

INTERNATIONAL
STANDARD

ISO/IEC
10918-1

First edition
1994-02-15

**Information technology — Digital
compression and coding of continuous-tone
still images: Requirements and guidelines**

*Technologies de l'information — Compression numérique et codage des
images fixes de nature photographique: Prescriptions et lignes directrices*



Reference number
ISO/IEC 10918-1:1994(E)

Contents

	Page
1 Scope.....	1
2 Normative references.....	1
3 Definitions, abbreviations and symbols.....	1
4 General.....	12
5 Interchange format requirements.....	23
6 Encoder requirements.....	23
7 Decoder requirements.....	23

Annexes

A Mathematical definitions.....	24
B Compressed data formats.....	31
C Huffman table specification.....	50
D Arithmetic coding.....	54
E Encoder and decoder control procedures.....	77
F Sequential DCT-based mode operation.....	87
G Progressive DCT-based mode of operation.....	119
H Lossless mode of operation.....	132
J Hierarchical mode of operation.....	137
K Examples and guidelines.....	143
L Patents.....	179
M Bibliography.....	181

© ISO/IEC 1994

All rights reserved. Unless otherwise specified, 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 publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

International Standard ISO/IEC 10918-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with the CCITT. The identical text is published as CCITT Recommendation T.81.

ISO/IEC 10918 consists of the following parts, under the general title *Information technology — Digital compression and coding of continuous-tone still images*:

- *Part 1: Requirements and guidelines*
- *Part 2: Compliance testing*

Annexes A, B, C, D, E, F, G, H and J form an integral part of this part of ISO/IEC 10918. Annexes K, L and M are for information only.

Patents

During the preparation of this part of ISO/IEC 10918, information was gathered on patents upon which application of the standard might depend. Relevant patents were identified as belonging to the patent holders listed in annex L. However, ISO/IEC cannot give authoritative or comprehensive information about evidence, validity or scope of patent and like rights. The patent holders have stated that licences will be granted under reasonable terms. Communications on this subject should be addressed to the patent holders (see annex L).

Introduction

This part of ISO/IEC 10918 was prepared by CCITT Study Group VIII and the Joint Photographic Experts Group (JPEG) of ISO/IEC JTC 1/SC 29/WG 10. This Experts Group was formed in 1986 to establish a standard for the sequential progressive encoding of continuous-tone grayscale and colour images.

This part of ISO/IEC 10918 sets out requirements and implementation guidelines for continuous-tone still image encoding and decoding processes, and for the coded representation of compressed image data for interchange between applications. These processes and representations are intended to be generic, that is, to be applicable to a broad range of applications for colour and grayscale still images within communications and computer systems. ISO/IEC 10918-2 sets out tests for determining whether implementations comply with the requirements for the various encoding and decoding processes specified in this part of ISO/IEC 10918.

The requirements which these processes must satisfy to be useful for specific image communications applications such as facsimile, Videotex and audiographic conferencing are defined in CCITT Recommendation T.80. The intent is that the generic processes of Recommendation T.80 will be incorporated into the various CCITT Recommendations for terminal equipment for these applications.

In addition to the applications addressed by the CCITT and ISO/IEC, the JPEG committee has developed a compression standard to meet the needs of other applications as well, including desktop publishing, graphic arts, medical imaging and scientific imaging.

This Specification aims to follow the guidelines of CCITT and ISO/IEC JTC 1 on *Rules for presentation of CCITT / ISO/IEC common text*.

INTERNATIONAL STANDARD

CCITT RECOMMENDATION

INFORMATION TECHNOLOGY – DIGITAL COMPRESSION AND CODING OF CONTINUOUS-TONE STILL IMAGES – REQUIREMENTS AND GUIDELINES

1 Scope

This CCITT Recommendation | International Standard is applicable to continuous-tone – grayscale or colour – digital still image data. It is applicable to a wide range of applications which require use of compressed images. It is not applicable to bi-level image data.

This Specification

- specifies processes for converting source image data to compressed image data;
- specifies processes for converting compressed image data to reconstructed image data;
- gives guidance on how to implement these processes in practice;
- specifies coded representations for compressed image data.

NOTE – This Specification does not specify a complete coded image representation. Such representations may include certain parameters, such as aspect ratio, component sample registration, and colour space designation, which are application-dependent.

2 Normative references

The following CCITT Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this CCITT Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this CCITT Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The CCITT Secretariat maintains a list of currently valid CCITT Recommendations.

- CCITT Recommendation T.80 (1992), *Common components for image compression and communication – Basic principles*.

3 Definitions, abbreviations and symbols

3.1 Definitions and abbreviations

For the purposes of this Specification, the following definitions apply.

3.1.1 abbreviated format: A representation of compressed image data which is missing some or all of the table specifications required for decoding, or a representation of table-specification data without frame headers, scan headers, and entropy-coded segments.

3.1.2 AC coefficient: Any DCT coefficient for which the frequency is not zero in at least one dimension.

3.1.3 (adaptive) (binary) arithmetic decoding: An entropy decoding procedure which recovers the sequence of symbols from the sequence of bits produced by the arithmetic encoder.

3.1.4 (adaptive) (binary) arithmetic encoding: An entropy encoding procedure which codes by means of a recursive subdivision of the probability of the sequence of symbols coded up to that point.

3.1.5 application environment: The standards for data representation, communication, or storage which have been established for a particular application.