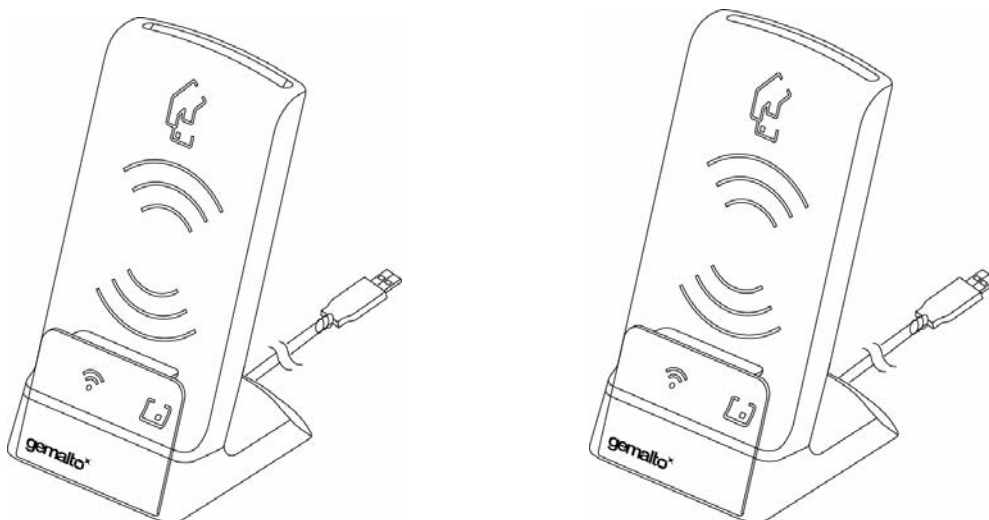


Prox-DU & Prox-SU

Dual interface USB smart card reader

Short Form Specification



Prox-DU & Prox-SU

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Printed in France.

REVISION HISTORY

Date	Release	Comments
March 2010	A	First release

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Introduction

This manual provides short information on the use of the Prox-DU and the Prox-SU dual interface (contactless and contact) USB smart card reader/writer.

This document is applicable to following reference:

Model	Reference	Comments
Prox-DU	HWP118184	Dual interface USB smart card reader Contact & contactless
Prox-SU	HWP118185	Contactless interface USB smart card reader With optional SIM/SAM slot
Prox-DU with stand	HWP118830	Prox-DU with a stand for vertical use
Prox-SU with stand	HWP118831	Prox-SU with a stand for vertical use

Table 1 – Dual interface USB smart card reader/writer models

For information on how to use the smart card reader/writer, please refer to the “Reference Manual” document.

For information on installation, please refer to the “Installation Guide” document.

Who Should Read This Book

This manual is designed for users of PC/SC smart card application.

Conventions

Byte Numbering

A string of n bytes consists of n number of concatenated bytes: Bn...B3...B0.

Bn is the most significant byte and B0 is the least significant byte:

A string of n bytes	Bn	Bn-1	-	-	-	B2	B1	B0
------------------------	----	------	---	---	---	----	----	----

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Please note the document reference number, your job function, and the name of your company. (You will find the document reference number at the bottom of the document.)

Overview

Description

The Prox-DU and the Prox-SU are Gemalto smart card reader/writers embedding the Prox and the GemCore technologies developed by Gemalto to interface contactless and contact smart cards:

- The Prox-DU is a **dual interface (contact and contactless)** USB smart card reader/writer:

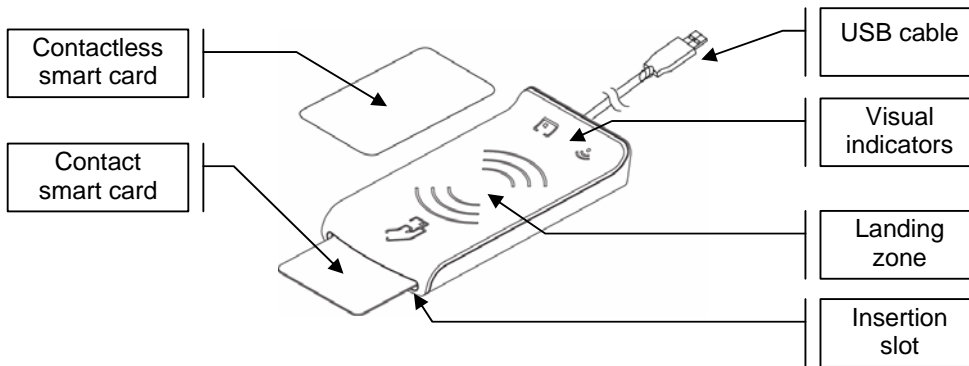


Figure 1 – Prox-DU view

- The Prox-SU is a **contactless interface** USB smart card reader including an internal SIM/SAM card slot:

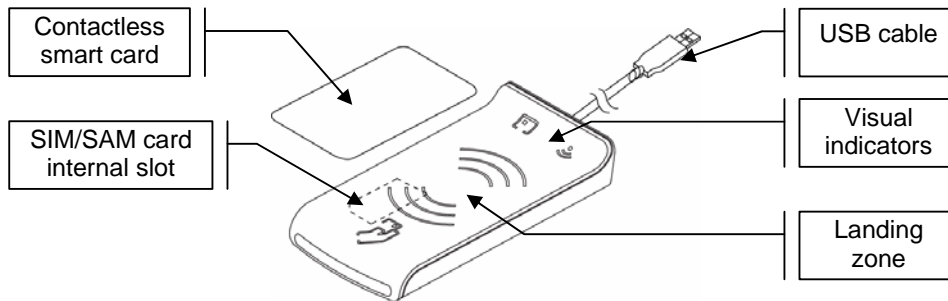


Figure 2 – Prox-SU view

The Prox technology complies with ISO14443 standard related to proximity cards applicable to type A and type B contactless smart cards.

The Prox technology uses MIFARE[®] (a registered trademark of NXP) technology as part of its integrated solution.

The GemCore technology complies with ISO7816 and EMV standard related to contact smart cards.

Both technologies also provide visual feedback for each smart card interface.

Main Features

The Prox-DU and The Prox-SU have the following common features:

- Up-to-date architecture using the Gemalto Prox and GemCore technologies
- Ability to drive any type of ISO14443-A&B T=CL contactless smart cards
- Ability to drive any type of MIFARE[®] contactless smart cards
- Ability to drive any type of ISO7816 contact smart card or SIM/SAM card
- Support for smart card with a higher baud rate (contact and contactless)
- Easily upgradeable download of the latest features
- Standard USB Full speed interface, bus powered (no external power supply required)
- Unique USB serial number which enables that the device can be plugged into any USB slot on a computer without having to re-install the driver
- Standard CCID interface for both smart card slot (contact and contactless)
- Standard HID interface for device administration
- No need of a proprietary USB driver. The standard CCID and HID drivers of the computer can be used
- PC/SC V2.0 compliant
- Embedded protection against dual interface smart card damage and switch feature to select the active interface (contact or contactless)

Prox and GemCore are Gemalto proprietary technologies developed for contactless and contact reader/writers. It is based on a specific operating system that interfaces with contactless and contact smart cards.

A stand can be attached to the reader/writer for vertical use:



Figure 3 – Prox-DU with the stand for vertical use

Prox-DU and Prox-SU differences

The main difference between the Prox-DU and Prox-SU models is related to the smart card slot:

- Prox-DU: the smart card slot located in the top cabinet is open. The user can insert or remove its **ID-1 size** smart card directly into or from the reader slot



Figure 4 – Prox-DU ID-1 size slot

- Prox-SU: the smart card slot located in the top cabinet is **closed**. The user should open the casing before inserting its **ID-000 size** smart card into the dedicated connector. When the casing is closed the SIM/SAM card cannot be removed.

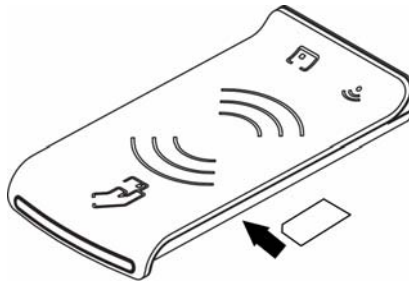


Figure 5 – Prox-SU ID-000 size slot

The following table shows all the different features supported by the Prox-DU and the Prox-SU reader/writers:

Feature	Prox-DU	Prox-SU
Contact card interface	ID-1 size format (smart card) Removable	ID-000 size format (SIM/SAM) Not removable
Dual interface protection	Managed Can be disabled according to device configuration	No management
Switch interface command	Available	Not useful
Product name in the string version	Gemalto Prox-DU	Gemalto Prox-SU
Product string in USB descriptor	Prox Dual USB PC Link Reader	Prox SU USB PC Link Reader
LEDs	The LED of the contact interface is blinking when no card is inserted	The LED of the contact interface is Off when no SIM/SAM is present

Table 2 – Prox-DU and Prox-SU differences

Smart card protection and switch feature

As the Prox-DU can interface two smart cards simultaneously, a dedicated protection system is included into the device to avoid to damage dual interface smart cards (both contact and contactless).

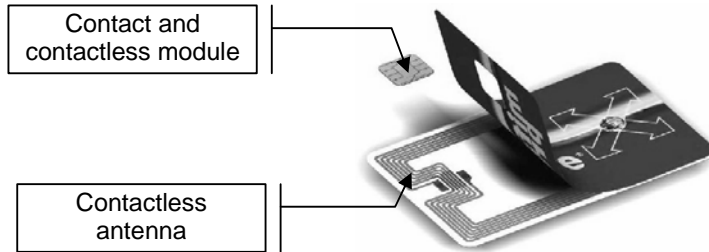


Figure 6 – Dual interface smart card view

To protect the smart card from undesired operation only one interface will be activated at a given time:

- The contact interface is deactivated when a contactless smart card is detected by the reader. The contact smart card power supply will be turned off to avoid powering the contact smart card.
- The contactless interface is deactivated when a contact card is detected by the reader. The RF field is turned off to avoid powering the contactless smart card.

The contactless interface will be activated again when the smart card is removed from the slot or when a dedicated **switch command** is send to the device by the application.

This feature will enable the user to **communicate with the two interfaces without moving the smart card from the slot.**

The dual interface smart card protection is enabled by default into the Prox-DU device. It can be disabled if needed by changing the reader/writer's configuration. When disabled the two smart card interfaces are available simultaneously.

Note: As it is not possible to have a dual interface SIM/SAM card, the smart card protection is not active with the Prox-SU device.

Using Smart Cards

The Prox-DU and Prox-SU reader/writers must be used with contactless and contact smart cards. Depending on the model, the following pictures show the different ways to use the smart cards:

The Prox-DU and a contactless smart card:

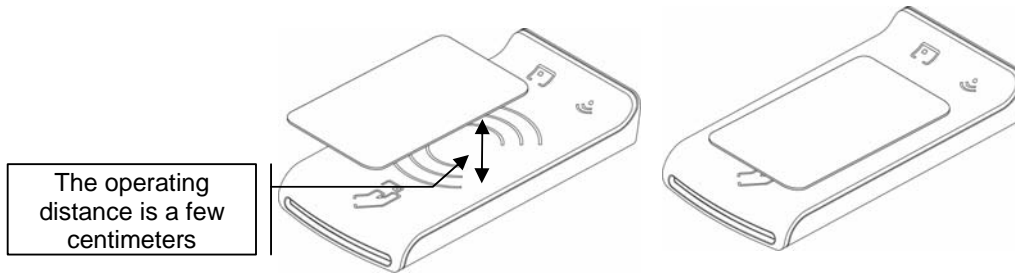


Figure 7 – The contactless smart card is put near or over the Prox-DU landing zone



Figure 8 – The contactless smart card is **not fully** inserted into the Prox-DU slot



Figure 9 – The contactless smart card is **fully** inserted into the Prox-DU slot (after the switch activation)

Note: if the contactless smart card is fully inserted into the slot, the contactless interface will be deactivated because the contact interface has a higher priority than the contactless interface. To activate the contactless smart card when it is fully inserted into the slot, the switch feature of the device should be activated.

Prox-DU & Prox-SU

The Prox-DU and a contact smart card:



Figure 10 – The contact smart card is fully inserted into the Prox-DU slot

The Prox-SU and a contactless smart card:

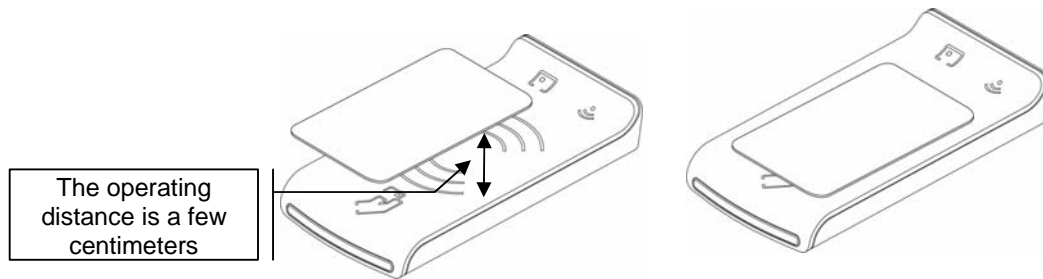


Figure 11 – The contactless smart card is put near or over the Prox-SU landing zone

The Prox-SU and a contact SIM/SAM card:



Figure 12 – The contact SIM/SAM card is inserted into the Prox-SU connector

Note: the SIM/SAM card cannot be installed or removed without opening the casing. The SIM/SAM card is permanently installed into the Prox-SU reader.

Environmental Characteristics

For an optimal performance, operate the Prox-DU and the Prox-SU under the following environment conditions:

Description	Value or Range
Operating Temperature	0°C to +50°C (+32°F to +122°F)
Storage Temperature	-20°C to +60°C (-4°F to +140°F)
MTBF reliability	900,000 hours at 20°C (MIL-HDBK-217F grade GB)
Humidity Range	0% to 95% non-condensing
Protection Index	Prox-DU: IP20 (open-case device) Prox-SU: IP40 (dustproof device)
EEPROM data	10 years minimum retention 100000 erase/write cycles
Physical Dimensions	Without stand: 26 mm x 69 mm x 126 mm max. (height x width x depth) With stand: 132 mm x 69 mm x 79 mm max. (height x width x depth)
Weight	Without stand: 145 g max. With stand: 255 g max.
Cabling Distance	1.80 m USB cable
Power Supply Voltage	USB bus powered
Power Supply Current Operating RF On	< 200 mA
Power Supply Current Operating RF Off	< 50 mA
Power Supply Current Suspend	< 2.5 mA
EMC Regulations	CE FCC Part 15 Class B
Safety	UL 60950 Recognized
Table 3 – Environmental Characteristics	

Interface capability

The Prox-DU and the Prox-SU devices support the following interfaces:

- One USB interface
- One contact smart card interface
- One contactless smart card interface
- Two visual indicators

Depending on the smart card type, the connectors used will be as shown in the next table:

Interface	Prox-DU Connector type	Prox-SU Connector type
USB	USB A plug	USB A plug
Contact card	ISO7810 ID-1 size ISO7816-2 8 pins	ISO7810 ID-000 size ISO7816-2 8 pins
Contactless card	Landing zone (No connector)	Landing zone (No connector)
Visual Indicators	One blue LED One yellow LED	One blue LED One yellow LED

Table 4 – Interface capability

Interface Features

USB serial interface

The USB interface is available with the Prox-DU and the Prox-SU.

The USB interface is USB 2.0 full speed compliant.

The USB interface is a **composite device** composed of the following devices:

- One USB Smart Card reader for the contact interface
- One USB Smart Card reader for the contactless interface
- One USB Human Interface Device for the reader administration



Figure 13 – USB devices (Windows XP example)

The USB interface does not requires a specific driver for use with various operating systems.

The standard USB CCID driver included into the operating system of the computer is used for the smart card interface.

The standard USB HID driver included into the operating system of the computer is used for the device administration.

The selective suspend is not supported by the USB interface. Only standard suspend is supported.

Contactless interface

The contactless interface is available with the Prox-DU and the Prox-SU and is composed of a landing zone located in the front cabinet defined by the following contactless logo:



Figure 14 – Contactless logo of the landing zone

The contactless antenna is integrated into the device. It consists of inductive loops and a matching circuit mounted into the printed circuit board.

This contactless interface complies with the ISO14443-A&B standard.

Prox-DU & Prox-SU

The characteristics for the contactless interface are as follows:

- Contactless type:
 - ISO14443-A Memory cards (MIFARE®)
 - ISO14443-A Microprocessor cards (T=CL)
 - ISO14443-B Microprocessor cards (T=CL)
 - Automatic scan between ISO14443-A and ISO14443-B
- Contactless baud rate:
 - 106 kbps - 212 kbps - 424 kbps - 848 kbps
- Contactless protocol:
 - MIFARE® classic
 - ISO14443-4 (T=CL)
- Contactless commands:
 - Compliant with PC/SC V2.0 Part 3 Revision 2.01.09 specifications

Contact interface

The contact interface is available with the Prox-DU and the Prox-SU and is composed of a smart card connector with a smart card slot located in the front cabinet for the Prox-DU and located inside the casing for the Prox-SU.

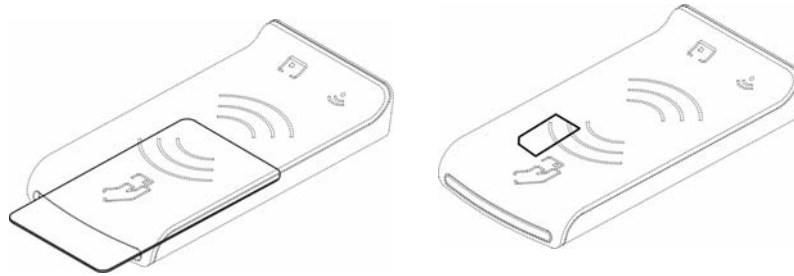


Figure 15 – Contact card slot (Prox-DU and Prox-SU)

The characteristics for the contact interface are as follows:

- Card type:
 - Asynchronous (Microcontroller based)
- Card size:
 - ID-1 for the Prox-DU (full size form factor)
 - ID-000 for the Prox-SU (SIM/SAM form factor)

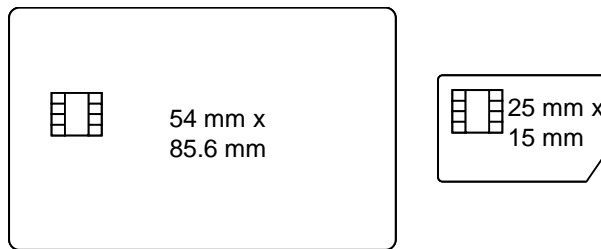


Figure 16 – ID-1 and ID-000 card size

Prox-DU & Prox-SU

- Card baud rate:
 - up to 500 kbps (TA1 = 97h for a clock frequency of 4 MHz)
- Card protocol:
 - T=0 and T=1 protocols
- Card compliance:
 - EMV and PC/SC modes. The interface is compliant with the EMV2000 version 4.0 specifications.
 - ISO 7816-3 and -4 and ability to supply the cards with 5 V, 3 V, or 1.8 V (Class A, B, or C cards respectively)
 - IAS version 1.0 certified (Identification, Authentication & Signature)

LED interface

Two LEDs are available as visual indicators:

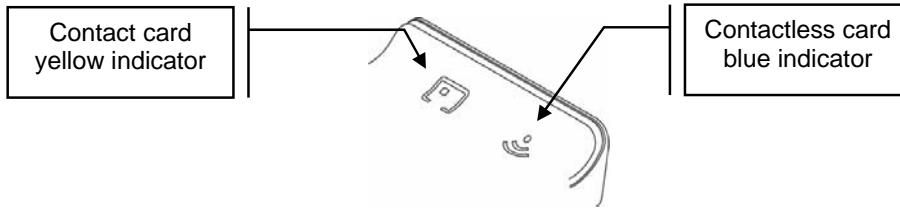


Figure 17 – Visual indicators

The indicators give information about the smart card interface as described in the next table:

Card Indicator	Description
Off	The card interface is deactivated
Slow Blink (0,2 s / 2 s)	The card interface is ready
Blink (0,5 s / 1 s)	The card is present and inactive (powered off)
On	The card is present and active (powered on)
Flashing	The card communication is in progress

Note: When no SIM/SAM card is inserted into the Prox-SU, the yellow indicator will always be off.

Installing the reader/writer

When the USB cable is plugged into the USB port of the computer:

- The two LED indicators will flash shortly to indicate the user that it has started properly,
- The installation wizard of the operating system will appear.

Follow the on-screen instructions, the wizard will automatically install the drivers required by the operating system.

The following table shows the driver to consider regarding the operating system:

Operating system	CCID driver	HID driver
Microsoft Windows 2000	Use Windows Update	Inbox
Microsoft Windows XP 32/64 bits	Use Windows Update	Inbox
Microsoft Windows Vista 32/64 bits	Inbox	Inbox
Microsoft Windows Seven 32/64 bits	Inbox	Inbox
Microsoft Windows CE 5.0 & 6.0	Upon request	Inbox
Microsoft Windows CE 6.0R2	Inbox	Inbox
Linux Debian distribution	libccid library: The USB CCID device is supported by the libccid library. This library provides a PC/SC IFD handler implementation for the USB smart card interface devices compliant to the CCID protocol (CCID driver V1.3.11 minimum). This library is packaged and distributed by most of the Linux distributions. Tips: Use the package manager from your specific Linux distribution to search for the libccid library and install it. <u>libccid source code</u> : It is available on the following web site : http://pcsc-lite.alioth.debian.org/ccid.html	Inbox
Linux Red Hat distribution	Use the latest CCID package (CCID driver V1.3.11 minimum). If not operating, use the Debian source code	Inbox
Linux Ubuntu distribution	Use the latest CCID package (CCID driver V1.3.11 minimum). If not operating, use the Debian source code	Inbox
Mac OS X Tiger (10.4)	Use the latest CCID package (CCID driver V1.3.11 minimum) available in the web site http://support.gemalto.com	Inbox

Prox-DU & Prox-SU

Mac OS X Leopard (10.5)	Use the latest CCID package (CCID driver V1.3.11 minimum) available in the web site http://support.gemalto.com	Inbox
Note that Gemalto is actively involved in the development and improvement of the Linux and Mac libraries.		

Note that all the drivers needed for the Prox-DU and the Prox-SU reader/writer are the standard drivers available into the operating system. No Gemalto proprietary drivers are needed, Microsoft Windows CE R5.0 & R6.0 except.

For Windows operating system the following web link can be used to get a cabinet containing the driver files:

<http://catalog.update.microsoft.com/v7/site/Search.aspx?q=Microsoft%20ccid>

If needed the following web link <http://support.gemalto.com> will give instructions how to get these drivers.

The next paragraph will detail the installation wizard for Microsoft Windows XP operating system.

Windows XP installation

The HID driver is always available in all the operating systems and the HID device will be installed automatically.

If the CCID driver is available in the operating system, the two CCID devices will be installed automatically, as described in the next paragraph “Windows XP installation without the Windows Update procedure”.

If the CCID driver is not available in the operating system, the two CCID devices will be installed after the Windows Update procedure, as described in the next paragraph “Windows XP installation using the Windows Update procedure”.

Windows XP installation without the Windows Update procedure

These installation steps will be effective only if the USB CCID diver is available in the operating system.

When the USB cable is plugged into the USB port of the computer the following popup dialog boxes will be successively displayed over the task bar:



Prox-DU & Prox-SU

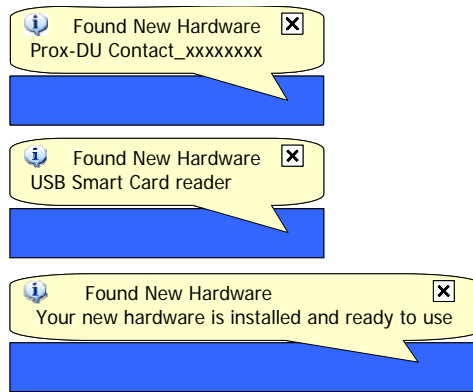


Figure 18 – Prox-DU Installation popup dialog boxes

xxxxxxx is the serial number printed on the label located on the back of the reader/writer.

Your Prox-DU or Prox-SU device is now ready to use.

Note: the popup dialog boxes will only appear the first time the device is connected to the computer.

Windows XP installation using the Windows Update procedure

These installation steps will be effective if the USB CCID driver not available in the operating system.

When the USB cable is plugged into the USB port of the computer the previous popup windows and the following wizard will appear:



Figure 19 – Windows XP Installation wizard: first window

- Click the “Yes, this time only” button to start the Windows Update procedure

Prox-DU & Prox-SU

- Click the “**Next**” button to continue (in the picture below 09A00235 is the serial number printed on the label located on the back of the reader/writer)

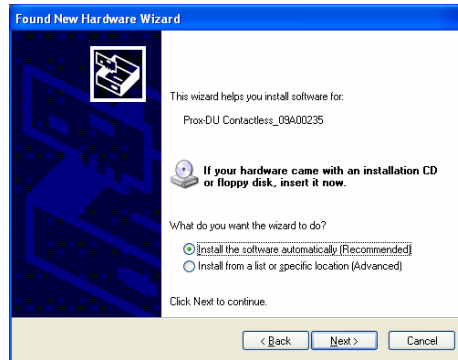


Figure 20 – Windows XP Installation wizard: second window

- Click the “**Install the software automatically (Recommended)**” button
- Click the “**Next**” button to continue

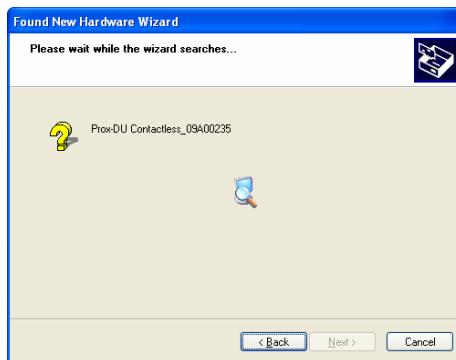


Figure 21 – Windows XP Installation wizard: third window

The Windows Update procedure will be running. Wait until the installation is completed:



Figure 22 – Windows XP Installation wizard: final window

Now the installation is finished. Your Prox-DU or Prox-SU device is ready to use.

Note: depending on the network configuration, the Windows Update procedure can take a long time. Please wait until the end of the procedure.

Checking the installation

To check if all the drivers have been properly installed, perform the following steps:

Check that the devices are recognized by the Device Manager (Windows XP):

- a) Right click the **"My Computer"** icon on the Desktop
- b) Select the **"Properties"** menu
- c) Select the **"Hardware"** tab
- d) Click the **"Device Manager"** button
- e) Click the **"Smart card readers"** icon

Two **"USB Smart Card reader"** icons should be displayed as shown in the next figure:

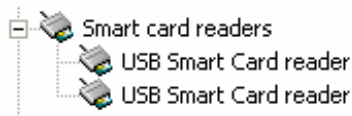


Figure 23 – USB smart card reader icons in the Device Manager window (Windows XP)

- f) Click the **"Human Interface Devices"** icon

Two **"HID devices"** icons should be displayed as shown in the next figure:

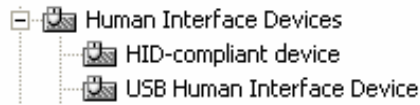


Figure 24 – USB HID icons in the Device Manager window (Windows XP)

Checking the smart card detection

To check if the Prox-DU or the Prox-SU reader/writer is able to detect contactless smart cards put a smart card near the reader/writer's antenna:

The blue LED should be set to an enlightened state.

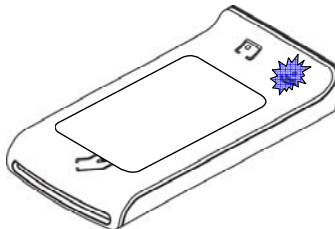


Figure 25 – Contactless smart card check

Prox-DU & Prox-SU

Note: The blue LED should return to the blinking state after a short time depending on the computer operating system. The smart card used for the check should be of course ISO14443-A or ISO14443-B compliant. Otherwise, no LED change will occur.

To check if the Prox-DU reader/writer is able to detect contact smart cards insert a smart card into the reader/writer's slot:

The yellow LED should be set to an enlightened state.



Figure 26 – Contact smart card check

Note: The yellow LED should return to the blinking state after a short time depending on the computer operating system. The smart card used for the check should be of course ISO7816-3 compliant. Otherwise, no LED change will occur. The second test is not available for the Prox-SU model.

Using PC/SC application

PC/SC Overview

The PC/SC specification describes the minimum functionality required of smart cards, smart card readers, and PCs to allow interoperability among compliant elements as provided by a variety of vendors.

The specification as a whole seeks to achieve the following objectives:

- Maintain consistency with existing smart card-related and PC-related standards while expanding upon them where necessary and practical.
- Enable interoperability among components running on various platforms (platform neutral).
- Enable applications to take advantage of products and components from multiple manufacturers (vendor neutral).
- Enable the use of advances in technology without rewriting application-level software (application neutral).
- Facilitate the development of standards for application-level interfaces to smart card services in order to enhance the fielding of a broad range of smart card-based applications in the PC environment.
- Support an environment that encourages the widest possible use of smart cards as an adjunct to the PC environment.

The next figure shows the PC/SC architecture:

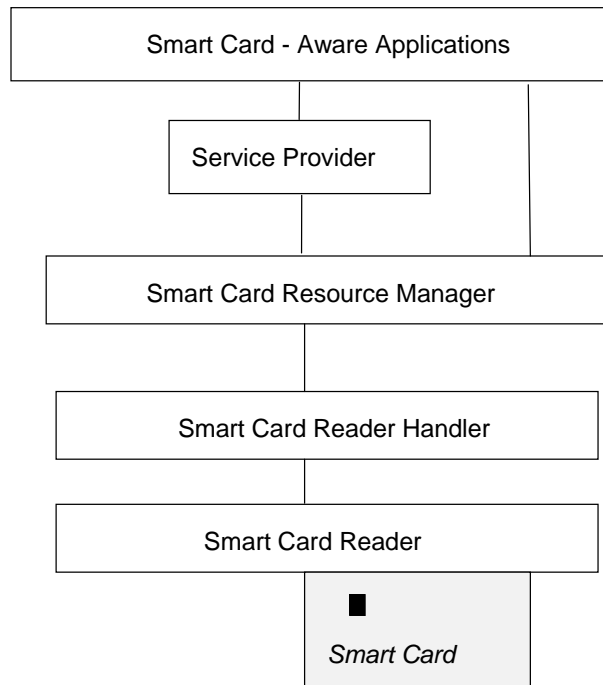


Figure 27 – PC/SC Architecture

Prox-DU & Prox-SU

The Prox-DU and the Prox-SU devices were designed to be fully compliant with the latest PC/SC specification.

The software design considerations presented in the PC/SC specification address the development of applications built on the architecture presented in the figure below.

This paragraph describes the way Smart Card-aware applications can use the functionality provided by the smart card. By using the Smart Card Resource Manager and the Service Provider layers, an application can use smart card functionality with some level of independence from a specific reader, or to some extent, from a specific smart card.

Standard PC/SC functions are listed the following tables:

Smart Card Database Query Functions: Query the smart card database	
SCardGetProviderId	Retrieve the identifier (GUID) of the primary service provider for the given card
SCardListCards	Retrieve a list of cards previously introduced to the system by a specific user
SCardListInterfaces	Retrieve the identifiers (GUIDs) of the interfaces supplied by a given card
SCardListReaderGroups	Retrieve a list of reader groups that have previously been introduced to the system
SCardListReaders	Retrieve the list of readers within a set of named reader groups

Table 5 – Smart Card Database Query Functions

Smart Card Database Management Functions: Manage the smart card database	
SCardAddReaderToGroup	Add a reader to a reader group
SCardForgetCardType	Remove a smart card from the system
SCardForgetReader	Remove a reader from the system
SCardForgetReaderGroup	Remove a reader group from the system
SCardIntroduceCardType	Introduce a new card to the system
SCardIntroduceReader	Introduce a new reader to the system
SCardIntroduceReaderGroup	Introduce a new reader group to the system
SCardRemoveReaderFromGroup	Remove a reader from a reader group

Table 6 – Smart Card Database Management Functions

Resource Manager Context Functions: Manage the context of the resource manager's database operations	
SCardEstablishContext	Establishes a context for accessing the smart card database
SCardReleaseContext	Closes an established context

Table 7 – Resource Manager Context Functions

Prox-DU & Prox-SU

Resource Manager Support Function: Release allocated memory	
SCardFreeMemory	Release memory returned through the use of SCARD_AUTOALLOCATE

Table 8 – Resource Manager Support Function

Smart Card Tracking Functions: Track smart cards within readers	
SCardLocateCards	Search for a card whose ATR string matches a supplied card name
SCardGetStatusChange	Block execution until the current availability of cards changes
SCardCancel	Terminate outstanding actions

Table 9 – Smart Card Tracking Functions

Smart Card and Reader Access Functions: Connect to and communicate with a smart card, including transferring data using $T=0$, $T=1$, and raw protocols	
SCardConnect	Connect to a card
SCardReconnect	Reestablish a connection
SCardDisconnect	Terminate a connection
SCardBeginTransaction	Start a transaction, blocking other applications from accessing a card
SCardEndTransaction	End a transaction, allowing other applications to access a card
SCardStatus	Provide the current status of the reader
SCardTransmit	Requests service and receives data back from a card using $T=0$, $T=1$, and raw protocols

Table 10 – Smart Card and Reader Access Functions

Direct Card Access Functions: Communicate with cards that may not conform to the ISO 7816 specifications	
SCardControl	Provide direct control of the reader
SCardGetAttrib	Get reader attributes
SCardSetAttrib	Set reader attribute

Table 11 – Direct Card Access Functions

To get more information about these commands please refer to the MSDN website:
<http://msdn.microsoft.com>.

Gem_PC/SC software tool

The Gemalto Gem_PCSC tool may help to become familiar with the PC/SC environment:

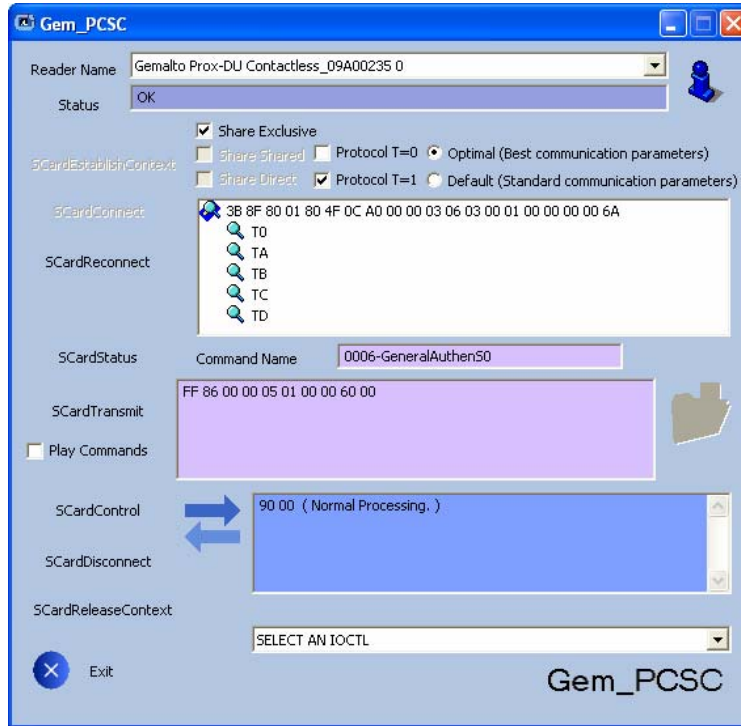


Figure 28 – Gem_PCSC window

The Gem_PCSC tool is available for download in the Gemalto support website: <http://support.gemalto.com>.

Prox-DU and Prox-SU PC/SC reader name

The Prox-DU and the Prox-SU device will be recognized using their PC/SC name.

The name will comply with the following string format:

- “Gemalto Prox-DU Contactless_xxxxxxx N1” for the Prox-DU contactless interface
- “Gemalto Prox-DU Contact_xxxxxxx N2” for the Prox-DU contact interface
- “Gemalto Prox-SU Contactless_yyyyyyyy N3” for the Prox-SU contactless interface
- “Gemalto Prox-SU Contact_yyyyyyyy N4” for the Prox-SU contact interface

N1, N2, N3, N4 are numbers delivered by the computer. xxxxxxxx or yyyyyyyy is the 8-byte reader/writer’s serial number printed on the label located on the rear cabinet.

The next figure displays the name for one Prox-DU connected to the computer:

```
Gemalto Prox-DU Contactless_xxxxxxx 0
Gemalto Prox-DU Contact_xxxxxxx 1
```

Figure 29 – Prox-DU PC/SC name

The next figure displays the name for one Prox-SU connected to the computer:

```
Gemalto Prox-SU Contactless_xxxxxxx 0
Gemalto Prox-SU Contact_xxxxxxx 1
```

Figure 30 – Prox-SU PC/SC name

The next figure displays the name for one Prox-DU and one Prox-SU both connected to the computer:

```
Gemalto Prox-DU Contactless_xxxxxxx 0
Gemalto Prox-DU Contact_xxxxxxx 1
Gemalto Prox-SU Contactless_yyyyyyyy 2
Gemalto Prox-SU Contact_yyyyyyyy 3
```

Figure 31 – Prox-DU and Prox-SU PC/SC names

The next figure displays the name for two Prox-DU devices both connected to the computer:

```
Gemalto Prox-DU Contactless_xxxxxxx 0
Gemalto Prox-DU Contact_xxxxxxx 1
Gemalto Prox-DU Contactless_yyyyyyyy 2
Gemalto Prox-DU Contact_yyyyyyyy 3
```

Figure 32 – Two Prox-DU PC/SC names

Prox-DU & Prox-SU

The two first names belong to the first Prox-DU device. The two next names belong to the second Prox-DU device.

Note: The application should use the name of the device for connecting the appropriate smart card interface.

PC/SC limitations

The Prox-DU and the Prox-SU devices have the following limitations:

- The contactless interface will only support the T=1 protocol.

Consequently any connection requiring the T=0 protocol will not be accepted by the contactless interface.

- Multi-activation of contactless smart cards is not supported.

Consequently the first smart card detected in front of the reader/writer will be activated. The remaining smart cards will be ignored.

- The communication with the contactless interface and the contact interface shall be exclusive.

Consequently the application shall not use the two interfaces simultaneously. Else communication errors can occur.

Interfacing with Contactless Cards

As defined in the PC/SC V2.0 specifications, the Prox-DU and the Prox-SU devices handle all the ISO7816-4 Inter Industry commands to interface ISO14443 contactless smart cards.

The Prox-DU and the Prox-SU devices support both type ISO14443-A and ISO14443-B cards.

In addition the Prox-DU and the Prox-SU devices will poll the field for the following smart card events:

- Insertion
- Removal

Detecting an insertion

The contactless reader/writer periodically sends out commands to poll the RF field. If a smart card comes within the range of the RF field, the contactless reader/writer detects the card and activates it.

When the card is activated, its properties are recorded and an insertion event is generated.

The ISO14443 contactless smart card will be activated using the reader parameters stored into the device's configuration EEPROM.

ISO14443-A and ISO14443-B cards are polled with a default periodic rate of 100 ms.

Note: Multi-activation of contactless smart cards is not supported by the Prox-DU and the Prox-SU devices. The first smart card detected in front of the reader/writer will be activated.

When a smart card insertion is detected, a CCID insertion notification message will be generated and the blue LED of the contactless reader/writer will be set to an enlightened steady state.

Detecting a removal

A smart card being removed from the field is detected by the contactless reader/writer.

The contactless reader/writer polls for an ISO14443-3 (MIFARE[®]) smart card by periodically accessing the smart card during periods when there is no communication between the reader/writer and the card.

The contactless reader/writer polls for an ISO14443-4 (T=CL) smart card by periodically sending negative acknowledge frames to the smart card expecting, either a positive acknowledge or the last I-block to be repeated (according to the ISO14443-4 standards).

When a smart card removal is detected, a CCID removal notification message will be generated and the blue LED of the contactless reader/writer will blink slowly.

ATR for contactless smart cards

The Answer To Request (ATR) returned by an ISO14443-A or ISO14443-B smart card is compliant with the PC/SC V2.0 Part 3 Revision 2.01.09 specifications.

The contactless smart card exposes its ATS or information bytes not directly, but via a specific ATR mapping.

Interfacing with MIFARE[®] Cards

As defined in PC/SC V2.0 Part 3 Revision 2.01.09 specifications, the Prox-DU and the Prox-SU devices perform the appropriate mapping for memory smart card commands that consist of Inter Industry commands (and the exposed data structures) to memory card commands (and the associated data structures defined for the MIFARE[®] contactless memory smart cards).

The Prox-DU and the Prox-SU devices will handle the following ISO7816-4 Inter Industry commands to interface with MIFARE[®] 1K, MIFARE[®] 4K, MIFARE[®] Ultralight and MIFARE[®] Mini memory smart cards:

- **Get Data:** retrieves the UID or the historical bytes of the ATS of the inserted smart card.
- **Load Keys:** Load MIFARE[®] secret into the contactless reader/writer.
- **General Authenticate:** Perform an authentication between the contactless reader/writer and the MIFARE[®] memory smart cards.
- **Read Binary:** Read data from the MIFARE[®] memory smart cards.
- **Update Binary:** Write data to the MIFARE[®] memory smart cards.

The MIFARE[®] 1K is a 8-Kbit (1 Kbyte) MIFARE[®] memory contactless smart card arranged as 64 memory blocks.

The MIFARE[®] 4K is a 32-Kbit (8 Kbytes) MIFARE[®] memory contactless smart card arranged as 256 memory blocks.

The MIFARE[®] Ultralight is a 512-bit (64 bytes) MIFARE[®] memory contactless smart card arranged as 16 memory pages.

The MIFARE[®] Mini is a 2.5-Kbit (320 bytes) MIFARE[®] memory contactless smart card arranged as 20 memory blocks.

Important note regarding contactless smart cards including both MIFARE[®] and ISO14443-A4 (T=CL) modes:

When the smart card is connected, the ISO14443-A4 (T=CL) mode will be selected. The corresponding ATR will be returned.

When a MIFARE[®] command is send to the smart card an automatic switch to the MIFARE[®] mode is done and the command will be processed accordingly.

When an ISO14443-A4 (T=CL) command is send to the smart card an automatic switch to the ISO14443-A4 (T=CL) mode is done and the command will be processed accordingly.

When the smart card is in the MIFARE[®] mode, the only way to retrieve the MIFARE[®] type (1K-4K-UL-Mini) is to reconnect the smart card. The appropriate MIFARE[®] ATR will then be returned.

ATR for MIFARE[®] cards

The Answer To Request (ATR) returned by a MIFARE[®] card is compliant with PC/SC V2.0 Part 3 Revision 2.01.09 specifications.

- The ATR returned by a MIFARE[®] Standard 1K will be:

3Bh 8Fh 80h 01h 80h 4Fh 0Ch A0h 00h 00h 03h 06h 03h 00h 01h 00h 00h 00h 00h 6Ah

- The ATR returned by a MIFARE[®] Standard 4K will be:

3Bh 8Fh 80h 01h 80h 4Fh 0Ch A0h 00h 00h 03h 06h 03h 00h 02h 00h 00h 00h 00h 69h

- The ATR returned by a MIFARE[®] Ultralight will be:

3Bh 8Fh 80h 01h 80h 4Fh 0Ch A0h 00h 00h 03h 06h 03h 00h 03h 00h 00h 00h 00h 68h

- The ATR returned by a MIFARE[®] Mini will be:

3Bh 8Fh 80h 01h 80h 4Fh 0Ch A0h 00h 00h 03h 06h 03h 00h 26h 00h 00h 00h 00h 4Dh

Interfacing with Contact Cards

ISO7816 asynchronous smart cards are accessible via standard PC/SC using Microsoft's library "winscard.dll". This type of cards supports at least one of the asynchronous protocols T=0 or T=1. No additional libraries or third-party software components are necessary to integrate ISO7816 smart cards.

As defined in the PC/SC specifications, the Prox-DU and the Prox-SU devices handle all the ISO7816-4 Inter Industry commands to interface ISO7816 asynchronous contact smart cards.

In addition the Prox-DU device will support the following smart card events:

- Insertion
- Removal

As the Prox-SU has no capability to detect a smart card insertion or removal, the SIM/SAM card will always be considered as inserted when the SIM/SAM card is into its connector.

Detecting an Insertion

The contact reader/writer will check if a smart card is inserted into the slot.

When a smart card insertion is detected, its properties are recorded and a CCID insertion notification message will be generated.

Detecting a Removal

A smart card being removed from the slot is detected by the contact reader/writer.

When a smart card removal is detected, a CCID removal notification message will be generated.

ATR for Contact Smart Cards

The Answer To Request (ATR) returned by a contact smart card is compliant with the ISO7816-3 specifications.

The Prox-DU and the Prox-SU will return the smart card ATR after a smart card power up.

For More Information

Standards and Specifications

- ISO/IEC 14443-1 Identification cards - Contactless ICC- Proximity cards Part 1: Physical characteristics
- ISO/IEC 14443-2 Identification cards - Contactless ICC- Proximity cards Part 2: Radio frequency power and signal interface
- ISO/IEC 14443-2 AMD1 Identification cards - Contactless ICC- Proximity cards Part 2: Radio frequency power and signal interface - Amendment 1: Bit rates of fc/64, fc/32 and fc/16
- ISO/IEC 14443-3 Identification cards - Contactless ICC- Proximity cards Part 3: Initialization and anti collision
- ISO/IEC 14443-3 AMD1 Identification cards - Contactless ICC- Proximity cards Part 3: Initialization and anti collision - Amendment 1: Bit rates of fc/64, fc/32 and fc/16
- ISO/IEC 14443-3 AMD1 COR1 Identification cards - Contactless ICC- Proximity cards Part 3: Initialization and anti collision - Amendment 1: Bit rates of fc/64, fc/32 and fc/16 – Technical Corrigendum 1
- ISO/IEC 14443-3 AMD3 Identification cards - Contactless ICC - Proximity cards Part 3: initialization and anti collision - Amendment 3: Handling of reserved fields and values
- ISO/IEC 14443-4 Identification cards - Contactless ICC- Proximity cards Part 4: Transmission protocol
- ISO/IEC 14443-4 AMD1 Identification cards - Contactless ICC- Proximity cards Part 4: Transmission protocol - Amendment 1: Handling of reserved fields and values
- ISO/IEC 7816-1 Identification cards - Integrated circuits cards with contacts Part 1: Physical characteristics
- ISO/IEC 7816-2 Identification cards - Integrated circuits cards with contacts Part 2: Dimensions and location of the contacts
- ISO/IEC 7816-3 Identification cards - Integrated circuits cards with contacts Part 3: Electronics signals and transmission protocols
- ISO/IEC 7816-4 Identification cards - Integrated circuits cards with contacts Part 4: Organization, security and command for interchange
- Universal Serial Bus - Device Class: Smart Card CCID - Specification for Integrated Circuit(s) Cards Interface Devices - Revision 1.1
- PC/SC V2 specifications: Part 3. Requirements for PC-Connected Interface Devices - Revision 2.01.09

End of Document
