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SERIES V: DATA COMMUNICATION OVER THE
TELEPHONE NETWORK

Interfaces and voiceband modems

**Electrical characteristics for balanced
double-current interchange circuits operating
at data signalling rates up to 10 Mbit/s**

ITU-T Recommendation V.11

(Previously "CCITT Recommendation")

ITU-T V-SERIES RECOMMENDATIONS
DATA COMMUNICATION OVER THE TELEPHONE NETWORK

- 1 – General
- 2 – Interfaces and voiceband modems**
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- 5 – Transmission quality and maintenance
- 6 – Interworking with other networks

For further details, please refer to ITU-T List of Recommendations.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation V.11 was revised by ITU-T Study Group 14 (1993-1996) and was approved by the WTSC (Geneva, October 9-18, 1996).

NOTE

1. In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.
2. The status of annexes and appendices attached to the Series V Recommendations should be interpreted as follows:
 - an *annex* to a Recommendation forms an integral part of the Recommendation;
 - an *appendix* to a Recommendation does not form part of the Recommendation and only provides some complementary explanation or information specific to that Recommendation.

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CONTENTS

	<i>Page</i>
1 Introduction.....	1
2 Field of application	1
3 Symbolic representation of interchange circuit.....	1
4 Generator polarities and receiver significant levels	2
4.1 Generator	2
4.2 Receiver	2
5 Generator.....	2
5.1 Resistance and d.c. offset voltage	2
5.2 Static reference measurements.....	3
5.3 Dynamic voltage balance and rise time measurements.....	5
6 Load	6
6.1 Characteristics.....	6
6.2 Receiver input voltage – Current measurements	7
6.3 D.c. input sensitivity measurements	7
6.4 Input balance test	8
6.5 Terminator	8
7 Environmental constraints.....	9
8 Circuit protection	9
9 Detection of generator power-off or circuit failure	9
10 Measurements at the physical interchange point.....	10
10.1 Listing of essential measurements	10
10.2 Listing of optional measurements	10
Annex A – Compatibility with other interfaces.....	11
A.1 Compatibility of V.10 and V.11 interchange circuits in the same interface	11
A.2 Recommendation V.11 interworking with Recommendation V.10.....	11
Appendix I – Cable and termination.....	11
I.1 Cable.....	11
I.2 Cable length.....	11
I.3 Cable termination.....	13
Appendix II – Multipoint operation	13
Reference.....	13

Recommendation V.11

ELECTRICAL CHARACTERISTICS FOR BALANCED DOUBLE-CURRENT INTERCHANGE CIRCUITS OPERATING AT DATA SIGNALLING RATES UP TO 10 Mbit/s¹⁾

(Geneva, 1976; amended Geneva, 1980, at Melbourne, 1988, at Helsinki, 1993 and at Geneva, 1996)

1 Introduction

This Recommendation deals with the electrical characteristics of the generator, receiver and interconnecting leads of a differential signalling (balanced) interchange circuit with an optional d.c. offset voltage.

The balanced generator and load components are designed to cause minimum mutual interference with adjacent balanced or unbalanced interchange circuits (see Recommendation V.10) provided that waveshaping is employed on the unbalanced circuits.

In the context of this Recommendation, a balanced interchange circuit is defined as consisting of a balanced generator connected by a balanced interconnecting pair to a balanced receiver. For a balanced generator, the algebraic sum of both the outlet potentials, with respect to earth, shall be constant for all signals transmitted; the impedances of the outlets with respect to earth shall be equal. The degree of balance and other essential parameters of the interconnecting pair is a matter for further study.

Annex A and Appendices I and II are provided to give guidance on a number of application aspects as follows:

- Annex A – Compatibility with other interfaces.
- Appendix I – Cable and termination.
- Appendix II – Multipoint operation.

NOTE – Generator and load devices meeting the electrical characteristics of this Recommendation need not operate over the entire data signalling rate range specified. They may be designed to operate over narrower ranges to satisfy requirements more economically, particularly at lower data signalling rates.

Reference measurements are described which may be used to verify certain of the recommended parameters but it is a matter for individual manufacturers to decide what tests are necessary to ensure compliance with this Recommendation.

2 Field of application

The electrical characteristics specified in this Recommendation apply to interchange circuits operating with data signalling rates up to 10 Mbit/s.

Typical points of application are illustrated in Figure 1.

Whilst the balanced interchange circuit is primarily intended for use at the higher data signalling rates, its use at the lower rates may be necessary in the following cases:

- 1) where the interconnecting cable is too long for proper unbalanced circuit operation;
- 2) where extraneous noise sources make unbalanced circuit operation impossible;
- 3) where it is necessary to minimize interference with other signals.

3 Symbolic representation of interchange circuit

See Figure 2.

The equipment at both sides of the interface may implement generators as well as receivers in any combination. Consequently, the symbolic representation of the interchange circuit, Figure 2 below, defines a generator interchange point as well as a load interchange point.

¹⁾ This Recommendation is also designated as Recommendation X.27 in the X-Series Recommendations.

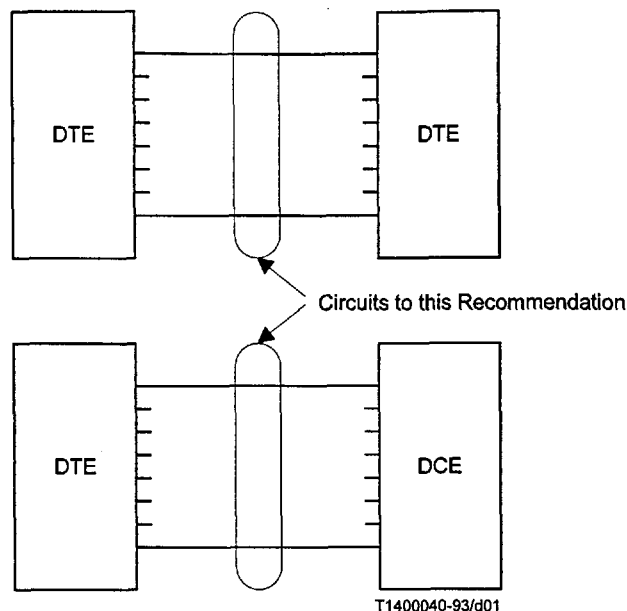


FIGURE 1/V.11

Typical applications of balanced interchange circuits

For data transmission applications, it is commonly accepted that the interface cabling will be provided by the DTE. This introduces the line of demarcation between the DTE plus cable and the DCE. This line is also called the interchange point and physically implemented in the form of a connector. The applications also require interchange circuits in both directions. This leads to an illustration as shown in Figure 3.

4 Generator polarities and receiver significant levels

4.1 Generator

The signal conditions for the generator are specified in terms of the voltage between output points A and B shown in Figure 2.

When the signal condition 0 (space) for data circuits or ON for control and timing circuits is transmitted, the output point A is positive with respect to point B. When the signal condition 1 (mark) for data circuits or OFF for control and timing circuits is transmitted, the output point A is negative with respect to point B.

4.2 Receiver

The receiver differential significant levels are shown in Table 1, where V_A' and V_B' are respectively the voltages at points A' and B' relative to point C'.

5 Generator²⁾

5.1 Resistance and d.c. offset voltage

5.1.1 The total generator resistance between points A and B shall be less than or equal to 100 ohms and be adequately balanced with respect to point C. The degree of balance required, both static and dynamic, is left for further study).

²⁾ For test purposes other than specified in this Recommendation (e.g. signal quality measurement), a transmitter test load of 100 ohms may be used.