ph1, Ph2, Ph3)

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'C'(43h)	'2'(32h)	13h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field				Epilogue field
HEADER	LEN	EC	DATA			LRC
60h	0004h	??	Ph1	Ph2	Ph3	??
1 byte	2 byte	1 byte	1byte	1byte	1byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.3.3 Initial command

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'C'(43h)	'3'(33h)	12h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

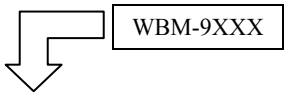
9.3.4 Get version

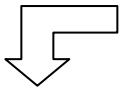
HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'C'(43h)	'4'(34h)	15h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .





Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	0006h	30h	??	??
1 byte	2 byte	1byte	5 bytes	1 byte

HOST

*Data: Version of the device

9.4 Magnetic card Command

9.4.1 Code List

(1) Track ID List

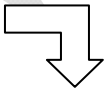
* Track ID			
	%(25h)	1 Track	76 bytes
	? (3Fh)	2 Track	37 bytes
	&(26h)	3 Track	104 bytes

(2) Error Code List

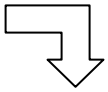
EC(Error Code)	Description
'0' (30h)	Normal execution
'1' (31h)	Blank error
'2' (32h)	Preamble error
'3' (33h)	Postamble error
'4' (34h)	Parity error
'5' (35h)	LRC error

9.4.2 MS continues Forward read mode & MS direct read triple track

HOST



Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'M'(4Dh)	'1'(31h)	1Eh



1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

ex) MS Card(forward read)

i) Error Code: 30h (Triple track good)

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	**30h**	??	??
1 byte	2 byte	1byte	Variable	1 byte

2 Track				1 Track				3 Track			
30h	Track ID	Data	00	30h	Track ID	Data	00	30h	Track ID	Data	00
good				good				good			
2Track (?)				1Track (%)				3 Track (&)			

ii) Error Code: 30h (track 2 errors)

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	**30h**	??	??
1 byte	2 byte	1byte	Variable	1 byte

2 Track			1 Track				3 Track ID			
EC	Track ID	00	EC	Track ID	Data	00	EC	Track ID	Data	00
2Track (?)			1Track (%)				3 Track (&)			

9.4.3 MS continues Backward read mode & MS direct read triple track

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'M'(4Dh)	'2'(32h)	1Dh
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.4.4 MS continues read mode clear

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC

60h	0002h	'M'(4Dh)	'3'(33h)	1Ch
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1 for the Command code list.

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	??	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2 for the Error code list.

9.5 Smart card command

9.5.1 Smart card power OFF

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'I'(49h)	'1'(31h)	1Ah
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

* If the module does not insert a card when the host sends a command (power on) to the module, the above format is the same

9.5.2 Smart card power ON (ATR)

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'I'(49h)	'2'(32h)	19h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	ATR	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.5.3 Smart card DIRECT (APDUs)

HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	DATA	LRC
60h	??	'I'(49h)	'3'(33h)	APDUs	??
1 byte	2 byte	1 byte	1 byte	variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	APDUs	??
60h	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.5.4 Smart card Select

HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	DATA	LRC
60h	3	'I'(49h)	'4'(34h)	??	??
1 byte	2 byte	1 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	1	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.6 Memory card command

9.6.1 Memory card power OFF

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'R'(52h)	'1'(31h)	01h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

* If the module do not insert a card when the host send a command (power on) to the module, the above format is a same

9.6.2 Siemens memory Card (SLE4418/28/42) -- Power On (ATR)

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'R'(52h)	'2'(32h)	02h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	ATR	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.6.3 Siemens memory Card (SLE4418/28) -- Read IC card without protect

IC CARD DIRECT FOR SLE4418/SLE4428 command is for communication with the IC card (SLE4418/SLE4428), and it is available after executing IC POWER ON. SLE4418 card has same function with SLE4428 just except not using of PSC to read or write data on an IC card in Hex value, the start address is necessary which is available for 000h ~ max 3FFh As " ***len** is the length of data to read or write from start address, start address data length" Should not be more than 3FFh

This command is to read data in 1 bytes of Hex value from start address for length the maximum length to read at once is 256 bytes (100h)

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***len**	LRC
60h	0006h	'R'(52h)	'3'(33h)	??	??	??
1 byte	2 byte	1 byte	1 byte	2 bytes	2 bytes	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***sa** : start address (2bytes : Hex value : 000h~ 3FFh)

***len** : data length (2bytes : Hex value : 001h ~ 100h)

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

* Hex value: ***len** bytes **(**If ***sa** + ***len** > 3FFh, the unit reads by 3FFh)

9.6.4 Siemens memory Card (SLE4418/28) -- Read IC card with protect

This command is to read data in 2 bytes (1byte to check protection existence and 1 byte in Hex value). The Maximum length is 256 bytes (100h) from start address for length.

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***len**	LRC
60h	0006h	'R'(52h)	'3'(34h)	??	??	??
1 byte	2 byte	1 byte	1 byte	2 bytes	2 bytes	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

***sa:** start address (2bytes : Hex value : 000h~ 3FFh)

***len**: data length (2bytes : Hex value : 001h ~ 100h)

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	***DATA**	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	Variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

* Hex value: 2 x ***len** bytes (If ***sa** + ***len** > 3FFh, the unit reads by 3FFh)

***DATA** format

Protect check	**Data**
2Ah(*) : Protect data	**??**
20h(space) : Not protect data	
1 byte	1 byte

9.6.5 Siemens memory Card (SLE4418/28) -- Write IC card without protect

This command is to write and verify 1 byte data in hex value from the start to the end are by one, and the maximum data length which can write at once is 256 bytes. (100h)

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***Data**	LRC
60h	??	'R'(52h)	'5'(35h)	??	??	??
1 byte	2 byte	1 byte	1 byte	2 bytes	Variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***sa**: start address (2bytes: Hex value: 000h~ 3FFh)

***Data**: data length (Max. 256bytes)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.6 Siemens memory Card (SLE4418/28) -- Write IC card with protect

This command is same as ' write IC card without protect ' except one point that the unit writes data with protection to prevent over- writing

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***Data**	LRC
60h	??	'R'(52h)	'6'(36h)	??	??	??
1 byte	2 byte	1 byte	1 byte	2 bytes	Variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***sa**: start address (2bytes: Hex value: 000h~ 3FFh)

***Data**: data length (Max. 256bytes)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2 for the Error code list.

9.6.7 Siemens memory Card (SLE4428) ---------- PSC code verify (Only use when writing/reading with protect)

This command should be done before writing data If the input PSC code is different from the original PSC code. The value at IC card address 3FDh will be down counted in bit and, if the value of 3FDh be come ' 0' after 8 times of miss input the IC card will not be valid any move , Therefore error count should be checked when this command is performed.

	D_7							Do
1'st error	1	1	1	1	1	1	1	0
2'nd error	1	1	1	1	1	1	0	0
8'th error	0	0	0	0	0	0	0	0

Zero count Lock

- Address : 3FDh -

HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	Data	LRC
60h	0004h	'R'(52h)	'7'(37h)	***PCS-code**	??
1 byte	2 byte	1 byte	1 byte	2 bytes	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

***PCS-code**: Hex value (2bytes)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

* If you want to know the error value and PSC value after it is verified well by this command, you can use "Read IC Card without protect" command and define a start address and length (**start address**: 3FDh, **length**: 003h).

* If you want to change **PSC-code** again after it is verified well by this command, you can use "Write IC card without protect"command and change it in 3FEh, 3FFH, area of SLE 4428 PSC code.

Ex) command to change current PSC to "1234" (***sa** = 3FEh, ***Data** = ' 1234 ‘)

Prologue field		Information field						Epilogue field
HEADER	LEN	CLA	INS	***sa**		***Data**		LRC
60h	0006h	‘R’(52h)	‘5’(35h)	03h	FEh	12h	34h	Deh
1 byte	2 byte	1 byte	1 byte	2 bytes		2 bytes		1 byte

9.6.8 Siemens memory Card (SLE4442) ---------- Read main memory

IC CARD DIRECT FOR SLE4442 command is for communication with the IC card (SLE4442), and it is available after executing IC POWER ON. To read or write data on an IC card in hex value, the start address is necessary which is available for Min. 00h ~ Max. FFh As " *len is the length of data to read or write from start address, start address data length “should not be more than FFh.

This command is to read main memory (20h~FFh) data in 1 bytes of hex value.

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	‘T’(54h)	‘1’(31h)	08h
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	00E0h	??	??	??
1 byte	2 byte	1 byte	224 bytes	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list .

9.6.9 Siemens memory Card (SLE4442) ---------- Read protect memory

This command is to read protect memory (00h~1Fh) data in 2 bytes of Hex value.

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'T'(54h)	'2'(32h)	09h
1 byte	2byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	***DATA**	LRC
60h	0041h	??	??	??
1 byte	2 byte	1 byte	32 bytes	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

***DATA** format

Protect check	**Data**
2Ah(*) : Protect data	**??**
20h(space) : Not protect data	
1 byte	1 byte

9.6.10 Siemens memory Card (SLE4442) ---------- Write without protect

This command is to write unprotected memory.

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***Data**	LRC
60h	??	'T'(54h)	'3'(33h)	??	??	??
1 byte	2 byte	1 byte	1 byte	1 byte	Variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***sa**: start address (1bytes: Hex value: 00h~ FFh)

***Data**: data length (Max. 256bytes) -- Hex value (length of ***Data** + ***sa** <= FFh)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.11 Siemens memory Card (SLE4442) ---------- Write with protect

This command is to write with protection to prevent over-writing.

This command can write on the area where the new data and exist data are same among protected memories.

HOST

Prologue field		Information field				Epilogue field
HEADER	LEN	CLA	INS	***sa**	***Data**	LRC
60h	??	'T'(54h)	'4'(34h)	??	??	??

1 byte	2 byte	1 byte	1 byte	1 byte	Variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***sa**: start address (1bytes: Hex value: 00h~ 1Fh)

***Data**: data length (Max. 32bytes) -- Hex value (length of ***Data** + ***sa** <= 20h)

WBM-9XXX

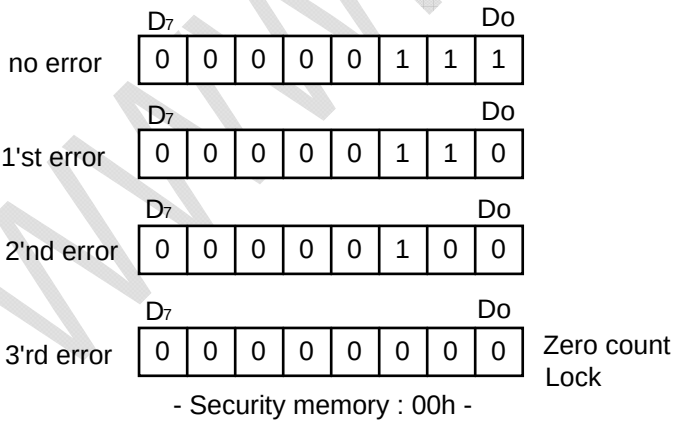
Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.12 Siemens memory Card (SLE4442) ---------- PSC compare

This command should be done before writing data If the input PSC code is different from the original PSC code, the value at 00h of security memory will be down counted in bit and, if the value of 00h be come ' 0 ' after 3 times of miss input the IC card will not be valid any move ,Therefore error count should be checked when this command is performed.



HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	Data	LRC
60h	0005h	'T'(54h)	'5'(35h)	***PCS-code**	??
1 byte	2 byte	1 byte	1 byte	3 bytes	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

***PCS-code**: Hex value (3 bytes)

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	***Data**	LRC
60h	0005h	??		??
1 byte	2 byte	1 byte	4 bytes	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

***Data**: Error Counter value (1 byte) and Security memory values (3 bytes)

9.6.13 Siemens memory Card (SLE4442) ---------- PSC modify

This is the command to modify PSC after executing PSC COMPARE command.

PSC COMPARE must be executed after PSC modification is done.

HOST

Prologue field		Information field			Epilogue field
HEADER	LEN	CLA	INS	Data	LRC
60h	0005h	'T'(54h)	'6'(36h)	***PCS-code**	??
1 byte	2 byte	1 byte	1 byte	3 bytes	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

***PCS-code**: Hex value (3 bytes)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.14 Siemens memory Card (SLE4442) ---------- Read security memory

This is the command to read security memory where PSC errors count and PSC are existed.

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'T'(54h)	'7'(37h)	0Eh
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list.

***PCS-code**: Hex value (3 bytes)

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	***Data**	LRC
60h	0005h	??	***PCS-code**	??

1 byte	2 byte	1 byte	4 bytes	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

***Data**: Error Counter value + Security memory values (4 bytes)

9.6.15 Atmel memory Card (AT24C01/2/4/8/16/32/64/128/256/512) ------ Power On

HOST

Prologue field		Information field		Epilogue field
HEADER	LEN	CLA	INS	LRC
60h	0002h	'A'(41h)	'1('31h)	??
1 byte	2 byte	1 byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0002h	30h	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.16 Atmel memory Card (AT24C01/2/4/8/16/32/64/128/256/512) ------ Byte write

*EC CODE

30h	Normal execute
15h	Communication error

HOST

Prologue field		Information field						Epilogue field
HEADER	LEN	CLA	INS	***tp**	***da**	***wa**	***Data**	LRC
60h	0007	'A'(41h)	'2('32h)	??	A0h	??	??	??
1 byte	2 byte	1 byte	1 byte	1byte	1byte	2byte	1byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

*tp: card type

*da: device address

*wa: word address

*Data: data length (1byte)

Card type	Card type code
AT24C01	1
AT24C02	2
AT24C04	3
AT24C08	4
AT24C16	5
AT24C32	6
AT24C64	7
AT24C128	8
AT24C256	9
AT24C512	10

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.17 Atmel memory Card (AT24C01/2/4/8/16/32/64/128/256/512) ------ Page write

HOST

Prologue field		Information field							Epilogue field
HEADER	LEN	CLA	INS	***tp**	***da**	***wa**	***len**	***Data**	LRC
60h	??	'A'(41h)	'3'(33h)	??	A0h	??	??	??	??
1 byte	2 byte	1 byte	1 byte	1byte	1byte	2byte	1byte	Variable	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***tp:** card type

***da**: device address

***wa:** word address

***len:** write data length

***Data**: data length (Max. 256bytes)

WBM-9XXX

Prologue field		Information field	Epilogue field
HEADER	LEN	EC	LRC
60h	0001h	??	??
1 byte	2 byte	1 byte	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

9.6.18 Atmel memory Card (AT24C01/2/4/8/16/32/64/128/256/512) ------ Current address/sequential read

HOST

Prologue field		Information field					Epilogue field
HEADER	LEN	CLA	INS	***tp**	***da**	***len**	LRC
60h	0005h	'A'(41h)	'4'(34h)	??	A1h	??	??

1 byte	2 byte	1 byte	1 byte	1byte	1 bytes	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***tp:** card type

***da**: device address

***len:** read data length

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	DATA	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	variable	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

* Hex value: ***len** bytes **(**If ***da** + ***len** > FFh, the unit reads by FFh)

9.6.19 Atmel memory Card (AT24C01/2/4/8/16/32/64/128/256/512) ------ Random/Sequential read

HOST

Prologue field		Information field							Epilogue field
HEADER	LEN	CLA	INS	***tp**	***da1**	***wa**	***da2**	***len**	LRC
60h	0008h	'A'(41h)	'5(35h)	??	A0h	??	A1h	??	??
1 byte	2 byte	1 byte	1 byte	1byte	1byte	2byte	1byte	1 byte	1 byte

WBM-9XXX

* Information field (CLA, INS): See section 9.1. for the Command code list .

***tp:** card type

***da**: device address

***wa:** word address

***len:** write data length

***Data**: data length (Max. 256bytes)

WBM-9XXX

Prologue field		Information field		Epilogue field
HEADER	LEN	EC	***Data**	LRC
60h	??	??	??	??
1 byte	2 byte	1 byte	***len** bytes	1 byte

HOST

* Error code byte (EC): See section 9.2. for the Error code list.

* Hex value: ***len** bytes **(**If ***da** + ***len** > FFh, the unit reads by FFh)

10. SAMPLE: IC CARD SCHLUMBERGER (ME2000)

10.1 IC Power on (ATR)

IC CARD is initialized by the smart card reader and the card sends back the following response to reset, which has overall 15 bytes (each byte described below is hexadecimal encoded).

TS=3B	direct convention A(ZZAZZZAA)Z
T0=F8	F indicates that TA1, TB1, TC1 and TD1 are sent 8 indicates eight history characters.
TA1=11	indicates a transfer rate of 9600 bit/s and clock frequency of 3.57 MHz.
TB1=20	indicates that no programming voltage is required and the maximum programming current is 50mA.
TC1=03	indicates that the extra guard time is 3 etu.
TD1=40	indicates that TC2 is sent and the protocol is type 0.
TC2=FF	indicates that the maximum wait time between two characters is 25.5 seconds.
KEY ATTEMPT	indicates the number of consecutive incorrect master key entry attempts allowed when writing key: WRITE-KEY.
REST KEY	indicates the number of consecutive incorrect master key entry attempts remaining.
ATTEMPT PIN	indicates the number of consecutive incorrect PIN entry attempts (secret code number 0) allowed when writing the PIN=WRITE-SC.
REST PIN	indicates the number of consecutive incorrect PIN entry attempts remaining.
Card type =12	card type
Mask version=10	mask version
ME1 ME2 = 90 00	if everything is correct

10.2 Direct IC card

Exchanges of information concerning a command from a terminal to the card of two types.

Incoming instruction:

Terminal	C	INS	P1	P2	LEN		DATA		
Card						PB		ME1	ME2

Outgoing instruction:

Terminal	C	INS	P1	P2	LEN				
Card						PB	DATA	ME1	ME2

C	1 byte	C is always 00.
INS	1 byte	instruction code.
P1 P2	2 byte	Information required to execute the instruction.
LEN	1 byte	length of data in bytes. A key or secret code has eight bytes. Data to be encrypted or decrypted must be on eight bytes.
PB	1 byte	This phase is not mandatory. If the five bytes (C, INS, P1, P2, L) are recognized and accepted then PB=INS.
DATA	n byte	This phase is not mandatory. Presence of absence of this phase is conditional on the instruction code.
ME1 ME2	2 byte	This phase is mandatory, indicating whether the instruction requested by the terminal can be executed (two bytes) or whether the instruction has been executed correctly

COMMAND FORMAT

NAME	INS	P1	P2	LENGTH	DATA
CREATE	E0	file name	RA1	2	number of records, record length
CREATE_PURSE	E8	file name	type	6	RA1, RA2, RA3, n, l, SC1_2
OPEN	E4	file name	type	0	/
WRITE_MAN	50	/	/	1 to 8	serial number to write
READ_MAN	54	/	/	1 to 8	serial number read
WRITE	C4	record no	offset	1 to 40 *	values to read
READ	C6	record no	offset	1 to 40 *	values read
ERASE	C8	/	/	0	/
STATUS	C2	secret no	/	2	Max attempts, remaining
REACT	4C	crypt	/	8	value to enter (key)
WRITE_KEY	46	max	/	8	master key value
CHANGE_KEY	4A	/	/	8	new master key value
KEY_PRES	48	crypt	/	8	value to enter

WRITE_SC	40	max	secret no	8	secret code value
CHANGE_SC	44	/	secret no	8	new secret code value
SC_PRES	42	crypt	secret no	8	value to enter
REACT	4C	crypt	/	8	value to enter (key)
INHIB_DES	AA	/	/	0	/
DES_ENCRYPT	A0	record no	record no	8 ▪	data to encrypt
DES_DECRYPT	A4	record no	record no	8 ▪	data to decrypt
MAC_GEN	A8	record no	record no	8 ▪	data to encrypt
RANDOM	AC	/	/	8	random number
READ_RESULT	A2	/	/	8	result read
CREDIT	32	/	/	3	MC
DEBIT	34	/	/	3	MD
CREDIT_CERTIF	36	/	/	14	MC(3), NT(3), Certif(8)
DEBIT_CERTIF	38	/	/	6	MD(3), NT(3)
READ_PURSE	30	/	/	6	SR(3), NT(3)

* : Offset + length must be less than or equal to the records of the file concerned

▪ : The record length for the file concerned must be greater than or equal to 8

RETURN CODES

90 00	everything OK
90 02	command not executed (for various reasons: incorrect parameter value, access barred, etc)
90 06	problem writing in EEPROM
90 08	disable (maximum number of consecutive incorrect code entry attempts reached)
6F 00	command not recognized (the code does not exist, or a current erase function prevents it being used, see ERASE)

TEST SAMPLE

Power Off -> Power On	3B F8 11 20 03 40 FF FF FF FF FF 12 10 90 00

NAME	Command Data	Return Data
READ_RESULT	00 A2 00 00 08	A2 FF 00 EF 04 FF 00 F7 00 90 00
RANDOM	00 AC 00 00 08	AC 8C 82 28 C7 91 6B 1E C0 90 00
READ_MAN	00 54 00 00 08	54 00 00 00 EA 56 01 00 0F 90 00
CREATE	00 E0 01 00 02 05 28	90 00
OPEN	00 E4 01 00 00	90 00
WRITE	00 C4 01 00 05 31 32 33 34 35	C4 90 00

READ	00 C6 01 00 14	C6 31 32 33 34 35 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 90 00

11. SAMPLE: IC CARD (II)

- G&D (STARCOS SV 1.1) T=1 Protocol

11.1 IC Power off -> IC Power on (ATR)

IC CARD is initialized by the smart card reader and the card sends back the following response to reset, which has overall 22 bytes (each byte described below is hexadecimal encoded).

TS=3B	direct convention A(ZZAZZZAA)Z
T0=9F	9 indicates that TA1 and TD1 are sent F indicates fifteen history characters.
TA1=11 TD1=81 TD2=21 TB3=34 T1–TF	Indicates a transfer rate of 9600 bit/s and clock frequency of 3.57MHz Indicates that TD2 is sent and the protocol is type 1. (T=1) Indicates that tTB3 is sent and the protocol is type 1. Indicates that BWI=3, CWI=4TC2. Indicates that Historical Byte. (STARCOS SV 11 C7)

11.2 Direct IC card

Exchanges of information concerning a command from a terminal to the card.

(Content ISO 7816/3, ISO 7816/4)

Terminal	NAD	PCB	LEN	DATA	EDC

Card	NAD	PCB	LEN	DATA	EDC

NAD	1 byte	Node Address and Desnation Address.
PCB	1 byte	Protocol Control Byte.
LEN	1 byte	Data Length.
DATA	0 – 240 byte	CLA INS P1 P2 P3 Data Le or Receive Data or Sw1, Sw2.
EDC	n byte	.Error Detection Code.

11.2.1 COMMAND FORMAT

NAME	INS	P1	P2	LENGTH	DATA
CREATE	E0	00,01,02,03	00	10	KEY, FID, AC
CRYPT	F8	01,02,03	KID	Data size	DATA
DECREASE	30	EF	00	3	DATA
EXCHANGE CHALLENGE	80	03	00	4	RANDOM NUMBER
EXTERNAL AUTHENTICATE	82	00	KID	08	Ek (RNDicc)
GET CARD DATA	F6	00	00	0 to 18	CARD DATA
GET CHALLENGE	84	00	00	08	RANDOM NUMBER
INCREASE	32	EF	00	3	DATA
INTERNAL AUTHENTICATE	88	00	KID	08	RNDifd
KEY STATUS	F2	00	KID	0 to 1	Initial KFPC
LOCK FILE	76	03	00,FF	02	FID
MUTUAL AUTHENTICATE	8A	45	KID	18	Ek (RNDifd || RNDicc || CD)
READ BINARY	B0	Offset	Short ID	Data size	Requested Data
READ RECORD	B2	Record no	Short ID	Data size	Requested Data
REGISTER DF	52	Memory High	Memory Low	0A	DF-ID || AID
SECURE DECREASE	34	EF	KID	0F	value || MAC || RND
SECURE INCREASE	36	EF	KID	0F	value || MAC || RND
SELECT FILE	A4	00,02,04	00	2 to 8	FID or AID
UPDATE BINARY	D6	Offset	Short ID	Data size	Data of Update
UPDATE RECORD	DC	Record no	Short ID	Data size	Data of Update
VERIFY	20	20	KID	08	PIN
VERIFY AND CHANGE	24	20,30	KID	10	PIN || NEW PIN
WRITE KEY	F4	00,01	KID	11,08	DATA

11.2.2 RETURN CODES

90 00	Everything OK
61 00	Too much data
62 82	End of file reached
65 00	EDC error or write error
6A 00	DF ID or DF name already exists or file not registered yet or incorrect EF-ID
6A 84	Insufficient memory
6B 00	Parameters P1/P2 incorrect
6D 00	Incorrect INS

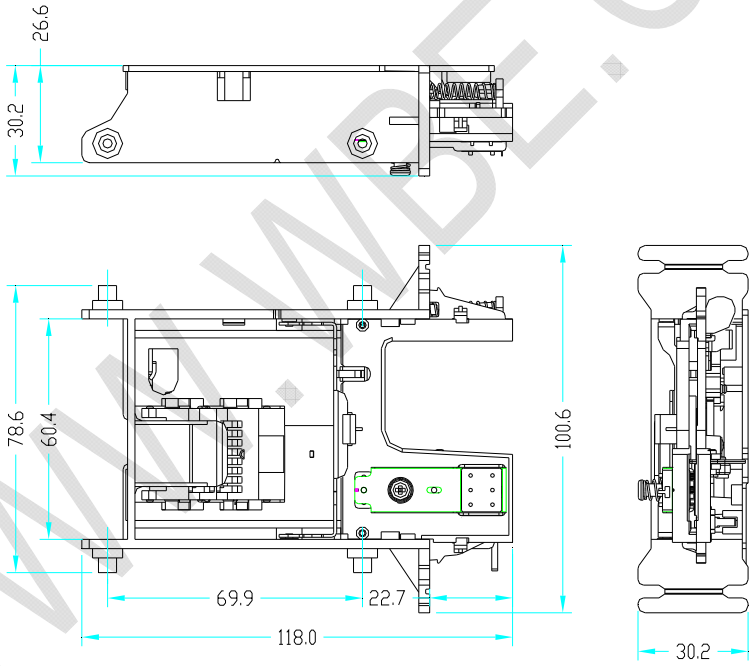
11.2.3 TEST SAMPLE

Power Off -> Power On	3B 9F 11 81 21 34 53 54 41 52 43 4F 53 20 20 53 56 20 31 31 20 43 37

Command	Command Data	Return Data
CREATE FILE	80 E0 03 00 10	90 00
SELECT FILE	00 A4 00 00 02 FID	90 00
UPDATE BINARY	00 D6 00 00 Lc	90 00
READ BINARY	00 B0 00 00 Le	READ DATA 90 00
GET CHALLENGE	00 84 00 00 08	RANDOM NUMBER 90 00
GET CARD DATA	80 F6 00 00 00	CARD SERIAL NUMBER 90 00

12. DIMENSIONS

A. Main body



A. Bezel