Version 1.3

GPR400

Reference Manual

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ABOUT THIS GUIDE

This manual describes the GEMPLUS GPR400 Compact Smartcard Reader/Writer.

Audience

This manual assumes that you are familiar with Smartcards and Smartcard reader technology.

How to Use This Manual

The following paragraphs tell you where to find information when you need it. Read this section in order to use this guide to its full potential.

Preface

Read the Preface for a general description of the GPR400 and of its environment.

GPR400 Hardware

Read the “GPR400 Hardware” section for a description of the hardware and its connections.

Sending Commands to a Smartcard

This section describes how to send commands to a Smartcard via the GPR400. It includes the following information:

- command format,
- a list of Smartcard commands and other commands.

TABLE OF CONTENTS

PREFACE

The GPR400 (GEMPLUS Pocket Reader 400) is a Smartcard reader/writer that has approximately the same dimensions as a Smartcard, and that fits into a standard PCMCIA slot. When fitted into the PCMCIA slot, the GPR400 leaves enough space for a Smartcard also to be inserted into the PCMCIA slot beneath it, with its edges touching the Smartcard's module as shown in Figure 1 below. It therefore is an electrical adapter that is compliant with the ISO 7816-3 Smartcard standard for PCMCIA products.

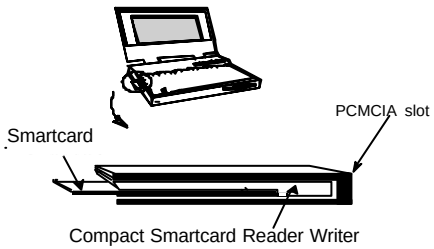

Fig 1: GPR400, PCMCIA Slot, and Smartcard Configuration

When the reader is connected to the PCMCIA interface, it is seen as an I/O PC Card (type II) as defined by PCMCIA standard releases 2.0 and above.

The GPR400 has 128 Kbytes of optional flash memory and 2 Kbytes of RAM. The flash memory (if present) is used by the embedded microcontroller with a 16 Kbyte partition and cannot be accessed directly by the PCMCIA interface. It can be used for:

- Smartcard application executable files,
- data files, such as Smartcard blacklists or information files,
- other executable files, such as the extended memory for a microcontroller.

The RAM manages the PCMCIA interface as follows :

- 32 bytes are used for I/O data exchange,
- 2016 bytes are used as the Attribute Memory (defined by the PCMCIA Standard 2.1 or by the PC Card Standard) and can also be used as extended executable memory for the microcontroller.

THE GPR400 HARDWARE

The GPR400 Smartcard interface complies with ISO 7816-1,-2, and -3 standards and is compatible with embossed Smartcards. The GPR400 is connected to a portable PC using a PCMCIA slot (socket).

The PCMCIA Connector

The GPR400 is compatible with all PCMCIA sockets that accept type II PC Cards (5.0 mm in thickness). The GPR400 includes a standard 68 pin connector.

The Smartcard module is compliant with the ISO 7816 - 2 standard.

GPR400 Architecture Overview

The GPR400 is based on a microcontroller. It communicates with the PCMCIA bus using a specific component (ASIC) containing 2 Kbytes of RAM.

The flash memory (128 Kbytes) is mapped onto the embedded microcontroller. Please note this memory is optional in this release.

The GPR400 has an 8-bit data I/O structure.

The GPR400's power supply is provided by the PCMCIA interface (Vcc=5V).

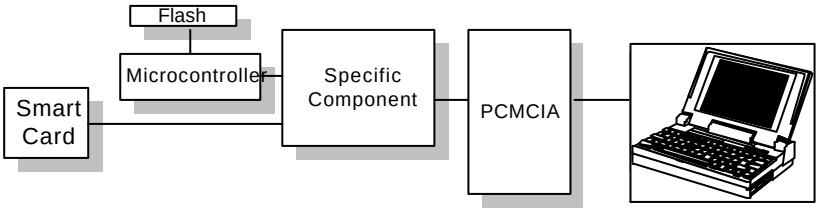

Fig 2: GPR400 Architecture

The 2K byte Memory

The GPR400 has 2K bytes of RAM included in the specific component. These 2K bytes are mapped as follows:

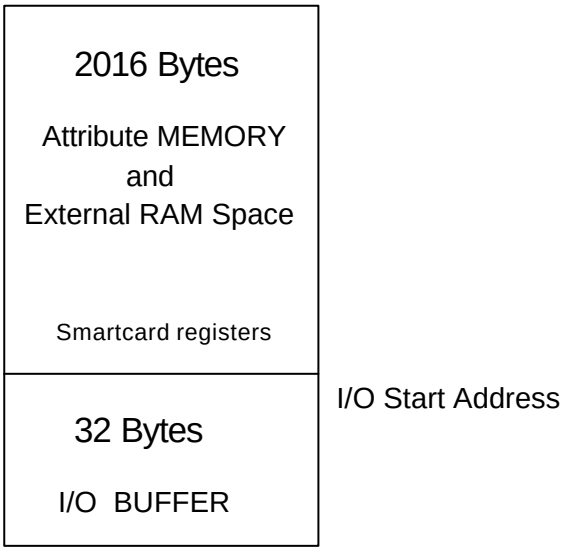

Figure 3. GPR400 2k Bytes RAM Structure

The first 2016 bytes are used to store the Card Information Structure (C.I.S.), the specific PCMCIA defined registers for I/O PC Card (Configuration Option Register), the registers for the Smartcard interface and some external RAM data which are used by the embedded microprocessor for external data space or executable programs (application programs or Smartcard drivers). The C.I.S. is downloaded by the internal microcontroller. The external RAM data can be loaded by the embedded microcontroller or by the PCMCIA interface (Attribute Memory space access).

The 32-byte I/O buffer is used to transmit application commands to the microcontroller handling interface with the smart card.

PCCard Configuration

When inserted into the computer, the GPR400 must be configured by the host. To accomplish this, the host must first read the C.I.S. starting at address 000h in the Attribute Memory. Then the GPR400 can be configured using the Configuration Option Register (address FA0h) for an I/O base address : 0300h, 0320h, 0340h, 0200h, 220h, 0240h or any space 32-byte long memory space.

Configuration Option Register structure (see also PCCard Standard):

bit 7: set to 1, this bit initializes the GPR400 (minimum pulse of 5 µs)

bit 6-5 : reserved (reset to 0)

bit 4-0 : these bits are defined by the I/O base address as described in the following table:

Configuration Option register value	I/O address
18	300h-31Fh
19	320h-33Fh
1A	340h-35Fh
10	200h-21Fh
11	220h-23Fh
12	240h-25Fh
01	all 32 bytes boundary address

The register value 01 configures the GPR400 for all I/O addresses; the INPACK signal is then systematically transmitted (see the PCCard Standard).

SENDING COMMANDS TO THE READER

You can send the same commands to a Smartcard from the GPR400 as those from any other reader. The command parameters will vary according to the Smartcard, and they are listed in this section. For details regarding available commands for each Smartcard, read the appropriate documentation.

When you send a command to a Smartcard, you send it from the host to the GPR400 I/O buffer. The microcontroller verifies that the command format is correct; it then passes the command on to the appropriate Smartcard.

You transmit commands to the GPR400 in a Type Length Variable (TLV) format.

***Note**: When you develop applications for portable PCs that run on batteries, bear in mind the following recommendation to limit battery power consumption:*

Power Off the Smartcard when you have finished accessing it, and power down the GPR. This will switch the GPR400 into Power Down mode.

Sending Commands to the GPR400

This section describes, in full detail, how to send Smartcard commands to the GPR400. You send commands to the GPR400 through the 32-byte I/O buffer. The first 2 bytes are specific registers and the other 30 bytes (address 02h to 1Fh) are used to store the TLV command. Four other specific registers are located at the end of the Attribute Memory. The following is a description of the 6 specific registers:

General Setup Register

Read only access: Address FB8h in the Attribute Memory

bit 4:= 0: Attribute Memory and I/O buffer locked

= 1: Attribute Memory and I/O buffer accessible

other bits: Internal use.

Smartcard Register 1

Read only access: Address FBAh in the Attribute Memory.

bit 4: = 1: Smartcard was pulled-out

= 0: Smartcard is in the reader

bit 7: = 1: Smartcard inserted

= 0: no Smartcard inserted

other bits : internal use

Smartcard Register 2

Read only access: internal use : Address FBCh in the Attribute Memory

Clock and Control Register

Read only access: internal use : Address FBEh in the Attribute Memory

Handshake Register

Handshake register (read and write): address 00h **in the I/O buffer**.

bit 0 : Master Reset : A "RESET GPR" sets this bit to a minimum time of 5 microseconds and waits for 20 milliseconds. This command is the first action to perform after a "POWER DOWN GPR": it reactivates the embedded microprocessor. Note that the GPR400 is automatically reactivated when inserted into the PCMCIA socket.

bit 1 : INTR : GPR400 interrupt request: After sending the GPR400 command in the I/O buffer, the host must set this bit to 1 in order to launch the execution phase. This bit will be reset by the GPR400 after the execution of the command.

bit 2 : BUSY/IREQ : this bit is an image of the PCMCIA pin IREQ (Interrupt Request). The GPR400 sets this bit to 1 after command execution, forcing the IREQ pin to 0. The host can receive the command response and then reset this bit to 0.

bits 3 to 7 : for PRG control (see Using PRG section)

PRG Data register

The PRG Data register (refer to the “Using the PRG” section) is located at address 01h **in the I/O buffer**.

Command and Response Format

The GPR400 command and response are structured in the TLV format. This is as follows:

Type, Length, Variable

Description of the TLV Field

Type T

This value specifies the command on one byte. The command function is one of the following:

- Select Card
- Open Session
- Close Session
- APDU Exchange
- Activate Driver
- Power Down GPR
- Load Memory
- Read Memory
- Exec Memory
- IFD Status

The response to a command is in the same location. The Type value is equal to the command type value plus 02h (bit 1 set to 1).

Length L

This specifies the length, in bytes, of the V field, and must be a value from 1 to 28. The length field is coded on one byte.

Variable V

This field must be the same length as that specified in L. The command itself will be entered in this field (see the list of commands later in this section).

Chaining TLV fields

The maximum length of a standard TLV field is 30 bytes (length of the I/O buffer). To transmit larger commands, the host can chain TLV fields. The V variable is then divided into V1, V2, ... Vn and transported in the TLiVi chaining field noted Tc ('c' for chaining).

T, L, V <=> (Tc1,L1,V1) + (Tc2,L2,V2) +.. + (Tn,Ln,Vn)

Tc1 : first block (index 1) of a chaining field (index c)

Tn : Block n of the last chaining field (index c is not present)

L = L1 + L2 +.. + Ln

The index “c” corresponds to the value of bit 2 of type T with :

bit 2 = 1 : chaining field.

bit 2 = 0 : standard field or last field.

The maximum chaining field Length is : V1 + V2 + .. + Vn = 256 bytes (this corresponds to a 256-byte buffer for data exchange with a Smartcard).

GPR400 Commands

Select Card

This command initializes the reader for the Smartcard protocol used in the application. Note that by default the Smartcard interface is configured for ISO T = 0 protocol, with the clock equal to 3.68 MHz. The T=1 protocol is automatically set if the GPR400 recognizes the T=1 Smartcard during an “OPEN SESSION” command.

Command Format

T = 50h

L = 01

V = b7...b0

where:

b1 .b0 = 00: Downloaded Smartcard driver 0

01: RFU (Reserved for Future Use)

10: Driver ISO 7816-3

11: RFU

b4 = 0: Smartcard clock = 3.68 MHz

1: Smartcard clock = 7.36 MHz

b7, b5, b3, b2 : :RFU

Answer Format

Type Ta = Tc + 02h (52h)

Length L = 01

Variable V = Reader Status Code

Open Session

This command powers the Smartcard on. The power on sequence is fully compatible with ISO 7816-3 standards and determines whether the T=0 or T=1 protocol will be used.

This command powers a Smartcard on and sends the Answer To Reset (ATR) to the terminal. If the Smartcard is already powered on, then the command merely returns the ATR (this function then permits either a cold or a warm reset).

Command Format

T = 20h

L = 00

Answer Format

Type	Ta = Tc + 02h (22h)
Length	L = Length (SmartCard Answer to reset) +1
Variable	V = Reader Status Code (1 byte), Answer To Reset

Close Session

This command powers off a Smartcard in compliance with ISO 7816 standards.

Command Format

T = 10h

L = 00

Answer Format

Type	Ta = Tc + 02h (12h)
Length	L = 01
Variable	V = Reader Status Code

APDU Exchange

This command sends a request to a Smartcard (T=0 or T=1 or use of downloaded drivers).

In this mode, the GPR400 relays the Transport Protocol Data Unit (TPDU) command to the Smartcard, and then returns the TPDU response from the Smartcard to the application.

The T=1 protocol management implemented by the GPR400 offers a transparent mode mechanism. The other T=1 mechanisms, such as chaining, retransmission, and resynchronization must be handled by the external application.

The Exchange Data buffer for ISO Smartcards has a length of 256 bytes.

Command Format

T = 30h
L = Length of V field
V = Vex

where	*Vex = DIR, Vinf for T=0 protocol*
ISO In command :	DIR=00
	Vinf = CLA, INS, P1, P2, Lin, Data IN
ISO Out command :	DIR=01
	Vinf = CLA, INS, P1, P2, Lout

Vex = Nad, Pcb, Le, Vinf, E for T=1 protocol (TPDU format)

Vinf = CLA, INS, P1, P2, Lin, Data, Lout

Answer Format

Type	Ta = Tc + 02h
Length	L = Length of V field
Variable	V = Reader Status Code (1 byte) , Vans
where :	Vans = Data Out for T=0 protocol.
	Vans = Nad, Pcb, Le, Data, E (Data received from the Smartcard in a TPDU format T=1)

Activate Driver

This command validates a downloaded IC driver or a specific command (subroutine) for the GPR400. The data corresponding to this driver or this specific command must first be downloaded using the “LOAD MEMORY” command. The downloaded IC Driver is used to exchange data with Smartcards that do not support T=0 or T=1 (e.g. GPM256, GPM896, GFM, GAM, etc...). The validated command is used to customize the GPR400 or to create a new command.

Command Format

T = 70h

L = 03

V = DIR, ADR

where : DIR :

b1..b0 :	00 : downloaded IC driver
	01, 10 : RFU
	11 : specific command driver
b2 :	0 : driver located in RAM
	1 : driver located in flash
b3 : (if b2=1)	b3=0: first page of flash, b3=1: second page of flash
b6..b4 :	RFU
b7 :	b7=0 : current driver invalid
	b7=1 : current driver valid

ADR : address on two bytes of the beginning of the driver (MSB, LSB)

Answer Format

Type	Ta = Tc + 02h (72h)
Length	L = 01
Variable	V = Reader Status Code (1 byte)

Reset GPR

This command is not controlled by the GPR400. It is directly accessed from the Handshake Register (refer to the “Handshake Register” section).

Power Down GPR

This command puts the GPR400 in low-consumption mode (Standby or Power Down modes).

In Standby mode, when a Smartcard is inserted, a TLV Answer and an interrupt signal are sent to the Host. If a Smartcard is already inserted, the TLV is the GPR400’s only answer.

***Note**: This command does not power down the Smartcard interface (use the Close Session command).*

Power Down is the GPR400’s very low-consumption mode (this applies only if a “CLOSE SESSION” has been executed).

To reactivate the reader, you need to perform a “RESET GPR” before sending any commands (refer to the “Handshake Register” section).

Command Format

T = 40h

L = 01

V = 00 : Power down mode

01: Standby mode

Answer Format

Type Ta = Tc + 02h (42h)

L = 01

V = Reader status byte

Answer Format (Smart card insertion event only)

Type Ta = Tc + 02h (42h)

L = 02

V = Reader status byte + Aah

Load Memory

This command downloads bytes to the RAM or to the optional Flash Memory. The data comes from the host or from the Smartcard.

Note: *The memory is divided into two 64-Kbyte pages and/or four 16-Kbyte partitions for the Flash option.*

Command Format

T = 60h

L = Length of V field

V = DIR, ADR, (Vex), (Data)

where

DIR :

b1.b0 : 00: data from the Smartcard

10: data from the Host

01,11: RFU

b2 : 0 : loading to RAM

1 : loading to Flash Memory

b3 : if b2=1, b3 indicates the page (0 = page 0, 1 = page 1)

b5.b4 : 00 : downloading without erasing

10 : erasing the current 16 Kb partition before downloading

01 or 11: complete erasing before downloading

b6..b7 : RFU

ADR : physical address on two bytes (MSB, LSB)

Vex : (exclusive) : Smartcard command for data coming from a Smartcard

Data : (exclusive) : Data to load (for data coming from the host)

Answer Format

Type	Ta = Tc + 02h
Length	L = 01
Variable	V = Reader Status Code

Read Memory

This command reads bytes from the RAM or from the optional Flash Memory.

Command Format

T = 80h

L = Length of V field

V = DIR, ADR, Lng
where :

DIR :

b0..b1 : RFU

b2 = 0 : read from RAM

1 : read from flash memoryb3 : (if b2=1) b3 indicates the page (0= first 64-Kbyte block, 1= second block)

b4..b7 : RFU

ADR : physical address on two bytes (MSB, LSB)

Lng : number of bytes to be read (00 = 256 bytes)

Answer Format

Type	Ta = Tc + 02h
Length	L = Length of V field
Variable	V = Reader Status Code, Vinf
	Vinf corresponds to the data read.

Exec Memory

This command executes a specific command (sub-routine) pre-downloaded using the “LOAD MEMORY” command. This subroutine should normally be generated by GEMPLUS.

The driver can be downloaded a single time to non-volatile memory (i.e., the External Flash Memory), provided that the “VALIDATE DRIVER” command has already been executed.

Command Format

T = 90h

L = Length of V field

V = User Data

where :

The subroutine uses available User Data as parameters.

Answer Format

Type	Ta = Tc + 02h (92h)
Length	L = Length of V field
Variable	V = Reader Status Code , Answer User Data (user defined).

Status GPR

This command provides 3 types of information on the GPR400’s status: firmware, Smartcard and driver information.

Command Format

T = A0h

L = 01

V = b7...b0

where:

b1..b0 =	00: GPR400 firmware information
	01: checksum information (GPR400 firmware, RAM and Flash Memory)
	10: Smartcard register 1 & 2
b7 ...b2 :	RFU.

Answer Format

Type	Ta = Tc + 02h (A2h)
Length	L = Length of V field
Variable	V = Reader Status Code , information Data
	for GPR400 firmware information (7 bytes),
	Data=OS version: Binary Coded Decimal byte
	Mem: 00h if Flash Memory absent
	11h if Flash Memory present
	General Setup Register byte
	DIR and ADR bytes of the “Validate Driver” command fields
	PC Card Manufacturer info byte (LSB): see PCMCIA Standard
	for checksum information (2 or 3 bytes) , Data =
	Checksum GPR400 firmware
	Checksum RAM
	Checksum Flash Memory (optional)
	for Smartcard information (3 bytes), Data =
	Smartcard register 1
	Smartcard register 2
	Clock & Control register.

APPENDIX A - OPERATING SPECIFICATIONS

This appendix specifies the GPR400's operating conditions, including :

- maximum operating values
- operating conditions
- AC test conditions
- AC characteristics

Maximum Operating Values

Table 3 lists the GPR400's maximum operating conditions.

Table 3. GPR400 Maximum Operating Conditions

Condition	Value
Operating temperature	0ºC to + 55ºC
Storage temperature	-20ºC to + 65ºC
Voltage on any PIN with respect to ground	-0.5V to + 5.5V
Vpp supply voltage with respect to ground	-0.5V to + 7.0V
Vcc supply voltage with respect to ground	-0.5V to + 5.5V

***Note**: Conditions outside the values specified in Table 3 may cause permanent damage to the GPR400.*

Standard Operating Conditions

Table 4 lists the GPR400's standard operating conditions.

Table 4. GPR400 Standard Operating Conditions

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
Ta	Operating temperature	0		70	ºC	
Vcc	Vcc supply voltage	4.8		5.25	V	
Vpph	Active Vpp supply voltage (if needed)	4.5		5.5	V	
Vppl	Vpp during read operations	0		5.5	V	
ILi	Input leakage current			5	uA	Vcc = Vcc Max Vin = Vcc or Vss
lLo	Output leakage current		1	15	uA	Vcc = Vcc Max Vout = Vcc or Vss
Iccpd	Icc power down current		200	500	µA	Vcc = Vcc Max CE/ = Vcc
Iccop	Icc operating current		4	20	mA	Vcc = Vcc Max CE/ = Vil with no IccSmartcard inserted.
Vil	Input low voltage	-0.5		0.8	V	
Vih	Input high voltage	2.2		Vcc+0.5	V	
Vol	Output low voltage			0.40	V	Iol = 3.2 mA Vcc = Vcc min
Voh	Output high voltage			2.4	V	Ioh = -2 mA Vcc = Vcc min
Vppl	Vpp during read only operations	0		6.5	V	
Vpph	Vpp during read/write operations	4.5		5.5	V	

AC Test Conditions

The GPR400 AC Test conditions are listed below:

Input rise and fall times	10 ns
Input pulse levels	Vol and Voh
Input timing reference level	Vil and Vih
Output timing reference level	Vil and Vih

AC Characteristics

The GPR400 AC Characteristics are listed below:

Read access time	55 ns
Write access time	55 ns

(Attribute Memory and I/O buffer)

APPENDIX B - PIN-OUT DESCRIPTION

Table 5 describes the GPR400 PIN-OUT.

Table 5. GPR400 PIN-OUT.

PIN	Signal	I/O	Function	PIN	Signal	I/O	Function
1	GND	I/O	Ground	35	GND	O	Ground
2	D3	I/O	Data bit 3	36	CD1	I/O	Card Detect 1
3	D4	I/O	Data bit 4	37	D11	I/O	N.C.
4	D5	I/O	Data bit 5	38	D12	I/O	N.C.
5	D6	I/O	Data bit 6	39	D13	I/O	N.C.
6	D7	I/O	Data bit 7	40	D14	I/O	N.C.
7	CE1	I	PC Card Enable	41	D15	I/O	N.C.
8	A10	I	Add. bit 10	42	CE2	I	N.C.
9	OE	I	Output EN	43	NC		N.C.
10	A11	I	Add bit 11	44	IORD	I	I/O read
11	A9	I	Add bit 9	45	IOWR	I	I/O write
12	A8	I	Add bit 8	46	A17	I	N.C
13	A13	I	Add bit 13	47	A 18	I	N.C.
14	A14	I	Add bit 14	48	A 19	I	N.C.
15	WE	I	Write enable	49	A 20	I	N.C.
16	IREQ	O	Interrupt line	50	A 21	I	N.C.
17	Vcc 1	I	Power Supply	51	Vcc 2		Power Supply

PIN	Signal	I/O	Function	PIN	Signal	I/O	Function
18	Vpp1	I	Program Power Supply	52	Vpp2		N.C.
19	A16	I	N.C.	53	A22	I	N.C.
20	A15	I	N.C	54	A23	I	N.C.
21	A12	I	N.C	55	A24	I	N.C.
22	A7	I	Add bit 7	56	A25	I	N.C.
23	A6	I	Add bit 6	57	RFU		N.C
24	A5	I	Add bit 5	58	RST	I	Reset
25	A4	I	Add bit 4	59	WAIT	O	N.C.
26	A3	I	Add bit 3	60	Inpack	O	Valid access
27	A2	I	Add bit 2	61	REG	I	Reg. Valid
28	A1	I	Add bit 1	62	BVD2	O	Bat Volt Detect
29	A0	I	Add bit 0	63	BVD1	O	Bat Volt Detect
30	D0	I/O	Data bit 0	64	D8	I/O	N.C.
31	D1	I/O	Data bit 1	65	D9	I/O	N.C.
32	D2	I/O	Data bit 2	66	D10	I/O	N.C.
33	WP	O	Ground	67	CD2	O	Card Detect 2
34	GND		Ground	68	GND		Ground

The PINs are described below.

A0 - A11 (Input): addresses A0 through A11 are address bus lines allowing you to issue instructions directly to the Attribute Memory or to the I/O buffer.

D0 - D7 (input/output): signals D0 through D7 make up the bi-directional data bus. D7 is the most significant bit.

CE1 (input): GPR400 enable input signal. Active low.

OE (input): signal used to read the Attribute Memory. Active low.

WE (input): signal used to write Attribute Memory. Active low.

IORD (input): signal used to read I/O buffer. Active low.

IOWR (input): signal used to write in I/O buffer. Active low.

REG (input): signal to enable GPR400 access (Attribute Memory and I/O buffer)

INPACK (output): indicates the GPR400 is inserted (correct I/O address). Active low.

IREQ :(output) : Interrupt Request signal, indicates to the host that an answer is available.

CD1,CD2 (outputs): these signals detect whether the GPR400 is inserted or not. They are internally connected to the ground.

Vcc: GPR400 power supply (5V nominal) for all internal circuitry.

Vpp1: programming power supply, if the optional Flash Memory is present.

GND: ground for all internal circuitry.

BVD1, BVD2 (outputs): battery voltage detection. These signals are internally driven high to maintain SRAM Smartcard compatibility.

RST (= RESET) : must be set to 1 by the host to reset the GPR400, then reset to 0 during at least 20 ms.

APPENDIX C - SAMPLE GPR400 SCENARIOS

This appendix provides sample scenarios.

Scenario 1

GPR400 configuration at address 0240h in the host PC system resources.

This scenario is automatically done by the Socket and Card Services (PCMCIA Standard) if it is found in the host (in compliance with PCMCIA standard rel 2.1).

- Set the GPR400 power on.
- Read the C.I.S. in the Attribute Memory.
- Write (Attribute Memory) at address 0FA0h the value 12h (as mentioned in the C.I.S. configuration).

Scenario 2

Send an ISO command to a Smartcard.

(protocol T = 1 ; clock = 3.58 MHz)

Reset GPR :

write I/O at @ 0240h (Handshake Register) : bit 0 set to 1

and reset to 0,5 us later.

Select Card :

T.L.V. = 50.01.02

write I/O @0242h: 50h, @0243h 01h, @0244h 02h

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h 52h, @0243h 01h, @0244h 00h

Open Session:

T.L.V. = 20.00.
write I/O @0242h 20h, @0243h 00h.
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h 22h, @0243h 01h, @0244h 00h

APDU Exchange :

T.L.V. = 30.L.(Nad, Pcb, Le, Vinf, E)
write I/O @0242h: 30 L.(Nad, Pcb, Le, Vinf, E)
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h : 32.L.(Nad, Pcb, Le, Vinf, E)

Close Session :

T.L.V. = 10.00.
write I/O @0242h: 10.00
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h : 12.01.00

PowerDown GPR :

T.L.V. = 40.01.00.
write I/O @0242h: 40.01.00
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h : 42.01.00.

Scenario 3

Send an ISO command to a new Smartcard.

(protocol T = X, clock = 3.68 MHz)

Reset GPR :

write I/O at @ 0240h (Handshake Register) : bit 0 set to 1

and reset to 0,5 us later.

Load memory : (Download X driver for the new Smartcard)

T.L.V. = 60.L < 01,ADH,ADL,DATA >

T.L.V. = 60.L. < 01,ADHnext, ADLnext, DATA >

until the entire driver corresponding to protocol X is downloaded

write I/O @0242h: 60 L <00,ADH, ADL, DATA >

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h : 62.01.00

.. and loop until last data appears.

Activate driver

T.L.V. = 70.03.81.ADh,ADl

ADh, ADl : base driver address.

write I/O @0242h: 70.03.80.ADh,ADl

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h : 72.01.00.

Select Card :

T.L.V. = 50.01.00

selection of Smartcard driver, clock = 3.68 MHz

write I/O @0242h: 50 01 00

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h : 52.01.00.

Open Session :

T.L.V. = 20.00.

write I/O @0242h: 20.00

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h : 22.01.00.

APDU Exchange :

T.L.V. = 30.L.Vex

The Vex Variable can be structured as T=0 or T=1
or it can have a specific format. It will be handled by the
new Smartcard driver.

write I/O @0242h: 30 L.Vex

write I/O @0240h : bit 1 set to 1

wait for Interrupt Request (IREQ)

then write I/O @0240h bit 2 reset to 0

read I/O @0242h : 32.L.Vex.

Close Session:

T.L.V. = 10.00.
write I/O @0242h: 10.00
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h : 12.01.00.

PowerDown GPR :

T.L.V. = 40.01.00.
write I/O @0242h: 40.01.00
write I/O @0240h : bit 1 set to 1
wait for Interrupt Request (IREQ)
then write I/O @0240h bit 2 reset to 0
read I/O @0242h : 42.01.00.

APPENDIX D - STATUS CODES

Status codes provided by the GPR400 are listed in the table below:

Code	Meaning
00	Command successfully executed.
04h	Unknown reader command. The first byte of the request is not a valid command type.
05h	Unknown Smartcard driver. The driver was not loaded.
10h	Response error at card reset. The first byte of the response (TS) is not valid.
12h	The L parameter is not valid; chaining buffer overflow or chaining Li value <> 28.
14h	Unknown card type. The T parameter in the Define Card Type command is not valid.
15h	Card turned off. A Power Up command must be given to the card prior to any other operation.
16h	The V parameter is incorrect.
19h	The Flash Memory is not present. The command is not supported.
1Ah	Error in an ISO format card command. The LN parameter in the ISO header does not correspond to the actual data length.
1Bh	A command has been sent with an incorrect number of parameters.
1Dh	The TCK check byte of an asynchronous card Answer To Reset is incorrect.
1Eh	Memory access is incorrect.
1Fh	Writing problem in the Flash Memory.
20h	Bad TLV command type <T>.

A0h	Card malfunction; the TA1 byte of an asynchronous card Answer To Reset is incorrect. The Smartcard protocol is not accepted.
A2h	Card malfunction. The card is not responding to reset or has interrupted an exchange (by time-out).
A3h	Parity error (in the course of an exchange between the asynchronous card and the reader). The error only occurs after several unsuccessful attempts at retransmission.
E4h	The card has just sent the reader an invalid "Procedure Byte" (see ISO 7816-3).
E5h	A command was issued, but no data was exchanged.
E7h	The SW1 and SW2 bytes returned by the card are not 90 00h.
F7h	Card removed; the card has been withdrawn while carrying out of an instruction. Make sure that the card instruction is complete.
F8h	Card in short circuit.
FBh	Card absent. There is no card in the connector. The card may have been removed when powered on, but no instruction has been interrupted.