

Implementation of
ENV 1292:1995

Identification card systems — Integrated circuit(s) cards and interface devices — Additional test methods

Committees responsible for this Draft for Development

The preparation of this Draft for Development was entrusted to Technical Committee IST/17, Identification cards and related services, upon which the following bodies were represented:

- APACS (Barclaycard)
- APACS (Lloyds Bank)
- APACS (Midland Bank)
- APACS (Nat West Bank)
- Association for Payment Clearing Services (APACS)
- BT Laboratories
- Cellnet
- Consumer Policy Committee of BSI
- Electricity Association
- GEC Card Technology
- HMSO
- Post Office Counters Ltd.
- Rochford Thompson Equipment
- Shell UK
- Thorn Transit Systems International
- Vodafone Ltd.
- Westinghouse Cubic Ltd.

This Draft for Development, having been prepared under the direction of the Information Systems Technology Assembly, was published under the authority of the Standards Board and comes into effect on 15 September 1995

© BSI 03-2000

The following BSI reference relates to the work on this Draft for Development:
Committee reference IST/17

ISBN 0 580 24468 7

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of ENV 1292	3

National foreword

This Draft for Development is identical with the European Prestandard ENV 1292:1994 *Identification card systems — Integrated circuit(s) cards and interface services — Additional test methods*. In the UK the Draft for Development is the form now chosen for ENVs in the information technology area.

This Draft for Development is published under the direction of the Information Systems Technology Assembly whose Technical Committee IST/17 has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on interpretation, or proposals for change, and to keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

NOTE International and European Standards, as well as overseas standards, are available from Customer Services, BSI, 389 Chiswick High Road, London, W4 4AL.

After two years this ENV will be reviewed by CEN/CENELEC members with a view to its:

- conversion into a European Standard (which would be implemented in the UK as a British Standard);
- extension once for a further two years;
- replacement by a revised ENV (which would be published in the UK as a revised Draft for Development;
- withdrawal.

The future of this Draft for Development is therefore bound to that of the ENV and the Draft for Development will not be reviewed or developed separately.

This publication is not to be regarded as a British Standard.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 28 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Identification card systems — Integrated circuit(s) cards and interface devices — Additional test methods

Systèmes de cartes d'identification — Cartes à
circuit(s), intégré(s) et dispositifs d'interface —
Autres méthodes d'essai

Identifikationskartensysteme — Chipkarten
und Kartenzugangsgeräte — Zusätzliche
Prüfverfahren

This European Prestandard (ENV) was approved by CEN on 1994-05-18 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 224, Machine readable cards, related device interfaces and operations of which the secretariat is held by AFNOR.

According to the CEN/CENELEC Internal Regulations the following countries are bound to announce the existence of this European Prestandard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

	Page		Page
Foreword	2	4.3.1 Testing tool specifications	11
1 Scope	3	4.3.2 Answer to reset (ATR) timing	11
2 Normative references	3	4.3.3 Character repetition	12
3 Definitions and abbreviations	4	4.3.4 Parity error detection	12
3.1 Definitions	4	4.3.5 Structure and content of ATR	13
3.1.1 core recommendations: The documents device under test in which the customer describes to the testing institution a precise set of tests and its suite	4	4.3.6 Global characters	13
3.2 Abbreviations	4	4.3.7 Interface characters (TAi, TBi, TCi, TDi)	14
4 Test methods	4	4.3.8 Character Waiting Time (CWT)	14
4.1 ICC electrical tests	4	4.3.9 Block Guardtime (BGT)	15
4.1.1 I/O contact	5	4.3.10 Block sequencing by the card	15
4.1.2 Fall and rise times for I/O contact	5	4.3.11 Reactions of the ICC to protocol errors	16
4.1.3 VPP contact	6	4.3.12 Recovery of a transmission error by the ICC	17
4.1.4 CLK current	6	4.3.13 Resynchronisation	17
4.1.5 RST current	7	4.3.14 IFSD negotiation	18
4.1.6 VCC current	7	4.3.15 Abortion by the IFD	18
4.2 IFD electrical tests	8	4.4 IFD Physical tests	18
4.2.1 Spurious voltage on outputs	8	4.4.1 IFD location of the contacts	18
4.2.2 Activation of contacts	8	4.4.2 Insertion/withdrawing forces	19
4.2.3 VCC voltage	9	4.4.3 Pushing force on the ICC contacts	20
4.2.4 VPP contact	9	4.4.4 Physical damage	21
4.2.5 Input/Output contact	9	4.4.5 Heat dissipation	22
4.2.6 CLK contact	10	4.5 IFD communication tests	22
4.2.7 RST voltage	10	4.5.1 Character repetition	22
4.2.8 Card Reset	10	4.5.2 Character frame	23
4.2.9 Deactivation of the contacts	10	4.5.3 Structure of a command header for T = 0 protocol	23
4.2.10 Detection of card removal	11	4.5.4 VPP request for T = 0	23
4.3 ICC communication tests	11	4.5.5 Character Waiting Time (CWT)	24
		4.5.6 Block Guardtime (BGT)	24
		4.5.7 Block sequencing by the IFD	25
		4.5.8 Reactions of the IFD to invalid PCBs	26
		4.5.9 Recovery of a transmission error by the IFD	27
		4.5.10 IFSC negotiation	27
		4.5.11 Abortion by the ICC	27
		4.5.12 Recovery of an error in an S(RESYNCH response) block	28
		Figure 1 — Testing tool for IFD location of the contacts	19
		Figure 2 — Principle for measuring the insertion/withdrawing forces	20
		Figure 3 — Principle of the pushing force equipment	21
		Figure 4 — Principle for testing damages	22

1 Scope

This European Prestandard described test methods for **Interface Devices (IFD)** and **IC cards (ICC)** in addition to those described in ISO/IEC 10373:1993.

Additional test methods in this European Prestandard cover the following aspects:

for ICC:

- electrical tests for synchronous and asynchronous cards;
- communication tests for asynchronous transmission;

for IFD:

- physical tests;
- electrical tests;
- communication tests for asynchronous transmission.

All results of tests undertaken in accordance with this European Prestandard may be compared with the values defined in core recommendations and standards (and considered in conjunction with other data) to determine the conformance of the Device Under Test with its core recommendations and standards.

To obtain such conformance may require, for test case defined in this European Prestandard, a sequence of tests for each scenario (utilising a range of parameters) to ensure that the worst case and extreme conditions are tested.

The scope of the tests to be performed relates only to the functionality defined in the core recommendations and standards.

All apparatus indicated in this European Prestandard are not mandatory and are assumed adequate for testing normal operation conditions. For testing extreme conditions, alternative equipment with more functionality may be required.

All results are to be given together with their uncertainty.

Test methods described in this European Prestandard are intended to be performed separately.

These test specifications do not provide any test procedure for Protocol Type Selection (PTS) as defined in ISO/IEC 7816-3:1989/Amd.2:1994.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 27810:1989, *Identification cards — Physical characteristics*.

EN 27816-1:1989, *Identification cards — Integrated circuit(s) cards with contacts — Part 1: Physical characteristics*.

EN 27816-2:1989, *Identification cards — Integrated circuit(s) cards with contacts — Part 2: Dimensions and location of the contacts*.

EN 27816-3:1992, *Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocols*.

EN 27816-3:1992/A1:1993, *Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocols — Amendment 1: Protocol type T = 1, asynchronous half duplex block transmission protocol*.

ISO/IEC 10373:1993, *Identification cards — Test methods*.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this European Prestandard, the following definition applies:

3.1.1

core recommendations

the documents device under test in which the customer describes to the testing institution a precise set of tests and its suite

core recommendations may also contain specific details about the device under test which are to be taken into consideration when testing

core recommendation may also require the testing of the device under test in more severe conditions

core recommendations may contain criteria and values different to the standard to be tested against

3.2 Abbreviations

For the purposes of this European Prestandard, the following abbreviations apply:

C_{IN} :	input capacitance
CLK :	clock
C_{OUT} :	output capacitance
etu :	elementary time unit
GND :	ground
I_{CC} :	supply current at VCC contact
ICC :	integrated circuit(s) card
IFD :	Interface device
IFSD :	Information field size for the interface device
I_{IH} :	high level input current
I_{IL} :	low level input current
I_{OH} :	high level output current
I_{OL} :	low level output current
I_{PP} :	programming current at VPP contact
RST :	reset
tF :	fall time between 90 % and 10 % of signal amplitude
t_R :	rise time between 10 % and 90 % of signal amplitude
V_{CC} :	power supply voltage at VCC contact
V_{IH} :	high level input voltage
V_{IL} :	low level input voltage
V_{OH} :	high level output voltage
V_O :	low level output voltage
V_{PP} :	programming voltage at VPP contact

4 Test methods

4.1 ICC electrical tests

All measurements are defined with respect to GND contact and in an ambient temperature range of 0 °C to 50 °C.

All currents flowing to the card are positive.

4.1.1 *I/O contact*

4.1.1.1 *Reference*

EN 27816-3:1992.

4.1.1.2 *Definition*

The I/O contact is used as input (reception mode for the card) or output (transmission mode) for data exchange.

The I/O contact has two possible states:

- State Z or high impedance state;
- State A or active state.

4.1.1.3 *Objective*

To measure the voltage of I/O contact under normal operating conditions during transmission mode and to measure the input current during reception mode.

4.1.1.4 *Apparatus*

- Oscilloscope:
 - vertical system: 1 V/div, 8 div, 255 points resolution (or 32 mV);
 - horizontal system: Sweep speed from 10 μ s/div to 100 ms/div;
 - trigger DC coupling, single mode.
- Controllable current source.
- Function Generator.
- PC to control the overall equipment.

4.1.1.5 *Procedure*

This voltage depends on the IFD (Interface Device).

Transmission mode:

With the tool record the voltage of I/O contact during the transmission mode (ATR). The output current (I_O) should be forced to the values stated in the standard.

Reception mode:

After ATR, the tool shall send any character to card. The input current shall be measured for $V_{IH} = V_{CC}$ and $V_{IL} = 0$ V.

4.1.1.6 *Result*

Transmission mode:

The minimum and the maximum values for output voltage shall be recorded.

Reception mode:

The input currents shall be recorded.

4.1.2 *Fall and rise times for I/O contact*

4.1.2.1 *Reference*

EN 27816-3:1992.

4.1.2.2 *Definition*

The fall time (t_F) is the time between 90 % and 10 % of signal amplitude.

The rise time (t_R) is the time between 10 % and 90 % of signal amplitude.

4.1.2.3 *Objective*

To measure t_F and t_R .

4.1.2.4 *Apparatus*

- Oscilloscope:
 - vertical system: 1 V/div, 8 div, 255 points resolution (or 32 mV);
 - horizontal system: Sweep speed from 0,1 μ s/div to 10 μ s/div;

- trigger DC coupling, single mode.
- Power supply: 5 V.
- Pull up resistor 20 kohm, or controllable current source with equivalent electrical characteristics.
- Load capacitance: 30 pF.

4.1.2.5 Procedure

Transmission mode:

During transmission mode (answer to reset cycle for example) measure t_F and t_R . The output capacitance shall be equal to 30 pF.

Reception mode:

After ATR the tool shall send any character to the card. Measure t_F and t_R .

4.1.2.6 Result

The values obtained for t_F and t_R shall be recorded.

4.1.3 VPP contact

4.1.3.1 Reference

EN 27816-3:1992.

4.1.3.2 Definition

V_{PP} contact may be used to supply the voltage required to program or to erase the internal non volatile memory.

4.1.3.3 Objective

To measure the current (I_{PP}) and the power on VPP contact.

4.1.3.4 Apparatus

- Oscilloscope:
 - vertical system: 0,01 V/div, 8 div, 255 points resolution (or 32 mV);
 - horizontal system: Sweep speed from 10 μ s/div to 100 ms/div;
 - trigger DC coupling, single mode.
- Power supply.
- Current probe: Shunt resistance of 0,5 ohm.
- Rise and fall time filter: capacitor after the shunt resistor 5 μ F.

4.1.3.5 Procedure

During the Answer To Reset cycle the card provides the interface device with the values of VPP voltage and I_{PP} current.

Idle state:

Set V_{PP} to V_{CC} during the ATR. Measure I_{PP} .

Active state:

Set V_{PP} to the value given in the ATR.

Measure I_{PP} , the rise and fall times during writing cycle.

4.1.3.6 Result

Record the values obtained.

4.1.4 CLK current

4.1.4.1 Reference

EN 27816-3:1992.

4.1.4.2 Definition

The CLK contact is optional. When it is used, it provides the card with a clocking or timing signal (delivered by the Interface Device).

4.1.4.3 Objective

To measure the current consumed by the card on CLK contact.

4.1.4.4 Apparatus

- Oscilloscope:
 - vertical system: 1 V/div, 8 div, 255 points resolution (or 32 mV);
 - horizontal system: Sweep speed of 50 ns/div;
 - trigger DC coupling, auto mode.
- Pulse generator for CLK:
 - square duty cycle with frequency $f_i = 3,5712$ MHz;
 - amplitude range from 0 V to 5 V;
 - mode DC with Offset from 0 V to 0,5 V.
- Current probe:
 - shunt resistance 2 kohm with capacitance compensation.

4.1.4.5 Procedure

Generate the CLK signal and measure the current.

4.1.4.6 Result

Record the value obtained.

4.1.5 RST current

4.1.5.1 Reference

EN 27816-3:1992.

4.1.5.2 Definition

RST contact optional. RST contact is used for reset control by the IFD (Interface Device).

4.1.5.3 Objective

To measure the current consumed by the card on RST contact.

4.1.5.4 Apparatus

- Oscilloscope:
 - vertical system: 1 V/div, 8 div, 255 points resolution (or 32 mV);
 - horizontal system: Sweep speed from 1 ms/div to 10 ms/div;
 - trigger DC coupling, auto mode.
- Pulse generator for RST:
 - Square duty cycle with period $24 \text{ ms} > 22,8 \text{ ms} = (40\,000 + 40\,000) \text{ CLK}$;
 - Amplitude range from 0 V to 5 V;
 - Mode DC with Offset from 0 V to 0,5 V.
- Current probe: Shunt resistance 2 kohm with capacitance compensation.

4.1.5.5 Procedure

Generate the RST signal and measure its current.

4.1.5.6 Result

Record the value obtained.

4.1.6 VCC current

4.1.6.1 Reference

EN 27816-3:1992.

4.1.6.2 Definition

VCC contact is used to supply the power voltage for the card. This contact is optional.