



## NBS5xxx User Manual



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***Telium***<sup>®</sup>,

*technological excellence,*

*high security performance.*

# MANUFACTURER'S DECLARATION OF CONFORMITY

## **NBS5xxx Terminals:**

These terminals comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For body worn operation, the terminals have been tested and meet RF exposure guidelines when used with an accessory that contains no metal and that positions the handset a minimum of 1 cm from the body. Use of other accessories may not ensure compliance with RF exposure guidelines.

## **NBS50x0B Bases:**

These devices comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## **NBS5030B Base:**

For compliance with FCC and Industry Canada RF Exposure Requirements, the base is required to be located more than the safety distance of 20 cm away from any person during operation.

**CAUTION:** Changes or modifications to the terminal and base, not expressly approved by NBS Payment Solutions, could void your authority to operate this equipment under FCC regulations

# 1 EQUIPMENT

**NBS5xxx** is the mobile terminal for electronic payment in the 21st century.

*It answers user comfort requirements, as well as the continually growing demands of payment card providers, whether in terms of performance, security or upgradeability.*

**NBS5xxx** is based on SAGEM Monetel's **Telium**<sup>®</sup> technology.

The **NBS5xxx** terminal is:

- **ultra-powerful,**
- **highly secure,**
- **multi-application,**
- **very reliable,**
- **upgradeable,**
- **easy to operate.**

**NBS5xxx** is ready for migration to EMV smart cards while still providing the secure processing of magnetic stripe cards.

**NBS5xxx** is today's terminal for future electronic payment.

## 1.1 GENERAL HARDWARE DESCRIPTION

### 1.1.1 NBS5500, CDMA terminal, main characteristics

<b>Main processor</b>	– ARM9 32-bit RISC rated at 200 MIPS
<b>Crypto processor</b>	– Crypto microcontroller: 50 MIPS
<b>Internal memory</b>	– FLASH: 16 Mb – SDRAM: 16 Mb
<b>Main smart card reader</b>	– Synchronous and asynchronous; – clock frequency: 3.57 MHz, 7.14 MHz and 14.28 MHz – Vcc = 5V, 3V and 1.8V
<b>2 SAMs (Secure Access Modules)</b>	– asynchronous – clock frequency 3.57 MHz, 7.14 MHz and 14.28 MHz – Vcc = 5V, 3V and 1.8V
<b>Magnetic stripe card reader</b>	– ISO1 + ISO2 stripes
<b>Display</b>	– graphic display, 128 x 64 pixels, 57 x 36 mm, backlit
<b>Key pad</b>	– 16 backlit keys (including 3 colour keys "Confirm", "Correct", "Cancel", and a "Function" key)
<b>Navigation pad</b>	– 6 backlit keys
<b>Printer</b>	– Easy loading – Thermal – 24 characters per line – 15 lines/second in alphanumeric print mode – ticket width: 58 mm – roll diameter: 40 mm
<b>Buzzer</b>	– yes
<b>Batteries</b>	– NiMh - 1500 mAh – Battery life: 200 standard transactions – Standby lifetime: 300 hours – Batteries recharged on NBS50x0 base (plug-in external power supply) – Recharge time: 50% of battery life after 2 hours.
<b>Terminal ports</b>	– 1 slave USB port – 1 master USB port
<b>Base ports</b> NBS5010B NBS5020B	– Charging base only (no external ports) – 1 simplified RS232C port, Dial-up modem
<b>Modem</b>	– V22, V22b, V32b – initiator and responder – plug-in phone cable – fast connect
<b>Terminal options</b>	– ISO1 + ISO2 + ISO3 stripes – 2 SAMs – Second smart card reader – MMC or SD card interface – Memories: 16 Mb Flash and 16 Mb RAM – Lithium-Ion batteries (1600 mAh)

	Terminal:	Base:
<b>Weight:</b>	about 425g (full with paper)	about 100g
<b>Phone cable length:</b>		about 3m

### 1.1.2 NBS5600, GPRS terminal, main characteristics

<b>Main processor</b>	- ARM9 32-bit RISC rated at 200 MIPS
<b>Crypto processor</b>	- Crypto microcontroller: 50 MIPS
<b>Internal memory</b>	- FLASH: 16 Mb – SDRAM: 16 Mb
<b>Main smart card reader</b>	- Synchronous and asynchronous; - Clock frequency: 3.57 MHz, 7.14 MHz and 14.28 MHz - Vcc = 5V, 3V and 1.8V – asynchronous
<b>3 SAMs</b>	- Clock frequency: 3.57 MHz, 7.14 MHz and 14.28 MHz - Vcc = 5V, 3V and 1.8V
<b>Magnetic stripe card reader</b>	- ISO1 + ISO2 stripes
<b>Display</b>	- graphic display, 128 x 64 pixels, 57 x 36 mm, backlit
<b>Keypad</b>	- 16 backlit keys (including 3 colour keys "Confirm", "Correct", "Cancel", and a "Function" key)
<b>Navigation pad</b>	- 6 backlit keys
<b>Printer</b>	- Easy loading - Thermal - 24 characters per line - 15 lines/second in alphanumeric print mode - Ticket width: 58 mm – Roll diameter: 40 mm
<b>Buzzer</b>	- yes
<b>Batteries</b>	- NiMh - 1500 mAh - Battery life: 180 standard transactions – Standby lifetime: 200 hours - Batteries recharged on "G base" (plug-in external power supply) - Recharge time: 50% of battery life after 2 hours. - Recharging with travel charger (connection on terminal)
<b>Terminal ports</b>	- 1 slave USB port – 1 master USB port
<b>Base ports</b> NBS5010B NBS5020B	- Charging base only (no external ports) - 1 simplified RS232C port, Dial-up modem
<b>GPRS modem</b>	- Tri-band: GSM (900 MHz), DCS (1800 MHz), PCS (1900 MHz) Mobile class B (GPRS and GSM supported) - Multi-slot class 10 (4+1 / 3+2) - GPRS context maintenance – Dedicated SIM
<b>Terminal options</b>	- ISO1 + ISO2 + ISO3 stripes - Second smart card reader - MMC or SD card interface - Memories: 16 Mb Flash and 16 Mb RAM - Lithium-Ion batteries (1600 mAh)
<b>Option of "P base"</b> (in place of the "G base")	- Modem V22, V22b, V32b - 1 simplified RS232C port

	Terminal:	G Base:
<b>Weight:</b>	about 475g (full with paper)	about 100g



### 1.1.3 NBS5700, BLUETOOTH terminal, main characteristics

<b>Main processor</b>	– ARM9 32-bit RISC rated at 200 MIPS	
<b>Crypto processor</b>	– Crypto microcontroller: 50 MIPS	
<b>Internal memory</b>	– FLASH: 16 Mb – SDRAM: 16 Mb	
<b>Main smart card reader</b>	– Synchronous and asynchronous; – Clock frequency: 3.57 MHz, 7.14 MHz and 14.28 MHz – Vcc = 5V, 3V and 1.8V	
<b>4 SAMs</b>	– asynchronous – Clock frequency: 3.57 MHz, 7.14 MHz and 14.28 MHz – Vcc = 5V, 3V and 1.8V	
<b>Magnetic stripe card reader</b>	– ISO1 + ISO2 stripes	
<b>Display</b>	– graphic display, 128 x 64 pixels, 57 x 36 mm, backlit	
<b>Keypad</b>	– 16 backlit keys (including 3 colour keys "Confirm", "Correct", "Cancel", and "Function" key)	
<b>Navigation pad</b>	– 6 backlit keys	
<b>Printer</b>	– Easy loading – Thermal graphic – 24 characters per line – 15 lines/second in alphanumeric print mode – Ticket width: 58 mm – Roll diameter: 40 mm	
<b>Buzzer</b>	– yes	
<b>Batteries</b>	– NiMh - 1500 mAh – Battery life: 200 standard transactions – Standby lifetime: 300 hours – Batteries recharged on "B base" (plug-in external power supply) – Recharge time: 50% of battery life after 2 hours.	
<b>Terminal ports</b>	– 1 slave USB port – 1 master USB port	
<b>Base ports</b>	NBS5030B NBS5040B	– 2 simplified RS232C ports, Ethernet port – 1 simplified RS232C port, Dial-up modem
<b>Modem</b>	– V22, V22b, V32b – initiator and responder – plug-in phone cable – fast connect – Isolation relay of phone line	
<b>Bluetooth radio port Terminal / Base</b>	– Outdoor range: up to 100 m – Speed: 350 kbps – Simultaneous management of 3 terminals per Bluetooth base	
<b>Terminal options</b>	– ISO1 + ISO2 + ISO3 stripes – Second smart card reader – MMC or SD card interface – Memories: 16 Mb Flash and 16 Mb RAM – Lithium-Ion batteries (1600 mAh)	
<b>Option of communicating "B base"</b> (exclusive with STN modem)	– Ethernet – 2 simplified RS232C ports – 1 slave USB port	

	Terminal:	Base:
<b>Weight:</b>	about 465g (full with paper)	about 100g
<b>Phone cable length:</b>		about 3m

## 1.1.4 Other common features

	Terminal:	Base:
<b>Dimensions (L x W x H):</b>	180 x 79 x 57 mm	152 x 88 x 41
<b>Cover colour options:</b>	black and grey	black

### Ergonomics specially designed to improve:

- introduction and removal of smart cards
- magnetic stripe card reading
- operator guiding, using navigation keys and dialogue
- input on touch-effect large-key keypad
- information display using large backlit screen

### Data security

Implemented security features:

- Tamper resistant
- Tamper detective
- Tamper responsive

Use of powerful algorithms for encryption and authentication.

### From an ultra powerful processor through to software development

The NBS5xxx circuit board is based on an ARM 9 processor with very large scale integration: "a circuit board in a chip". It contains a series of smart peripherals and a **32-bit RISC** processor rated at 180 MHz, capable of remaining active with very low consumption levels.

These manage:

- Software **actual isolation**, essential in a multi-application context. The design of the processor ensures the integrity of the software applications and their data. Thus no application can have its data or code consulted or altered by another.
- **Simultaneity** among the various peripherals, reducing the transaction time required, for example, when printing while inputting data on the keypad.
- Memory space, which is **directly addressable** by the processor (no paging mechanism). Software development is made easier, and memory space availability is optimal.
- Standby mode that keeps the terminal activated between transactions even when not placed on its base (which avoids having to wait for the device to switch on and off).

- Easy integration of the NBS5xxx in all types of business thanks to the thermal printer's **silence**, a compact **footprint** and excellent **ergonomics**.

The NBS5xxx has been designed to make maintenance easy and improve reliability.

The NBS5xxx is fully **downloadable, including the downloader itself!**

In addition the operating system now onboard each NBS5XXX offers highly evolved functions such as the **maintenance system**, **local diagnostics** and **remote diagnostics**, functions improving after sales service and enabling efficient equipment management.

Memory space optimization was also in the design brief. The software is compressed and stored in non-volatile memory.

**Reduced download time** The reduction of download time was a major requirement; it is very reduced, thanks to **data compression** techniques. Of course, **selective downloading** enables one software application to be downloaded or changed independently of the others or the system. The use of FTP TCP/IP and PPP allows download times to be optimized. Once the connection has been made with the V32b modem, downloading a **120 Kb** software application takes about **1 min**.

The application software development platform is one of the most efficient on the market. It enables developments and debugging in **"C" language** in an integrated development environment.

## 1.2 DETAILED HARDWARE CHARACTERISTICS

### 1.2.1 Processors - the power of *Telium*<sup>®</sup> technology

*"A CIRCUIT BOARD BUILT INTO A CHIP".*

Main characteristics

Main CPU	ARM 32-bit RISC processor
Clock frequency	180 MHz
<b>Capacity</b>	<b>200 MIPS</b>

CRYPTO CPU	ARM 32-bit RISC processor
Clock frequency	60 MHz
Capacity	50 MIPS

Calendar	Leap-year management
Time and date stamping	Without seasonal hour changes

The power of the NBS5XXX's processors gives the following performance:

Algorithm Keys	Algorithm		
	RSA	SDA	DDA
1024 exp 3	2.5 ms	5.1 ms	7.7 ms
1024 exp $2^{16} + 1$	22 ms	44.1 ms	66.2 ms
2048 exp 3	8 ms	16.1 ms	24.2 ms
2048 exp $2^{16} + 1$	72 ms	144 ms	218 ms

## 1.2.2 Data security

### 1.2.2.1 Equipment design

The terminal was designed with the goal of resisting tampering, in order to keep the confidential character of sensitive data (keys or confidential code), and to delete this data as soon as a tamper attempt is detected.

#### Tamper resistance

- All the data are inside the crypto processor and are thus physically protected by the chip. This prevents the reading of secret bank keys and confidential codes.
- The display, keypad and smart card readers are controlled by the crypto processor.

#### Tamper detection

Protection against tampering

- By micro switches
- By temperature surveillance
- By voltage surveillance

#### Tamper evidence

When tampering occurs, the terminal reacts:

- The crypto processor deletes sensitive data
- A message is displayed to alert the user
- The crypto processor locks
- The keypad locks with display of the message, "unauthorized" or "irruption"
- The damaged security labels provide evidence that the product has been opened.

### 1.2.2.2 Software design

Software loading is made secure. Only **authentic, signed and certified software** can be loaded into the terminal.

- a) The software identification scheme is based on:
  - Asymmetric encryption algorithm with public and private keys
  - Certified **RSA** cards
  - Software Signature Tool (SST)
- b) Software intended to be loaded into the secure terminal must first be signed by a Software Signature Tool (SST).  
They can then be downloaded using an LLT (Local Loading Tool).

- c) Once the software is loaded, the **crypto processor checks** the loaded software's certificate and signature. This operation constitutes the authentication. If the loaded software is authentic, it is accepted.

If this condition is satisfied, the downloading of software into an NBS5XXX using an LLT or a TMS operates the same way as for other products in SAGEM Monetel's EFT range.

NOTE: "LLT" and "TMS" are described in the section "Loading software".

### 1.2.2.3 Use design

- The product has to be activated before any use. Once activated, the terminal is operational. Activation enables:
  - software loading,
  - product security.

### 1.2.2.4 Standards

Compliance with international specifications for:

- PEDS (PIN Entry Device Security): on-line or off-line terminals accepting PIN cards (debit/credit).
- EMV (Europay, Mastercard, Visa) standards: standard smart card processing (EMV standards) version V4.0, EMV2000

ISO 13491, secure cryptographic devices (1999-07)  
ISO 11568, Key Management Techniques (1994-12-01)  
ISO 9564-1, PIN Management and Security (1997)  
EPCI  
Visa card accepting device requirements (March 1998)

### 1.2.3 The isolation mechanism by electronic locking system

#### Isolation

Read/write isolation is obtained by USER confinement in the application software memory space. Inter-software isolation is controlled by an MMU (Memory Management Unit).

#### MMU features

- **Material protection**
- **Total inter-software protection (read/write)**
- **Code protection**

#### Inviolable memory protection

The controller **checks each access** to the memory.

#### The OS is inviolable and protected

The Processor distinguishes two execution worlds:

- USER world: software domain.

-SUPERVISOR world: OS domain. No software running in the USER world can access the SUPERVISOR world. This exclusion mechanism is ensured by the processor itself. Therefore the OS is inviolable, even in the case of an application software bug. This system inviolability ensures that the isolation mechanism supervised by the OS always remains operational.

#### The OS ensures the inter-inviolability of software applications

The OS can decide the access rights of the USER world at any time.

The **MMU** used by the processor enables the software's addressable space to be delimited.

A software application can only write to the memory space corresponding to the scope of its data field. Any attempt **to write or read** in another space is immediately "trapped" by the controller, generating an exception. Thus the OS keeps a track of this incident for future use with remote diagnostics. The other software applications remain non-violated and operational. Furthermore, the software in question cannot even self-destruct, because its write access to code is denied.

### 1.2.4 Memory capacity

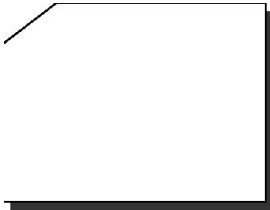
FLASH:	16 Mb
SDRAM:	16 Mb

### 1.2.5 Data storage time

The NBS5XXX has a lithium battery

Characteristics	3 volts 500 mAh welded
Forecast battery duration:	7 years (with the following assumptions: 1 year storage maximum as from the manufacturing date, at 25°C, and 45 days/year not powered at 25°C)

### 1.2.6 Multimedia Card (MMC) or Secure Digital card (SD Card)



The terminal has one connector capable of receiving an MMC or SD Card.

These cards are memory extensions that enable file size in the terminal to be increased.



## 1.2.7 Smart card readers

The NBS5XXX can be equipped with:

- 1 main smart card reader named CAM1,
- 1 secondary smart card reader named CAM2,
- 4 positions for SAM readers.

### CAM readers

- **Main reader CAM1:**  
Situated on the front, this allows easy introduction and removal, leaving the card visible to the user.
- **Secondary reader CAM2:**  
It is situated under the terminal. The card fits in easily. The card is hidden by a flap that completely blocks access.

### CAM reader features

- International standards ISO 7816
- EMV 2000 approval level 1 (EMV 4.0)
- Conform with GIE Cartes Bancaire (French credit cards) and GIE SESAM-Vitale (French health care authority).
- Smart cards and memory cards (asynchronous and synchronous)
- Cards accepted:
  - asynchronous cards to standard ISO 7816 and to EMV specifications
  - synchronous cards (see next page)
- Detection and protection against accidental removal
- Specially designed ergonomic card introduction zone

Conformity with ISO standards	ISO 7816-1, 2, 3
Protocol used	protocol T=0 & T=1
Convention	Direct and inverse
Clock frequency	3.57 MHz, 7.14 MHz or 14.28 MHz
Protection	Detection of short-circuit or over-consumption, VCC Detection of accidental removal by interruption
Power supply voltage Vcc	5V, 3V & 1.8V
Programming voltage Vpp	Not connected

Grip:	8 friction contacts (middle chip) Contact for card presence and removal
Number of operations	100,000

Synchronous cards	Separate logical outputs on contacts 4 and 8
-------------------	--

Examples of usable cards:

- asynchronous T=0
- asynchronous T=1
- synchronous

GEM Plus: GPM 416/896 5V and compatible  
GPM 271  
GPM 2k (S10)  
GPM 8k (S9)  
GFM 2k (S8)  
GFM 4k (S8)

SIEMENS: SLE 4404  
SLE 4418 (S9)  
SLE 4428 (S9)  
SLE 4432 (S10)  
SLE 4436  
SLE 4442 (S10)  
SLE 5536

etc. (the material and logical base of NBS5XXX is open, and enables the development of other synchronous drivers).

#### **SAM readers** (Security Access Module)

4 SAM readers can accept cards in "microsim ID000" (minicard) format.  
The SAM readers are easy to access through two access flaps.



NOTE: Synchronous cards and SAM contacts C4 and C8 are not managed.

## 1.2.8 Magnetic stripe card reader



Swipe reader

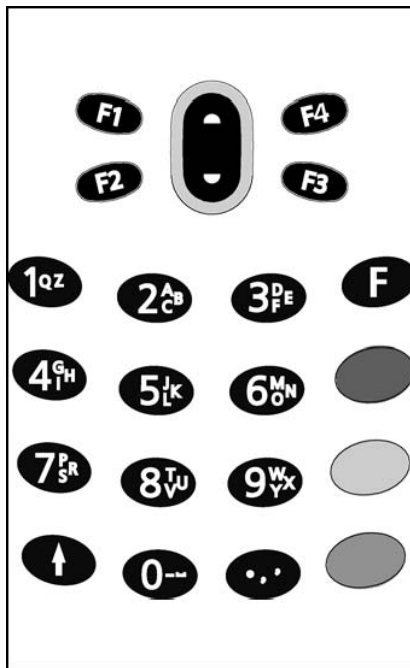
Large acceptance range:

Slow swipes at 10 cm/sec,  
Fast swipes at 100 cm/sec.

Reader type	Manual
Tracks read	Track 2 and 1
Card formats accepted	ISO 7810, 7811-1, 2, 3, 4 & 7813
Card swipe speed	10 cm/s to 100 cm/s
Reading error rate	< 0.5%
Reading direction	From back to front and front to back
Card slot	Vertical, guided by marking on cover
Head lifespan	100,000 swipes

Options	Tracks 1 & 2 & 3
---------	------------------

## 1.2.9 Keypad - Navigation pad



### Navigation pad

4 function keys and an "up/down" navigation pad for dropdown menus  
Backlit

### Keypad

12 numeric keys with alphanumeric marking  
Fast paper advance and terminal switching on key  
(terminal switched off with key combination)

Function keys with banking conformal colours

Key 5 with Braille bumps for visually handicapped

Green key with two Braille bumps for visually handicapped

Backlit

Self-adhesive code cover

KEYPAD - NAVIGATION PAD	
Number of keys	16 + up/down navigation pad + 4 function keys F1 - F4
Type	Elastomer membrane
Area	about 43 cm <sup>2</sup>
Bounce	< 10 ms
Number of operations	1 million
Pressing force	80-200 g
Key size	approx. 9 x 5 mm (width x height)
Key pitch	approx. 13 x 12 mm (horizontal x vertical)
Backlit	By LED

### Alphanumeric input:

The NBS5XXX enables the input of alphanumeric characters on its keypad. This input is facilitated by the keypad's screen-printed alphabetic characters.

## 1.2.10 Display screen



Graphic display: 128 x 64 pixels  
Active zone: 57 x 36 mm  
Backlit  
FSTN technology

<b>DISPLAY</b>	<b>128 x 64</b>
Type	LCD
Display area	55 x 30 mm
Number of pixels	128 x 64
Character size (example)	
21 char/line* 6 x 8 pts	2.46 x 3.6 mm
16 char/line* 8 x 10 pts	3.28 x 4.5 mm
12 char/line* 10 x 12 pts	4.10 x 5.4 mm
Technology	FSTN
Assembly	Clipped onto CU card
Protection	By PMMA window

\*The number of characters per line mentioned is for illustration, and it depends on the character font used.

## 1.2.11 Printer



**Easy and fast paper loading**

**BAR TYPE THERMAL PRINTER**

**SILENT**

< 55 dB at 1 m

**FAST:**

24 characters/line More than 15 lines/second in alphanumeric print mode  
Fast paper-advance function: More than 40 mm/s

### GRAPHICS

Character size	> 3 x 2 mm (H x w)
Character font	Software defined
Number of characters/line	24 in standard mode
Printing attributes	Modes: condensed (48 characters/line), bold, double height, double width, etc.
Printing colour	Black
Paper loading	<b>Easy paper loading</b> system
Paper presence detection	Optical sensor

Graphic mode	Definition of graphic characters or LOGOS 384 pixels/line
--------------	--

Paper rolls:	Same as EFT terminals range
- Paper colour	white
- Paper width	58 mm
- Diameter	40 mm
- Length	about 18 m
- Paper roll lifetime	about 95 CB transactions (France)

## 1.2.12 Modem

Modem V22, V22b, V32, **V32b**, (respectively 1200, 2400, 9600, 14400 bauds)

Full duplex synchronous or asynchronous

Full software setting

AT compatible Built into the terminal, communicates with the STN.

Galvanic isolation 2500 V / 1 min

Responder, initiator, busy line detection

A telephone can be connected to the terminal

Fast connect

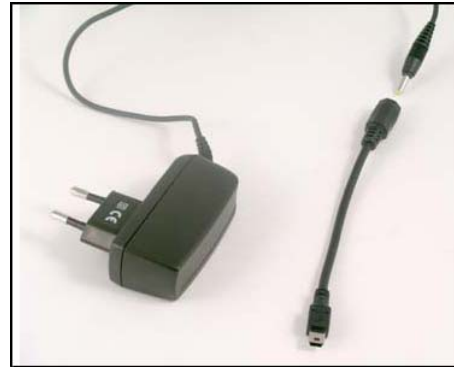
DIALLER	Possible use of private exchanges DTMF dial-up according to 4 software set levels Pulsed dial-up Checking of routing and tones
Electronic interface  Framing Emission levels Reception levels Line quality Protection	<b>V32b</b> , V32, V42, V42b, MNP4 & MNP5 V22 b, V22 (variant B), - Full duplex - asynchronous - synchronous  Software set Software set Operation from 0 to -43 dBm; carrier loss from -43 to -48 dBm Line error rate tolerated: from 10 <sup>-3</sup> to 10 <sup>-6</sup> Line differential security: 250 V non-destructive Galvanic isolation between line interface and modem: 2500 volts /1 min
CONNECTIVITY	<b>Plug-in</b> cable, length 3m, fitted with RJ11 at both ends. Connection to network by RJ11 socket + adapter phone jack if necessary
LOGIC	AT compatible command set Setting of DTMF emission levels, data, Framing, etc. Setting of adaptability to local network conditions Setting of dial-up characteristics (intertrains, delays, etc.) Setting using the keypad

### 1.2.13 Power supply unit

Wall-mount unit  
(possible accessory: BA-USB travel adapter)

Standard, rectified regulated

Meeting French and international  
safety standards



The power supply unit is adapted to the constraints and standards in force in the country of use.

The characteristics of the power supply unit are:

Input voltage	100-240 V 50/60 Hz
Output voltage	5 V, 1 A
Protection	Against surges: thermal fuse placed on primary Against conducted interference: integral filter
Standards	Case class II double Isolation to IP 40 Transformer class E Flammability according to standard UL 94.V1
Mechanical interface	Power supply jack with safety catch Straight flexible cable: about 3 meters long between base and power supply unit, plug-in on base side
Weight	100 g
Dimensions	27 x 71 x 77 mm



## 1.2.14 External ports available on the base

### 1.2.14.1 NBS5010B (Charging base only - no external ports)

- Power supply jack input

The connectors visible on the NBS5010B base are not functional, except the power supply jack.



### 1.2.14.2 NBS5020B (Com port and dial-up modem)

The external appearance of the NBS5020B base is the same as the NBS5010B. Connection using standard RJ11 connectors

- Phone line input
- Phone line tapping
- Serial port (fast serial port for many possible connections: till, cheque editor, PC, external modem, etc.)
- Power supply jack input



#### COM

Electronic interface Number of wires	Simplified RS232 CTS RX TX GND
---	-----------------------------------

Mechanical interface	Modular jack 6 points 1 = Ground 3 = Rx 4 = Tx 5 = CTS
----------------------	--

Logical Interface	300-115 kbps Software set framing
-------------------	--------------------------------------

Connection examples	<b>Local loading tool</b> Recording till Cheque reader/editor Computer External modem RS 485 converter unit
---------------------	---

### 1.2.14.3 NBS5030B (Bluetooth base - Ethernet)

Connection using standard RJ11 connectors

- Ethernet
- Two fast Serial ports
- Power supply jack input



	COM1	COM2	Ethernet
Electronic interface Number of wires	Simplified RS232 CTS RX TX GND	Simplified RS232 RX TX GND	IEEE 802.3
Mechanical interface	Modular jack 6 points RJ11 1 = Ground 3 = Rx 4 = Tx 5 = CTS	Modular jack 4 points RJ9 2 = Ground 3 = Rx 4 = Tx	Modular jack 8 points RJ45
Logical interface	300-115 kbps Software-set framing	300-115 kbps Software-set framing	10 Mbps and 100 Mbps compatible

#### 1.2.14.4 NBS5040B (Bluetooth base – Dial-up)

- Phone line input
- Phone line tapping
- Serial port (fast serial port for many possible connections: till, cheque editor, PC, external modem, etc.)
- Power supply jack input



#### COM

Electronic interface	Simplified RS232
Number of wires	CTS RX TX GND

Mechanical interface	Modular jack 6 points
	1 = Ground
	3 = Rx
	4 = Tx
	5 = CTS

Logical Interface	300-115 kbps
	Software set framing

Connection examples	<b>Local loading tool</b>
	Recording till
	Cheque reader/editor Computer
	External modem
	RS 485 converter unit

### 1.2.15 External ports available on the terminal



Slave mini-USB (function),  
Master mini-USB (host),  
Conform to USB1.1 standard

	Slave mini-USB	Master mini-USB
Electronic interface	Slave USB	Master USB
Number of wires	1 = 5V 2 = D- 3 = D+ 5 = GND	1 = 5V regulated 100 mA 2 = D- 3 = D+ 5 = GND
Power supply	Travel battery charger	
Mechanical Interface	Type B mini-USB socket	Type A mini-USB socket
Logical Interface	12 Mbps max USB 1.1	Low speed: 1.5 Mbps High speed: 12 Mbps USB 1.1
Connection examples	<b>Local loading tool</b> POS integration Power supply unit with travel charger	USB key Fingerprint sensor

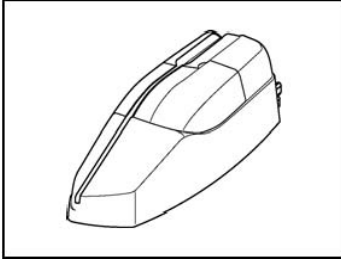
### 1.2.16 Buzzer

Audible device that can be used by the application software

Greater than 65 dB at 1 m

Frequency set by software (except when entering PINs)

## 1.3 PERIPHERALS



- ELC10 equipment range:  
Cheque editor/reader (see instructions, reference 87 714 586 on ELC10).

... Other peripherals, including peripherals fitted with USB sockets

## 2 SOFTWARE

*The terminal, equipped with **Telium**<sup>®</sup> technology, has a structure that supports several software applications coexisting without mutual interference.*

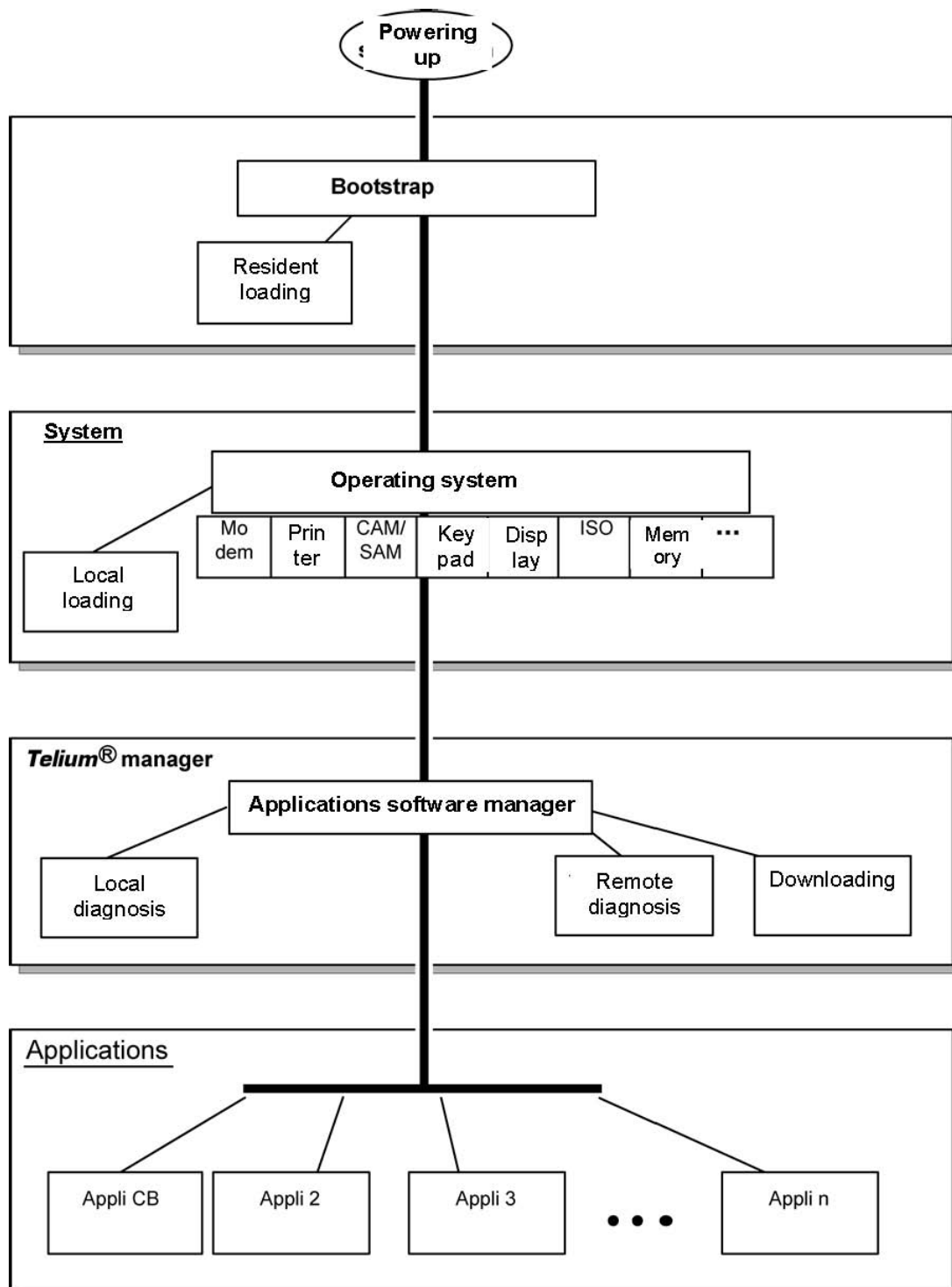
*The OS is multitask, real-time and pre-emptive.*

*The inputs/outputs are managed under interruptions.*

*This means the peripherals can be processed simultaneously, and thus improves the terminal's performance.*

*It can be downloaded to FLASH memory.*

## 2.1 SOFTWARE ARCHITECTURE



The software architecture is divided into three levels:

- System
- Multi-application manager
- Independent applications

The system manages access to all the terminal's peripherals. Access is completed via standard C primitives for all the input/output peripherals (keypad, printer, etc.) and via specific primitives for other peripherals (smart cards and magnetic stripe cards). Further, the system takes charge of memory management. It allocates memory space to the software applications and controls access.

The multi-applications manager is the entity that calls on the various software applications loaded in the terminal in response to the various events that occur in the terminal.

The software applications are modeled around the demands made by the multi-applications manager. Each request or input point represents a processing operation to be performed. Each software application manages the execution of these processing operations according to its specifications. This standardization based on input points simplifies the implementation of the software applications on terminals built using **Telium**<sup>®</sup> technology. It provides natural access to the modularity concepts and improves the maintainability and quality of the software applications.



## 2.2 SOFTWARE SECURITY MANAGEMENT

The terminal is designed to execute only authentic software and to do this in a ranked context.

The terminal performs the following checks

a) When loading software, the terminal checks:

- Its authenticity, which is verified by checking its signature using the RSA algorithm with a 1024-bit key.

b) Before running software, the terminal checks:

- Its presence, which is verified by looking for the software's identity.
- Its integrity, which is verified by checksums and CRCs.

## 2.3 OPERATING SYSTEM (OS)

### 2.3.1 Bootstrap

The bootstrap is resident.

The bootstrap very briefly takes control of the terminal following each powering up to perform the initialization and the self-test. Then it automatically runs the OS which in turn starts the applications manager.

Thus the Bootstrap provides the following functionalities:

- Memory and checksum self-test
- Local loading of the OS if absent
- OS authenticity check and start-up.

## 2.3.2 Operating system (OS) characteristics

The OS is (down)loaded into the memory. It is upgradeable. After a few fractions of a second following powering up, it takes control. It checks the presence, integrity and authenticity of the system components and application software present in the terminal.

The maintenance subsystem takes control in the following cases:

- if no authentic software application is present,
- or if a manual action by the operator is made when powering up,
- or if it is activated by application software.

The maintenance subsystem ensures, among other things, application software downloading.

The OS ensures the start of the multitask core and then runs the application software by making a set of services available to them:

- **Multitask management:** Availability of a pre-emptive real-time environment, based on interruptions, events and letter boxes. This management enables simultaneous processing, which improves the terminal's performance.
- **Input/output management:** This is carried out under interruptions, generally in buffered mode. Thus, the applications software developer enters a "conventional" C context.
- **System alarms management:** Certain incidents (e.g. swipe card reading error) detected by the OS are recorded. They can be used later by the maintenance subsystem during remote or local diagnostics.
- **Application software alarms management:** A number of incidents detected by the software applications can be saved by the OS at their request. This recording is used later as in the case of system alarms.
- **Application software isolation management:** The OS provides the mechanisms described in the section on software isolation and memory protection. Between software isolation is managed by an **MMU** (Memory Management Unit).
- **Software loading and downloading management:** The OS offers the (down)loading services described in the section "Software loading"

## 2.4 TELIUM<sup>®</sup> MANAGER

The main functions offered by Telium<sup>®</sup> manager are the following:

- Application software management
- Terminal initialization
- Terminal maintenance
- Card recognition and routing to the application software

It selects the application software:

- EMV application software (complies with EMV2000 level 2 (EMV4.0))
- non-EMV application software

In France, it is compatible with the following environments

- Health
- French banking
- "Private applications"

### 2.4.1 Terminal initialization

#### 2.4.1.1 Operating requirements

To function, the terminal has to be equipped with its OS, the applications software manager and at least one application. If one of the three components is missing, the terminal warns the operator who has to load it.

If no application software is initialized, the applications manager displays a message asking for an application to be initialized.

If at least one application is initialized, the terminal is operational. The applications manager then awaits an event to poll the software applications loaded in the terminal.

#### 2.4.1.2 Initializing common parameters

The applications manager is used to load the common parameters:

Date, time, message display language, phone network configuration data, local loading of remote diagnostics.

## 2.4.2 Terminal maintenance

The terminal has maintenance functions for...

- Properties
- Local loading
- Diagnostics

### 2.4.2.1 Properties

The properties function is used to print the following tickets:

- List of applications software loaded into the terminal: version number, checksum, etc. The applications manager prints this information for itself and for the operating system.
- Applications software call time: remote collect, loading, etc.
- Total number of transactions in each application file contained in the terminal.

### 2.4.2.2 Loading

The program update function is used to update the terminal by:

- Using a special local loading tool connected to the terminal,
- Loading using the information supplied at the moment of initialization of the applications manager.

### 2.4.2.3 Diagnostics

The diagnostics function is used for:

- **Local diagnostics**

The operator can request the printout of incidents or alarms saved in the terminal. This saving consists of two groups of items:

- Incident counters: used for repetitive-type incidents, when only the number of occurrences is of use,  
e.g. the number of incorrect swipe readings.
- Exceptional events. The information content depends on the type of incident. Generally this is the date and time, and then information on the incident itself. These events are saved in a revolving file where the most recent are kept.

- **Remote diagnostics**

This allows the operator to make a call to the server to transfer information saved in the terminal. The server can thus enrich a database for ensuring efficient monitoring of equipment, propose preventive maintenance services, operating statistics, etc.

## 2.5 SOFTWARE LOADING

### 2.5.1 Local loading and downloading

Software can be loaded:

- Locally via the serial port (COM or USB): local loading.
- Remotely via the switched telephone network (STN) or by X25: downloading.

The techniques used:

- TCP/IP
- data compression,
- authenticity checking,
- memory allocation management, etc.

best optimize the (down)loading operations. Hence savings in (down)loading time, use security, ease of upgrade, and number of software programs installed in the terminal

### 2.5.2 Tools: LLT and TMS

#### LLT (Local Loading Tool)

The LLT is used for local software loading.

The LLT is comprised of:

- PC running Windows 2000/NT4,
- SAGEM Monetel loading software,
- PC-terminal connection cable.

Local Loading is carried out:

- Using the PC with the LLT installed, on the serial COM or USB slave port
- Automatic switching to the local loader of the OS.

Two possible connections:

- By COM port: Speed 115,200 bps
- By USB slave port: Speed about 8 Mbps

Selection of the software to load is guided on the PC screen using an Explorer-type windowing system (Windows Loader).

Loading time of 200-kb software application:

- About 15 s via the COM port
- Less than 5 s via the USB port

#### TMS (Terminal Management Server)

The TMS is a file server PC that ensures the downloads as well as the other tasks it handles.

See its full description in the "TMS" section

### 2.5.3 Loading and managing memory allocation in the terminal

- Before (down)loading, the system checks that the memory space is available.
- Software loading (possibly compressed) is done into flash.  
If software is deleted, the system frees the space.  
If software is upgraded, the system loads the new software, checks it and then deletes the old.

The whole memory zone remains used and usable. No zone is reserved for upgrades.

- When the terminal starts up (power up or reset) the software applications are decompressed and the code copied into RAM.

### 2.5.4 Improved software downloading

Includes the following characteristics:

- Loading via FTP TCP/IP and PPP for optimized loading.  
V32b downloading performance is:
  - about 1.4 kbps on the original files. Once the connection has been made with the V32b modem, downloading a **120 Kb** software application takes about **1 min**.
- Automatic dial-up and access to the download server in the switched telephone network (STN) or by X25 (TRANSPAC in France) through public PAD or private PAD access.
- Data compression according to algorithm based on the Lempel-Ziv method ensuring compression rates of about 40%.
- For downloading, only the improved software application will be downloaded. In addition, the terminal manages this and not the remote server, which offers operating security during multiple source loading.
- Recall management in case of communication breakdown This service enables an interrupted download to be resumed at the same place where it had lost connection and only to download the unfinished part.

The downloaded software is executed securely, using the authenticity check.

## 2.5.5 Starting the download

The download request can be made from:

- **The applications manager at the business's request.** This is especially the case of a program update or the addition of new software into the terminal's memory. In this case the procedure is simplified to the maximum.

Thus, the user starts the call **from the applications manager** by choosing the upgrade function from the dialogue menus and keys. Dial-up and connection to the server are automatic.

- For an upgrade, the user has nothing to enter.
- For a new software request, the user is guided on screen to make the choice. The business's ID is not requested. The ID saved in the terminal is automatically transmitted to the server.

- **The application software at the request of the centre or the business (e.g. in France by "envelopes").**

In this case, the downloading is **fully automatic**. The downloading ticket lets the business know.



## 2.6 DEVELOPMENT WORKSTATION

### Introduction

Using this development workstation, applications software can be produced for the NBS5XXX range of terminals.

The software is written in high level C language in a multi-applications environment. SAGEM Monetel makes available all the software and equipment required for development. This includes the documentation. Also, training sessions are offered.

Finally, migration tools and documentation facilitate migration operations for all prior applications running on EFT10, EFT20 or EFT30.

### Required configuration

The development workstation executes on a Pentium PC running under Windows 2000/NT<sup>TM</sup>. Development tools for ARM such as a crossed compiler are necessary. These comprise:

- C compiler, assembler and link editor for ARM and Thumb,
- Development environment,
- TPE simulator for debugging the application from the development PC.
- Debugger at source level (ADW) operating via an ARM JTAG Multi-Ice debugger (optional)

### Supply

The development workstation SDK 30 comprises:

- User licence of M<sup>2</sup>OS software which includes:
  - Operating system (OS),
  - Applications software manager,
  - Libraries,
  - Related documentation in PDF files,
- User licence of SST (Software Signature Tool),
- User licence of LLT (Local Loading Tool),
- Card and RSA card reader for signing applications software.

Note: For using the development workstation with a debugger, it is useful to complete it with:

- A specific NBS5XXX model for testing applications
- The ARM Multi-Ice debugger (optional)

Migration EFT10/20/30 to NBS5XXX help can also be supplied as an option.

### Related services

- **Training**
  - Application software development on NBS5XXX  
Length: 3 days  
Place: Guilhaumand-Granges 07500 - France
  - Migration of EFT10/20/30 software to NBS5XXX  
Length: 2 days  
Place: Guilhaumand-Granges 07500 - France

Training prerequisites:

A good knowledge of C language is necessary. Some experience of onboard software can be useful.

- **Technical support**

Lasts 6 months following the training

It includes access to the hot-line, and to the updates of the documentation and software during this period.

## 2.7 OTHER SOFTWARE PACKAGES

Optional:

- TCP/IP package:
  - TCP/IP stack using PPP with EFT10S/20S, APIS compatible
  - FTP support
  - TCP/IP stack for Ethernet
- EMV Level 2 module

## 2.8 APPLICATIONS SOFTWARE CATALOGUE, FRANCE

Developed in C language, according to the new techniques of the object-oriented design method, software operating on terminals of the EFT10, EFT20 and EFT30 ranges completes the functionalities of terminals based on *Telium*<sup>®</sup> technology.

The multi-application function is managed by the applications software manager.

### 2.8.1 Standard bank software B0' CB V5.2 local payment

#### Functionalities

- Initialization by swiping the retailer card only.
- Multi-money processing,
- Multi-business processing,
- Debit transaction,
- Extended cancellation of debit transaction (according to remote settings)
- Credit transaction (according to remote settings),
- Processing of:
  - o smart cards (mask B0'),
  - o magnetic stripe cards ISO 2 (foreign card) according to remote settings.  
Card processing priority is given to the EMV software.
- Delayed recovery if the acquiring bank has opened this service,
- Card payment retailer compatibility: edition of card payment subtotal ticket (debit, credit/cancellation), and by currency or money,
- Edition of card payments log,

#### Storage

- Retailer parameters
- File: 200 transactions,
- Black list: 1000 items.

#### Protocol

Conform with electronic payment manual MPE V5.2.

#### Environment

The B0' CB software must be downloaded using:

- The EMV CB software,
- The EMV module software.

#### Conformity:

The B0' CB software complies with the standards of the GIE Cartes Bancaires (French credit cards) MPE V5.2.

## 2.8.2 Bank software EMV CB V5.2 local payment

### Functionalities

- Initialization by swiping the retailer card only.
- Multi-money processing,
- Multi-business processing,
- Debit transaction,
- Extended cancellation of debit transaction (according to remote settings),
- Credit transaction (according to remote settings),
- Delayed recovery if the acquiring bank has opened this service (according to remote settings),
- Processing of:
  - cards with EMV smart cards,
  - magnetic stripe cards ISO 2 (foreign card) according to remote settings. Card processing priority is given to this software (EMV CB) over the software B0' CB.
- Card payment retailer compatibility: edition of card payment accumulation ticket (debit, credit/cancellation), and by currency or money,
- Edition of card payments log,

### Storage

- Retailer parameters
- File: 200 transactions,
- Black list: 1000 items.

### Protocol

Conform with electronic payment manual MPE V5.2.

### Environment

The software EMV CB must be downloaded using:

- The B0' CB software,
- The EMV module software.

### Conformity:

The CB EMV software complies with the standards of the GIE Cartes Bancaires (French credit cards) MPE V5.2.

### 2.8.3 Other software

A series of software programs enhances the terminal's basic functions.

Applications software isolation ensures the inviolability of the software present in the terminal.

For example, there are:

- Programs derived from the credit card Standard software:
  - Bank-specific programs with their own options in addition to the "standard" options
  - Service extensions 5.2 (VAD, Quasi-cash)
  
- "Private" card programs
  - Amex
  - Cetelem (CETDIS, CETNCB)
  - PASS
  - Cofinoga
  - Diners
  - JCB
  - CREDIPAR
  - Fidélité
  - Accord Finances
  - SOVAC Paiement
  - SOVAC Fidélité
  - Etc.
  
- Cheque processing programs piloting various available cheque editor/readers
  - ELC10
  - ELC 200 / 300
  - ELC 427 / ELC 437 / ELC 477
  - Any equipment using the "Concert ELC" protocol.
  
- Options of the basic cheque processing software
  - FNCI (French national file of unpaid cheques) look-up using the CHPN protocol
  - Access to the cheque guarantee service offered by Chèques Service/EQUIFAX/LUNARI
  - Processing of the Cheques image using the CHPR protocol
  
- E-cash processing programs
  - Monéo
  
- Health applications processing programs
  - Application EI96 for the connected to IT equipment mode

SAGEM Monetel publishes a **"EFT software catalogue"**. This catalogue describes each of the software programs available.

# 3 TERMINAL MANAGEMENT SYSTEM

## 3.1 TERMINAL MANAGEMENT SERVER (TMS)

**TMS** = (Terminal Management Server)

### TMS functions

The TMS provides management functions for terminal equipment, i.e.

- software downloading
- parameter downloading
- equipment monitoring (equipment status, alarms, software present, etc.)

Thanks to its modular architecture and the use of market standards, the TMS application can be adapted to the amount of equipment to be managed. Thus a configuration for **10,000 terminals** can be run on a PC equipped with **16 serial channels**, to enable the update of a software program within two weeks.

### TMS breakdown

TMS comprises applications software running on one or more PCs

- PC and servers under Windows NT 4.0/Windows 2000
- Oracle DBMS
- Person-machine interface to Windows standard
- Communication with the terminals by STN lines or X25 access

### TMS applications software

Services offered by the TMS:

- Definition of the **equipment information**: terminal declarations, retailers, groups, insertion of software and parameters, messages to terminals.
- **Communication** with the terminals: for downloading exchanges of software, parameters, collection of field configuration, counters, and alarms. Equipment in the EFT10, EFT20 and EFT30 ranges can also be managed by TMS.
- **Terminals monitoring**: for each terminal, the field configuration, field software and parameters, history of loadings and diagnostics are available.
- **Equipment monitoring**: audit log (call report, operator actions), report of terminals not up to date, availability of monitoring and diagnostics data for use by external tools.
- **Cyclic calls**: cyclic call data can be defined for each terminal. These data enable the terminal to make a call to the TMS to periodically upload its diagnostics, and check the presence of new software or parameters to be loaded.

## 3.2 REMOTE DIAGNOSTICS AND MAINTENANCE

REMOTE DIAGNOSTICS AND MAINTENANCE <b><u>CURATIVE</u></b>	REMOTE DIAGNOSTICS AND MAINTENANCE <b><u>PREVENTIVE</u></b>
<p>The terminal's OS can save information on the terminal's use and upload it to the server. This is given in the form of incident counters organized by typology, and others in the form of events.</p> <p>Each program can detect an anomaly and request the system to keep track. "Application"- type and "system"-type anomalies are recorded. Both types can be very useful for diagnostics.</p> <p>In case of malfunctioning, the user can start the remote diagnostic function. Thus, the server operator sees the entire saved zone uploaded, and most importantly the last incident. This helps the diagnostics, and the operator can in certain cases take action remotely. This is remote diagnostics and possibly remote maintenance. Take two examples:</p> <ul style="list-style-type: none"><li>• The case where a card (say AMEX) is refused by the terminal. The server operator can see the content of the refused card, and can analyze the cause of the refusal. The operator may see that the AMEX software is not present in the terminal software. A simple download suffices to restore correct operation.</li><li>• The case where a smart card incident has been saved. This may be a retailer using the terminal incorrectly.</li></ul>	<p>In normal operation, periodic collection of the information contained in a terminal can enable the detection of deterioration in the terminal's performance, which may indicate an approaching failure or also incorrect use of the terminal. The server operator can then decide on the action to take to prevent the failure that would make the terminal unavailable. Take an example:</p> <p>At the time of a periodic upload of information saved in the terminal, the counter of incorrect readings of stripe cards is too high for the given period.</p> <p>This may mean:</p> <ul style="list-style-type: none"><li>• incorrect use of the terminal, e.g. incorrect card swipe direction</li><li>• Actual reading faults, which may be due to "soiling" of the reading head or which requires its replacement. Intervention can be started and fault repaired before it repeats, thus increasing terminal availability.</li></ul> <p>Observed incidents may be resolved remotely, for example by downloading a new software version, thus avoiding any traveling, and especially by maintaining equipment up to date, significantly increasing each terminal's availability rate, and facilitating the task of equipment monitoring and management.</p>





## 4 SERVICES



## 4.1 SUMMARY OF SERVICES

Training	Installation and exploitation Applications software OEMC/M <sup>2</sup> OS development (3 days) EMV Level 2 package (2 days) Development workstation SDK30
Support	Hot-line support Technical assistance
After-Sales Service	Fixed cost repair of an NBS5XXX
Downloading server centre	User licence Installation and commissioning User training Hot-line support Technical assistance
Software / Licences	User licence for local loading tool, LLT User licence for applications software Licence for manager, M <sup>2</sup> OS Licence for software signature tool, SST Licence for "EMV Level 2 package "

# 5 ANNEXES

## 5.1 STANDARDS

NBS5XXX complies with:

The new "Radio and Telecommunications Terminal Equipment" directive (known as R&TTE 99/05/EC) French and European standards on personal safety (EN 60950),

French and European standards on the disturbance produced by equipment and immunity characteristics, the specifications of the GIE Cartes Bancaires (French credit cards).

### Immunity characteristics

Tests of immunity to...	Standards	Details
... electrostatic discharges	EN 55024 ed. 1998 / A1-2001 EN 61000-4-2	
... radio-frequency electromagnetic fields	EN 55024 ed. 1998 / A1-2001 EN 61000-4-3	
... electrical fast transients/bursts	EN 55024 ed. 1998 / A1-2001 EN 61000-4-4	
... voltage dips, short interruptions and voltage variations	EN 55024 ed. 1998 / A1-2001 EN 61000-4-11	
... surges	EN 55024 ed. 1998 / A1-2001 EN 61000-4-5	
...radio disturbances	EN 55024 ed. 1998 / A1-2001 EN 61000-4-6	

### Disturbance produced by the equipment

	Standards	Details
Conducted disturbance	EN 55022 ed. 1998 / A1-2000	Class B
Radiated disturbance	EN 55022 ed. 1998 / A1-2000	Class B
Limits for harmonic current emissions	EN 61000-3-2 ed.2000	
Limitation of voltage fluctuations and flicker	EN 61000-3-3 ed.95	

### Operating climatic environment

	Standards	Details
Temperature		+5°C to + 45°C
Max. relative humidity		85% RH to + 40°C

### Storage conditions

	Standards	Details
Temperature		- 20°C to + 55°C
Max. relative humidity		85% RH to + 55°C

## 5.2 DOCUMENTATION

DESCRIPTION	CONTENTS
<p>Technical instructions Description of the software workshop Description of the Server</p>	<p>Detailed description of the NBS5XXX range Introduction to the software development workshop Introduction to the downloading server</p>
<p>Software catalogue Software use guide</p>	<p>Descriptive list of the available software Using the standard functions of the software described</p>
<p>Loading instructions Reference instructions of the applications software manager Software reference instructions</p>	<p>Method of loading and downloading software into the terminal Detailed description of the applications software manager functions Detailed description of all the functions, messages, and tickets of the software described</p>

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