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TRANSMISSION SYSTEMS AND MEDIA GENERAL CHARACTERISTICS OF NATIONAL SYSTEMS FORMING PART OF INTERNATIONAL CONNECTIONS

PRINCIPLES OF DETERMINING AN IMPEDANCE STRATEGY FOR THE LOCAL NETWORK

Supplement 31 to ITU-T Series G Recommendations

(Previously "CCITT Recommendations")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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

Supplement 31 to ITU-T Series G Recommendations was prepared by the ITU-T Study Group XII (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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PRINCIPLES OF DETERMINING AN IMPEDANCE STRATEGY FOR THE LOCAL NETWORK

(Helsinki, 1993)

(referred to in Series G Recommendations)

1 Introduction

This Supplement gives the background and guidance required to support a consistent approach to impedance planning in the local network. It is clear that impedance issues are having an increasingly important influence on end-to-end performance as they can affect a significant number of transmission parameters. There is a need to bring together the important impedance issues relating to the local part of the overall connection.

Previous contributions to CCITT have indicated that it is highly unlikely that a single set of impedances will be suitable for all networks hence this Supplement does not set out to derive such a unified set of values. The aim is to identify the overall issues and provide sufficient guidance that the transmission planner can develop the optimum solution for his local situation whilst still meeting the CCITT objectives for overall performance.

For the purposes of this Supplement "local network" is taken to include all the customer equipment and network equipment required to provide the transmission path between the acoustic reference point at the customer's telephone instrument and the first 4-wire digital point in the national and international 4-wire chain of circuits. This, therefore, includes all the analogue portions of the connection where impedance can be an issue.

2 Structure

The Supplement is divided into three main clauses:

- an outline of the relevant network components (e.g. digital local exchange) and the associated important impedances (e.g. input and balance impedances);
- a guide to the influence of the impedances on the principal transmission planning parameters such as loudness rating, echo and stability. The clause quantifies the contribution of the specific impedances to these parameters and identifies any existing Recommendation covering specific performance objectives;
- an outline of a recommended procedure enabling development of a consistent set of impedances for a new local network situation or to reappraise an existing situation.

3 Relevant impedances

3.1 Customer and network equipment

There are clearly a very large number of combinations of customer and network equipment that could be used to access the national 4-wire chain of circuits. Customer equipment can include fixed or cordless telephones (analogue or digital), analogue or digital PABXs and the interconnecting leased lines. In addition, it is important that non-speech terminal equipment such as voice-band data modems is taken into account as echo can affect the performance of these devices. The network equipment will include the local loop (analogue or digital) and analogue or digital exchanges with their interconnecting junctions.

Whilst it is difficult to illustrate every combination of equipment it is possible to indicate the combinations most likely to influence the impedance arguments. Figure 1 shows typical customer and network equipment, including possible interconnection arrangements for access to the 4-wire chain for commonly occurring equipment. As an example it shows a 2-wire telephone connected to the national 4-wire chain via 2 PABXs, a 4-wire local line, an analogue local exchange and a PCM multiplexor. Figure 1 also identifies the 2-wire to 4-wire conversion units (also referred to as hybrids in the following text) which influence the impedance planning.