FEDERAL AVIATION AGENCY
FLIGHT STANDARDS SERVICE
Washington 25, D. C.

June 19, 1962

REGULATIONS OF THE ADMINISTRATOR DRAFT RELEASE NO. 62-29

SUBJECT: Revision to Technical Standard Order C35b "Radio Marker Receiving Equipment Operating on 75 mc. (For Air Carrier Aircraft)"

The Flight Standards Service of the Federal Aviation Agency has under consideration an amendment to Part 514 of the Regulations of the Administrator to revise Technical Standard Order C35b "Radio Marker Receiving Equipment Operating on 75 mc. (For Air Carrier Aircraft". The reasons therefor are set forth in the explanatory statement of the attached proposal which is being published in the Federal Register as a notice of proposed rule making.

The Flight Standards Service desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments should be submitted, preferably in duplicate, to the Docket Section of the Federal Aviation Agency, and in order to insure consideration must be received on or before August 13, 1962.

George C. Pratt

Director
Flight Standards Service

FEDERAL AVIATION AGENCY

FLIGHT STANDARDS SERVICE

(14 CFR 514)

[Regulatory Docket No. 1259 ; Draft Release No. 62-29]

TECHNICAL STANDARD ORDERS FOR AIRCRAFT MATERIALS PARTS, PROCESSES AND APPLIANCES

NOTICE OF PROPOSED RULE MAKING

Pursuant to the authority delegated to me by the Administrator (14 CFR Part 405) notice is hereby given that the Federal Aviation Agency has under consideration a proposal to revise Section 514.37 of Part 514 of the Regulations of the Administrator (14 CFR Part 514) by adding a new technical standard order. This Technical Standard Order establishes minimum performance standards for airborne radio marker receiving equipment operating on 75 mc. to be used on civil aircraft of the United States engaged in air carrier operations.

The amendment is proposed to incorporate new environmental test procedures which were developed to be more compatible with existing and anticipated aircraft environmental conditions. These are in a new FAA standard replacing RTCA Paper 87-54/DO-57 referenced in TSO-C35b (§ 514.37). A change to the emission of spurious radio frequency requirement is the only change to the minimum performance standards. Otherwise the FAA standard is similar to RTCA Paper 87-54/DO-57.

Interested persons may participate in the making of the proposed rule by submitting such written data, views or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room C-226, 1711 New York Avenue, N. W., Washington 25, D. C. All communications received on or before August 13, 1962, will be considered by the Administrator before taking action on the proposed rule. The proposals contained in this notice may be changed in light of the comments received. All comments submitted will be available in the Docket Section for examination by interested persons at any time.

This amendment is proposed under the authority of Sections 313(a) and 601 of the Federal Aviation Act of 1958 (72 Stat. 752, 775; 49 U.S.C. 1354(a), 1421).

In consideration of the foregoing it is proposed to amend Part 514 as follows:

By revising section 514.37 to read as follows:

§ 514.37 Radio marker receiving equipment operating on 75 mc. (for air carrier aircraft) - TSO-C35c--(a) Applicability - (1) Minimum performance standards. Minimum performance standards are hereby established for airborne radio marker receiving equipment operating on 75 mc. which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne radio marker receiving equipment operating on 75 mc. manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the minimum performance standards contained in Federal Aviation Agency Standard entitled "Minimum Performance Standards for Airborne Radio Marker Receiving Equipment Operating on 75 mc.",[1/] dated April 6, 1962, and Radio Technical Commission for Aeronautics Paper 120-61/DO-108[2/] entitled, "Environmental Test Procedures Airborne Electronic Equipment", dated July 13, 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) Exception. Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order.

(i) Temperature-Altitude Test - Categories A, B, C, or D.

(ii) Humidity Test - Categories A or B.

(iii) Vibration Test - Categories A, B, C, D, E, or F.

1/Copies may be obtained upon request addressed to Publishing and Graphics Branch Inquiry Section, MS-158, Federal Aviation Agency, Washington 25, D.C.

2/Copies of this paper may be obtained from the RTCA Secretariat, Room 1072, T-5 Building, 16th & Constitution Avenue, N.W., Washington 25, D.C., at a cost of 75 cents per copy.

(iv) Audio-Frequency Magnetic Field Susceptibility Test - Categories A or B.

(v) Radio-Frequency Susceptibility Test - Category A.

(vi) Emission of Spurious Radio-Frequency Energy Test - Category A.

(b) Marking. (1) In addition to the markings specified in § 514.3 (d), the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These should be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. Reading from left to right, the category designations shall appear on the nameplate in the following order so that they may be readily identified:

(i) Temperature-Altitude Test Category.

(ii) Humidity Test Category.

(iii) Vibration Test Category.

(iv) Audio-Frequency Magnetic Field Susceptibility Test Category.

(v) Radio-Frequency Susceptibility Test Category.

(vi) Emission of Spurious Radio-Frequency Energy Test Category.

(vii) Explosion Test.

(2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identification would be as follows: Env. Cat. DABAAAX.

(3) In some cases such as under the Temperature-Altitude Test Category, a manufacturer may wish to substantiate his equipment under two categories. In this case, the nameplate shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner: Env. Cat. $\frac{A}{D}$ABAAAX.

(4) Each major component of equipment (antenna, power supply, etc.) shall be identified with at least the manufacturers' name, TSO number, and the environmental categories over which the equipment component is designed to operate.

(c) Data requirements. Six copies each of the following, except where noted, together with the statement of conformance shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(1) Manufacturer's operating instructions and equipment limitations.

(2) Installation procedures with applicable schematic drawings, wiring diagrams, and specifications. Indicate any limitations, restrictions, or other conditions pertinent to installation.

(3) One copy of the manufacturer's test report.

George C. Prill

Director
Flight Standards Service

Issued in Washington, D. C., on June 19, 1962.

FEDERAL AVIATION AGENCY

WASHINGTON, D.C.

MINIMUM PERFORMANCE STANDARDS FOR AIRBORNE RADIO MARKER RECEIVING EQUIPMENT OPERATING ON 75 MC.

APRIL 6, 1962

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INTRODUCTION

This document sets forth minimum performance standards for airborne radio marker receiving equipment operating on 75 mc.

Compliance with these standards by manufacturers and users is required as a means of assuring that the equipment will satisfactorily perform its intended function.

Inasmuch as the measured values of radio equipment performance characteristics may be a function of the method of measurement, standard test conditions and methods of test are also included in this document.

The word "equipment" as used herein includes all of the components or units necessary (as determined by the equipment manufacturer) for the equipment to perform properly its intended function. For example, an airborne radio marker receiving "equipment" may include an antenna, a receiver unit, a control box, a power supply, a shock mount, etc. In the case of this example, all of the foregoing components or units comprise the "equipment". It should not be inferred from this example, however, that every airborne radio marker receiving equipment will necessarily include all of the foregoing components. This will depend on the design used by the equipment manufacturer.

MINIMUM PERFORMANCE STANDARDS FOR AIRBORNE RADIO MARKER RECEIVING EQUIPMENT OPERATING ON 75 MC.

1.0 GENERAL STANDARDS

1.1 Rating of Components

The equipment shall not incorporate in its design any components of such rating that, when the equipment is operated throughout the range of the specified environmental tests, the rating established by the manufacturer of the component is exceeded. For electron tubes, the continuous commercial service rating of the tube manufacturer is applicable except for the heaters and filaments. The voltage applied to the heaters and filaments of electron tubes shall be within 5% of the manufacturer's rating when the equipment is operated under standard operating conditions. When the heaters and filaments are connected in series, the 5% tolerance shall apply to the sum of their voltage ratings.

1.2 Operation of Controls

The design of the equipment shall be such that the controls intended for use during flight cannot be operated in any possible position combination of sequence which would result in a condition whose presence or continuation would be detrimental to the reliability of the equipment.

1.3 Effects of Test

Unless otherwise provided, the design of the equipment shall be such that, subsequent to the application of the specified tests, no discernible condition exists which would be detrimental to the continued performance of the equipment.

1.4 RF Gain Control

Means shall be provided for so fixing the adjustment of receiver sensitivity that, when flying over a Z marker at 1000 feet above ground at 120 mph ground speed, a light "on" time between 12 and 15 seconds is obtained. The fixed sensitivity adjustment control shall not be readily variable by flight personnel. When the equipment is designed for in-flight control of receiver sensitivity, the in-flight controls shall not be capable of adjusting the receiver sensitivity below the fixed setting level.

1.5 Lamp Actuation (Single Lamp)

In the case of equipment designed to operate a single lamp, the lamp shall be actuated by each of the three modulation frequencies.

1.6 Lamp Actuation (Three Lamps)

In the case of equipment designed to operate a separate lamp for each of the three modulation frequencies, the 400 cps tone shall actuate the blue light, the 1300 cps tone the amber light, and the 3000 cps tone the white light.

2.0 MINIMUM PERFORMANCE STANDARDS UNDER STANDARD TEST CONDITIONS

The test procedures, applicable to a determination of the performance of airborne 75 Mc radio marker receiving equipment under standard test conditions, are set forth in Appendix "A" of this report.

2.1 Audio Frequency Response

The total spread in audio output of the receiver shall not exceed 9 db when the frequency of the modulation on the input signal is varied over the combined ranges of 380 to 420 cps, 1235 to 1365 cps, and 2850 to 3150 cps. The rf level of the input signal shall be ten times that producing lamp operate threshold at 1300 cps.

2.2 Lamp Frequency Response

The variation in rf input level required to produce lamp operate threshold shall not exceed 9 db when the frequency of the modulation on the input signal is varied over the combined ranges of 380 to 420 cps, 1235 to 1365 cps, and 2850 to 3150 cps.

2.3 Audio Level Characteristic

The receiver audio output at each of the modulation frequencies of 400, 1300, and 3000 cps shall not vary more than 10 db when the level of the rf input signal is varied over the range from that producing lamp operate threshold to 200,000 μv.

2.4 Rated Audio Power Output

The audio output power of the receiver shall be not less than the rated output when an rf signal having a level ten times that producing lamp operate threshold at 1300 cps is applied to the receiver input.

2.5 Audio Noise Level—Without Signal

a. The level of the noise output of the receiver, in the absence of an rf input signal, shall be at least 35 db below the output obtained with an rf input signal having a level ten times that producing lamp operate threshold.

b. The level of the output at discrete audio frequencies, in the absence of an rf input signal, shall be at least 40 db below the output obtained with an rf input signal having a level ten times that producing lamp operate threshold. Equipment designed for an AC power source shall meet this requirement at all power frequencies within the range for which the equipment is designed.

2.6 Audio Noise Level—With Signal

a. The receiver output signal plus noise-to-noise ratio shall be at least 20 db over the range of rf input signal level from that producing lamp operate threshold to 200,000 μv.

b. The level of the receiver output at discrete audio frequencies shall be at least 30 db below the signal plus noise output over the range of rf input signal level from that producing lamp operate threshold to 200,000 μv. Equipment designed for an AC power source shall meet this requirement at all power frequencies within the range for which the equipment is designed.

2.7 Distortion

Over the range of rf signal input level from that producing lamp operate threshold to 200,000 μv, the combined noise and distortion in the equipment output shall not exceed 30% of the total output.

2.8 Output Regulation

With an output load of 200% of design impedance and with an output load of 50% of design impedance, the distortion in the output shall not exceed 30%, and the output voltage level shall be within 2:1 of the level when the load is that for which the receiver is designed.

2.9 Emission of Spurious Radio Frequency Energy

The levels of conducted and radiated spurious radio frequency energy emitted by the equipment shall not exceed those levels specified in Appendix A of RTCA Paper 120-61/DO-108—"Environmental Test Procedures—Airborne Electronic Equipment", dated July 13, 1961, for the aircraft category for which the equipment is designed.

2.10 Sensitivity Depression

a. The level of the rf input signal at 75 Mc, required to produce lamp operate threshold, shall not increase more than 4 db when there is added to the receiver input channels 4 and5 television signals having a level of 3.5 v.

b. The level of the rf input signal at 75 Mc, required to produce lamp operate threshold, shall not increase more than 4 db when there is added to the receiver input a .5 v rf signal frequency modulated 1300 cps at a deviation of $\pm$15 kc. This standard shall be met over the FM signal frequency ranges of 72.02–74.58 Mc and 75.42–75.98 Mc.

2.11 Input Operating Differential

The ratio of the rf input signal level required to produce lamp operate threshold when the rf input signal level is increasing to the rf input signal level required to produce lamp operate threshold when the rf input signal level is decreasing shall not exceed 2 : 1.

2.12 Voltage Standing Wave Ratio

When the receiver is designed for use with an antenna transmission line, the voltage standing wave ratio produced on the transmission line having a characteristic impedance for which the receiver input circuit is designed shall not exceed a value of 2 to 1 when the transmission line is connected to the receiver input and a 75 Mc signal is fed to the receiver through the transmission line.

2.13 Cross Modulation

a. The voltage across the indicator lamp(s) due to cross modulation shall not exceed the voltage at lamp operate threshold nor shall the audio output exceed one-half the manufacturer's rated output when there are applied simultaneously to the receiver input an unmodulated carrier at center response frequency having a level equal to that of a signal producing lamp operate threshold and a television signal having a level of 3.5 v. This standard shall be met at the television signal frequencies of channels 2 through 6.

b. The voltage across the indicator lamp(s) due to cross modulation shall not exceed the voltage at lamp operate threshold nor shall the audio output exceed one-half the manufacturer's rated output when there are applied simultaneously to the receiver input an unmodulated carrier at center response frequency having a level equal to that of a signal producing lamp operate threshold and a .5 v rf signal frequency modulated 1300 cps at a deviation of ±15 kc. This standard shall be met over the FM signal frequency ranges of 72.02–74.58 Mc and 75.42–75.98 Mc.

2.14 Spurious Response

a. The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of 0.5 v, amplitude modulated 30% in turn at 400, 1300, and 3000 cps, is varied over the frequency range of .190 Mc to 1500 Mc, excluding the band from 65 to 85 Mc.

b. The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of .5 v, frequency modulated in turn at 400, 1300, and 3000 cps at a deviation of ±15 kc, is varied over the frequency ranges of 72.02–74.58 Mc and 75.42–75.98 Mc.

c. The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of 3.5 v with television signal modulation is applied at television signal frequencies of channels 2 through 6.

2.15 Nose Bandwidth

The level of the input signal required to produce lamp operate threshold over the input signal frequency range of 75 Mc −10 kc to 75 Mc +10 kc shall not be more than 6 db above the input required to produce lamp operate threshold at the frequency of maximum response.

2.16 Lamp Operate Selectivity

In the case of equipment designed to operate a separate lamp for each of the three modulation frequencies of 400, 1300 and 3000 cps, the voltage across the two lamps not intended to be operated shall be less than 30% of rated lamp voltage over the input signal range from that producing lamp operate threshold to 200,000 μv.

2.17 Antenna Polarization

The antenna to be used on the aircraft shall be designed so as to produce, when installed according to the manufacturer's instructions, a maximum response from 75 Mc signals radiated from below the aircraft with the received electric field component parallel to the line of flight.

2.18 Lamp Actuation—Keying

The variation in intensity of the light from the lamps shall indicate the keying of the modulation of the input signal. The modulation of the input signal shall be keyed at the rate of six dots per second, and the modulation ON time to modulation OFF time ratio shall be 1 : 1.

3.0 MINIMUM PERFORMANCE STANDARDS UNDER ENVIRONMENTAL TEST CONDITIONS

Unless otherwise specified, the test procedures applicable to a determination of the performance of this equipment under environmental test conditions are set forth in RTCA Paper 120–61/DO–108 "Environmental Test Procedures — Airborne Electronic Equipment" dated July 13, 1961.

3.1 Temperature—Altitude Test

3.1.1 Low Temperature Test

When the equipment is subjected to this test:

a. The rf input required to produce lamp operate threshold shall be within 6 db of that required under standard operating conditions.

b. The audio output with an input signal having a level of ten times that producing lamp operate threshold shall be within 6 db of the output obtained under standard operating conditions.

3.1.2 High Temperature Test

a. When the equipment is operated at the High Short-Time Operating Temperature:

(1) All mechanical devices shall operate satisfactorily.

(2) There shall be no evidence of materials, such as grease or potting and sealing compounds, exuding or dripping from the equipment.

b. When the equipment is operated at the High Operating Temperature the audio output with an input signal having a level of ten times that producing lamp operate threshold shall be within 6 db of the output obtained under standard operating conditions.

3.1.3 Decompression Test (When Required)

When the equipment is subjected to this test the performance requirements of paragraphs 2.3 and 2.4 shall be met.

3.1.4 Altitude Test

When the equipment is subjected to the altitude test, the performance requirements of paragraphs 2.3 and 2.4 shall be met.

3.2 Humidity Test

a. After being subjected to humidity and within 15 minutes after primary power is applied, the lamp operate sensitivity shall be within 4:1 of that obtained under standard operating conditions. The audio output shall be within 6 db of that obtained under standard operating conditions when the rf signal input level in each case is ten times that producing lamp operate threshold under standard operating conditions.

b. Within four hours from the time primary power is applied, the lamp operate sensitivity shall be within 2 db of that obtained under standard operating conditions. The audio output shall be within 2 db of that obtained under standard operating conditions when the rf signal level in each case is ten times that producing lamp operate threshold under standard operating conditions.

3.3 Shock Test

a. Following the application of the Operational Shocks, the lamp operate sensitivity shall be within 2 db of that obtained under standard operating conditions. The audio output shall be within 2 db of that obtained

under standard operating conditions when the rf signal level in each case is ten times that producing lamp operate threshold under standard operating conditions.

b. Following the application of the Crash Safety Shocks, the equipment under test shall have remained in its mounting, and no parts of the equipment or its mounting shall have become detached and free of the equipment. Paragraph 1.3 does not apply.[1]

3.4 Vibration Test

When subjected to this test, the standards of paragraphs 2.5(*a*) and 2.6(*a*) shall be met. The level of the input signal required to produce lamp operate threshold shall be within 2 db of that required under standard operating conditions.

3.5 Temperature Variation Test

When the equipment is subjected to this test, the standards of paragraph 2.15 shall be met.

3.6 Low Voltage Test

a. When the primary power voltage(s) of DC operated equipment is 80% and when that of AC operated equipment is 87½% of standard test voltage(s), the equipment shall start and continue to operate electrically and mechanically. Degradation of performance is tolerable.

b. DC operated equipment shall operate satisfactorily within two (2) minutes upon returning the primary power voltage(s) to normal after the gradual reduction of the primary power voltage(s) from 80% to 50% of standard test voltage(s).

c. The gradual reduction of the primary power voltage(s) of DC operated equipment from 50% to 0% of standard test voltage(s) shall produce no evidence of the presence of fire or smoke.[2]

3.7 Conducted Voltage Transient Test

a. Following the Intermittent Transient Test, the performance requirements of paragraph 2.4 shall be met.

b. During the Repetitive Transients Tests, the performance requirements of paragraphs 2.5 and 2.6 shall be met.

3.8 Conducted Audio-Frequency Susceptibility Test

When the equipment is subjected to this test, the performance requirements of paragraphs 2.5 and 2.6 shall be met.

3.9 Audio-Frequency Magnetic Field Susceptibility Test

When the equipment is subjected to this test, the performance standards of paragraphs 2.5 and 2.6 shall be met.

3.10 Radio-Frequency Susceptibility Test (Radiated and Conducted)

When the equipment is subjected to this test, the performance requirements of paragraphs 2.4 and 2.7 shall be met, excepting within the band of ±100 kc of 75 Mc.

3.11 Explosion Test (When Required)

During the application of this test, the equipment shall not cause detonation of the explosive mixture within the test chamber.

[1] The application of this test and that required by paragraph 3.6(*c*) may result in damage to the equipment under test. Therefore, they may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

[2] The application of this test and that required by paragraph 3.3(*b*) may result in damage to the equipment under test. Therefore, they may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

APPENDIX A

TEST PROCEDURES
AIRBORNE RADIO MARKER RECEIVING EQUIPMENT OPERATING ON 75 MC.

NOTE

THE TEST PROCEDURES SET FORTH IN PART II OF THIS APPENDIX ARE SATISFACTORY FOR USE IN DETERMINING THE PERFORMANCE OF AIRBORNE RADIO MARKER RECEIVING EQUIPMENT OPERATING ON 75 MC. *TEST PROCEDURES WHICH PROVIDE EQUIVALENT INFORMATION MAY BE USED.*

PART I

DEFINITIONS OF TERMS AND CONDITIONS OF TEST

The following definitions of terms and conditions of test are applicable to the equipment tests specified herein:

a. Power Input Voltage—Direct Current

Unless otherwise specified, when the receiver is designed for operation from a direct current power source, all measurements shall be conducted with the power input voltage adjusted to 13.75 v, ±2% for 12–14 v equipment, or to 27.5 v, ±2% for 24–28 v equipment. The input voltage shall be measured at the receiver power input terminals.

b. Power Input Voltage—Alternating Current

Unless otherwise specified, when the receiver is designed for operation from an alternating current power source, all tests shall be conducted with the power input voltage adjusted to design voltage ±2%. In the case of receivers designed for operation from a power source of essentially constant frequency (e.g, 400 cps), the input frequency shall be adjusted to design frequency ±2%. In the case of receivers designed for operation from a power source of variable frequency (e.g., 350 to 1000 cps), tests shall be conducted with the input frequency adjusted to within 5% of a selected frequency within the range for which the equipment is designed.

c. Adjustment of Equipment

The circuits of the receiver shall be properly aligned and otherwise adjusted in accordance with the manufacturer's recommended practices prior to the application of the specified tests.

d. Test Instrument Precautions

Due precautions shall be taken to prevent the introduction of errors resulting from the connection of headphones, voltmeters, oscilloscopes, and other test instruments across the input and output impedances of the receiver during the conduct of the tests.

e. Ambient Conditions

Unless otherwise specified, all tests shall be conducted under conditions of ambient room temperature, pressure, and humidity. However, the room temperature shall not be lower than 10° C.

f. Warm-up Period

Unless otherwise specified, all tests shall be conducted after a warm-up period of not less than fifteen (15) minutes.

g. Connected Loads

Unless otherwise specified, all tests shall be performed with the receiver outputs connected to loads having the impedance value for which the receiver is designed.

h. RF Input Voltage

The "rf input voltage" is defined as the "open circuit" voltage of the circuit connected to the receiver input. The circuit connected to the receiver input shall be the equivalent of the rf input voltage in series with an impedance having a resistance within 10% and a reactance of not more than 10% of the characteristic impedance of the transmission line for which the receiver is designed.

NOTE: The rf input voltages specified herein are for the case of a receiver designed for a transmission line having a nominal characteristic impedance of 52 ohms. In the case of a receiver designed for a transmission line having a nominal characteristic impedance of other than 52 ohms, the rf input voltage values shall be computed according to the following equation:

$$E_2 = \sqrt{E_1^2 \frac{R_2}{52}}$$

Where E_2 is the rf input voltage to be used in the case of a receiver designed for a transmission line having a nominal characteristic impedance other than 52 ohms—

E_1 is the rf input voltage specified herein—

R_2 is the nominal characteristic impedance of the transmission line for which the receiver is designed.

i. **Test Signal Modulation**

Unless otherwise specified, the rf input signal shall be a 75 Mc ±.005% signal amplitude modulated 95% successively at 400 ±1% cps, 1300 ±1% cps, and 3000 ±1% cps.

j. **Lamp Operate Threshold**

The term "lamp operate threshold", as used herein, is defined as that condition wherein an increase of 5% or less in rf input signal voltage results in lighting of the indicator lamp. In the case of receivers in which the voltage across the indicator lamp(s) varies with the signal input, the lamp(s) is considered lit when the voltage appearing across the lamp terminals is one-half or more of its average rated voltage.

k. **Receiver Sensitivity Setting**

Unless otherwise specified, the receiver gain shall be adjusted to produce lamp operate threshold with an rf input signal level of 2000 μv.

PART II

DETAILED TEST PROCEDURES

T–1 AUDIO FREQUENCY RESPONSE

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

AF Signal Generator (Hewlett Packard Model 200B or equivalent).

Audio Output Meter (General Radio Model 583A or equivalent).

Voltmeter of suitable impedance and range (if required) for determining lamp operate threshold.

Measurement Procedure

Apply to the receiver input an rf signal having a level ten times that producing lamp operate threshold at 1300 cps and measure the audio output over the input signal modulation frequency ranges of 380–420 cps, 1235–1365 cps, and 2850-3150 cps.

T–2 LAMP FREQUENCY RESPONSE

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

AF Signal Generator (Hewlett Packard Model 200B or equivalent).

Voltmeter, if required, of suitable impedance and range for determining lamp operate threshold.

Measurement Procedure

Apply to the receiver input an rf signal amplitude modulated 95% at each of the following frequencies: 380, 400, 420, 1235, 1300, 1365, 2850, 3000, and 3150 cps. For each modulation frequency, determine the level of the input signal required to produce lamp operate threshold. Compute the difference in db between the maximum and minimum input signal levels.

T–3 AUDIO LEVEL CHARACTERISTIC

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

AF Signal Generator (Hewlett Packard Model 200B or equivalent).

Audio Output Meter (General Radio Model 583A or equivalent).

Voltmeter of suitable impedance and range (if required) for determining lamp operate threshold.

Measurement Procedure

Apply an rf signal to the receiver input and measure the audio output at each of the modulation frequencies of 400, 1300, and 3000 cps over the rf signal input level range from that producing lamp operate threshold to 200,000 μv. Determine the difference in db between the maximum and minimum output levels.

T–4 RATED AUDIO POWER OUTPUT

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

AF Signal Generator (Hewlett Packard Model 200B or equivalent).

Audio Output Meter (General Radio Model 583A or equivalent).

Voltmeter of suitable impedance and range, if required, for determining lamp operate threshold.

Measurement Procedure

Apply to the receiver input an rf signal having a level ten times that producing lamp operate threshold at 1300 cps. Determine the audio power output at the modulation frequencies of 400, 1300, and 3000 cps.

AUDIO NOISE LEVEL—WITHOUT SIGNAL

Equipment Required

Resistance having a value equal to the impedance for which the receiver output is designed.

Vacuum Tube Voltmeter (Ballantine Model 300 or equivalent).

Wave Analyzer (General Radio Model 736A or equivalent).

Measurement Procedure

Connect to the receiver input an impedance equal to that for which the receiver is designed. Measure (a) the wide band audio noise output and (b) the output at discrete frequencies over the range of 50 to 10,000 cps.

In the case of receivers designed for an AC power source, determine the maximum audio output over the range of input power frequency for which the equipment is designed.

AUDIO NOISE LEVEL—WITH SIGNAL

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Audio Output Meter (General Radio Model 583A or equivalent).

Wave Analyzer (General Radio Model 736A or equivalent).

Measurement Procedure

Apply to the receiver input an rf signal.

a. Determine the minimum signal plus noise-to-noise ratio over the range of input signal level from that producing lamp operate threshold to 200,000 μv.

b. Remove the modulation from the input signal and determine the maximum output at discrete frequencies over the range of 50 to 10,000 cps when the input signal level is varied over the range from that producing lamp operate threshold to 200,000 μv.

In the case of receivers designed for an AC power source, make the above determinations over the combined ranges of signal input level from that producing lamp operate threshold to 200,000 μv and input power frequency for which the receiver is designed.

T–7 DISTORTION

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Distortion and Noise Meter (RCA 69B or equivalent).

Measurement Procedure

Apply to the receiver input an rf signal. Determine the maximum percentage of distortion plus noise at 400, 1300, and 3000 cps at an input signal level producing lamp operate threshold at 1300 cps and at an input signal level ten times that producing lamp operate threshold at 1300 cps.

T–8 OUTPUT REGULATION

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Distortion and Noise Meter (RCA Model 69B or equivalent).

Output load resistors having values equal to 50%, 100%, and 200% of the output load impedance for which the receiver is designed.

Measurement Procedure

Apply to the receiver input an rf signal having a level ten times that producing lamp operate threshold at 1300 cps. Determine, at the modulation frequencies of 400, 1300, and 3000 cps, the percentage of distortion plus noise in the audio output and the audio output voltage level with output loads equal to 50%, 100%, and 200% of that for which the receiver is designed.

T–9 EMISSION OF SPURIOUS RADIO FREQUENCY ENERGY

Equipment Required

See Paragraphs 1 and 2, Page 3 of Appendix A of Paper 120–61/DO–108.

Measurement Procedure

See Paragraph 3, Page 5 of Appendix A.

T–10 SENSITIVITY DEPRESSION

Equipment Required

A Combining Unit as shown in Figure 1.

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Frequency modulated signal generator.

Television signal amplifier capable of boosting the level of a TV signal to at least 3.5 v peak. The frequency response characteristic of the amplifier shall be within 3 db over the frequency range from −.5 Mc to +4 Mc of the video carrier frequency. For the purpose of this test, a signal simulating that of a TV signal may be used. Such simulated TV signal shall be a 3.5 v peak rf signal pulse modulated at a rate of 60 pps. The pulse duration shall be 800 to 1000 μs, and the rise and decay time shall not exceed .08 μs.

Measurement Procedure

Connect the two signal generators (or the amplitude modulated signal generator and the television signal amplifier) as shown in Figure 1.

Apply a 75 Mc desired signal modulated 1300 cps. Adjust the signal input level to produce lamp operate threshold.

Apply, successively, a television signal having a level of 3.5 v and an FM signal modulated 1300 cps at a deviation of ±15 kc and having a level of .5 v and determine the db increase in level of the desired signal required to produce lamp operate threshold. Conduct this test at television channel frequencies 4 and 5 in the case of the television signal and at 74.6 Mc and 75.4 Mc in the case of the FM modulated signal.

T–11 INPUT OPERATING DIFFERENTIAL

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Measurement Procedure

Apply to the receiver input an rf signal. Determine the ratio in db of the rf input signal level required to produce lamp operate threshold when the input signal level is slowly increasing to the rf input signal level required to produce lamp operate threshold when the input signal level is slowly decreasing.

T–12 VOLTAGE STANDING WAVE RATIO

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

Slotted line or impedance bridge.

Measurement Procedure

a. When the slotted line is used:

Connect the slotted line between the receiver input and the signal generator. Turn the receiver on and operate it normally. Set the level of the input signal below the level which overloads the receiver input circuit. Measure the maximum and minimum voltages along the slotted line and calculate the VSWR *using the following* equation:

$$\text{VSWR} = \frac{\text{Maximum voltage along the slotted line}}{\text{Minimum voltage along the slotted line}}$$

b. When the impedance bridge is used, measure the impedance of the input circuit and compute the VSWR.

T–13 CROSS MODULATION

Equipment Required

AM Signal Generator (Hewlett Packard Model 608B or equivalent).

FM signal generator.

Television signal amplifier capable of boosting the level of a TV signal to at least 3.5 v peak. The frequency response characteristic of the amplifier shall be within 3 db over the range from −.5 Mc to +4 Mc of the video carrier frequency. For the purpose of this test, a simulated TV signal may be used. Such simulated TV signal shall be an rf signal pulse modulated at a rate of 60 pps. The pulse duration shall be 800 to 1000 μs, and the rise and decay time shall not exceed .08 μs.

A Combining Unit as shown in Figure 1.

Audio Output Meter (General Radio Model 583A or equivalent).

Measurement Procedure

Connect the two signal generators together by means of the "Combining Unit" as shown in Figure 1.

Apply to the receiver input a 75 Mc desired signal modulated 1300 cps. Adjust the signal input level to produce lamp operate threshold. Remove the modulation from the desired carrier.

Apply, successively, a television signal having a level of 3.5 v and an FM signal modulated 1300 cps at a deviation of ±15 kc and having a level of .5 v and determine whether the lamp voltage exceeds lamp operate threshold voltage and whether the audio output exceeds one-half the manufacturer's rated output. Conduct this test at television channel frequencies 2 through 6 in the case of the television signal and over the ranges of 72.02–74.58 Mc and 75.42–75.93 Mc in the case of the FM signal.

NOTE: At each setting, determine whether the output is due to cross modulation or to direct demodulation of the undesired signal. Make this determination by turning off the desired carrier and noting audio output. If the output drops, cross modulation has been encountered, and the data should be recorded. If the output does not drop, the undesired signal is at a spurious response frequency, and the data should not be recorded.

SPURIOUS RESPONSE

Equipment Required

AM signal generators to cover the band from .190 Mc to 1500 Mc.

Audio Output Meter (General Radio Model 583A or equivalent).

Voltmeter, if required, of suitable impedance and range for determining lamp operate threshold.

FM signal generator.

Television signal amplifier capable of boosting the level of a TV signal to at least 3.5 v peak. The frequency response characteristic of the amplifier shall be within 3 db over the range from −.5 Mc to +4 Mc of the video carrier frequency. For the purpose of this test, a simulated TV signal may be used. Such simulated TV signal shall be an rf signal pulse modulated at a rate of 60 pps. The pulse duration shall be 800 to 1000 μs, and the rise and decay time shall not exceed .08 μs.

Measurement Procedure

Determine whether the voltage across the indicator lamp(s) exceeds lamp operate threshold or the audio output exceeds one-half rated output when:

a. The rf input signal has a level of .5 v is amplitude modulated 30% successively at 400, 1300, and 3000 cps, and its radio-frequency is varied over the range from .190 Mc to 1500 Mc, excluding the band 65 Mc to 85 Mc.

b. The rf input signal is a television signal having a level of 3.5 v and frequencies of television channels 2 through 6.

c. The rf input signal has a level of .5 v, is frequency modulated successively at 400, 1300, and 3000 cps, and its center frequency is varied over the range of 65 Mc to 85 Mc, excluding the band 74.6 Mc to 75.4 Mc.

T–15 NOSE BANDWIDTH

Equipment Required

Signal Generator (Hewlett Packard Model 608B or equivalent).

Voltmeter, if required, of suitable impedance and range for determining lamp operate threshold.

Measurement Procedure

Apply to the receiver input an rf signal and determine the signal level required to produce lamp operate threshold over the rf signal frequency range from 75 Mc −10 kc to 75 Mc +10 kc.

T–16 LAMP OPERATE SELECTIVITY

(Applies only to receivers designed to operate a separate lamp for each modulation frequency.)

Equipment Required

RF Signal Generator (Hewlett Packard Model 608B or equivalent).

AF Signal Generator (Hewlett Packard Model 200B or equivalent).

Voltmeter of suitable impedance and range for determining the voltage across the indicator lamps or the relay coils.

Measurement Procedure

Apply to the receiver input an rf signal. Determine the voltage across the indicator lamps not intended to be lit over the rf input signal range from that producing lamp operate threshold to 200,000 μv.

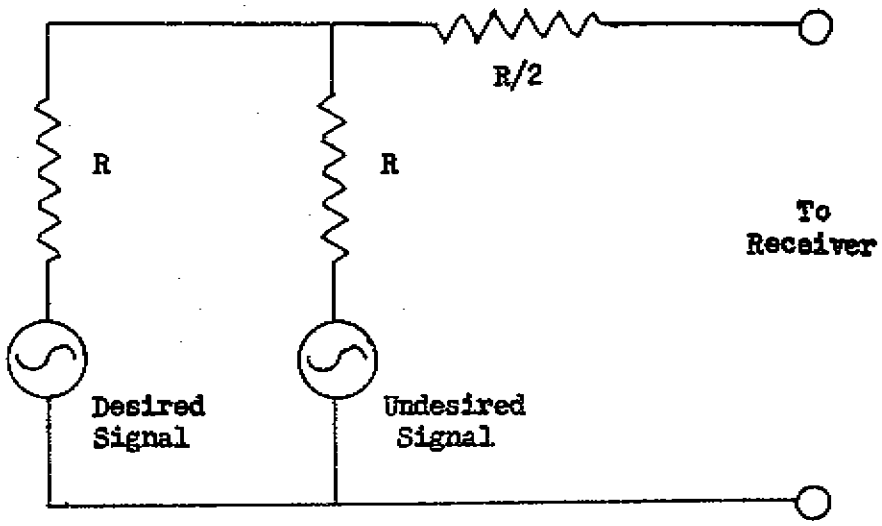

FIGURE 1 –Combining Unit.