CyberMouse

Smart Card Reader / Writer

Reference Manual

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Contents

INTRODUCTION

The Smart Card Reader/Writer CyberMouse is an interface for the communication between a computer (for example, a PC) and a smart card.

Different types of smart cards have different commands and different communication protocols. This prevents in most cases the direct communication between a smart card and a computer. The CyberMouse Reader/Writer establishes a uniform interface from the computer to the smart card for a wide variety of cards. By taking care of the card specific particulars, it releases the computer software programmer of getting involved with the technical details of the smart card operation, which are in many cases not relevant for the implementation of a smart card system.

The CyberMouse Smart Card Reader/Writer is connected to the computer through a serial asynchronous interface (RS-232) or USB interface. The reader accepts commands from the computer, carries out the specified function at the smart card and returns the requested data or status information.

NOTE - Although the CyberMouse is a true *card reader/writer* as it can read and write smart cards, the terms *card reader* or *reader* will be used indifferently to refer to the CyberMouse, for the sake of readability and because these designations are commonly in use for this kind of devices.

FEATURES

- ISO7816-1/2/3 compatible smart card interface
- Supports most common memory-based smart cards (2-wire bus, 3-wire bus)
- Supports CPU-based cards with T=0 and/or T=1 protocol
- Three CLK frequencies for microcontroller-based cards: 3.68MHz, 1.84MHz and 0.92MHz
- Automatic CLK frequency selection and PTS (protocol type selection) procedure
- Smart card interface short circuit protected
- RS-232 interface to PC with simple command structure
- Selectable baud rate of serial interface to PC, max. 115.2 kBit/s
- Installation of up to three security application modules (SAM) inside the reader
- Convenient stand available as accessory

SUPPORTED CARD TYPES

The CyberMouse can operate a wide range of card types or card IC types. The table presented in Appendix A explains which card type selection value must be specified for the various card types supported by the reader.

A. Memory-based smart cards (synchronous interface)

- '104' type EEPROM non-reloadable token counter cards, including:
  AM104, AM221
  Atmel AT88SC06
  Gemplus GPM103
  SGS-Thomson ST 1305 (192 bits), ST 1335 (272 bits)
  Siemens SLE 4406, SLE 4436 (221 bits), SLE5536

- Cards following the I^2C bus protocol (free memory cards) with memory capacity up to 16 Kbit and minimum 4 bytes page write capability, including:
  AM1KF, AM2KF, AM4KF, AM8KF
  Atmel AT24C01/02/04/08/16
  Gemplus GFM2K, GFM4K
  SGS-Thomson ST14C02C,14C04C

- Cards following the extended I^2C bus (XIIC) addressing protocol with memory capacity up to 64 Kbytes and minimum 4 bytes page write capability, including, in particular:
  AM64KP
  Microchip 24C65

- '416'/'896' type intelligent EEPROMs with security and PIN, including:
  AM416
  Atmel AT88SC101/2/3, AT88SC1601/1604
  Gemplus GPM416, GPM896
  Siemens SLE 4404

- Siemens SLE4432/4442 intelligent 256 bytes EEPROM with write protect function:
  AM2KP, AM2KS
  SLE 4432, SLE 4442

- Siemens SLE 4418/4428 intelligent 1K bytes EEPROM with write-protect function:
  AM8KP, AM8KS
  SLE 4418, SLE 4428

- EEPROMs with MICROWIRE interface, including:
  AM256
  NM93CS06/CS46

- Cards following the T2G protocol:
  SGS-Thomson ST1333

- XICOR card type, including:
  X76F041, X76F128/640, X76F100

B. Microcontroller-based smart cards (asynchronous interface)

The CyberMouse supports EEPROM microcontroller-based cards with internal programming voltage (VPP) generation and the following programming parameters transmitted in the ATR:

PI1 = 0 or 5
I = 25 or 50

The following communication protocol modes are supported:

T	F	D	N
0 / 1	372	1	0...255
0 / 1	558	1	0...255
0 / 1	558	0.5	0...255
0 / 1	558	0.25	0...255
0 / 1	744	1	0...255
0 / 1	744	2	0...255
0 / 1	744	0.5	0...255
0 / 1	744	0.25	0...255
0 / 1	744	0.125	0...255
0 / 1	1116	1	0...255
0 / 1	1116	2	0...255
0 / 1	1116	0.5	0...255
0 / 1	1116	0.25	0...255
0 / 1	1488	1	0...255
0 / 1	1488	2	0...255
0 / 1	1488	4	0...255
0 / 1	1488	0.5	0...255
0 / 1	1488	0.25	0...255

0 / 1	1860	1	0...255
0 / 1	1860	2	0...255
0 / 1	1860	4	0...255
0 / 1	1860	0.5	0...255
0 / 1	1860	0.25	0...255
0 / 1	512	1	0...255
0 / 1	512	0.5	0...255
0 / 1	512	0.25	0...255
0 / 1	768	1	0...255
0 / 1	768	2	0...255
0 / 1	768	0.5	0...255
0 / 1	768	0.25	0...255
0 / 1	1024	1	0...255
0 / 1	1024	2	0...255
0 / 1	1024	0.5	0...255
0 / 1	1536	1	0...255
0 / 1	1536	2	0...255
0 / 1	1536	4	0...255
0 / 1	1536	0.5	0...255
0 / 1	2048	1	0...255
0 / 1	2048	2	0...255
0 / 1	2048	4	0...255

The CyberMouse performs the Protocol Type Selection (PTS) procedure as specified *in ISO7816-3:1989/Amd.2: 1994*.

When the card ATR indicates the specific operation mode (TA_2 present; bit b5 of TA_2 must be 0) and that particular mode is not supported by the CyberMouse, the reader will reset the card to set it to negotiable mode. If the card cannot be set to negotiable mode, the reader will reject the card.

When the card ATR indicates the negotiable mode (TA_2 not present) and communication parameters other than the default parameters, the CyberMouse will execute the PTS and try to use the communication parameters that allow operating the card at the highest CLK frequency (3.6864MHz), or allow at the highest communication speed (shortest *etu*), in this priority. If the card does not accept the PTS, the reader will use the default parameters (F=372, D=1).

For the meaning of the aforementioned parameters, please refer to *ISO7816, part 3*.

SMART CARD INTERFACE

The interface between the CyberMouse and the inserted smart card follows the specifications of *ISO7816-3* with certain restrictions or enhancements to increase the practical functionality of the CyberMouse.

A. Smart Card Power Supply VCC (C1)

The current consumption of the inserted card must not be higher than **30mA**.

B. Programming Voltage VPP (C6)

According to ISO 7816-3, the smart card contact C6 (VPP) supplies the programming voltage to the smart card. Since all common smart cards in the market are EEPROM based and do not require the provision of an external programming voltage, the contact C6 (VPP) has been implemented as a normal control signal in the CyberMouse and is used only with memory-based smart cards. The electrical specifications of this contact are identical to those of the signal RST (at contact C2).

C. Card Type Selection

The controlling PC has to always select the card type through the proper command sent to the CyberMouse prior to activating the inserted card. This includes both the memory cards and MCU-based cards.

For MCU-based cards the reader allows to select the preferred protocol, T=0 or T=1. However, this selection is only accepted and carried out by the reader through the PTS when the card inserted in the reader supports both protocol types. Whenever an MCU-based card supports only one protocol type, T=0 or T=1, the reader automatically uses that protocol type, regardless of the protocol type selected by the application.

D. Interface for Memory-based Cards

The electrical interface for memory-based smart cards uses all eight smart card contacts (C1 to C8), even though *ISO 7816-3* defines only the functions of six contacts (C1, C2, C3, C5, C6 and C7). This allows the CyberMouse to perform all functions offered by memory cards which use the contacts C4 and/or C8 for control purposes.

E. Interface for Microcontroller-based Cards

For microcontroller-based smart cards only the contacts C1 (VCC), C2 (RST), C3 (CLK), C5 (GND) and C7 (I/O) are used. A frequency of 3.68 MHz, 1.84 MHz or 0.92 MHz is applied to the CLK signal (C3), depending on the parameters indicated by the card in the ATR and the outcome of the PTS.

F. Card Tearing Protection

The CyberMouse provides a mechanism to protect the inserted card when it is suddenly withdrawn while it is powered up. The power supply to the card and the signal lines between the CyberMouse and the card are immediately deactivated when the card is being removed. As a general rule, however, to avoid any electrical damage, **a card should only be removed from the reader while it is powered down.**

NOTE - The CyberMouse does never by itself switch on the power supply to the inserted card. This must explicitly be done by the controlling computer through the proper command sent to the reader.

G. Short Circuit Protection

The smart card interface signal lines of the CyberMouse are designed to endure a permanent short circuit between any two or more of the contacts in the smart card connector without causing any damage to the reader. A short circuit between the smart card pins VCC (C1) and GND (C5) is detected by the CyberMouse when the inserted card is powered up and effects the immediate deactivation of the smart card interface. A corresponding status code is transmitted by the CyberMouse to the host computer.

POWER SUPPLY

The CyberMouse requires a voltage of 5V DC, 200mA, regulated, power supply. The CyberMouse gets the power supply from PC (through the cable supplied along with each type of reader).

A. Status LEDs

Two LEDs on the front of the reader indicate the presence of the power supply to the reader and the activation status of the smart card interface:

Red LED Indicates 5V power supply to the reader is present.

After a reset of the reader (by removing/applying the power supply, or through the RS-232/USB interface), the red LED flashes three times.

Green LED Indicates power supply to the smart card is switched on, i.e., the smart card is activated.

SERIAL INTERFACE

The CyberMouse is connected to a computer through a serial asynchronous interface following the RS-232 standard.

A. Communication Parameters

The following communication parameters are used by the CyberMouse and cannot be modified by the host computer:

Transmission protocol	:	serial asynchronous
Parity	:	none
Data Bits	:	8
Stop Bits	:	1
Handshake	:	through CTS

The CyberMouse provides two means to select the transmission speed (baud rate) used by the reader in the normal operation, by hardware and/or by software.

1. Hardware Baud Rate

The default hardware baud rate setting is 9600 bps.

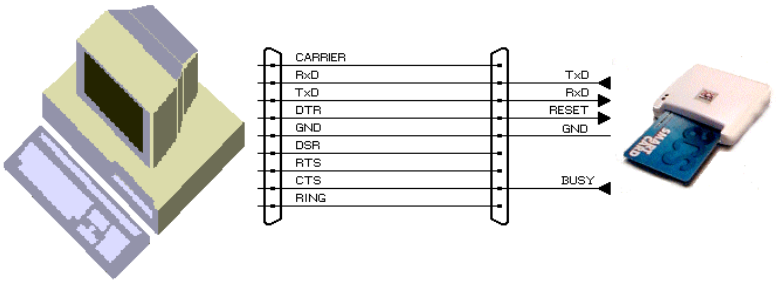
2. Software Baud Rate Selection

The *SET_PROTOCOL* command allows setting the transmission speed (baud rate) and a delay time inserted between the bytes transmitted by the reader to the PC.

Please note that the setting made with this command is volatile and will be lost when the reader is being reset or powered up next time.

B. Interface Wiring

For the communication between the CyberMouse and a computer, five lines of the RS-232 interface are used: RxD, TxD, CTS, DTR and GND.



RS-232 Interface Wiring

Pin	PC	Cyber-mouse	Function
2	**RxD**	**TxD**	Data transmitted from PC to CyberMouse.
3	**TxD**	**RxD**	Data transmitted from CyberMouse to PC.
4	**DTR**	**RESET**	RESET input signal. Allows performing a hardware reset of the reader module through the RS-232 interface. Applying a logic '1' signal (negative voltage according to the RS-232 convention) to this pin causes a hardware reset of the CyberMouse.
5	**GND**	**GND**	Reference voltage level for power supply and serial interface.
7	**CTS**	**$\overline{\text{BUSY}}$**	CTS (Clear To Send) signal to the PC. Indicates to the PC whether the CyberMouse is ready to receive the next command. A logic '0' signal (positive voltage according to the RS-232 convention) is applied to this pin while the CyberMouse is executing a command. Only when a '1' signal is present at this pin can the PC send a command to the CyberMouse.

NOTE - Communication problems between the CyberMouse and a PC can occur if a 25 pin to 9 pin RS-232 adapter or a cable is used in which not all 9 signal lines are connected. Adapters supplied with computer mouse frequently have not all lines connected. For the correct operation of the reader, use only a 9 pin to 25 pin adapter and a serial interface cable in which all 9 signal lines are connected!

NOTE - To prevent any radio interference between the CyberMouse and other electrical and electronic equipment, do not use an RS-232 cable longer than 3 meters!

USB INTERFACE

The CyberMouse is connected to a computer through a USB following the USB standard.

A. Communication Parameters

The CyberMouse is connected to a computer through USB as specified in the USB Specification 1.0. The CyberMouse is working in low speed mode, i.e. 1.5 Mbps.

USB Interface Wiring

Pin	Signal	Function
1	**V_{BUS}**	+5V power supply for the reader
2	**D-**	Differential signal transmits data between CyberMouse and PC.
3	**D+**	Differential signal transmits data between CyberMouse and PC.
4	**GND**	Reference voltage level for power supply

NOTE - In order for the CyberMouse functioning properly through USB interface, CyberMouse proprietary device drive has to be installed. Please refer to the *Device Driver Installation Guide* for more detail. You can download the newest driver from www.cybermouse.de

COMMUNICATION PROTOCOL

In the normal operation, the CyberMouse acts as a slave device with regard to the communication between a computer and the reader. The communication is carried out in the form of successive command-response exchanges. The computer transmits a command to the reader and receives a response from the reader after the command has been executed. A new command can be transmitted to the CyberMouse only after the response to the previous command has been received.

There are two cases where the reader transmits data without having received a command from the computer, namely, the Reset Message of the reader and the Card Status Message.

1. Command

a) Normal Command (Length < 255 bytes)

A command consists of four protocol bytes and a variable number of data bytes and has the following structure:

byte	1	2	3	4 ... N+3 (0<N<255)	N+4
	Header	Instruction	Data length = N	Data	Checksum

Header — Always 01_H to indicate the start of a command.

Instruction — The instruction code of the command to be carried out by the CyberMouse

Data Length — Number of subsequent data bytes.(0 < N < 255)

Data — Data contents of the command.
For a READ command, for example, the data bytes would specify the start address and the number of bytes to be read. For a WRITE command, the data bytes would specify the start address and the data to be written to the card.

The data bytes can represent values to be written to a card and/or command parameters such as an address, a counter, etc.

Checksum — The checksum is computed by XORing all command bytes including header, instruction, data length and all data bytes.

The following example shows the structure of a command with instruction code = 91_H and three data bytes with the values 11_H, 22_H and 33_H, respectively:

byte	1	2	3	4	5	6	7
	01_H	91_H	03_H	11_H	22_H	33_H	93_H

b) Extended Command (Length >= 255 bytes)

A command consists of six protocol bytes and a variable number of data bytes and has the following structure:

byte	1	2	3	4	5	6 ... N+5 (N>0)	N+6
	Header	Instruction	Data Length = N			Data	Checksum
			FF_H	Data Length N			

Header — Always 01_H to indicate the start of a command.

Instruction — The instruction code of the command to be carried out by the CyberMouse.

Data Length — Number of subsequent data bytes, and is encoded in 3 bytes. The first byte is FF_H. The second byte and the third byte represent data length N.

Data — Data contents of the command.
For a READ command, for example, the data bytes would specify the start address and the number of bytes to be read. For a WRITE command, the data bytes would specify the start address and the data to be written to the card.

The data bytes can represent values to be written to a card and/or command parameters such as an address, a counter, etc.

Checksum — The checksum is computed by XORing all command bytes including header, instruction, data length and all data bytes.

2. Response

The response from the CyberMouse to any command depends on whether the command has been received by the reader without error (e.g., checksum error).

a) No transmission error with normal response (Length < 255 bytes)

The response by the CyberMouse to a correctly received command consists of three protocol bytes, two status bytes and a variable number of data bytes and has the following structure:

byte	1	2	3	4	5 ... N+4 (0<N<255)	N+5
	Header	SW1	SW2	Data length = N	Data	Checksum

Header — Always 01_H to indicate the start of the response.

SW1 — Indicates the command execution status:
90_H = command successfully executed
60_H = error in command data; command cannot be executed
67_H = error detected in command execution
FF_H = status message initiated by the reader

SW2 — Further qualification of the command execution status.
A table listing the possible values of the status bytes SW1 and SW2 and the corresponding meaning is given in Appendix B.

Data Length — Number of subsequent data bytes ($0 < N < 255$)

Data — Data contents of the command.
For a *READ_DATA* command, for example, the data bytes would contain the contents of the memory addresses read from the card. The data bytes can represent values read from the card and/or status information.

Checksum — The checksum is computed by XORing all response bytes including header, status bytes, data length and all data bytes.

The following example shows the structure of the response to a command which has successfully been executed and which returns three data bytes with the values 11_H, 22_H and 33_H, respectively:

byte	1	2	3	4	5	6	7	8
	01_H	90_H	00_H	03_H	11_H	22_H	33_H	92_H

b) No transmission error with extended response (Length >= 255 bytes)

The response by the CyberMouse to a correctly received command consists of three protocol bytes, two status bytes and a variable number of data bytes and has the following structure:

byte	1	2	3	4	5	6	7 ... N+6 (N>0)	N+7
	Header	SW1	SW2	Data length = N			Data	Checksum
				FF_H	Data Length N			

Header — Always 01_H to indicate the start of the response.

SW1 — Indicates the command execution status:

90_H = command successfully executed
60_H = error in command data; command cannot be executed
67_H = error detected in command execution
FF_H = status message initiated by the reader

SW2 — Further qualification of the command execution status.
A table listing the possible values of the status bytes SW1 and SW2 and the corresponding meaning is given in Appendix B.

Data Length — Number of subsequent data bytes, and is encoded in 3 bytes. The first byte is FF_H. The second byte and the third byte represent data length N.

Data — Data contents of the command.
For a *READ_DATA* command, for example, the data bytes would contain the contents of the memory addresses read from the card. The data bytes can represent values read from the card and/or status information.

Checksum — The checksum is computed by XORing all response bytes including header, status bytes, data length and all data bytes.

c) Transmission error

If the receiving party of a command (i.e., the CyberMouse) or a response (i.e., the computer) detects an error in the data length or the checksum of a command, it disregards the received data and sends a "NOT ACKNOWLEDGE" message to the transmitting party upon completion of the faulty transmission. The "NOT ACKNOWLEDGE" message consists of two bytes:

byte	1	2
	05_H	05_H

If the CyberMouse responds with a 'NOT ACKNOWLEDGE' message to a command from the computer, the computer would normally transmit the command again.

If the computer detects a transmission error in a response from the CyberMouse, it can send the 'NOT ACKNOWLEDGE' to the reader upon which the reader will transmit the most recent response again.

3. Reset Message

A reset of the reader occurs automatically whenever the reader is being powered up. A reset can also be actuated through the RS-232/USB interface.

In either case the reader transmits **one time** a Reset Message, which has the same structure as the normal response to a command and the following contents:

byte	1	2	3	4	5	6
	Header	**SW1**	**SW2**	**Data length**	**Data**	**Checksum**
	01_H	FF_H	00_H	01_H	BAUD=12_H	

BAUD — Indicates the hardware baud rate setting (default baud rate), which is set to 9600 bps (this is only valid in the RS232 reader).

The reader does not expect an acknowledge signal from the computer. After transmitting the Reset Message the reader is waiting for the first command from the computer.

4. Card Status Message

When a card is being inserted into the reader or an inserted card is being removed from the reader while the reader is idle, i.e., not executing a command, the reader transmits a Card Status Message to notify the host computer of the change in the card insertion status.

In a system where these unsolicited messages from the reader to the computer are not desired, they can be disabled with the *SET_NOTIFICATION* command. Please note that the setting made with this command is volatile and will be lost with the next reader reset or power up. By default, the Card Status Message will be transmitted by the reader after a reset.

The Card Status Messages have the following structure and contents:

Card Status Message for Card Insertion

byte	1	2	3	4	5
	Header	**SW1**	**SW2**	**Data length**	**Checksum**
	01_H	FF_H	01_H	00_H	FF_H

Card Status Message for Card Removal

byte	1	2	3	4	5
	Header	**SW1**	**SW2**	**Data length**	**Checksum**
	01_H	FF_H	02_H	00_H	FC_H

A card status message is transmitted only **once** for every card insertion or removal event. The reader does not expect an acknowledge signal from the computer. After transmitting a status message, the reader waits for the next command from the computer.

NOTE - If the card is being removed from the reader **while a card command is being executed**, the reader will transmit a normal response to the computer with the response status bytes indicating the card removal during command execution (see *Appendix B: Response Status Codes*).

B. Transmission Protocol

The start of a command (to the reader) or a response (from the reader, including the Reset Message and Card Status Messages) is indicated by the respective party through the transmission of the single byte Start-of-Text (STX) character with the value 02_H.

The end of a command or response is indicated through the single byte End-of-Text (ETX) character with the value 03_H.

Within the command and response transmission only ASCII characters representing the hexadecimal (hex) digits 0...F are used. Each byte of a command or response is splitted into its upper and lower halfbyte (nibble). For each halfbyte is transmitted the ASCII character representing the respective hex digit value. For example, to transmit the data byte $3A_H$, two bytes are actually sent on the interface, namely, 33_H (ASCII code for '3') followed by 41_H (ASCII code for 'A'):

Data byte value $3A_H$

Transmitted values 33_H = '3' 41_H = 'A'

The following example shows the transmission of a command with instruction code $A2_H$ and one data byte with the value $3D_H$. The command has the following structure:

byte	1	2	3	4	5
	Header	**Instruction**	**Data length**	**Data**	**Checksum**
	01_H	$A2_H$	01_H	$3D_H$	$9F_H$

This command is transmitted on the serial interface in 12 bytes as follows:

byte	1	2	3	4	5	6	7	8	9	10	11	12
	STX	**'0'**	**'1'**	**'A'**	**'2'**	**'0'**	**'1'**	**'3'**	**'D'**	**'9'**	**'F'**	**ETX**
	02_H	30_H	31_H	41_H	32_H	30_H	31_H	33_H	44_H	39_H	46_H	03_H

For the representation of the hex halfbyte values as the corresponding ASCII characters in commands, the CyberMouse accepts both upper case characters 'A' ... 'F' (41_H ... 46_H) and lower case characters 'a' ... 'f' (61_H ... 66_H):

byte	1	2	3	4	5	6	7	8	9	10	11	12
	STX	**'0'**	**'1'**	**'A'**	**'2'**	**'0'**	**'1'**	**'3'**	**'D'**	**'9'**	**'F'**	**ETX**
	02_H	30_H	31_H	41_H	32_H	30_H	31_H	33_H	44_H	39_H	46_H	03_H

... is equivalent to:

byte	1	2	3	4	5	6	7	8	9	10	11	12
	STX	**'0'**	**'1'**	**'a'**	**'2'**	**'0'**	**'1'**	**'3'**	**'d'**	**'9'**	**'f'**	**ETX**
	02_H	30_H	31_H	61_H	32_H	30_H	31_H	33_H	64_H	39_H	66_H	03_H

In its response messages, the CyberMouse uses upper case characters 'A' ... 'F'.

COMMANDS

The commands executed by the CyberMouse can generally be divided into two categories, namely, Control Commands and Card Commands.

Control Commands control the internal operation of the CyberMouse. They do not directly affect the card inserted in the reader and are therefore independent of the selected card type.

Card Commands are directed toward the card inserted in the CyberMouse. The structure of these commands and the data transmitted in the commands and responses depend on the selected card type.

A. Control Commands

1. GET_ACR_STAT

This command returns relevant information about the particular CyberMouse model and the current operating status, such as, the firmware revision number, the maximum data length of a command and response, the supported card types, and whether a card is inserted and powered up.

Command format

Instruction Code	Data length
01_H	00_H

Response data format

REV	MAX_C	MAX_R	C_TYPE	C_SEL	C_STAT

REV — 10 bytes CyberMouse firmware type and revision code. The following data are transmitted:
AC-SETxxxx

'xxxx' represents the firmware revision code, for example, '0109'.

MAX_C — The maximum number of command data bytes.

MAX_R — The maximum number of data bytes that can be requested to be transmitted in a response.

C_TYPE — The card types supported by the CyberMouse. This data field is a bitmap with each bit representing a particular card type. A bit set to '1' means the corresponding card type is supported by the reader and can be selected with the *SELECT_CARD_TYPE* command. The bit assignment is as follows:

byte	1								2							
card type	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

See Appendix A for the correspondence between these bits and the respective card types.

C_SEL — The currently selected card type as specified in a previous *SELECT_CARD_TYPE* command. A value of 00_H means that no card type has been selected.

C_STAT — Indicates whether a card is physically inserted in the reader and whether the card is powered up:
00_H : no card inserted
01_H : card inserted, not powered up
03_H : card powered up

2. SET_PROTOCOL

This command is used to control the line speed of the communication channel between CyberMouse reader and host device. The line speed of the communication is controlled by two factors, namely, the Delay Factor and the Baud Rate.

Command format

Instruction Code	Data length	Data
		DELAY N
03_H	01_H	

to change only the Delay Factor (for RS232 reader only), or

Instruction Code	Data length	Data	
		DELAY N	BAUD RATE
03_H	02_H		

to change the Delay Factor and the Baud Rate (for RS232 reader only).

DELAY Determines the time delay inserted by the CyberMouse between two consecutive bytes sent in order to adapt to slower host system speeds. The time delay is given by N * 0.1msec, with N ranging from 0 ... 255 (00 - FF_H). The default value is N = 0 (delay changes only valid on RS232 reader).

BAUD RATE Selects the baud rate (bps) of the serial interface between reader and host system. The default hardware baud rate is 9600 bps. (baud rate changes only valid on RS232 reader).

BAUD RATE	Serial baud rate (bps)
12_H	9600
11_H	19200
10_H	38400
03_H	14400
02_H	28800
01_H	57600
00_H	115200

Response data format

No response data

The new protocol becomes effective by the completion of the *SET_PROTOCOL* command, immediately **after the CyberMouse has sent out the response string to the** *SET_PROTOCOL* **command**.

3. SELECT_CARD_TYPE

This command sets the required card type. The firmware in the CyberMouse adjusts the communication protocol between reader and the inserted card according to the selected card type.

Command format

Instruction Code	Data length	Data
		TYPE
02_H	01_H	

TYPE See Appendix A for the value to be specified in this command for a particular card to be used.

Response data format

No response data

4. RESET

This section describes the *RESET* command only for the case when no card type is selected or when the card type 00_H is selected. For all other cases, please refer to the specific section described for each individual card type.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

ATR			

ATR The answer-to-reset string returned by the card.

The return status code for this command is 90 00_H when the inserted card is a T=0 card, 90 01_H when the inserted card is a T=1 card, and 90 10 $_H$ when the inserted card is a memory card; otherwise the status code is 60 20_H.

5. SET_NOTIFICATION

This command disables / enables the Card Status Messages transmitted by the reader to notify the host computer of the insertion or removal of a card.

Command format

Instruction Code	Data length	Data
		NOTIFY
06_H	01_H	

NOTIFY Specifies whether the Card Status Message shall be transmitted to notify the host computer of card insertion / removal
01_H : transmit Card Status Message
02_H : do not transmit Card Status Message

Response data format

No response data

B. Card Commands

The available commands and the parameters specified in the card commands as well as the data transmitted in the response from the CyberMouse depend on the selected card type.

1. '104' - type non-reloadable Token Counter Cards

a) RESET

This command powers up the card inserted in the card reader and performs a card reset.

If the card is powered up when the command is being issued, only a reset of the card is carried out; the power supply to the card is not switched off.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

ATR			

ATR — Four bytes Answer-To-Reset read from the card.
The ATR bytes are read from the card with LSB first, i.e., the first bit read from the card is the LSB of the first ATR byte.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card. The bytes are read from the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

Command format

Instruction Code	Data length	Data		
			ADDR	LEN
90_H	03_H	00_H		

ADDR — Byte address of first byte to be read from the card

LEN — Number N of data bytes to be read from the card
($0 < N \leq MAX\_R$)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x — Data bytes read from the card memory

d) WRITE_DATA

To write one byte to the specified address of the inserted card. The byte is written to the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

Two different WRITE modes are available for this card type, which are distinguished by a flag in the command data field:

a) Write
The byte value specified in the command is written to the specified address. This command can be used for writing personalization data and counter values to the card.

b) Write with carry
The byte value specified in the command is written to the specified address and the command is sent to the card to erase the next lower counter stage. This write mode can therefore only be used for updating the counter value in the card.

With either write mode, the byte at the specified card address is not erased prior to the write operation and, hence, memory bits can only be programmed from '1' to '0'.

The backup mode available in the SLE4436 card can be enabled or disabled in the write operation.

Command format

Instruction Code	Data length	Data			
			ADDR	MODE	BYTE
91_H	04_H	00_H			

ADDR — Byte address of byte to be written

MODE — Specifies the write mode and backup option (SLE4436)
00_H : write
01_H : write with carry
02_H : write with backup enabled
03_H : write with carry and with backup enabled

BYTE — Byte value to be written to the card

Response data format

No response data

e) ERASE_DATA (ST1335)

To erase the specified number of bytes starting at the specified address, i.e., set all bits to '1'.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
95_H	03_H			

ADDR — Byte address in the card of the first byte to be erased

LEN — Number of bytes to be erased in the card

Response data format

No response data

f) PRESENT_TRANSPORT_CODE

To submit the transport code to the card in order to enable the card personalization mode. The following actions are executed by the CyberMouse:

- search a '1' bit in the presentation counter and write the bit to '0'
- present the specified code to the card

The CyberMouse does not try to erase the presentation counter after the code submission! This must be done by the application software through a separate 'Write with carry' command.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR	BYTE 1	BYTE 2	...	...	BYTE N
92_H							

LEN Number of transport code bytes, N, + 1

ADDR Byte address of the presentation counter in the card

BYTE x Transport code

Response data format

No response data

g) AUTHENTICATE_CARD (SLE4436)

To read a card authentication certificate from a SLE4436 card. The following actions are executed by the CyberMouse:

- select Key 1 or Key 2 in the card as specified in the command
- present the challenge data specified in the command to the card
- generate the specified number of CLK pulses for each bit of authentication data computed by the card
- read 16 bits of authentication data from the card
- reset the card to normal operation mode

The CyberMouse returns the 16 bits of authentication data calculated by the card in the response.

Command format

Instruction Code	Data length	Data					
		KEY	CLK_CNT	BYTE 1	...	...	BYTE 6
96_H	08_H						

KEY Key to be used for the computation of the authentication certificate:
00_H : key 1
01_H : key 2

CLK_CNT Number of CLK pulses to be supplied to the card for the computation of each bit of the authentication certificate.

BYTE 1...6 Card challenge data

Response data format

CERT	

CERT 16 bits of authentication data computed by the card. The LSB of BYTE 1 is the first authentication bit read from the card.

h) AUTHENTICATE_CARD (ST1335)

To read a card authentication certificate from a ST1335 card. The following actions are executed by the CyberMouse:

- present the challenge data specified in the command to the card
- generate the required number of READ and PROG pulses for the computation of signature by the card
- read 4 bits of authentication data from the card
- reset the card to normal operation mode

The CyberMouse returns the 4 bits of authentication data calculated by the card in the response.

Command format

Instruction Code	Data length	Data			
		BYTE 1	BYTE 2	BYTE 3	BYTE 4...
96_H	04_H				

BYTE 1...4 Card challenge data

Response data format

CERT

CERT Single byte response which holds 4 bits of authentication data computed by the card. The LSB of CERT is the first authentication bit read from the card.

i) AUTHENTICATE_CARD (SLE5536)

To read a card authentication certificate from a SLE5536 card. The following actions are executed by the CyberMouse:

- select Key 1 or Key 2 in the card as specified in the command
- present the challenge data specified in the command to the card
- generate the specified number of CLK pulses for each bit of authentication data computed by the card
- read 16 bits of authentication data from the card
- reset the card to normal operation mode

The CyberMouse returns the 16 bits of authentication data calculated by the card in the response.

Command format

Instruction Code	Data length	Data					
		KEY	CLK_CNT	BYTE 1	...	...	BYTE 6
96_H	08_H						

KEY Key to be used for the computation of the authentication certificate:
00_H : key 1 with no cipher block chaining
01_H : key 2 with no cipher block chaining
80_H : key 1 with cipher block chaining
81_H : key 2 with cipher block chaining

CLK_CNT Number of CLK pulses to be supplied to the card for the computation of each bit of the authentication certificate.

BYTE 1...6 Card challenge data

Response data format

CERT	

CERT 16 bits of authentication data computed by the card. The LSB of BYTE 1 is the first authentication bit read from the card.

2. I²C-Bus cards (standard and extended addressing)

a) RESET

This command powers up the card inserted in the card reader. No action is taken if the card is powered up when the command is being issued.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

No response data

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) SET_OPTIONS

To set the memory page size for the Page Write mode and **for the XIIC-bus cards**, the chip select address bits transmitted in the XIIC-bus control byte.

If this command is not sent to the CyberMouse, the default value for the memory page size is four (4) bytes and the default value for the XIIC-bus chip select address bits is 000_B.

Command format

Instruction Code	Data length	Data
		OPTION
84_H	01_H	

OPTION Chip select address and memory page size

$xxxxxPPP_B$: Page size :

000	=	4 bytes
001	=	8 bytes
010	=	16 bytes
011	=	32 bytes
100	=	64 bytes
101	=	64 bytes
110	=	64 bytes
111	=	64 bytes

$xA_2A_1A_0xxxx_B$: Chip select address bits (**only XIIC-bus cards**)

Response data format

No response data

d) READ_DATA

To read the specified number of bytes from the specified address of the inserted card.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
90_H	03_H			

ADDR Byte address of first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card
($0 < N \leq MAX\_R$)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

e) WRITE_DATA

To write the specified data bytes to the specified address of the inserted card.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
91_H							

LEN Number of data bytes to be written to the card, N, + 2

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

Response data format

No response data

f) READ_P&HE (AM64KP and compatible)

To read the block write-protection status (registers PROT_START and PROT_CNT) and the block number of the *High Endurance* memory block (register HE_BLOCK) from the AM64KP card.

Command format

Instruction Code	Data length
97_H	00_H

Response data format

START	BLK_CNT	HE_BLK

START Value of register PROT_START, i.e., the number of the first write-protected block

BLK_CNT Value of register PROT_CNT, i.e., the number of write-protected blocks starting from block # START

HE_BLK Value of register HE_BLOCK, i.e., the number of *the High Endurance* memory block

g) SET_PROTECTION (AM64KP and compatible)

To set the block write-protection in the card (registers PROT_START and PROT_CNT).

Command format

Instruction Code	Data length	Data	
		START	BLK_CNT
94_H	02_H		

START New value of register PROT_START, i.e., the number of the first block to be write-protected (0 ≤ START ≤ 15)

BLK_CNT New value of register PROT_CNT, i.e., the number of blocks to be write-protected starting from block # START (0 < BLK_CNT ≤ 15)

Response data format

No response data

h) SET_HE (AM64KP and compatible)

To relocate the *High Endurance* memory block to the specified block address.

Command format

Instruction Code	Data length	Data
		HE_BLK
94_H	01_H	

HE_BLK New value of register HE_BLOCK, i.e., the block number of the *High Endurance* memory block (0 ≤ HE_BLK ≤ 15)

Response data format

No response data

3. '416'/'896' - type intelligent EEPROMs with Security and PIN

a) RESET

This command powers up the card inserted in the card reader and performs a card reset.

If the card is powered up when the command is being issued, only a reset of the card is carried out, the power supply to the card is not switched off.

Command format

Instruction Code	Data length
80 H	00 H

Response data format

ATR			

ATR Four bytes Answer-To-Reset read from the card.
The ATR bytes are read from the card with LSB first, i.e., the first bit read from the card is the LSB of the first ATR byte.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81 H	00 H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card. The bytes are read from the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
90 H	03 H			

ADDR Byte address of first byte to be read from the card

LEN Number N of data bytes to be read from the card (0 < N ≤ MAX_R)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

d) WRITE_DATA

To write the specified data bytes to the specified address of the inserted card. The bytes are written to the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

The data contents at the specified addresses are not erased prior to the write operation and, hence, memory bits can only be programmed from '1' to '0'.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
91_H							

LEN Number of data bytes to be written to the card, N, + 2

ADDR Byte address in the card of the first byte to be written

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

Response data format

No response data

e) ERASE_DATA

To erase the specified number of bytes starting at the specified address, i.e., set all bits to '1'.

NOTE - The memory of the 416/896 type cards is organized in words (16 bits) and only complete words can be erased. Therefore, if an odd number N (N=2*X + 1; 0 ≤ X) of bytes is specified in the *ERASE_DATA* command, N+1 bytes will actually be erased.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
95_H	03_H			

ADDR Byte address in the card of the first byte to be erased

LEN Number of bytes to be erased in the card

Response data format

No response data

f) PRESENT_CODE

To submit a secret code to the card to enable the read or write operations according to the card lifecycle stage and the setting of option bits in the card.

Through parameters specified in the command data, this command allows to present all the different codes provided by different card types, such as the transport code, the erase code, etc.

The following actions are executed by the CyberMouse:

- present the specified code to the card
- if applicable, search a '1' bit in the error/erase counter at the specified address and write the bit to '0'
- if applicable, try to erase the erase counter / error counter / reloadable memory area immediately following the secret code in the card memory

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		CNT	BYTE 1	...	BYTE N
92_H							

LEN Number of code bytes, N, + 3

ADDR Byte address of the presented code in the card

CNT Number of bits of the presentation/erase counter
00 = No counter bits but ERASE must be executed after code presentation
FF_H = No counter bits, no ERASE after code presentation

BYTE x Secret code

Examples: SLE4404 (416 bits) - Presentation of Secret Code (PIN)
N = 02
LEN = 05

ADDR = 08
CNT = 04

GPM896 (896 bits) - Presentation of Erase Code 1
N = 06
LEN = 09
ADDR = 36_H
CNT = 00

AT88SC1604 - Presentation of Security Code 3
N = 02
LEN = 05
ADDR = $5CB_H$
CNT = FF_H

Response data format

BYTE 1	...	BYTE N

BYTE x Contents of the presentation/erase counter (if applicable)

N = Max (1, CNT/ 8)

NOTE - No response data are transmitted if the command parameter CNT is 00 or FF_H.

g) SET_FUSE

To set the FUSE pin of the inserted card to the required electrical state. The FUSE pin controls the way a card interprets the status of the internal FUSE bit.

The selection becomes active only after a card reset. The default state of the FUSE pin after selecting this card type is 'not connected' (= high impedance), which is by most cards interpreted as 'Fuse blown'.

Command format

Instruction Code	Data length	Data
		FUSE
84_H	01_H	

FUSE State of the FUSE pin
00_H : not connected (high impedance)
01_H : High (5V)
FF_H : Low (0V)

Response data format

No response data

h) BLOW_FUSE

To execute the process for blowing a fuse at the specified memory address to irreversibly change the card life cycle state.

NOTE - This command is only used with the ATMEL cards of type AT88SCxxxx. The AM416 / GPM896 / SLE4404 cards use normal WRITE operations to the proper addresses to blow the fuses.

Command format

Instruction Code	Data length	Data	
		ADDR	
94_H	02_H		

ADDR Byte address of the fuse. The first bit (bit 0) at this byte address will be written to 0 using the special control signal timing required by the AT88SCxxxx cards.

Response data format

No response data

4. Siemens SLE 4432/4442 intelligent 256 Byte Memory Card

a) RESET

This command powers up the card inserted in the card reader and performs a card reset.

If the card is powered up when the command is being issued, only a reset of the card is carried out, the power supply to the card is not switched off.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

ATR			

ATR — Four bytes Answer-To-Reset read from the card.
The ATR bytes are read from the card with LSB first, i.e., the first bit read from the card is the LSB of the first ATR byte.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
90_H	03_H			

ADDR — Byte address of first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN — Number N of data bytes to be read from the card $(0 < N \leq MAX\_R)$

Response data format

BYTE 1	BYTE 2	BYTE 3	...	BYTE N	PROT 1	...	PROT L

BYTE x — Data bytes read from the card memory

PROT y — Bytes containing the protection bits of the data bytes read
(0...4 bytes)

The protection bits are only returned in the response data if the start address ADDR specified in the command is $< 20_H$, i.e., it is lying within the first 32 bytes of card memory which can be write protected.

Accordingly, the number of PROT bytes returned depends on how many of the data bytes read lie within the protectable area. If all data bytes read are outside the protectable area, only the data bytes read from the card are returned in the response, no PROT bytes are returned.

The arrangement of the protection bits in the PROT bytes is as follows:

PROT 1								PROT 2								....							
P8	P7	P6	P5	P4	P3	P2	P1	P16	P15	P14	P13	P12	P11	P10	P9	..	..	..	..	..	..	P18	P17

Px is the protection bit of BYTE x in the response data

'0' : byte is write protected
'1' : byte can be written

d) WRITE_DATA

To write the specified data bytes to the specified address of the inserted card.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
91_H							

LEN — Number of data bytes to be written to the card, N, + 2

ADDR — Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x — Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

Response data format

No response data

e) WRITE_PROTECTION

To write the protection bits for the specified addresses in the card.

Each of the bytes specified in the command is internally in the card compared with the byte stored at the specified address and if the data match, the corresponding protection bit is irreversibly programmed to '0'.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
94_H							

LEN — Number of data bytes to be write protected, N, + 2

ADDR — Byte address in the card of the first byte to be write protected. The high byte of the address is specified as the first byte of ADDR.

BYTE x — Byte values to be compared with the data in the card starting at address ADDR. BYTE 1 is compared with the data at address ADDR; BYTE N is compared with the data at address ADDR+N-1.

Response data format

No response data

f) PRESENT_CODE (only SLE 4442)

To submit the secret code to the card to enable the write operation with the SLE 4442 card.

The following actions are executed by the CyberMouse:

- search a '1' bit in the presentation error counter and write the bit to '0'
- present the specified code to the card
- try to erase the presentation error counter

Command format

Instruction Code	Data length	Data		
		CODE		
92_H	03_H			

CODE Three bytes secret code (PIN)

Response data format

ERRCNT	CODE		

ERRCNT The value of the presentation error counter after the code presentation.

CODE The three bytes secret code read from the card.
If the correct code has been presented to the card, the value of ERRCNT is 07_H and the value of CODE is identical to the code data specified in the command.

g) READ PRESENTATION ERROR COUNTER (only SLE 4442)

To read the presentation error counter

Instruction Code	Data length
92_H	0_H

Response data format

ERRCNT	DUMMY		

ERRCNT The value of the presentation error counter.

DUMMY Three bytes dummy data read from the card.

h) CHANGE_CODE (only SLE 4442)

To write the specified data as new secret code in the card.

The current secret code must have been presented to the card with the *PRESENT_CODE* command prior to the execution of this command!

Command format

Instruction Code	Data length	Data		
		CODE		
93_H	03_H			

CODE The three bytes new secret code (PIN)

Response data format

No response data

5. Siemens SLE 4418/4428 intelligent 1K Byte Memory Card

a) RESET

This command powers up the card inserted in the card reader and performs a card reset.

If the card is powered up when the command is being issued, only a reset of the card is carried out, the power supply to the card is not switched off.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

ATR			

ATR Four bytes Answer-To-Reset read from the card.
The ATR bytes are read from the card with LSB first, i.e., the first bit read from the card is the LSB of the first ATR byte.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
90_H	03_H			

ADDR Byte address of first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card (0 < N ≤ MAX_R)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	BYTE N	PROT 1	...	PROT L

BYTE x Data bytes read from the card memory

PROT y Bytes containing the protection bits of the data bytes read (1...4 bytes)

The number L of protection bytes returned in the response is determined by the number N of data bytes read from the card as follows:

$$L = 1 + INT(N/8)$$

The arrangement of the protection bits in the PROT bytes is as follows:

PROT 1								PROT 2								....							
P8	P7	P6	P5	P4	P3	P2	P1	P16	P15	P14	P13	P12	P11	P10	P9	..	..	..	..	..	..	P18	P17

Px is the protection bit of BYTE x in the response data

'0' : byte is write protected
'1' : byte can be written

d) WRITE_DATA

To write the specified data bytes to the specified address of the inserted card.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
91_H							

LEN — Number of data bytes to be written to the card, N, + 2

ADDR — Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x — Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

Response data format

No response data

e) WRITE_PROTECTION

To write the protection bits for the specified addresses in the card.

Each of the bytes specified in the command is internally in the card compared with the byte stored at the specified address and if the data match, the corresponding protection bit is irreversibly programmed to '0'.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
94_H							

LEN — Number of data bytes to be write protected, N, + 2

ADDR — Byte address in the card of the first byte to be write protected. The high byte of the address is specified as the first byte of ADDR.

BYTE x — Byte values to be compared with the data in the card starting at address ADDR. BYTE 1 is compared with the data at address ADDR; BYTE N is compared with the data at address ADDR+N-1.

Response data format

No response data

f) PRESENT_CODE (only SLE 4428)

To submit the secret code to the card to enable the write operation with the SLE 4442 card. The following actions are executed by the CyberMouse:

- search a '1' bit in the presentation error counter and write the bit to '0'
- present the specified code to the card
- try to erase the presentation error counter

Command format

Instruction Code	Data length	Data	
		CODE	
92_H	02_H		

CODE — Two bytes secret code (PIN)

Response data format

ERRCNT	CODE	

ERRCNT The value of the presentation error counter after the code presentation.

CODE The two bytes secret code read from the card.

If the correct code has been presented to the card, the value of ERRCNT is FF_H and the value of CODE is identical to the code data specified in the command.

g) READ PRESENTATION ERROR COUNTER (only SLE 4428)

To read the presentation error counter for the secret code.

Command format

Instruction Code	Data length
92_H	0_H

Response data format

ERRCNT	DUMMY		

ERRCNT The value of the presentation error counter.

DUMMY Three bytes dummy data read from the card.

6. '93CS06/46' type EEPROMs with MICROWIRE interface

NOTE - The memory of the 93CS06/46 type EEPROM is electrically organized in words (16 bits) and only complete words can be read, written and erased.

a) RESET

This command powers up the card inserted in the card reader. If the card is powered up when the command is being issued, the power supply to the card will not temporarily be switched off.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

No response data

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) READ_DATA

To read the specified number of words from the specified address of the inserted card.

Command format

Instruction Code	Data length	Data	
		ADDR	LEN
90_H	03_H		

ADDR Word address of first word to be read from the card

LEN Number N of data words to be read from the card $(0 < N \leq MAX\_R/2)$

Response data format

WORD 1		WORD 2.		...		WORD N	

BYTE x Data words read from the card memory. Each data word is transmitted in two bytes, with the high byte of the word transmitted first.

d) WRITE_DATA

To write the specified data words to the specified address of the inserted card.

Command format

Instruction Code	Data length	Data									
	LEN	ADDR		WORD 1		...		...		WORD N	
91_H											

LEN Number of data words to be written to the card, N, multiplied by 2, + 2

ADDR Word address of the first word to be written to the card

WORD x Word values to be written to the card starting at word address ADDR. WORD 1 is written to address ADDR; WORD N is written to address ADDR+N-1. Each word is transmitted in two bytes with the high byte of the word transmitted first.

Response data format

No response data

e) WRITE_ALL

To fill the complete card memory with the specified value.

Command format

Instruction Code	Data length	Data	
		DATA	
95_H	02_H		

DATA The word value to be written to all card addresses. The value is transmitted in two bytes with the high byte of the word transmitted first.

Response data format

No response data

f) READ_PROT

To read the contents of the write-protection register from the card (i.e., the start address of the write-protected memory area).

Command format

Instruction Code	Data length
97_H	00_H

Response data format

PROT

PROT Value of write protection register, i.e., the address of the first write-protected word.

g) SET_PROTECTION

To set the start address of the write-protected memory area in the card.

Command format

Instruction Code	Data length	Data
		PROT
94_H	01_H	

PROT New value of the write protection register, i.e., the address of the first word to be write-protected

Response data format

No response data

h) CLEAR_PROTECTION

To clear the write-protection register in the card, i.e., to set all memory addresses to 'not write-protected'.

Command format

Instruction Code	Data length
94_H	00_H

Response data format

No response data

i) DISABLE_PROTECTION

Irreversibly to disable access to the write-protection register in the card. The contents of the write-protection register is not changed and the currently write-protected memory area cannot be modified any more.

Command format

Instruction Code	Data length	Data	
94_H	02_H	FF_H	FF_H

Response data format

No response data

7. ST1333 - type EEPROM WITH T2G PROTOCOL

NOTE - a programmed bit is '1' while an erased bit is '0' for this type of card.

a) RESET

This command powers up the card inserted in the card reader and performs a card reset.

If the card is powered up when the command is being issued, only a reset of the card is carried out; the power supply to the card is not switched off.

Command format

Instruction Code	Data length
80_H	00_H

Response data format

ATR			

ATR — Four bytes Answer-To-Reset read from the card.
The ATR bytes are read from the card with LSB first, i.e., the first bit read from the card is the LSB of the first ATR byte.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card. The bytes are read from the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

Command format

Instruction Code	Data length	Data		
			ADDR	LEN
90_H	03_H	00_H		

ADDR — Byte address of first byte to be read from the card

LEN — Number N of data bytes to be read from the card
($0 < N \leq MAX\_R$)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x — Data bytes read from the card memory

d) WRITE_DATA

To write <u>one</u> byte to the specified address of the inserted card. The byte is written to the card with LSB first, i.e., the bit at card address 0 is regarded as the LSB of byte 0.

Two different WRITE modes are available for this card type, which are distinguished by a flag in the command data field:

a) Write
The byte value specified in the command is written to the specified address. This command can be used for writing personalization data and counter values to the card.

b) Write with carry
The byte value specified in the command is written to the specified address and the command is sent to the card to erase the next lower counter stage. This write mode can therefore only be used for updating the counter value in the card.

With either write mode, the byte at the specified card address is not erased prior to the write operation and, hence, memory bits can only be programmed from '0' to '1'.

The backup mode available in the ST1333 card can be enabled or disabled in the write operation.

Command format

Instruction Code	Data length	Data			
			ADDR	MODE	BYTE
91_H	04_H	00_H			

ADDR Byte address of byte to be written

MODE Specifies the write mode and backup option (ST1333)
00_H : write
01_H : write with carry
02_H : write with backup enabled
03_H : write with carry and with backup enabled

BYTE Byte value to be written to the card

Response data format

No response data

e) ERASE_DATA

To erase the specified number of bytes starting at the specified address, i.e., set all bits to '0'.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
95_H	03_H			

ADDR Byte address in the card of the first byte to be erased

LEN Number of bytes to be erased in the card

Response data format

No response data

f) PRESENT_TRANSPORT_CODE

To submit the transport code to the card in order to enable the card personalization mode. The following actions are executed by the CyberMouse:

- search a '0' bit in the presentation counter and write the bit to '1'
- present the specified code to the card

The CyberMouse does not try to erase the presentation counter after the code submission! This must be done by the application software through a separate 'Write with carry' command.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR	BYTE 1	BYTE 2	...	...	BYTE N
92_H							

LEN Number of transport code bytes, N, + 1

ADDR Byte address of the presentation counter in the card

BYTE x Transport code

Response data format

No response data

g) AUTHENTICATE_CARD

To read a card authentication certificate from a ST1333 card. The following actions are executed by the CyberMouse:

- present the challenge data specified in the command to the card
- generate the required number of READ and PROG pulses for the computation of signature by the card
- read 4 bits of authentication data from the card
- reset the card to normal operation mode

The CyberMouse returns the 4 bits of authentication data calculated by the card in the response.

Command format

Instruction Code	Data length	Data			
		BYTE 1	BYTE 2	BYTE 3	BYTE 4
96_H	04_H				

BYTE 1...4 Card challenge data

Response data format

CERT							
B8	B7	B6	B5	B4	B3	B2	B1

CERT B1 - B4 are 4 bits of authentication data computed by the card.

8. X76F041 Card (Xicor)

a) RESET

This command powers up the card inserted in the card reader.

No action is taken if the card is powered up when the command is being issued.

Command format

Instruction Code	Data length
80 H	00 H

Response data format

ATR			
19 H	55 H	AA H	55 H

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81 H	00 H

Response data format

No response data

c) READ_DATA

To read the specified number of bytes from the specified address of the inserted card. Please note that the reader always use the sequential read command to read out the data.

The X76F041 card allows reading data only within a block. However, the AC-SET EVB handles the reading across block boundaries transparently to the application. Thus, data can be read from any address irrespective of the bock structure of the card., provided that the adjacent blocks are **both not READ protected**.

Command format

Instruction Code	Data length	Data		
		ADDR		LEN
90 H	03 H			

ADDR Byte address of first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card (0 < N ≤ MAX_R)

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

d) READ_DATA_WITH_PASSWORD

To read the specified number of bytes from the specified address of the inserted card after submission of the specified READ password.

The X76F041 card allows reading data only within a block. However, the AC-SET EVB handles the reading across block boundaries transparently to the application. Thus, data can be read from any address irrespective of the bock structure of the card., provided that the adjacent blocks are **both READ protected**.

Command format

Instruction Code	Data length	Data					
		PASSWORD (8 bytes)			ADDR		LEN
90 H	0B H	PW7	….	PW0			

ADDR Byte address of the first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card ($0 < N \leq MAX\_R$)

PASSWORD The READ password

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

e) CONFIG_READ

This command is the same as *READ_DATA_WITH_PASSWORD* except that the CONFIGURATION password is used in this command and the read operation is not restricted to a certain memory area.

Command format

Instruction Code	Data length	Data					
		PASSWORD (8 bytes)			ADDR		LEN
92 H	0B H	PW7	….	PW0			

ADDR Byte address of first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card ($0 < N \leq MAX\_R$)

PASSWORD The CONFIGURATION password

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

f) WRITE_DATA

To write the specified number of data bytes starting from a specified address.

The X76F041 card allows writing data only to one complete sector (8 bytes) at a time. However, the AC-SET EVB handles the writing across sector boundaries transparently to the application. Thus, any number of data bytes can be written to any address irrespective of the sector structure of the card provided that the number of bytes to be written is a multiple of 8 and that adjacent memory blocks are **both not WRITE protected**.

Command format

Instruction Code	Data length	Data					
	LEN	ADDR		BYTE 1	...	...	BYTE N
91 H							

LEN Number of data bytes to be written to the card, N, + 2

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

Response data format

No response data

g) WRITE_DATA_WITH_PASSWORD

To write the specified number of data bytes starting from a specified address, after submitting the specified WRITE password to the card.

The X76F041 card allows writing data only to one complete sector (8 bytes) at a time. However, the AC-SET EVB handles the writing across sector boundaries transparently to the application. Thus, any number of data bytes can be written to any address irrespective of the sector structure of the card provided that the number of bytes to be written is a multiple of 8 and that adjacent memory blocks are **both WRITE protected**.

Command format

Instruction Code	Data length	Data							
	LEN	PASSWORD (8 bytes)			ADDR		BYTE 1	...	BYTE N
94 H		PW7	….	PW0					

LEN Number of data bytes to be written to the card, N, + 10

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

PASSWORD WRITE password

Response data format

No response data

h) CONFIG_WRITE

This command is exactly the same as *WRITE_DATA_WITH_PASSWORD* except that the CONFIGURATION password is used in this command and the write operation is not restricted.

Command format

Instruction Code	Data length	Data							
	LEN	PASSWORD (8 bytes)			ADDR		BYTE 1	...	BYTE N
93 H		PW7	….	PW0					

LEN Number of data bytes to be written to the card, N, + 10

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

PASSWORD CONFIGURATION password

Response data format

No response data

i) CARD_ADMIN

This command is used to perform various card administration functions.

Command format

Instruction Code	Data length	Data							
	LEN	PASSWORD (8 bytes)			CMD	RSLEN	PARAM x		
95 H		PW7	….	PW0			1	..	N

LEN — Number of data bytes of the command

CMD — Command code for the administration function (refer to Table 7-1)

PASSWORD — Password to be submitted with the command

RSLEN — Expected length of response data (refer to Table 7-1)

PARAM x — Input parameter for the command (refer to Table 7-1)
Not all commands require input parameters!

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x — Data bytes read from the card memory

Table 7-1: Command codes and parameters

CMD	PARAM	Length of PARAM (bytes)	PASSWORD	Response length (RsLen)
Program the WRITE password				
0x00	[New READ password, 2 times]	16	[Old READ password]	0
Program the READ password				
0x10	[New WRITE password, 2 times]	16	[Old WRITE password]	0
Program the CONFIGURATION password				
0x20	[New CONFIGURATION password, 2 times]	16	[Old CONFIGURATION password]	0
Reset the WRITE password				
0x30	Nil	0	[CONFIGURATION password]	0
Reset the READ password				
0x40	Nil	0	[CONFIGURATION password]	0
Program the configuration registers				
0x50	[New configuration register values]	5	[CONFIGURATION password]	0
Read the configuration registers				
0x60	Nil	0	[CONFIGURATION password]	5
Mass program				
0x70	Nil	0	[CONFIGURATION password]	0
Mass erase				
0x80	Nil	0	[CONFIGURATION password]	0

9. X76F128/640 Card (Xicor)

a) RESET

This command powers up the card inserted in the card reader.

No action is taken if the card is powered up when the command is being issued.

Command format

Instruction Code	Data length
80 H	00 H

Response data format for X76F128 Card

ATR			
19 H	28 H	AA H	55 H

Response data format for X76F640 Card

ATR			
19 H	64 H	AA H	55 H

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81 H	00 H

Response data format

No response data

c) READ_DATA_WITH_PASSWORD

To read the specified number of bytes from the specified address of Array 0 or Array 1 of the inserted card, after submission of the specified READ password for Array 0 or Array 1, respectively.

The X76F128/640 card allows reading data only within an array.

Command format

Instruction Code	Data length	Data						
		ARRAY	PASSWORD (8 bytes)			ADDR		LEN
90 H	0C H		PW7	….	PW0			

ARRAY Array number. 0 for Array 0, 1 for Array 1

ADDR Byte address of the first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card (0 < N ≤ MAX_R)

PASSWORD The READ password for the array specified in ARRAY.

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

d) WRITE_DATA_WITH_PASSWORD

To write the specified number of data bytes starting from a specified address of Array 0 or Array 1, after submitting the specified WRITE password of the corresponding array to the card.

Command format

Instruction Code	Data length	Data							
	LEN	ARRAY	PASSWORD (8 bytes)			ADDR		BYTE 1	...	BYTE N
91 H			PW7	….	PW0					

ARRAY Array number. 0 for Array 0, 1 for Array 1

LEN Number of data bytes to be written to the card, N, + 11

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

PASSWORD WRITE password for the array specified.

Response data format

No response data

e) RESET_PASSWORD

This command is will clear both arrays and set all passwords to all zero, after submitting the correct password for reset.

Command format

Instruction Code	Data length	Data		
	LEN	PASSWORD (8 bytes)		
96 H	08	PW7	….	PW0

PASSWORD RESET password

f) RESET_DEVICE

This command will clear the X76F128/640 retry counter and reactivate the device, after submitting the correct password for reset. When this command is used prior to the retry counter overflow, the retry counter is reset and no arrays or passwords are affected. If the retry counter has overflowed, all memory areas are cleared and all commands are blocked and the retry counter is disabled. Issuing a valid RESET_DEVICE command (with reset password) to the device resets and re-enables the retry counter and re-enables the other commands. Again, the passwords are not affected.

Command format

Instruction Code	Data length	Data		
	LEN	PASSWORD (8 bytes)		
97 H	08	PW7	….	PW0

PASSWORD RESET password

Response data format

No response data

g) CHANGE_PASSWORD

This command is used to change the X76F128/640 various passwords after submitting the original corresponding password.

Command format

Instruction Code	Data length	Data									
	LEN	TYPE	PASSWORD (8 bytes)			NEWPASS(8 bytes)			NEWPASS (8 bytes)		
95_H	19_H		PW7	....	PW0	NW7	.	NW0	NW7	..	NW0

LEN	Number of data bytes of the command
TYPE	Password type :
	0 : Read Array 0 Password
	1 : Read Array 1 Password
	2 : Write Array 0 Password
	3 : Write Array 1 Password
	4 : Reset Password
PASSWORD	Original password to be submitted with the command
NEWPASS	New Password (type twice)

Response data format

No response data

10. X76F100 Card (Xicor)

a) RESET

This command powers up the card inserted in the card reader.

No action is taken if the card is powered up when the command is being issued.

Command format

Instruction Code	Data length
80 H	00 H

Default Response data format

ATR			
19 H	00H	AA H	55 H

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81 H	00 H

Response data format

No response data

c) READ_DATA_WITH_PASSWORD

To read the specified number of bytes from the specified address of the inserted card after submission of the specified READ password.

Command format

Instruction Code	Data length	Data					
		PASSWORD (8 bytes)			ADDR		LEN
90 H	0B H	PW7	….	PW0	00		

ADDR Byte address of the first byte to be read from the card. The high byte of the address is specified as the first byte of ADDR.

LEN Number N of data bytes to be read from the card ($0 < N \leq MAX\_R$)

PASSWORD The READ password

Response data format

BYTE 1	BYTE 2	BYTE 3	...	...	BYTE N

BYTE x Data bytes read from the card memory

d) WRITE_SECTOR_DATA_WITH_PASSWORD

To write the specified number of data bytes(in multiples of 8) starting from a specified address, after submitting the specified WRITE password to the card. The starting address must be on a sector start (i.e. multiples of 8).

Command format

Instruction Code	Data length	Data							
	LEN	PASSWORD (8 bytes)			ADDR		BYTE 1	...	BYTE N
91 H		PW7	….	PW0	00				

LEN Number of data bytes to be written to the card, N, + 10

ADDR Byte address in the card of the first byte to be written. The high byte of the address is specified as the first byte of ADDR.

BYTE x Byte values to be written to the card starting at address ADDR. BYTE 1 is written to address ADDR; BYTE N is written to address ADDR+N-1.

PASSWORD WRITE password

Response data format

No response data

e) CHANGE_ PASSWORD

This command will change the password for READ or the password for WRITE, after submitting the WRITE password.

Command format

Instruction Code	Data length	Data						
	LEN	TYPE	PASSWORD(8 bytes)			NEWPASS (8 bytes)		
95 H	11_H		PW7	….	PW0	PW7	....	PW0

TYPE Password type: 0 = READ password
1 = WRITE password

PASSWORD WRITE password

NEWPASS new READ or WRITE password

Response data format

No response data

11. MCU-based Card

a) RESET (3V or 5V)

This command powers up the card inserted in the card reader and performs a card reset. If the card is powered up when the command is being issued, only a reset of the card is carried out. The power supply to the card is not switched off.

To reset the card using 5V, normal reset command can be used

Command format (Reset using 5V)

Instruction Code	Data length
80_H	00_H

To reset the card using 3V, extended reset command can be used

Command format (Reset using 3V)

Instruction Code	Data length	Data
80_H	01_H	01_H

Response data format

ATR					

ATR Answer-To-Reset as transmitted by the card according to ISO7816-3.

NOTE - The ATR is only returned in the CyberMouse response if the communication protocol of the card is compatible with the reader, i.e., if the card can be processed by the CyberMouse. Otherwise, the CyberMouse returns an error status and deactivates the smart card interface.

b) POWER_OFF

This command powers off the card inserted in the card reader.

Command format

Instruction Code	Data length
81_H	00_H

Response data format

No response data

c) EXCHANGE_APDU

To exchange an APDU (Application Protocol Data Unit) command/response pair between the MCU card inserted in the CyberMouse and the host computer.

Command format

Instruction Code	Data length	Data									
	LEN	CLA	INS	P1	P2	Lc	BYTE 1	...2	...	BYTE N	Le
$A0_H$											

LEN Length of APDU command data, N, + 6 ($0 < N \leq MAX\_R$)
CLA APDU instruction class byte
INS APDU instruction
P1 APDU parameter byte 1
P2 APDU parameter byte 2
Lc APDU command data length
BYTE x APDU command data
Le Expected APDU response data length

NOTE - With the T=0 communication protocol it is not possible to transmit data to the card and from the card in a single command-response pair. Hence, only either Lc or Le can be greater than 0 in an *EXCHANGE_APDU* command when a T=0 card is in the reader. If both parameters have a value greater than 0, the CyberMouse does not execute the command and returns an error status.

Response data format

BYTE 1	...	...	BYTE N	SW1	SW2

BYTE x Response data from card (if any)

SW1, SW2 Status code returned by the card.

d) EXCHANGE_T1_FRAME

To exchange an APDU (Application Protocol Data Unit) command/response pair between the MCU card inserted in the CyberMouse and the host computer using T1 protocol.

Command format

Instruction Code	Data length	Data
	LEN	T1 BLOCK FRAME
$A1_H$		

LEN Length of APDU command data, N

DATA T1 Block frame to be sent to the card

Response data format

BYTE 1	...	...	BYTE N

BYTE x Response T1 Block from card (if any)

12. Security Application Module (SAM)

a) ACTIVATE_SAM

To power up and reset the specified SAM and transmit the SAM's ATR in the response.

Command format

Instruction Code	Data length	Data
		SM#
88 H	01 H	

SM# SAM to be activated - SAM0, SAM1 or SAM2.
Must be 0; values other than 0 are only allowed with the CyberMouse-M20-3 board.

Response data format

ATR					

ATR Answer-To-Reset as transmitted by the card according to ISO7816-3.

NOTE - The ATR is only returned in the CyberMouse response if the communication protocol of the SAM is compatible with the reader, i.e., if the SAM can be processed by the CyberMouse. Otherwise, the CyberMouse returns an error status and deactivates the SAM.

b) DEACTIVATE_SAM

This command powers off the SAM inserted in the CyberMouse-M20-1 board.

Command format

Instruction Code	Data length
89 H	00 H

Response data format

No response data

c) EXCHANGE_SAM_APDU

To exchange an APDU (Application Protocol Data Unit) command/response pair between the SAM in the CyberMouse-M20-1 board and the host computer.

Command format

Instruction Code	Data length	Data									
	LEN	CLA	INS	P1	P2	Lc	BYTE 1	...2	...	BYTE N	Le
B0 H											

LEN Length of APDU command data, N, + 6 (0 < N ≤ MAX_R)
CLA APDU instruction class byte
INS APDU instruction
P1 APDU parameter byte 1
P2 APDU parameter byte 2
Lc APDU command data length
BYTE x APDU command data
Le Expected APDU response data length

NOTE - With the T=0 communication protocol it is not possible to transmit data to the SAM and from the SAM in a single command-response pair. Hence, only either Lc or Le can be greater than 0 in an *EXCHANGE_SAM_APDU* command when a T=0 SAM is in the reader. If both parameters have a value greater than 0, the CyberMouse does not execute the command and returns an error status.

Response data format

BYTE 1	...	...	BYTE N	SW1	SW2

BYTE x Response data from SAM (if any)

SW1, SW2 Status code returned by the SAM.

APPENDIX A: SUPPORTED CARD TYPES

The following table summarizes which values must be specified in the *SET_CARD_TYPE* command for a particular card type to be used, and how the bits in the response to the *GET_ACR_STAT* command correspond with the respective card types.

Cyber-mouse card type code		Siemens	Atmel	SGS-Thomson	Gemplus	Others
01	AM104 AM221	SLE4406 SLE4436 SLE5536	AT88SC06	ST1305 ST1335	GPM103	
02	AM1KF AM2KF AM4KF AM8KF		AT24C01 AT24C02 AT24C04 AT24C08 AT24C16	ST14C02C ST14C04C	GFM1K GFM2K GFM4K	
03	AM416	SLE4404	AT88SC101 AT88SC102 AT88SC1601 AT88SC1604		GPM416 GPM896	
05	AM8KP AM8KS	SLE4418 SLE4428				
06	AM2KP AM2KS	SLE4432 SLE4442				
07	AM64KP					24C65
08	AM256					93CS06/46
$0A_H$						X76F041
$0B_H$				ST1333		
$0C_H$	MCU-based cards with T=0 communication protocol					
$0D_H$	MCU-based cards with T=1 communication protocol					
$0E_H$						X76F128/640
10_H						X76F100

APPENDIX B: RESPONSE STATUS CODES

The following table summarizes the possible status code bytes SW1, SW2 returned by the CyberMouse:

SW1	SW2	Status
90	00	OK – command successfully executed
90	01	OK – using T=1 protocol (only in response to the RESET command)
90	10	OK – synchronous protocol is used (only in response to the RESET command). The exact card type should be selected by using the SELECT_CARD_TYPE command.
60	01	No card type selected
60	02	No card in reader
60	03	Wrong card type specified
60	04	Card not powered up; This status code is also returned in a response if the card was temporarily removed during a card access.
60	05	Invalid Instruction Code
60	20	Card failure
60	22	Short circuit at card connector
62	01	Secret code verify failed
67	01	Command incompatible with card type
67	02	Card address error
67	03	Data length error
67	04	Invalid length of response (with READ command)
67	05	Secret code locked
67	12	APDU command aborted (only MCU-based card using T=1 protocol); the command abortion may be caused by a card internal failure.

APPENDIX C: CYBERMOUSE FIRMWARE REVISION INDEX

Revision	Modifications
1.09	first distributed release

APPENDIX D: TECHNICAL SPECIFICATIONS

Device

CyberMouse Smart Card Reader/Writer

Power supply

Supply voltage ..... Regulated 5V DC
Supply current..... < 100mA (without smart card)

The presence of the power supply voltage is indicated through a red LED on the reader

Serial Communication Interface

Type ..... RS-232C, five lines: RxD, TxD, CTS, DTR, GND
Connector..... supplied together with the reader

Universal Serial Bus Interface

Type ..... USB, four lines: +5V, GND, D+ and D-
Connector..... supplied together with the reader

Smart Card Interface

Standard ..... ISO 7816 1/2/3, T=0 and T=1
Supply current..... max. 30mA
Short circuit protection ..... +5V / GND on all pins

The presence of the smart card power supply voltage is indicated through a green LED on the reader

CLK frequency..... 3.68 MHz / 1.84 MHz / 0.92 MHz
Card connector..... sliding contacts (8 contacts)
Card insertion cycles..... min. 100,000

Case

Dimensions ..... 77mm (L) x 68mm (B) x 20mm (H)
Color ..... bone gray
Weight..... 0.16 kg

Operating Conditions

Temperature ..... 0 - 50° C

NOTES

NOTES