SLOVENSKI STANDARD
SIST ENV 13154-2:2005

01-marec-2005

Izmenjava podatkov v aplikacijah sistemov ogrevanja, hlajenja, prezraļevanja in klimatizacije (HVAC) ï 2. del: Protokoli

Data communication for HVAC application field net - Part 2: Protocols

Ta slovenski standard je istoveten z: ENV 13154-2:1998

ICS:

35.240.99	Uporabniġke reġitve IT na drugih podroļjih	IT applications in other fields
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

SIST ENV 13154-2:2005 en

EUROPEAN PRESTANDARD
PRÉNORME EUROPÉENNE
EUROPÄISCHE VORNORM

ENV 13154-2

June 1998

ICS 35.240.99; 97.120

Descriptors: open systems interconnection, network interconnection, buildings, heating, ventilation, air conditioning, data bus, data transmission, protocols

English version

Data communication for HVAC application field net - Part 2: Protocols

This European Prestandard (ENV) was approved by CEN on 29 May 1998 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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Ref. No. ENV 13154-2:1998 E

Contents

Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 247 "Controls for mechanical building services", the secretariat of which is held by SNV.

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

This ENV 13154-2 prestandard is part of a series of standards for system-neutral data communications in HVAC systems. The content of this prestandard covers the data communications on the field level. The position of this standard in the whole range of standards for mechanical building services, especially in the data communication field of controls for mechanical building services is illustrated in figure 1.

No existing European standards are superseded. At present this document exists only in English.

Attention is drawn to the fact that the protocols contained in the Annexes to this prestandard are claimed to be the subject of patent, trademark and other Intellectual Property Rights (IPR). The proprietors of these protocols have given undertakings to CEN concerning the licensing of such intellectual property (where applicable) on fair and reasonable terms and on a non-discriminatory basis. These undertakings are the subject of dossiers maintained by CEN which may be inspected by interested third parties upon application to the CEN Central Secretariat in accordance with the provisions of CEN/CENELEC Technical Memorandum N°8.

Further information may be obtained from:

Annex A: BatiBUS	BatiBUS Club International (BCI) Il rue Hamlin F- 75016 Paris
Annex B: EHS	European Home Systems Association (EHSA) Excelsiorlaan 11 - Bus 1 B-1930 Zaventem
Annex C: EIB	European Installation Bus Association sc. (EIBA) Av. de la Tanche 5 B-1160 Bruxelles
Annex D: LonTalk®[1]	The Chief Financial Officer Echelon Corporation 4015 Miranda Avenue Palo Alto, CA 94304, USA

[1] Lontalk® is a registered trademark of the Echelon Corporation of Palo Alto, Ca United States of America

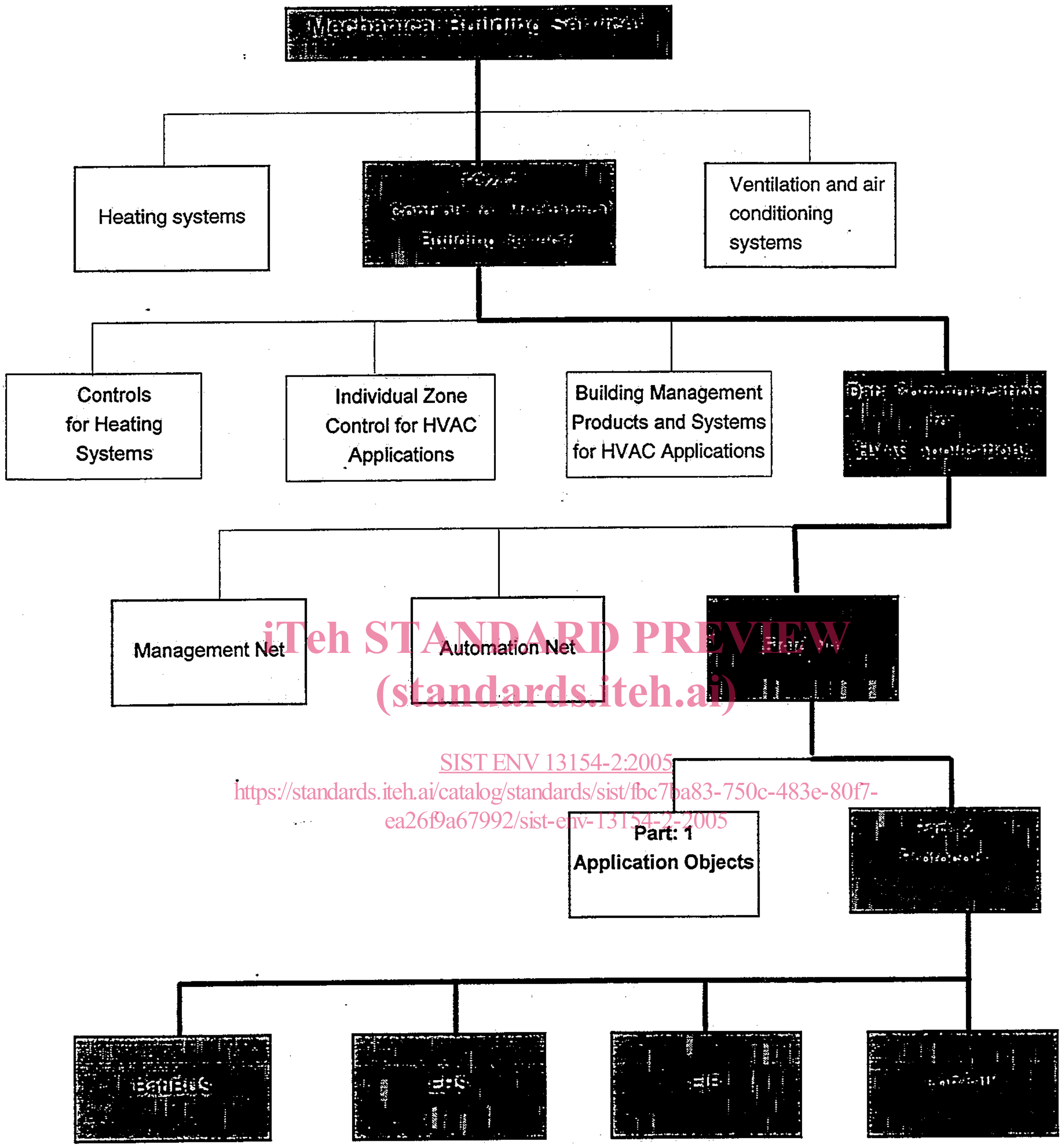


Figure 1: The shaded boxes indicate the contents and the hierarchy of this standard. The plain areas show the positioning of this standard in relationship to other relevant mechanical building services standards.

Introduction

This ENV 13154-2 has been prepared to provide mechanisms through which various vendors of building automation systems may exchange information in a standardised way. It defines communication capabilities and not control functionality.

This standard applies to the field level network according to the hierarchical levels defined by CEN/TC 247 in an EN in preparation "Building management products for HVAC applications, Part 1: System Structure and Definitions". This standard is to be used by all involved in design, manufacture, engineering, installation and commissioning activities.

This standard has been made in response to the essential requirements of the Constructive Products Directive

1 Scope

This European Prestandard defines a system neutral data communication mechanism for use at the field level in heating, ventilating, air-conditioning and related building management applications.

2 Normative Reference

This European Standard 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 standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 507498-1	Information processing systems - Open System Interconnection - Basic Reference Model
EN 50065-1	Signalling on low voltage electrical installations in the frequency range 3 kHz to 148.5 kHz
EN 50090	Home and Building Electronic Systems
EN 60950	Safety of information technology equipment
EN/IEC 1140	SELV
ISO/IS 9545,	Information technology - Open Systems Interconnection - Application Layer structure, December 1989.
ISO/TR 8509,	Information processing systems - Open Systems Interconnection - Service conventions, September 1987.

3 Definitions

The Definitions for each protocol are introduced in Annex A, B, C and D.

4 General Requirements

4.1 Protocols

The used protocol shall be a protocol described in:

Annex A (normative)	BatiBUS
Annex B (normative)	EHS
Annex C (normative)	EIB
Annex D (normative)	LonTalk

Conformance to this standard implies conformity to one of the protocols in Annexe A, B, C or D.

Products complying with Annex A shall be designated BatiBUS
Products complying with Annex B shall be designated EHS
Products complying with Annex C shall be designated EIB conform
Products complying with Annex D shall be designated LonTalk

4.2 Physical Layer

For each protocol, the physical layer shall be chosen as follows

The physical layer chosen for the BatiBUS protocol shall be specified according to Annex A.
The physical layer chosen for the EHS protocol shall be specified according to Annex B
The physical layer chosen for the EIB protocol shall be specified according to Annex C
The physical layer chosen for the LonTalk protocol shall be specified according to Annex D

Annex A (Normative)

BatiBUS

Contents

A.1 Overview of the BatiBUS protocol

The BatiBUS protocol is based on a low cost physical interface, based on a free-topology twisted pair transmission. The corresponding interface is easy to design from various available and non-specific components, such as 4 ou 8 bit microcontrollers. The physical transmission also allows for remote power supply of electronic products, via the same line.
The necessary definitions and abbreviations are defined in clause A.2 Definitions, abbreviations and notations.
The physical layer, as well as the data link layer, are described in clause A.3. Physical interface and frame structure.
The BatiBUS protocol also provides a comprehensive set of messages, that can be used for various applications, as well as system and network management. Some of these messages, or frames, are quite generic, and are automation object oriented ; others are more specific, and correspond to a command orientation.
The application layer and network management functionalities are presented in clause A.4. Application Layer and command code tables.

A.2. Definitions, abbreviations and notations

A.2.1. Definitions

For the purpose of this annex, the following definitions apply:

Acknowledgement waiting time: maximum time the source will wait for acknowledgement of a message containing an ACK request.

Acknowledgement response time: time between the end of a frame containing an ACK request and the beginning of the corresponding acknowledgement frame.

Address: information used to reach a specific station.

Bit: binary digit: unit of information circulating on the line (value 0 or 1).

Broadcast: frame transmission to multiple destinations.

Character: 11 bits set including 8 data bits and 1 check bit and two synchronisation bits (start bit and stop bit)

Collision: event occurring when two or more stations transmit simultaneously after detecting a free line condition.

Data link: protocol elements ensuring reliable message exchanges on the line; the manipulated data elements are known as frames.

Destination: station to which a frame is addressed.

Distortion: percentage ratio expressing the deviation between the instant a transition occurs and the ideal transition instant, divided by the bit duration (208 μ sec); the deviation is determined for each bit of a character from the start bit.

Frame: data packet comprising the information component of the data link layer. Two types of frames are distinguished: data frames carry messages; acknowledgement frames carry only information specific to the data link layer, acknowledging a previous data frame (acknowledgement frames are frequently referred to simply as ``acknowledgements'' or ACKs).

Inter frame time: time between the end of a frame (end of stop bit for the last character) and the beginning of the next frame (beginning of the start bit for the first character).

Line: physical medium (twisted pair) over which data exchange occurs.

Line load: percentage ratio representing the proportion of actual character transmission during a specified integration time interval.

Message: data bytes manipulated by the user. Three types of messages may be distinguished:

request messages require the recipient of the message to send **a response** message back to the source;

spontaneous message is transmitted in response to user-defined events (e.g. when a specified threshold is exceeded).

Odd parity bit: check bit whose value is such that there is an odd number of "0" within the data and parity fields.

Point: see station.

Response time: time between the end of a request frame and the beginning of the corresponding response frame.

Retry: re transmission of a request if an acknowledgement is not received within a specified time interval.

Source: station initiating a frame transmission.

Station: any device connected to the network; a station may have one or more addresses.

A.2.2. Notations used in this annex.

- "*" indicates that a frame may be used with the urgent priority mechanism.
- During emission bits are transmitted in the following order: D0,D1..D7.
- D7..D0 represents one byte of the data field.
- D7..D0= N represents the value of the byte (in hexadecimal).
- Dz..Dy= N represents a bit string value (in hexadecimal).
- Dz..Dy-D7..D0= N represents a value coded on more than one byte.

A.2.3 Notation of frames

This annex describes the different frames used in BatiBUS protocol. They are coded in this document with a number which can be simple (i.e. Frame 02, Frame 28) or compound (i.e. Frame 07-2, Frame 44-3).
The standardised variants are noted with a letter.
Examples:
Frame 45-a: Frame 45 variant a
Frame 43-3-a: Frame 43-3 variant a

A.3. Physical interface and frame structure

A.3.1 Topology

Bus, ring or star topologies or any combination thereof.

A.3.2 Connection mode

Multidrop.

A.3.3 Medium

Use of one twisted pair (shielded if necessary).

A.3.4 Line connection

Line polarity must be observed.

A.3.5 Network operation

Diffusion network.

A.3.6 Physical layer

Sending Station

- Maximum closed-circuit voltage across transmitter terminals: 1.5V @ 330 mA
- Maximum open-circuit leakage current: 100 μA @ 18V
- Maximum distortion: 10 %

Receiving Station

- Maximum input resistance: 500 kΩ
- Minimum current drain per station: 30 μA
- Threshold voltage: 8 V ± 1 V
- Minimum permissible distortion: 30 %

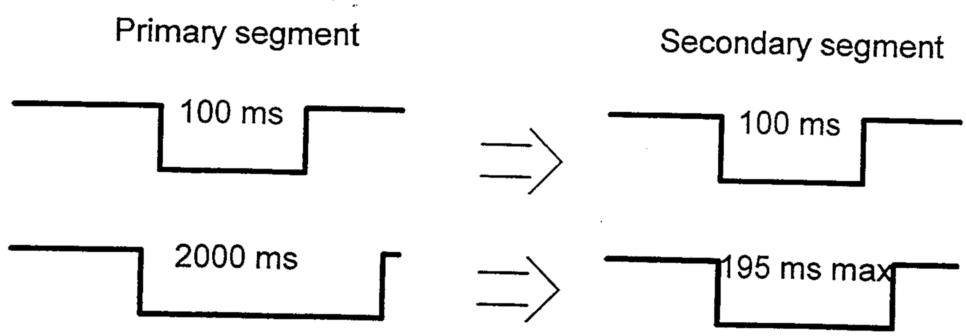
Data Link

- Maximum line resistance: 12 Ω between power supply and most remote station
- Maximum line capacitance: 250 nF
- Maximum station capacitance: 50 pF
- Maximum total station protection capacitance: 150 nF
- Open/closed and closed/open switching time (unloaded line): 0,5 μs minimum, 5 μs maxi
- Modulation rate: 4800 baud

Repeater

Connects a primary segment to a secondary segment. It is made of two receivers, two transmitters and optionally one or two power supplies. Between any two BatiBUS point two repeaters maximum are allowed. The information flow transfer logic is transparent to data. A short-circuit detected on one segment shall not be transmitted on the other segment for longer than 195 ms. A segment is declared short-circuited when it is in close-circuit state for longer than 165 ms. The turning logic shall not disturb collision detection and arbitration between points on different segments and shall not increase distortion by more than 5 %.

Examples :



Technology

- Maximum coupling capacitance
  Input/line: 5 pF per station connected to bus
  Output/line: 5 pF per station connected to bus
  Line/230 V mains: 50 pF
- Line/earth and mains/earth isolation: have to comply with applicable standards
- Decoupling capacitors line / ground or mains / ground are allowed but have to comply with relevant standards.
- Dielectric strength: Line / 230 V mains: 4 kV for 1 minimum @ 50 Hz
  Line/metal masses connected to protection conductor: 2 kV for 1 minimum @ 50 Hz
- Insulation resistance: Line / 230 V mains: 5 MΩ @ 500 V
- Minimum creepage distance: Line / 230 V mains: 8 mm
  Line/metal masses connected to protection conductor: 3 mm
- Impulse voltage performance as per IEC 60-2:
  Common mode: 4 kV, series resistance ≤ 50 Ω, energy 2 J
  Differential mode: 2 kV, series resistance < 50 Ω, energy 0,5 J

The tests results shall be considered satisfactory if the device specifications are maintained after 3 positive pulses and 3 negative pulses in both common and differential mode.

Electromagnetic Compatibility

- Electrostatic discharges (IEC 801-2): Level 3 (8 kV) minimum
- Electromagnetic field (IEC 801-3): Level 4 (10 V/m)
- Conducted interference (IEC 801-4):

Unshielded BatiBUS line: Level 4 (2 kV)
Shielded BatiBUS line: Level X (4 kV)
Auxiliary power supply with enclosed device: Level 4 (4 kV for 230 V mains)
Auxiliary power supply with exposed device: Level 3 (2 kV for 230 V mains)

- Emitted radiation: EN 55022 level A

Satisfaction to 801-2, 801-3,801-4 tests.
During the test voltage application :
acceptable

bit errors

behaviour errors when they affect subordinate functions of the equipment (e.g. display errors). These errors shall cease with the end of test voltage application.

NOT acceptable

all behaviour errors when they affect main functions of the equipment.

Medium Installation Requirements

The medium is supplied at Safety or Protective Extra Low Voltage ; a suitably stripped cable with an insulating sheath having a dielectric strength of 4 kV may be used. In this case, no other provisions are necessary to ensure electrical safety.

A.3.7 Bus power supply on a segment

The modulation technique used allows connection to the bus of stations supplied with power from the bus, and stations supplied by an external source (e.g. 230 V mains). The available bus-supply current can reach 150 mA.

Bus-supplied stations must ensure retention of required data during a up to 200 ms line closed-circuit condition.
Bus-Supplied Station Current Consumption

To simplify system engineering, the supply current of a station (both power supply and point) is expressed by a factor "C", defined as :

C = actual current / reference station supply current

C shall be calculated for the average and peak current drain, and the higher of the two values shall be rounded up to the next higher integer value.
Standard station supply current :
average (quiescent): 0.5 mA maxi
peak (reception): 0.825 mA maxi
Line supply current for a station supplied by an external source: average: C = 0.2
average (quiescent): 100 µA maxi
peak (reception): 165 µA maxi

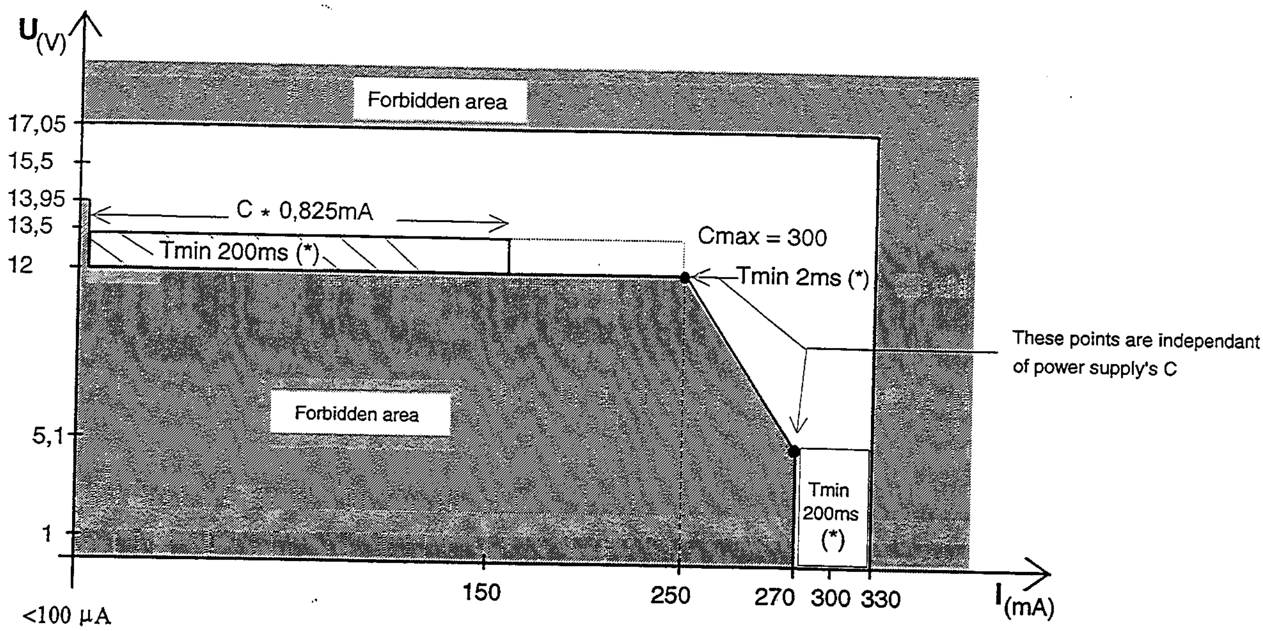
For an installation C = 300 maxi and

C of power supply > C used by points

Bus Power Supply General Requirements

- Power on/off switching shall be provided (leakage current < 1 mA on short circuit).
- Power supply must withstand a permanent line short-circuit condition and shall recover its characteristics within 5 mn after short-circuit suppression.
- Sum of bus-supplied station capacitance values: 40 mF, corresponding to a power-on time of 3 s max.
- Operation voltage for bus-supplied station: 9.5 V minimum

Power supply voltage
- No-load voltage:
  15.5 V ± 10% (static, I< 100 µA)
- Minimum voltage under load:
  13.5 V @ C*0.825 mA (250 mA if C= 300), (200 ms minimum current pulse duration)
  12 V @ 250 mA (2 ms minimum current pulse)
- Closed-circuit current:
  300 mA ± 10 % independently of power supply's C (200 ms minimum with 5,1 V and 1 V maxi)



(*) electrical parameters have to comply at least during mentioned time

BatiBUS' power supply gauge

<u>Note 1:</u> above mentioned specifications are given for a mains powered system. A system with battery backup, may be designed so that parameters "no-load voltage", "C on one segment", "line resistance" and "line voltage drop" are different during a power down but their arrangement shall ensure a minimum noise margin of 0.5 V in open circuit state for all points of the system (opened voltage 9.5 V minimum). The resulting installation constraints shall be clearly explained in the product documentation

<u>Note 2:</u> peak supply current measurement shall be made at least 800 ms after the beginning of sending frames made of the same number of '0" and "1" separated by a 22 ms inter frame time to the point under test

<u>Note 3:</u> for PELV circuits the negative pole of the power supply shall be grounded. The link from the bus to the ground shall be made at only (and only one point) of the BatiBUS power supply. In the case when one bus is composed of more than one segment without isolation between segments, only one point must be grounded.

Quiescent state:

stations are placed on standby (minimum supply current) for a preset time of 15 sec by a special frame.

A.3.8 Electrical data encoding

Line open/closed-circuit modulation:

Receiver Start: U < 7 V
Stop: U > 9 V
Logic ``0'': U > 9 V (open)
Logic ``1'': U < 7 V (closed)

Sender Start: U < 1.5 V @ 330 mA
Stop: I < 100 μa @ 18 V
Logic ``0'': I < 100 μa @ 18 V (open)
Logic ``1'': U < 1.5 V @ 330 mA (closed)