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STANDARDIZATION SECTOR
OF ITU

V.31 *bis*

**DATA COMMUNICATION
OVER THE TELEPHONE NETWORK**

**ELECTRICAL CHARACTERISTICS FOR
SINGLE-CURRENT INTERCHANGE CIRCUITS
USING OPTOCOUPERS**

ITU-T Recommendation V.31 *bis*

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation V.31 *bis* was published in Fascicle VIII.1 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

**ELECTRICAL CHARACTERISTICS FOR SINGLE-CURRENT
INTERCHANGE CIRCUITS USING OPTOCOUPERS**

(Malaga-Torremolinos, 1984)

1 General

In general, the electrical characteristics specified in this Recommendation apply to interchange circuits operating at data signalling rates up to 75 bit/s, which have been covered in Recommendation V.31, and also to interchange circuits operating at data signalling rates up to 1200 bit/s.

The electrical characteristics are specified to provide compatibility with existing equipment according to Recommendation V.31 which meet the voltage and current values given in Table 1/V.31 bis. The resistance values defined in Recommendation V.31 are converted into current and voltage values to meet the optocouplers requirements.

Each interchange circuit consists of two conductors (go and return leads) which are electrically insulated from each other and from all other interchange circuits. A common return lead can be assigned to several interchange circuits of a group.

2 Equivalent circuit of interface

Figure 1/V.31 bis shows the equivalent interchange circuit, together with the electrical characteristics laid down in this Recommendation. Some electrical characteristics vary depending upon whether the signal receive side is located in the data circuit-terminating equipment (DCE) or in the data terminal equipment (DTE). This fact is specially referred to below.

3 Signal source

The signal source must be isolated from ground or earth irrespective of whether it is located within the data circuit-terminating equipment or within the data terminal equipment.

If the signal receive side is in the data circuit-terminating equipment, the insulation resistance in the ON or OFF condition measured from either leg to ground or to any other interchange circuit shall not fall below 5 megohms and the capacitance measured between the same points shall not exceed 1000 picofarads.

Irrespective of the above, the following specifications apply to the signal source.

3.1 *Internal resistance of signal source R_1 , R_0*

The d.c. resistance of the signal source in the ON (or 1) condition R_1 depends on V_s , V_r and I_1 (see Figure 1/V.31 bis). The d.c. resistance of the signal source in the OFF (or 0) condition R_0 depends on V_r and I_0 (see Figure 1/V.31 bis).

3.2 *Current at the interface I_0*

The current I_0 , which represents the reverse current of the optocouplers in the OFF condition, should not exceed 10 μ A (see Figure 1/V.31 bis).

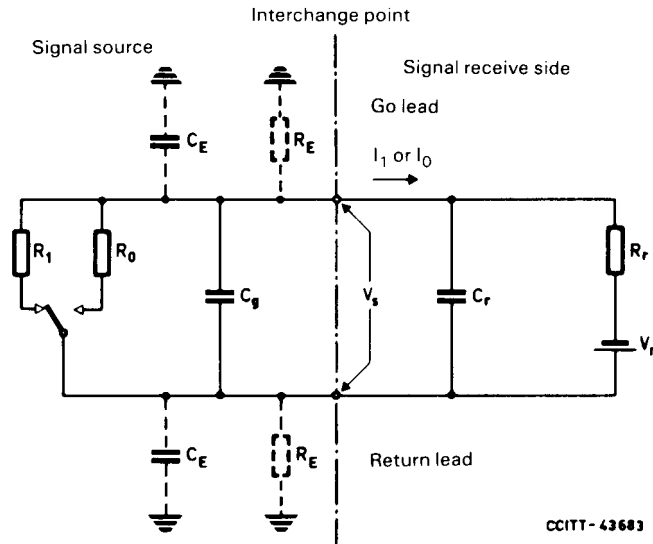
3.3 *Capacitance of signal source*

The capacitance of the signal source C_g including that of the interface cable, measured at the interface (see Figure 1/V.31 bis), should not exceed 2500 pF.

4 Signal receive side

4.1 Signal receive side in the DCE

The signal receive side in the DCE can be floating or connected to ground at any single point.



- R_1 Internal resistance of the signal source in the ON (or 1) condition.
- R_0 Internal resistance of the signal source in the OFF (or 0) condition.
- C_g Capacitance of signal source.
- C_r Capacitance of signal receive side.
- V_r Open circuit voltage of signal receive side.
- I_1 Current in interchange circuit in the ON (or 1) condition.
- I_0 Current in the interchange circuit in the OFF (or 0) condition.
- R_r Internal resistance of signal receive side.
- R_E Insulation resistance of signal source if the latter is in the data terminal equipment.
- C_E Ground capacitance of signal source if the latter is in the data terminal equipment.
- V_s Voltage between the two leads of the interchange circuit in the ON (or 1) condition.

FIGURE 1/V.31 bis

Equivalent circuit of interface

4.1.1 Open circuit voltage of the signal receive side V_r

The open circuit voltage V_r on the signal receive side of the DCE, measured at the interface (see Figure 1/V.31 bis), should not fall below 3 V and should not exceed 25 V. The polarity of V_r has to be chosen for the current direction DTE to DCE in the go lead and DCE to DTE in the return lead.

4.1.2 Current at the interface I_1

The current I_1 supplied by the receive side in the DCE should not fall below 0.1 mA and should not exceed 5 mA, when measured at the interface in the ON (or 1) condition.

4.1.3 Voltage at the interface V_s

The voltage at the interface V_s , measured between the go and return leads in the ON (or 1) condition, should not exceed 1 V.

4.1.4 *Internal resistance of signal receive side R_r*

The internal resistance R_r of the signal receive side of the DCE results from the limits for the open circuit voltage V_r of the signal receive side and the current I_1 at the interface, which are specified under §§ 4.1.1 and 4.1.2 above.

Even if R_r has an inductive component, the voltage at the interface should not exceed the maximum of 25 V specified under § 4.1.1 above.

4.1.5 *Capacitance of signal receive side C_r*

The capacitance of C_r , of the signal receive side in the DCE, including the capacitance of the cable up to the interface (see Figure 1/V.31 *bis*), is not specified. It is only necessary to ensure that the signal receive side works satisfactorily, allowing for the capacitance of the signal source C_g .

4.2 *Signal receive side in the DTE*

The signal receive side in the DTE can be connected to ground at any single point.

4.2.1 *Open circuit voltage of the signal receive side V_r*

The open circuit voltage V_r of the signal receive side of the DTE, measured at the interface (see Figure 1/V.31 *bis*), should not fall below 3 V and should not exceed 25 V. The polarity of V_r has to be chosen for the current direction DTE to DCE in the go lead and DCE to DTE in the return lead.

4.2.2 *Current at the interface I_1*

The current I_1 , supplied by the signal receive side in the DTE, should not fall below 0.1 mA and should not exceed 15 mA, when measured at the interface (see Figure 1/V.31 *bis*), in the ON (or 1) condition.

4.2.3 *Voltage at the interface V_s*

The voltage at the interface V_s , measured between the go and return leads in the ON (or 1) condition, should not exceed 1.5 V.

4.2.4 *Internal resistance of signal receive side R_r*

The internal resistance R_r of the signal receive side of the DTE results from the limits for the open circuit voltage V_r of the signal receive side and the current I_1 at the interface, which are specified under §§ 4.2.1 and 4.2.2 above.

4.2.5 *Capacitance of signal receive side C_r*

The capacitance of C_r of the signal receive side in the DTE including the capacitance of the cable is not specified. It is only necessary to ensure that the signal receive side works satisfactorily, allowing for the capacitance of the signal source C_g .

5 **Signal allocation**

Table 1/V.31 *bis* shows allocations of digital signals for data, control and timing circuits.

TABLE 1/V.31 *bis*

	$0.1 \text{ mA} \leq I_1 \leq 5 \text{ mA}$ (15 mA) $V_s \leq 1 \text{ V}$ (1.5 V)	$I_0 \leq 10 \text{ }\mu\text{A}$
Data circuits	1 condition	0 condition
Control and timing circuits	ON condition	OFF condition