



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**V.31**

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**DATA COMMUNICATION  
OVER THE TELEPHONE NETWORK**

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**ELECTRICAL CHARACTERISTICS FOR  
SINGLE-CURRENT INTERCHANGE CIRCUITS  
CONTROLLED BY CONTACT CLOSURE**

**ITU-T Recommendation V.31**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation V.31 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.

## Recommendation V.31

### ELECTRICAL CHARACTERISTICS FOR SINGLE-CURRENT INTERCHANGE CIRCUITS CONTROLLED BY CONTACT CLOSURE

(Geneva, 1972)

#### 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.

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 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 or in the data side is located in the data circuit-terminating equipment or in the data terminal equipment. 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 open-contact insulation resistance 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.

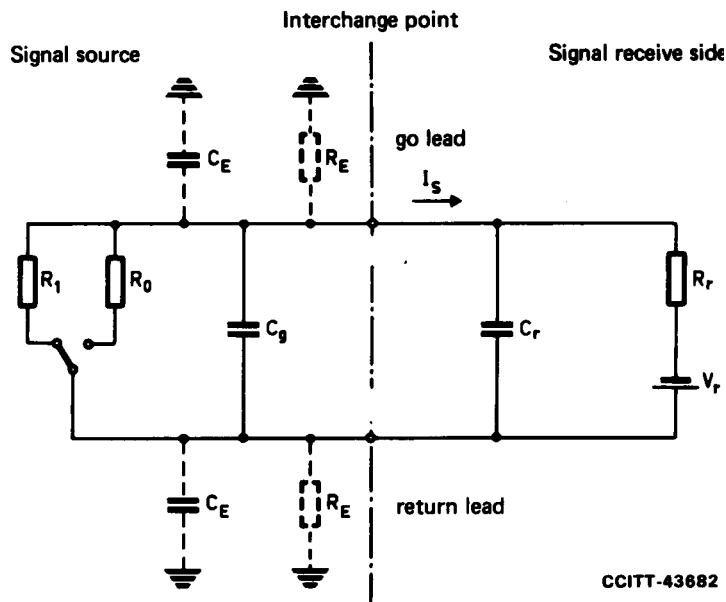
##### 3.1 Internal resistance of signal source $R_1, R_0$

The d.c. resistance of the closed contact  $R_1$ , including the resistance of the interface cable, measured at the interface (see Figure 1/V.31), should not exceed 10 ohms within the current and voltage ranges of the signal receive side.

The d.c. resistance of the open contact  $R_0$  including the insulation resistance of the interface cable should not fall below 250 kilohms when measured at the interface (see Figure 1/V.31) within the voltage range of the signal receive side.

##### 3.2 Capacitance of signal source $C_g$

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



$R_1$ =	internal resistance of the signal source in the closed contact condition
$R_0$ =	internal resistance of the signal source in the open contact condition
$C_g$ =	capacitance of signal source
$C_r$ =	capacitance of signal receive side
$V_r$ =	open circuit voltage of signal receive side
$I_s$ =	current in interchange circuit
$R_r$ =	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

FIGURE 1/V.31  
Equivalent circuit of interface

#### 4 Signal receive side

##### 4.1 Signal receive side in the data circuit-terminating equipment

The signal receive side in the data circuit-terminating equipment can be floating or connected to ground at any single point.

###### 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 data-circuit terminating equipment, measured at the interface (see Figure 1/V.31), should not fall below 3 volts and should not exceed 12 volts.

###### 4.1.2 Current at interface $I_s$

The current  $I_s$  supplied by the signal receive side in the data circuit-terminating equipment should not fall below 0.1 milliamp and should not exceed 15 milliamps, when measured at the interface (see Figure 1/V.31) in the closed contact condition, i.e. with an internal resistance of the signal source of  $R_1 \leq 10$  ohms.

*Note* - Irrespective of the current  $I_S$ , in the closed contact conditions, i.e. with an internal resistance of the signal source of  $R_1 \leq 10$  ohms, the voltage at the interface should not exceed 150 millivolts, when measured between go and return leads.

#### 4.1.3 *Internal resistance of signal receive side $R_r$*

The internal resistance  $R_r$  of the signal receive side of the data circuit-terminating equipment results from the limits for the open circuit voltage  $V_r$  of the signal receive side and the current  $I_S$ , 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 12 volts specified under § 4.1.1 above.

*Note* - This item is subject to further study.

#### 4.1.4 *Capacitance of signal receive side $C_r$*

The capacitance of  $C_r$  of the signal receive side in the data circuit-terminating equipment, including the capacitance of the cable up to the interface (see Figure 1/V.31), 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 data terminal equipment*

The signal receive side in the data terminal equipment 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 data terminal equipment, measured at the interface (see Figure 1/V.3 1), should not fall below 3 volts and should not exceed 52.8 volts.

#### 4.2.2 *Current at the interface $I_S$*

The current  $I_S$ , supplied by the signal receive side in the data terminal equipment, should not fall below 10 milliamps and not exceed 50 milliamps, when measured at the interface (see Figure 1/V.3 1) in the closed contact condition, i.e. with an internal resistance of the signal source of  $R_1 \leq 10$  ohms.

#### 4.2.3 *Internal resistance of signal receive side $R_r$*

The internal resistance  $R_r$  of the signal receive side in the data terminal equipment is obtained from the limits for the open circuit voltage  $V_r$  of the signal receive side and the current  $I_S$  at the interface, which are specified under §§ 4.2.1 and 4.2.2 above.

Even if  $R_r$  has an inductive component, the voltage at the interface should not exceed the maximum of 52.8 volts, specified under § 4.2.1.

*Note* - This item is subject to further study.

#### 4.2.4 *Capacitance of signal receive side $C_r$*

The capacitance of  $C_r$  of the signal receive side in the data terminal equipment 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  $C_g$ .

## Signal allocation

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

TABLE 1/V.31

	Closed contact $R_i \leq 10 \Omega$	Open contact $R_o \geq 250 \text{ k}\Omega$
Data circuits	"1" condition	"0" condition
Control and timing circuits	ON condition	OFF condition