Australian Standard®

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS

PART 1— GENERAL CONSIDERATIONS— ELECTRICAL MEASUREMENTS OTHER THAN THOSE AT AUDIO-FREQUENCIES

This standard, prepared by Committee TE/14/3, Radio Reception, was approved on behalf of the Council of the Standards Association of Australia on 6 December 1978 and was published on 1 April 1979.

The following scientific, industrial, consumer and governmental organizations and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Broadcasting Commission
Australian Consumers Association
Confederation of Australian Industry
Electronics Importers Association
Federation of Australian Commercial Television Stations
Federation of Australian Radio Broadcasters
Postal and Telecommunications Department, Broadcasting Engineering Division
Telecom Australia

Review of Australian Standards. *To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.*

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

Australian Standard®

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS

PART 1— GENERAL CONSIDERATIONS— ELECTRICAL MEASUREMENTS OTHER THAN THOSE AT AUDIO-FREQUENCIES

First published (as AS 1173) 1971
Revised and issued as AS 1173, Part 1 1979

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 1622 4

PREFACE

This standard was prepared under the authority of the Association's Committee on Radio-communications. It is technically identical with and substantially reproduced from IEC 107-1:1977, and it supersedes AS 1173—1971, which was the endorsement of IEC 107-1960. Acknowledgment is made of the assistance received from the IEC publication. Changes introduced in this edition are of an editorial nature only.

The purpose of this Part of the standard is to standardize the conditions and methods of measurement to be used for television receivers in order to permit comparison of the results. The standard is therefore a collection of selected measurements currently recommended for assessing receiver characteristics thought to be essential in assessing performance of a given type of receiver on a comparative basis. Other Parts of IEC 107 now being prepared and which will be considered for adoption as Parts of this standard will cover audio-frequency measurements, colorimetric and photometric measurements, and additional measurements.

The standard is neither mandatory nor limiting in the sense that no limiting values for the various characteristics are specified as acceptable performance levels. The choice of measuring methods is permitted and if necessary additional measurements may be made to suit the particular requirements.

The methods of measurement given have been selected to apply particularly to both monochrome and colour receivers designed according to the systems described in the Recommendations and Reports of the International Radio Consultative Committee (CCIR). Due regard, however, must be given to the transmission standard for television broadcasting published by the Australian Postal and Telecommunications Department.

For a complete understanding of the requirements of this standard reference may be required to the following:

AS 1099	Basic Environmental Testing Procedures for Electronics and Telecommunications Purposes Part 1—General Part 2—Tests
AS 1173	Recommended Methods of Measurement on Receivers for Television Broadcasting Transmissions Part 2—Electrical Measurements at Radio Frequencies*
AS 1188	Rules for Safe Practice in the Operation and Maintenance of Electronic Equipment
AS 2176	Primary Batteries
AS 3159	Electronic Sound and Vision Equipment

* In course of preparation.

CONTENTS

		Page
SECTION 1.	INTRODUCTION AND EXPLANATION OF TERMS	
1.1	Object	4
1.2	Scope	4
1.3	Definitions	4
SECTION 2.	CONDITIONS FOR MEASUREMENT	
2.1	Introduction	8
2.2	Measuring Conditions	8
2.3	Accuracy of Measuring Instruments	8
2.4	Presentation of Results	8
2.5	Deviations	8
2.6	Environmental Conditions	8
2.7	Standard Reference Conditions	8
2.8	Standard Referee Conditions	9
2.9	Standard Testing Conditions	9
2.10	Other Environmental Conditions	9
SECTION 3.	PRECAUTIONS DURING MEASUREMENTS	
3.1	Damage to Equipment	10
3.2	Safety Arrangements	10
SECTION 4.	POWER SUPPLY	
4.1	Types of Power Supply and Relevant Measuring Conditions	11
4.2	Mains-operated Receivers, Normal Conditions	11
4.3	Mains-operated Receivers, Over-voltages and Undervoltages	11
4.4	Accumulator-operated Receivers, Normal Conditions	12
4.5	Accumulator-operated Receivers, Over-voltages and Undervoltages	12
4.6	Primary Battery-operated Receivers, Normal Conditions	12
4.7	Primary Battery-operated Receivers, Overvoltages and Undervoltages	12
4.8	Additional Information	12
4.9	Receivers Designed to Operate Over a Moderate Range of Voltages without Adjustment	13
4.10	Receivers Designed to Operate Over a Wide Range of Voltages without Adjustment	14
4.11	Power and Current Consumption of Receivers	14
4.12	Maximum Power and Current Consumption of Receivers	14

CONTENTS (*continued*)

Page

SECTION 5. RADIO-FREQUENCY INPUT

5.1 Input Signal 15
5.2 Matching Networks for Providing a Specified Source Impedance for the Receiver Requiring Such Impedances . . . 15
5.3 Combining Networks 15
5.4 Balanced Radio-frequency Input Circuit 16
5.5 Method of Measurement of the Unbalance Ratio 16
5.6 Input Arrangements for Built-in Aerials 17
5.7 R.F. Input Signal Levels 17
5.8 Input Signal Levels, Expressed in Terms of the Available Power 17

SECTION 6. TUNING, OPERATING FREQUENCY, STABILITY AND CONTROL

6.1 General Methods of Tuning 19
6.2 Frequency Limits of the Tuning Ranges 19
6.3 Tuning Sensitivity 19
6.4 Automatic Frequency Control 20
6.5 Operating Frequency and Its Stability . . . 21
6.6 General Mechanical Properties of Tuning Systems 23
6.7 Performance Characteristics of Pre-settable Tuning Systems 24

SECTION 7. GEOMETRICAL PROPERTIES OF THE PICTURE

7.1 Picture Size 27
7.2 Curvature of Picture Screen 27
7.3 Geometrical Distortion 27
7.4 Overall Geometrical Distortion, Alternative Method of Measurement 30
7.5 Convergence Errors 31
7.6 Over and Under-scanning and Centring . . 32

SECTION 8. SYNCHRONIZING QUALITY

8.1 Line Scan Phase Error Characteristic 33
8.2 Line Scan Phase Transfer Characteristic 33
8.3 Line Scan Synchronizing Range 34
8.4 Pulling on Whites 34
8.5 Pulling on Vertical Synchronizing Pulses 34
8.6 Ragging 34
8.7 Weave and Ripple 35
8.8 Horizontal Scan Phasing 35
8.9 Quality of Interlace 35
8.10 Jumping 35
8.11 Scan Generator Frequency Variation with Time 35
8.12 Effects of Scanning Circuits upon Colour Signal Decoding 36

SECTION 9. SENSITIVITY

9.1 General Considerations 37
9.2 Standard Image and Standard Video Output Voltage 37
9.3 Gain Limited Sensitivity 37
9.4 Noise Limited Sensitivity 38
9.5 Synchronizing Sensitivity 39
9.6 Colour Sensitivity 39
9.7 Coefficient of Reflection at the Receiver input 39
9.8 Automatic Gain Control Static Characteristics 40
9.9 Automatic Gain Control Dynamic Characteristics 41
9.10 Chrominance Automatic Gain Control Characteristic 42
9.11 Composite Luminance and Chrominance Automatic Gain Control Dynamic Characteristics 43
9.12 Colour Killing 44
9.13 Colour Killer Response Time 44
9.14 Maximum Usable Single Input Signal Level 45
9.15 Maximum Usable Multiple Input Signal Level 45

SECTION 10. SELECTIVITY AND RESPONSE TO UNDESIRED SIGNALS

10.1 Single Signal Selectivity 47
10.2 Multiple Signal Selectivity 49
10.3 Intermediate Frequency Interference Ratio 50
10.4 Image Interference Ratio 50
10.5 Spurious Responses 50
10.6 Internally Generated Undesired Signals . . 51
10.7 Cross-modulation 52
10.8 Intermodulation 53
10.9 Frequency Doubling Spurious Test for Receivers using Multiplicative Intermediate Frequency Demodulation 54

SECTION 11. FIDELITY

11.1 General 56
11.2 Modulation-frequency/Response Characteristic Luminance Channel 56
11.3 Linear Waveform Response, Luminance Channel 57
11.4 Modulation-frequency/Response Characteristic, Chrominance Channel 60
11.5 Linear Waveform Response, Chrominance Channel 61
11.6 Black Level and its Stability 63
11.7 D.C. Component Distortion, Luminance Channel 66
11.8 D.C. Component Distortion, Colour Difference Signals 66
11.9 D.C. Component Distortion, Primary Colour Signals 67
11.10 Errors of Chrominance Signal Demodulation Angle—NTSC System . . . 68
11.11 Errors of Chrominance Signal Demodulation Angle—PAL System 69
11.12 Effects of Phase Distortion on Incoming Signal for Small Picture Areas—PAL System 70
11.13 Luminance/Chrominance Delay Inequality 71
11.14 G-Y Signal Matrixing Error 72
11.15 Primary Colour Signal Matrixing Error . . 73
11.16 Spurious Line Sequential Effects 74
11.17 Line Time Non-linearity, Luminance Signal 75
11.18 Line Time Non-linearity Colour Difference Signals 75
11.19 Line Time Non-linearity Primary Colour Signals 76

SECTION 12. COMPATIBILITY WITH AUDIO VISUAL RECORDING EQUIPMENT

12.1 Flagging 77
12.2 Horizontal Weave 77

FIGURES 1 to 46 79

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS

Part 1—General Considerations—Electrical Measurements Other than those at Audio-frequencies

SECTION 1. INTRODUCTION AND EXPLANATION OF TERMS

1.1 Object

The object of this standard is to standardize the conditions and methods for the measurements to be used for the study of a receiver for television broadcasting so as to make possible the comparison of the results of measurements. Specifying limiting values of the various quantities for acceptable performance is not an object of this standard.

The standard constitutes a catalogue of selected measurements recommended for assessing the essential properties of receivers of a given type. It is neither mandatory nor limiting; a choice of measurements can be made in each particular case and, if necessary, additional measurements may be carried out.

The recommended methods are designed to make possible the assessment of the performance of the complete receiver, without going into more than a minimum of detail and without giving its components separate consideration.

It should be realized that the measurements proposed are subject to future improvements as methods are refined and with the development of receiver techniques.

1.2 Scope

The methods of measuring the electrical, acoustic and optical properties described in this standard apply more particularly to broadcast television receivers designed for monochrome and colour vision reception with accompanying sound of the systems of the CCIR* recommendations and reports, due regard being given to national transmission standards.

1.3 Definitions

The following general definitions apply for the purpose of this standard.

1.3.1 *Voltage* and *current* mostly imply in television technique "peak-to-peak" values; this is indicated by p-p. Without such indication, voltage and current imply r.m.s. values unless otherwise specified. A fully modulated radio-frequency signal is a radio-frequency signal modulated to white level in accordance with the standard of the television system used. By convention, the signal strength is considered to be equal to the r.m.s. value of an unmodulated radio-frequency signal having the same peak amplitude as the modulated signal has at the peak of modulation. This corresponds to white level for systems using positive modulation and synchronizing level for systems using negative modulation as shown in Figures 1a and 1b.

Notes 1.— Greater modulation depths can occur with colour signals, see Clauses 1.3.2 and 1.3.3.

2.— The true r.m.s. value of a modulated signal will be different from this value, the magnitude of the difference depending on the depth of modulation and its waveform. In the tests in which a sine-wave modulated carrier can be used, the factor for conversion to peak values is given in the appropriate figures.

* CCIR: International Radio Consultative Committee.