



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**G.136**

(09/99)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,  
DIGITAL SYSTEMS AND NETWORKS

International telephone connections and circuits – General  
characteristics of the 4-wire chain formed by the  
international circuits and national extension circuits

---

**Application rules for automatic level control  
devices**

ITU-T Recommendation G.136

(Previously CCITT Recommendation)

---

ITU-T G-SERIES RECOMMENDATIONS  
**TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS**

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
General definitions	G.100–G.109
General Recommendations on the transmission quality for an entire international telephone connection	G.110–G.119
General characteristics of national systems forming part of international connections	G.120–G.129
<b>General characteristics of the 4-wire chain formed by the international circuits and national extension circuits</b>	<b>G.130–G.139</b>
General characteristics of the 4-wire chain of international circuits; international transit	G.140–G.149
General characteristics of international telephone circuits and national extension circuits	G.150–G.159
Apparatus associated with long-distance telephone circuits	G.160–G.169
Transmission plan aspects of special circuits and connections using the international telephone connection network	G.170–G.179
Protection and restoration of transmission systems	G.180–G.189
Software tools for transmission systems	G.190–G.199
<b>INTERNATIONAL ANALOGUE CARRIER SYSTEM</b>	
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
<b>TESTING EQUIPMENTS</b>	
<b>TRANSMISSION MEDIA CHARACTERISTICS</b>	G.600 – G.699
<b>DIGITAL TRANSMISSION SYSTEMS</b>	
TERMINAL EQUIPMENTS	G.700–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999

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

## **ITU-T RECOMMENDATION G.136**

### **APPLICATION RULES FOR AUTOMATIC LEVEL CONTROL DEVICES**

#### **Summary**

This Recommendation provides a set of general application guidelines for network based Automatic Level Control Devices. These network based ALC devices are expected to comply with Recommendation G.169 "Automatic Level Control Devices".

#### **Source**

ITU-T Recommendation G.136 was prepared by ITU-T Study Group 12 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 30 September 1999.

#### **Keywords**

ALC, automatic level control, application rules, planning guidelines.

## FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. 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, 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.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

## NOTE

In this Recommendation the term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration*, *ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

## INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

© ITU 2000

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

## CONTENTS

		<b>Page</b>
1	Introduction.....	1
2	References.....	1
3	Effects of level control.....	2
4	Automatic Level Control devices .....	2
4.1	Application guidelines .....	2
5	Insertion of ALC devices in a connection.....	3



## Recommendation G.136

### APPLICATION RULES FOR AUTOMATIC LEVEL CONTROL DEVICES

(Geneva, 1999)

#### 1 Introduction

This Recommendation applies only to network based Automatic Level Control (ALC) devices that are placed within networks. For the purposes of this Recommendation an ALC device is defined as any piece of signal processing equipment located in the digital transmission path which automatically adjusts the level of a signal towards a pre-determined value, or which modifies the frequency response or spectral content of the signal in such a way as to affect the overall level of the signal.

In a communication system one of the significant transmission parameters that can affect perceived quality is the overall loudness rating of the connection. This loudness level is controlled by the characteristics of the originating terminal, the loss of the network which is comprised of: accesses, switches, circuits, and the terminating terminal. The purpose of the audio path associated with the end-to-end connection is to facilitate the transfer of intelligence. Transfer of intelligence by communication involves not just the content of what is said but is affected by the ability of the speaker to rapidly change the volume of the speech, to convey emotion for example.

This Recommendation has been prepared to provide planning guidance for the placement of network based ALC devices that can arbitrarily change the signal level and bandwidth of a communication channel.

This Recommendation provides guidelines which, if followed, should ensure that network implemented with ALC devices will result in implementations that continue to be aligned with published ITU- T Recommendations.

#### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- ITU-T Recommendation G.101 (1996), *The transmission plan*.
- ITU-T Recommendation G.120 (1998), *Transmission characteristics of national networks*.
- ITU-T Recommendation G.121 (1993), *Loudness ratings (LRs) of national systems*.
- ITU-T Recommendation G.122 (1993), *Influence of national systems on stability and talker echo in international connections*.
- ITU-T Recommendation G.126 (1993), *Listener echo in telephone networks*.
- ITU-T Recommendation G.131 (1996), *Control of talker echo*.
- ITU-T Recommendation G.165 (1993), *Echo cancellers*.
- ITU-T Recommendation G.168 (1997), *Digital network echo cancellers*.
- ITU-T Recommendation G.169 (1999), *Automatic level control devices*.

- ITU-T Recommendation P.310 (1996), *Transmission characteristics for telephone band (300-3400 Hz) digital telephones.*
- ITU-T Recommendation P.340 (1996), *Transmission characteristics of hands-free telephones.*
- ITU-T Recommendation P.342 (1996), *Transmission characteristics for telephone band (300-3400 Hz) digital loudspeaking and hands-free telephony terminals.*

### **3 Effects of level control**

The design and implementation of the PSTN was shaped by international agreements which were formulated as ITU-T Recommendations relating to overall transmission performance and transmission planning guidance. In this regard the network related Recommendations, viz. G.101 – The transmission plan; G.121 – Loudness ratings (LRs) of national systems; G.120 – Transmission characteristics of national networks, and the terminal, viz. Recommendations P.310 – Transmission characteristics for telephone band (300-3400 Hz) digital telephones; P.340 – Transmission characteristics of hands-free telephones; P.342 – Transmission characteristics for telephone band (300-3400 Hz) digital loudspeaking and hands-free telephony terminals, have by default defined the range of acceptable end-to-end connection losses. The ITU-T has accepted the concept that customers may wish to modify the end-to-end connection loss and thus ITU-T Recommendations now make provision for the use of volume controls on terminal equipment, e.g. on telephone sets and automatic level control devices on audio conference bridges. Further, the placement of ALC devices should be consistent with the planning guidance provided in the following Recommendations, viz. G.122 – Influence of national systems on stability and talker echo in international connections, G.126 – Listener echo in telephone networks, G.131 – Control of talker echo, and G.175 – Transmission planning for private/public network interconnection of voice traffic.

It is recognized that the use of ALC devices can change the real time dynamics of a conversation and as a result, the transmission impairments that result from ALC devices must be controlled. Further, it is recognized that unless the placement of ALC devices within networks is performed in an orderly fashion, the integrity of the networks can be compromised. The following guidelines present a set of rules which if followed should result in acceptable network implementations.

### **4 Automatic Level Control devices**

Specific guidelines for deployment of ALCs may vary between national networks and even between networks within the same country. These guidelines are usually established in consideration of performance and customer expectations, competitive pressures, specific business goals, economic and technological constraints, etc. As a practical matter they must take into consideration the routing and the technology used to provide the connection.

#### **4.1 Application guidelines**

The following are a set of general application guidelines for Automatic Level Control devices which are compliant with Recommendation G.169. It is recognized that while there may be a need to develop application guidelines for ALC devices within national networks, that the generation of national guidelines is a national matter and thus is outside the scope of this Recommendation.

- 1) An ALC device should only be placed on connections which are equipped with active echo cancellers, e.g. echo cancellers which are compliant with Recommendation G.165 – Echo cancellers or G.168 – Digital network echo cancellers.



- 2) An ALC device should not be placed in the tail path of the echo canceller that is performing the echo control function for that connection. (When echo cancellers are tandemed only one of the echo cancellers is performing the echo cancelling functionality for that connection. The ALC device must not appear in the tail of the canceller that is performing the echo control function.)
- 3) ALC devices should never operate in tandem.
- 4) An ALC device should operate on signals received from other Administrations and should not modify a signal that is to be passed to another Administration, unless there is a bilateral agreement to do so.

## **5 Insertion of ALC devices in a connection**

An ALC device is a particular type of device that incorporates a speech processing function that acts upon a unidirectional speech signal. Thus, it is expected that ALC devices placed within the network will operate at a 4-wire point in the connection. This Recommendation is not intended to preclude any implementation scheme and recognizes that there may be implementation benefits if the ALC functionality is integrated into a device which also performs other speech processing functions, e.g. an echo canceller function.



## ITU-T RECOMMENDATIONS SERIES

- Series A Organization of the work of the ITU-T
- Series B Means of expression: definitions, symbols, classification
- Series C General telecommunication statistics
- Series D General tariff principles
- Series E Overall network operation, telephone service, service operation and human factors
- Series F Non-telephone telecommunication services
- Series G Transmission systems and media, digital systems and networks**
- Series H Audiovisual and multimedia systems
- Series I Integrated services digital network
- Series J Transmission of television, sound programme and other multimedia signals
- Series K Protection against interference
- Series L Construction, installation and protection of cables and other elements of outside plant
- Series M TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
- Series N Maintenance: international sound programme and television transmission circuits
- Series O Specifications of measuring equipment
- Series P Telephone transmission quality, telephone installations, local line networks
- Series Q Switching and signalling
- Series R Telegraph transmission
- Series S Telegraph services terminal equipment
- Series T Terminals for telematic services
- Series U Telegraph switching
- Series V Data communication over the telephone network
- Series X Data networks and open system communications
- Series Y Global information infrastructure and Internet protocol aspects
- Series Z Languages and general software aspects for telecommunication systems