RTCA Paper No. 246-78/EC-798
November 2, 1978

ERRATA SHEET

TO

DO-163

Page 12, delete text under 3.18 and substitute the following:

When the equipment is subjected to this test, it shall meet the requirements of DO-160 Environmental Conditions and Test Procedures for Airborne Electronic Equipment and Instruments for the Category of aircraft for which it was designed except for the following:

a. Conducted emissions within the occupied bandwidth of the selected channel and their harmonics shall not exceed these requirements by more than 30 dB.

b. Radiated emissions on harmonics of frequencies within the occupied bandwidth of the selected channel shall not exceed these requirements by more than 30 dB.

MINIMUM PERFORMANCE STANDARDS — AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS TRANSMITTING AND RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 TO 30 MEGAHERTZ

DOCUMENT NO. DO-163

MARCH 19, 1976

(Prepared by SC-131)

RADIO TECHNICAL COMMISSION FOR AERONAUTICS

RADIO TECHNICAL COMMISSION FOR AERONAUTICS
Suite 655, 1717 H Street, N. W.
Washington, D. C. 20006

MINIMUM PERFORMANCE STANDARDS - AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS TRANSMITTING AND RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 TO 30 MEGAHERTZ

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F O R E W O R D

This Document was prepared by Special Committee 131 of the Radio Technical Commission for Aeronautics (RTCA). It was approved by RTCA on March 19, 1976.

RTCA is an association of aeronautical organizations of the United States from both government and industry. Dedicated to the advancement of aeronautics, RTCA seeks sound technical solutions to problems involving the application of electronics and telecommunications to aeronautical operations. Its objective is the resolution of such problems by mutual agreement of its member organizations.

The findings of RTCA are in the nature of recommendations to all organizations concerned. As RTCA is not an official agency of the Government of the United States, its recommendations may not be regarded as statements of official government policy unless so enunciated by the government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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I N T R O D U C T I O N

This Document sets forth Minimum Performance Standards for airborne radio communications transmitting and receiving equipment operating within the radio-frequency range of 1.5 MHz to 30 MHz.

Compliance with these standards by manufacturers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function under all conditions normally encountered in routine aeronautical operations.

In any application of these minimum performance standards, due allowance should be made, where necessary, for equipments in current use which do not fully meet the standards contained herein.

It is recognized that any regulatory application of these standards is the responsibility of governmental agencies.

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 recommended in this Document.

The word "equipment" as used in this Document includes all of the components or units necessary (as determined by the equipment manufacturer) for the equipment to properly perform its intended function. For example, HF "equipment" may include an antenna and coupler, a transmitter 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 HF "equipment" will necessarily include all of the foregoing components. This will depend on the design used by the "equipment" manufacturer.

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S E C T I O N O N E

TRANSMITTERS

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MINIMUM PERFORMANCE STANDARDS - AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS TRANSMITTING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 TO 30 MEGAHERTZ

1.0 GENERAL STANDARDS

1.1 Operation of Controls

The operation of controls intended for use during flight, in all possible combinations and sequences, shall not result in a condition whose presence or continuation would be detrimental to the continued performance of the equipment.

1.2 Accessibility of Controls

Controls which are not normally adjusted in flight shall not be readily accessibly to flight personnel.

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.

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2.0 MINIMUM PERFORMANCE STANDARDS UNDER STANDARD CONDITIONS

The test procedures applicable to a determination of the performance of transmitting equipment including coupling units and definitions of terms, are set forth in Appendix A of this standard.

These standards apply to transmitters and to the transmitter portion of transceivers used for airborne high frequency radio communication equipment. The transmitters may operate over any specified region within the frequency band from 1.5 to 30 MHz as determined by the manufacturer's ratings.

The following standards are applicable primarily to the transmission of A3J (upper sideband suppressed carrier). A3H (AME) may be provided for compatibility with existing ground equipment. Appropriate standards are given for this provision.

2.1 Rated Power Output

The transmitter shall be capable of delivering a peak envelope power (PEP) equal to or greater than the manufacturer's rating.

2.2 Residual Radiation

When all sources of primary power are connected to the transmitter but the microphone switch is in the "open" position, the RF power output at the carrier frequency shall not exceed $.02 \times 10^{-12}$ W.

2.3 Spectrum Control

The power of any emission supplied to the antenna transmission line shall be attenuated with respect to the peak envelope power (PEP) of the transmitter as follows:

a. All spectrum components at a frequency lower in frequency than 100 Hz below the carrier frequency and higher in frequency than 2900 Hz above the carrier frequency shall be attenuated by at least 30 dB.

b. All spectrum components lower in frequency than 3.1 kHz below the carrier frequency and higher in frequency than 5.9 kHz above the

carrier frequency shall be attenuated by at least 38 dB.

c. All spectrum components lower in frequency than 6.1 kHz below the carrier frequency and higher in frequency than 8.9 kHz above the carrier frequency shall be attenuated by at least 43 dB.

2.4 Audio Distortion

Individual in-band harmonics of an audio test tone shall be suppressed at least 20 dB below the test tone.

2.5 Audio Frequency Response

The output power of the transmitter shall not vary more than 6 dB when the audio input level is held constant at a level producing an output 6 dB below rated PEP at the frequency of maximum response and the audio input frequency is varied from 350 to 2500 Hz.

2.6 Sidetone

When sidetone output is provided, its audio frequency response shall not vary more than 10 dB over the range of 350 to 2,500 Hz when the level of the audio input to the transmitter is adjusted to produce an output 6 dB below the rated peak envelope power of the transmitter.

2.7 Noise Level

The peak amplitude of the noise on the transmitter output shall not exceed 5% of the RF amplitude of the output signal, when an audio input frequency of 2000 Hz and at a level producing an RF output 6 dB below rated PEP is applied.

2.8 Overmodulation Protection

Some form of overmodulation protection such as ALC (Automatic Level Control) shall be provided. The protection circuit shall prevent the intermodulation limits of paragraph 2.3 from being exceeded when the transmitter audio input is increased 16 dB from a level which produces an RF output 6 dB below rated PEP.

2.9 Carrier Suppression

The level of the suppressed carrier shall be suppressed at least 26 dB below the full peak envelope power of the transmitter.

2.10 Frequency Stability

The frequency of the RF carrier shall be within ±20 Hz of the selected frequency.

2.11 AM Equivalent Mode

When A3H output mode is provided the carrier shall be suppressed not more than 6 dB below the peak envelope power of the transmitter.

2.12 Channel Selection Time

The time required to change from one channel to another shall not exceed 30 sec. In the case of a transmitter designed to operate with an antenna coupler, the time required for change from one channel to another is the overall transmitter/coupler time.

2.13 Antenna Coupling Circuits and Units

a. Efficiency

The RF efficiency of antenna coupling circuits and units shall be equal to or greater than the manufacturer's rated efficiency.

b. Power Rating

The RF power capability of antenna coupling circuits and units shall be equal to or greater than the manufacturer's power rating.

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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 Document DO-160 - "Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments", dated February 28, 1975.

3.1 Temperature and Altitude Tests (Paragraph 4.0, DO-160)

3.1.1 Low Operating Temperature Test

When the equipment is subjected to this test:

a. All mechanical devices shall operate satisfactorily.

b. The requirements of Paragraphs 2.1, 2.3, 2.10 and 2.11 shall be met, where applicable.

3.1.2 High Operating Temperature Tests

a. When subjected to the High Short-Time Operating Temperature, the equipment shall operate both electrically and mechanically.

b. When the equipment is operated at the High Operating Temperature:

(1) All mechanical devices shall operate satisfactorily.

(2) The requirements of Paragraphs 2.1, 2.3, 2.10 and 2.11 shall be met, where applicable.

3.1.3 Altitude Test

When the equipment is subjected to this test, the requirements of Paragraphs 2.1 and 2.7 shall be met, where applicable.

3.1.4 Decompression Test (When Required)

When the equipment is subjected to this test, the requirements of Paragraphs 2.1 and 2.7 shall be met, where applicable.

3.1.5 Overpressure Test (When Required)

When the equipment is subjected to this test:

a. All mechanical devices shall operate satisfactorily.

b. The requirements of Paragraph 2.1 shall be met, where applicable.

3.2 Temperature Variation Test (Paragraph 5.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.3 Humidity Test (Paragraph 6.0, DO-160)

After subjection to this test:

a. All mechanical devices shall operate satisfactorily.

b. Within 15 minutes after primary power is applied, the equipment shall operate at a level of performance which indicates that no significant failures of the equipment components or circuitry have occurred.

c. Within four hours from the time primary power is applied, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.4 Shock Tests (Paragraph 7.0 DO-160)

After subjection to this test:

a. All mechanical devices shall operate satisfactorily.

b. Following the application of the Operational Shocks, the requirements of Paragraphs 2.1, 2.3 and 2.10 shall be met, where applicable.

c. 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. 1/

3.5 Vibration Test (Paragraph 8.0, DO-160)

When subjected to this test, the requirements of Paragraphs 2.3, 2.7 and 2.10 shall be met, where applicable.

3.6 Explosion Test (When Required) (Paragraph 9.0, DO-160)

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

3.7 Waterproofness (Drip Proof) Test (When Required) (Paragraph 10.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.8 Hydraulic Fluid Test (When Required) (Paragraph 11.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.9 Sand and Dust Test (When Required) (Paragraph 12.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.10 Fungus Resistance Test (When Required) (Paragraph 13.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

1/ The application of these tests may result in damage to the equipment under test. Therefore, these tests may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

3.11 Salt Spray Test (When Required) (Paragraph 14.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.1 and 2.10 shall be met, where applicable.

3.12 Magnetic Effect Test (Paragraph 15.0, DO-160)

When the equipment is subjected to this test, it shall meet the requirements of DO-160, "Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments" for the category of installation for which the equipment is designed.

3.13 Power Input Tests (Paragraph 16.0, DO-160)

3.13.1 Normal Operating Conditions

When the equipment is subjected to these conditions, the requirements of Paragraphs 2.1, 2.3 and 2.10 shall be met were applicable.

3.13.2 Abnormal Operating Conditions

a. When the equipment is subjected to these conditions, it shall start and continue to operate electrically and mechanically. Degradation of performance is tolerable provided the equipment will resume normal operation when power input is returned to normal operating conditions.

b. DC operated equipment shall operate satisfactorily within two minutes upon returning primary power voltage(s) to normal after testing to low voltage conditions. 1/

1/ The two-minute time period specified does not include the time required for the operation of automatic protective circuits.

c. The gradual reduction to zero of the primary power voltage(s) for DC operated equipment shall produce no evidence of the presence of fire or smoke. 1/

3.14 Voltage Spike Conducted Test (Paragraph 17.0, DO-160)

a. Following the application of Intermittent transients, the requirements of Paragraph 2.1 shall be met, where applicable.

b. During the application of Repetitive Transients the requirements of Paragraphs 2.1 and 2.3 shall be met, where applicable.

c. After testing to Category A test requirements, if applicable, the equipment shall continue to operate electrically and mechanically without degradation of performance. The requirements of Paragraphs 2.1 and 2.3 shall be met, where applicable.

3.15 Audio Frequency Conducted Susceptibility Test (Paragraph 18.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraph 2.3 shall be met, where applicable.

3.16 Induced Signal Susceptibility Test (Paragraph 19.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraph 2.3 shall be met, where applicable.

3.17 Radio Frequency Susceptibility Test (Radiated and Conducted) (Paragraph 20.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraphs 2.1 and 2.3 shall be met, where applicable.

3.18 Emission of Radio Frequency Energy Test (Paragraph 21.0, DO-160)

When the equipment is subjected to this test, it

1/ The application of these tests may result in damage to the equipment under test. Therefore, these tests may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

shall meet the requirements of DO-160 "Environmental Conditions and Test Procedures for Airborne Electronic/ Electrical Equipment and Instruments" for the category of aircraft for which the equipment is designed.

S E C T I O N T W O

RECEIVERS

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MINIMUM PERFORMANCE STANDARDS - AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 TO 30 MEGAHERTZ

1.0 GENERAL STANDARDS

1.1 Operation of Controls

The operation of controls intended for use during flight in all possible combinations and sequences, shall not result in a condition whose presence or continuation would be detrimental to the continued performance of the equipment.

1.2 Accessibility of Controls

Controls which are not normally adjusted in flight shall not be readily accessible to flight personnel.

1.3 Effects of Test

Unless otherwise stated, the application of the specified tests shall produce no subsequently discernible condition which would be detrimental to the continued performance of the equipment.

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2.0 MINIMUM PERFORMANCE STANDARDS UNDER STANDARD CONDITIONS

The test procedures applicable to a determination of the performance of receiving equipment, including coupling units and definitions of terms, are set forth in Appendix B of this standard.

These standards apply to receivers and to the receiver portion of transceivers used for airborne high frequency radio communication equipment. The receivers may operate over any specified region within the frequency band from 1.5 to 30 MHz as determined by the manufacturer's ratings.

The following standards are applicable primarily to the reception of A3J (upper sideband suppressed carrier). A3H (AME) may be provided for compatibility with existing ground equipment. Appropriate standards are given for this provision.

2.1 AGC Characteristics

2.1.1 Audio Variation

Between the limits of 10 μv and 100,000 μv input, the audio output shall not vary more than 10 dB.

2.1.2 Attack Time

Less than 50 ms

2.1.3 Decay Time

0.1 to 2 sec.

2.2 Gain

A standard input signal of not more than 10 μv shall produce a receiver output which is not less than the manufacturer's published rated output.

2.3 Manual Gain Control

If a manual gain control is provided, the output of the receiver shall be adjustable from rated output to at least 20 dB below rated output over the RF input signal range of 10 to 100,000 μv.

2.4 Distortion

2.4.1 Intermodulation Distortion

When operating in the A3J mode and with a

standard two tone test signal applied to the receiver input at levels from 25 μv/Tone to 10,000 μv/Tone, the third order products shall be at least 25 dB below either of the two test tones in the output with the audio level adjusted to within 10 dB of the manufacturer's power output.

2.4.2 Harmonic Distortion

When operating in the A3H mode, if provided, the combined noise and distortion at the manufacturer's published rated output shall not exceed 20% when the receiver input signal is modulated 85% and the level is varied over the range of 50 μv to 100,000 μv. This requirement must be met over the audio frequency range of 350 to 2500 Hz.

2.5 Hum and Noise Level

With the receiver gain adjusted to produce rated output for an input level of 1000 μv, the hum and noise shall be at least 30 dB below reference output when the signal is removed and the IF gain is reduced a minimum of 50 dB by applying a constant voltage to the AGC bus. If an RF gain control is provided, it may be used in lieu of the AGC blocking voltage. When the equipment is designed for operation from an alternating current power source, this standard shall be met over the range of power source frequencies for which the equipment is designed.

2.6 Sensitivity

The level of an input signal required to produce a 6 dB signal plus noise-to-noise ratio shall not exceed 2.0 μv for the A3J mode and 5μv for the A3H mode, if provided, over the frequency band for which the receiver is designed.

2.7 Selectivity

2.7.1 SSB Selectivity

The level of an input signal required to produce produce rated output must not vary more than 6dB over the frequency range from f_c + 350 Hz to f_c + 2500 Hz. where f_c is the carrier frequency. At frequencies f_c - 1500 Hz and f_c + 4500 Hz the level of an input signal required to produce rated output must be at least 60 dB

greater than the level required at the frequency of maximum response.

2.7.2 AM Selectivity

The level of a standard AM input signal required to produce rated output shall not vary more than 6 dB over the input signal frequency range of ±2.5 kHz from the assigned channel frequency. At frequencies ±10 kHz from the assigned channel frequency, the level of a standard AM input signal required to produce rated output shall be at least 60 dB greater than the input required to produce rated output at the frequency of maximum response.

2.8 Spurious Responses

The level of an input signal required to produce an output signal plus noise-to-noise ratio of 6 dB must be at least 60 dB greater than that required with a standard SSB signal when the frequency of the input signal is varied over the range of 0.190 to 1260 MHz, excluding the range of f_c - 1500 Hz to f_c + 4500 Hz.

2.9 Cross Modulation

When operating in the A3J mode and with the simultaneous application of an SSB input signal having a frequency of f_c + 1000 Hz and an undesired signal, having a frequency displaced 10 kHz from the desired signal, with a modulation of 85% at 400 Hz, the 400 Hz receiver output due to cross modulation shall be at least 10 dB below the 1000 Hz reference tone under the following conditions:

Level of Desired Signal	Level of Undesired Signal
20 µv	1000 µv
2000 µv	100,000 µv

2.10 Desensitization

When operating in the A3J mode with a 10 µv standard SSB input signal (in band) the output of the receiver must not decrease more than 6 dB in the presence of an unmodulated carrier having a level of 10,000 µv and a frequency varied between 1.5 and 30 MHz, but excluding the frequency range of f_c - 3000 Hz and f_c + 6000 Hz where f_c is the carrier frequency.

2.11 Frequency Stability

The tuned frequency of the receiver shall be within ±20 Hz of the selected frequency. The limit shall be ±150 Hz where a clarifier is provided.

2.12 Channel Selection Time

The maximum time required to change from one channel to another, including the time required by an antenna coupler shall not exceed 30 sec.

3.0 MINIMUM PERFORMANCE STANDARDS UNDER ENVIRONMENTAL TEST CONDITIONS, HF/SSB RECEIVERS

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 Document DO-160 - "Environmental Conditions and Test Procedures for Airborne Electronic/ Electrical Equipment and Instruments", dated February 28, 1975.

3.1 Temperature and Altitude Tests (Paragraph 4.0, DO-160)

3.1.1 Low Operating Temperature Test

When the equipment is subjected to this test:

a. All mechanical devices shall operate satisfactorily.

b. The requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.1.2 High Operating Temperature Tests

a. When subjected to the High Short-Time Operating Temperature, the equipment shall operate both electrically and mechanically.

b. When the equipment is operated at the High Operating Temperature:

(1) All mechanical devices shall operate satisfactorily

(2) The requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.1.3 Altitude Test

When the equipment is subjected to this test, the requirements of Paragraphs 2.2 and 2.5 shall be met, where applicable.

3.1.4 Decompression Test (When Required)

When the equipment is subjected to this test, the requirements of Paragraphs 2.2 and 2.6 shall be met, where applicable.

3.1.5 Overpressure Test (When Required)

When the equipment is subjected to this test:

a. All mechanical devices shall operate satisfactorily.

b. The requirements of Paragraph 2.2 shall be met, where applicable.

3.2 Temperature Variation Test (Paragraph 5.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraph 2.11 shall be met, where applicable.

3.3 Humidity Test (Paragraph 6.0, DO-160)

After subjection to this test:

a. All mechanical devices shall operate satisfactorily.

b. Within 15 minutes after primary power is applied, the equipment shall operate at a level of performance which indicates that no significant failures of the equipment components or circuitry have occurred.

c. Within four hours from the time primary power is applied, the requirements of Paragraphs 2.2, 2.4.1 and 2.6 shall be met where applicable.

3.4 Shock Tests (Paragraph 7.0, DO-160)

After subjection to these tests:

a. All mechanical devices shall operate satisfactorily.

b. Following the application of the Operational Shocks, the requirements of Paragraphs 2.2, 2.5 and 2.7.1 shall be met, where applicable.

c. 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. 1/

3.5 Vibration Test (Paragraph 8.0, DO-160)

When subjected to this test, the requirements of Paragraph 2.4.1 shall be met, where applicable.

3.6 Explosion Test (When Required) (Paragraph 9.0, DO-160)

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

3.7 Waterproofness (Drip Proof) Test (When Required) (Paragraph 10.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.8 Hydraulic Fluid Test (When Required) (Paragraph 11.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.9 Sand and Dust Test (When Required) (Paragraph 12.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.10 Fungus Resistance Tests (When Required) (Paragraph 13.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

1/ The application of these tests may result in damage to the equipment under test. Therefore, these tests may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

3.11 Salt Spray Test (When Required) (Paragraph 14.0, DO-160)

After subjection to this test, the requirements of Paragraphs 2.2, 2.6 and 2.11 shall be met, where applicable.

3.12 Magnetic Effect Test (Paragraph 15.0, DO-160)

When the equipment is subjected to this test, it shall meet the requirements of DO-160, "Environmental Conditions and Test Procedures for Airborne Electronic/ Electrical Equipment and Instruments", for the category of installation for which the equipment is designed.

3.13 Power Input Tests (Paragraph 16.0, DO-160)

3.13.1 Normal Operating Conditions

When the equipment is subjected to these conditions, the requirements of Paragraphs 2.2, 2.4.1 and 2.6 shall be met where applicable.

3.13.2 Abnormal Operating Conditions

a. When the equipment is subjected to these conditions, it shall start and continue to operate electrically and mechanically. Degradation of performance is tolerable provided the equipment will resume normal operation when power input is returned to normal operating conditions.

b. DC operated equipment shall operate satisfactorily within two minutes upon returning primary power voltage(s) to normal after testing to low voltage conditions. 1/

1/ The two-minute time period specified does not include the time required for the operation of automatic protective circuits.

c. The gradual reduction to zero of the primary power voltage(s) for DC operated equipment shall produce no evidence of the presence of fire or smoke. 1/

3.14 Voltage Spike Conducted Test (Paragraph 17.0, DO-160)

a. Following the application of Intermittent Transients, the requirements of Paragraphs 2.2 and 2.6 shall be met, where applicable.

b. During the application of Repetitive Transients the requirements of Paragraphs 2.2, 2.5 and 2.6 shall be met, where applicable.

c. After testing to Category A test requirements, if applicable, the equipment shall continue to operate electrically and mechanically without degradation of performance. The requirements of Paragraphs 2.2, 2.5 and 2.6 shall be met, where applicable

3.15 Audio Frequency Conducted Susceptibility Test (Paragraph 18.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraphs 2.4.1 and 2.5 shall be met, where applicable.

3.16 Induced Signal Susceptibility Test (Paragraph 19.0, DO-160)

When the equipment is subjected to this test, the requirements of Paragraphs 2.2, 2.4.1 and 2.6 shall be met, where applicable.

3.17 Radio Frequency Susceptibility Test (Radiated and Conducted) (Paragraph 20.0, DO-160)

Set up equipment as prescribed in Appendix A, T-6 (sensitivity), except apply a 100 μV Standard SSB signal to the receiver's input.

A. When the radiated radio frequency susceptibility test is applied, the audio output shall be at least 20 dB below the reference output.

B. When the conducted radio frequency susceptibility test is applied, the audio output shall be at

1/ The application of these tests may result in damage to the equipment under test. Therefore, these tests may be conducted after the other tests are completed. Paragraph 1.3 does not apply.

least 20 dB below the reference output.

3.18 Emission of Radio Frequency Energy Test (Paragraph 21.0 DO-160)

When the equipment is subjected to this test it shall meet the requirements of DO-160, "Environmental Conditions and Test Procedures for Airborne Electronic/ Electrical Equipment and Instruments", for the category of aircraft for which the equipment is designed.

M E M B E R S H I P

Special Committee 131

MINIMUM PERFORMANCE STANDARDS - AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 TO 30 MEGAHERTZ

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A P P E N D I X A

TEST PROCEDURES

TRANSMITTERS

NOTE: THE TEST PROCEDURES SET FORTH IN PART II OF THIS APPENDIX ARE SATISFACTORY FOR USE IN DETERMINING THE PERFORMANCE OF AIRBORNE RADIO COMMUNICATIONS TRANSMITTING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 - 30 MHz. TEST PROCEDURES WHICH PROVIDE EQUIVALENT INFORMATION MAY BE USED.

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PART I

DEFINITIONS OF TERMS AND CONDITIONS OF TEST

The following Definitions of Terms and Conditions of Test are applicable to the equipment specified herein.

A. Power Input Voltage

Unless otherwise specified, all tests shall be conducted with the power input voltage adjusted to design voltage ±2%. The input voltage shall be measured at the equipment power input terminals. Design voltages in use as of the date of this Document are 13.75 V DC, 27.5 V DC and 115 V AC.

B. Power Input Frequency

1. In the case of equipment designed for operation from an AC power source of essentially constant frequency (e. g:, 400 Hz), the input frequency shall be adjusted to design frequency ±2%.

2. In the case of equipment designed for operation from an AC power source of variable frequency (e. g., 300 to 1000 Hz), unless otherwise specified, tests shall be conducted with the input frequency adjusted to within 5% of a selected frequency and within the range for which the equipment is designed.

C. Adjustment of Equipment

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

D. Test Equipment Precautions

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

E. Antenna Accessories

Antenna impedance matching and coupling components supplied or recommended for use with the equipment shall be used in tests requiring such components.

F. Ambient Conditions

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

G. Warm-Up Period

Unless otherwise specified, all tests shall be conducted after a period of operation of not less than 15 min at the manufacturer's maximum duty cycle with a continuous transmit time of at least one min.

H. Standard Transmitter Load

Unless otherwise specified, the transmitter must be loaded into a standard test antenna. The standard test antenna shall have a resistance within 10% and a reactance of not more than 10% of the load impedance for which the equipment is rated.

I. Phantom Microphone

In the conduct of tests which require that an audio frequency signal be applied to the transmitter audio frequency input circuit, the signal shall be applied through a phantom microphone circuit having the impedance and direct current flow characteristic of the type of microphone for which the transmitter is designed.

J. Single Sideband

The general term single sideband as used in this standard, unless otherwise specified, applies to transmissions with the carrier suppressed at least 26 dB below peak envelope power and the information transmitted higher in frequency than the carrier (upper sideband).

K. Standard Two-Tone Test Signal

The standard two-tone test signal shall consist of test tones having frequencies of 400 and 1800 Hz adjusted to provide equal amplitudes in the transmitter output.

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PART II

DETAILED TEST PROCEDURES 1/

NOTE: Some equipment may contain protective circuitry limiting the average power output of the transmitter to less than that required for two tone testing at full PEP output. Therefore, it is permissible to disable the power limiting circuits during tests provided suitable precautionary measures are taken, such as additional cooling during the test.

T-1 RATED POWER OUTPUT

Equipment Required

Voltmeter (Hewlett-Packard Model 410-B or equivalent)

Two (2) Audio Oscillators (Hewlett-Packard Model 200CD or equivalent)

Audio Combining Unit (Figure 1)

Standard Test Antenna

Measurement Procedure

With the transmitter operating, apply the standard two tone test signal and adjust the controls as recommended by the manufacturer. Adjust the transmitter controls as recommended by the manufacturer. Observe the reading at the standard test antenna and compute the PEP output. The power output must be determined at each of the following frequencies within the range for which the transmitter is designed: 1.5, 3, 5, 10, 20 and 30 MHz or the nearest available frequencies.

1/ See NOTE: on the cover of this Appendix.

T-2 RESIDUAL RADIATION

Equipment Required

Spectrum Analyzer (Hewlett-Packard Model 141-T with 8552B and 8553B or equivalent)

Standard Test Antenna

Measurement Procedure

With all sources of primary power applied to the equipment but with the microphone switch or the carrier control key in the "OFF" position, measure the RF voltage across the standard test antenna at f_c and compute the power output.

T-3 SPECTRUM CONTROL

Equipment Required

Spectrum Analyzer (Hewlett-Packard Model 141-T and 8552B and 8553B or equivalent)

Two (2) Audio Oscillators (Hewlett-Packard Model 200CD or Equivalent)

Voltmeter (Hewlett-Packard Model 410-B or equivalent)

Standard Test Antenna

Audio Combining Unit (Figure 1)

RF Sampling Network (Figure 2)

Measurement Procedure

With the transmitter operating, apply a standard two tone test signal at a level which produces manufacturer's rated power output. Connect the spectrum analyzer at the standard test antenna and measure the intermodulation distortion products. Measurement shall be made at the highest and lowest RF frequencies for which the transmitter is designed.

T-4 AUDIO DISTORTION

Equipment Required

Same as T-3 less one (1) Audio Oscillator and Audio Combining Unit.

Measurement Procedure

With the transmitter operating, apply a 400 Hz audio test signal at a level which produces an output 6 dB below the manufacturer's rated PEP power output. Connect the spectrum analyzer at the standard test antenna and measure the level of 400 Hz audio tone harmonics.

T-5 AUDIO FREQUENCY RESPONSE

Equipment Required

Audio Oscillator (Hewlett-Packard Model 200CD or equivalent)

Voltmeter (Hewlett-Packard Model 410-B or equivalent)

Phantom Microphone (Figure 4)

Standard Test Antenna

Measurement Procedure

With the transmitter operating, apply 1000 Hz audio test signal which produces an output 6 dB below manufacturer's rated PEP. Maintain the audio input level constant throughout the test. Determine the peak envelope power at the frequency of maximum and minimum response within the range of 350 - 2500 Hz.

T-6 SIDETONE

Equipment Required

Audio Oscillator (Hewlett-Packard Model 200CD or equivalent)

Output Power Meter (General Radio Model 583-A or equivalent)

Voltmeter (Hewlett-Packard Model 410-B or equivalent)

Standard Test Antenna

Measurement Procedure

With equipment set up the same as in T-5, connect an audio meter to the sidetone output. Maintain the audio input level constant throughout the test. Vary audio input frequency from 350 to 2500 Hz and measure sidetone response.

T-7 NOISE LEVELS

Equipment Required

Same as T-5 plus,
Distortion Analyzer (Hewlett-Packard Model 331-A or equivalent)

Measurement Procedure

Apply through a phantom microphone circuit a single tone at 2000 Hz of sufficient amplitude to create a peak envelope power of 6 dB below rated output. Couple a diode detector (see Figure 3) to the transmitter output. Connect an AC voltmeter in series with a 2000 Hz notch filter and a DC voltmeter in parallel across the detector load resistor. With the transmitter operating, read the AC and the DC voltmeters. The noise level in percent of tone amplitude is:

$$\frac{\text{PEAK AC VOLTS}}{\text{DC VOLTS}} \times 100$$

NOTE: The purpose of the 2000 Hz notch filter is to attenuate the 2000 Hz audio component caused by the suppressed carrier, which could mask the true noise level of the transmitter and still be within the permissible carrier suppression limit of 26 dB below PEP

T-8 OVERMODULATION PROTECTION

Equipment Required

Same as T-3

Measurement Procedure

Connect the spectrum analyzer to the standard test antenna. Apply a standard two tone test signal at a level to produce 6 dB below rated PEP. Increase the audio input level 16 dB, and measure intermodulation distortion at the lowest and highest frequencies within the range for which the transmitter is designed

T-9 CARRIER SUPPRESSION

Equipment Required

Same as T-3

Measurement Procedure

Connect the spectrum analyzer to the standard test antenna. Apply a standard two tone test signal at a level to produce the manufacturer's PEP output rating. Measure carrier level referencing PEP.

T-10 FREQUENCY STABILITY

Equipment Required

Audio Oscillator (Hewlett-Packard Model 200CD or equivalent)

Voltmeter (Hewlett-Packard Model 410-B or equivalent)

Frequency Counter (Hewlett-Packard Model 5328-010-030 or equivalent) 1/

RF Sampling Network (Figure 2)

Phantom Microphone (Figure 3)

Standard Test Antenna

1/ NOTE: Oven controlled standards. Requires 24 hour warm-up.

Measurement Procedure

Connect the frequency counter to the standard test antenna through the RF sampling network. Apply a 1000 Hz tone to the audio input and measure the output frequency (fc = output frequency - 1000 Hz). If the transmitter is capable of A3H (AM equivalent) transmission, the carrier shall be used in lieu of the 1000 Hz tone.

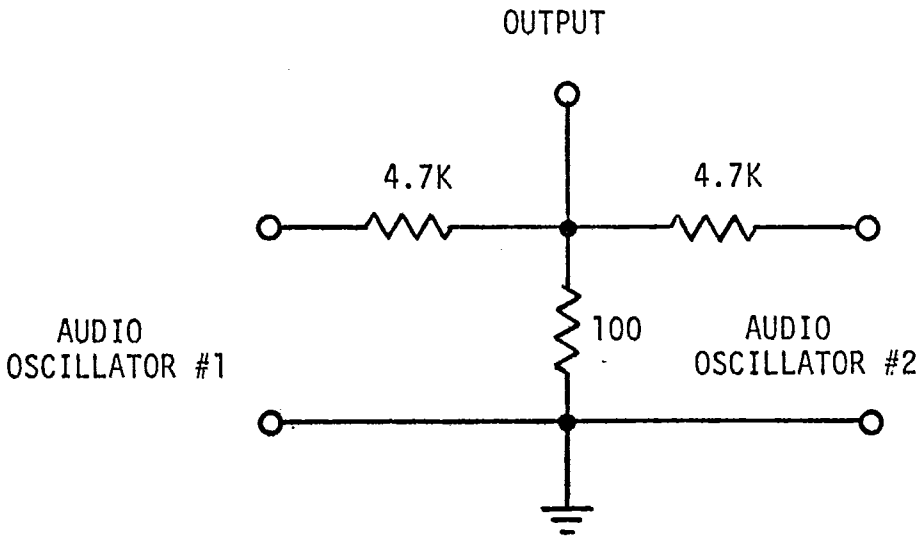
T-11 AM EQUIVALENT MODE

Equipment Required

Same as T-3

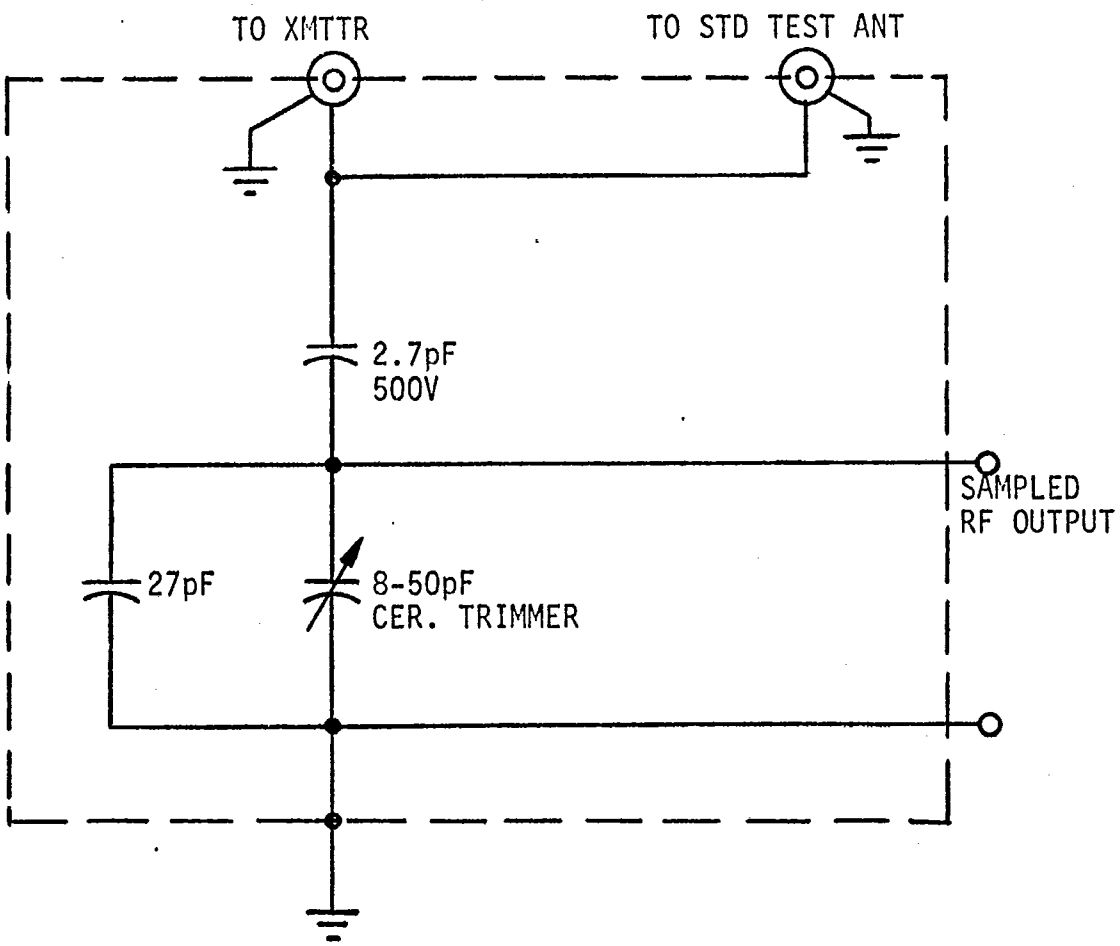
Measurement Procedure

Set the transmitter to A3H mode and apply a 1000 Hz audio test signal at a level which produces manufacturer's rated output. Connect the spectrum analyzer at the standard test antenna and measure carrier level.



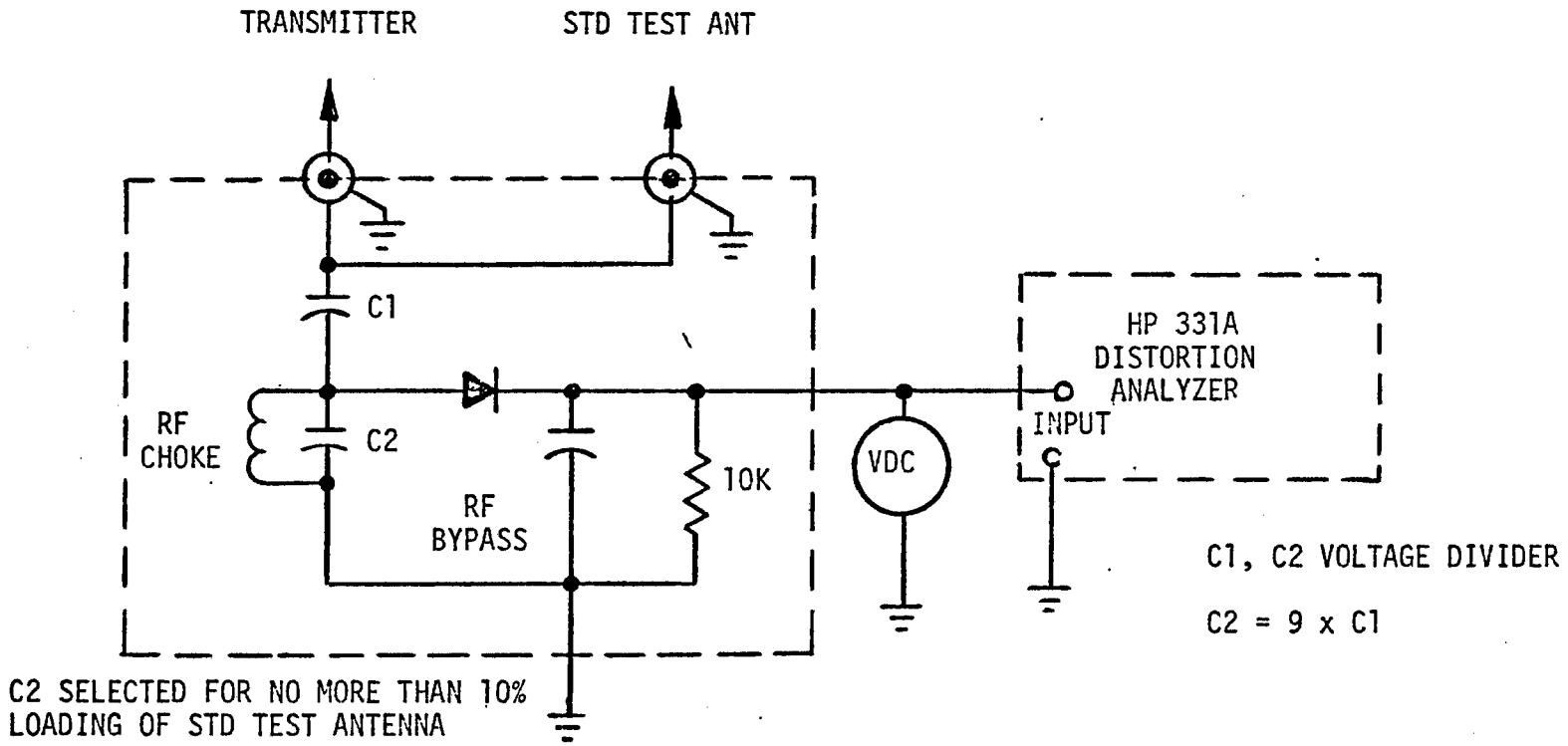
AUDIO COMBINING UNIT

FIGURE 1



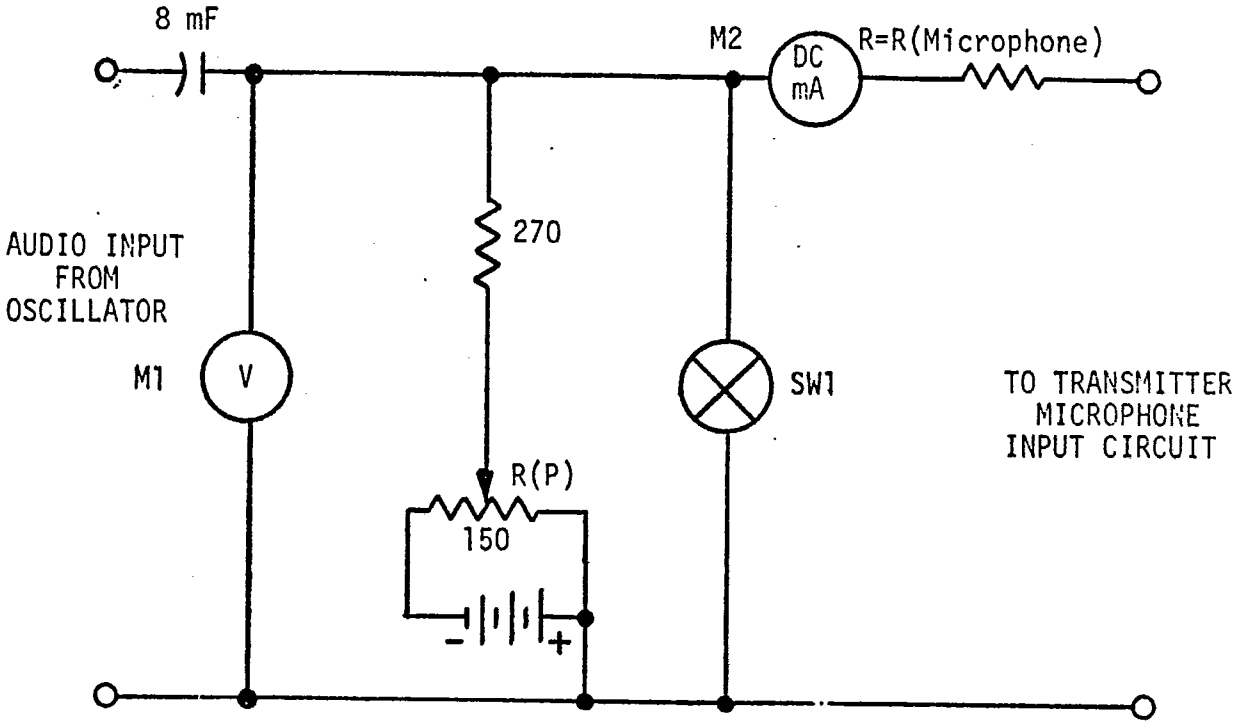
RF SAMPLING NETWORK

FIGURE 2



NOISE TEST FIXTURE

FIGURE 3



PHANTOM MICROPHONE CIRCUIT

FIGURE 4

In the conduct of tests which require that an audio frequency signal be applied to the transmitter audio frequency input circuit, the signal shall be applied through a phantom microphone having the impedance and direct current flow characteristics of the type of microphone for which the transmitter is designed.

Adjust R(P) to give same reading on M2 with SW1 open as when closed. (NOTE: When SW1 is closed, M2 measures the DC microphone current supplied by the transmitter. SW1 must be open during the conduct of tests). The audio frequency input voltage to the transmitter is measured by M1.

A P P E N D I X B

TEST PROCEDURES

RECEIVERS

NOTE: THE TEST PROCEDURES SET FORTH IN PART II OF THIS APPENDIX ARE SATISFACTORY FOR USE IN DETERMINING THE PERFORMANCE OF AIRBORNE RADIO COMMUNICATIONS RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5 - 30 MHz. TEST PROCEDURES WHICH PROVIDE EQUIVALENT INFORMATION MAY BE USED.

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PART I

DEFINITION OF TERMS AND CONDITIONS OF TEST

The following Definitions of Terms and Conditions of Test are applicable to the test procedures specified herein:

A. Power Input Voltage

Unless otherwise specified, all tests shall be conducted with the power input voltage adjusted to design voltage ±2%. The input voltage must be measured at the receiver input terminals. Design voltages in use as of the date of this Document are 13.75 V DC, 27.5 V DC and 115 V AC.

B. Power Input Frequency

1. In the case of receivers designed for operation from an AC power source of essentially constant frequency (e.g., 400 Hz), the input frequency shall be adjusted to design frequency ±2%.

2. In the case of equipment designed for operation from an AC power source of variable frequency (e. g., 300 to 1000 Hz), unless otherwise specified, tests shall be conducted with the input frequency adjusted to within 5% of a selected frequency and within the range for which the equipment is designed.

C. Adjustment of Equipment

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

D. Test Equipment Precautions

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

E. Ambient Conditions

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

F. Warm-Up Period

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

G. Connected Load

Unless otherwise specified, all tests shall be performed with the equipment output connected to a load having the imedance value for which the equipment is designed.

H. Signal Source

1. Variable Source Impedance. When the receiver input circuit is designed for a variable source impedance, the test antenna shall consist of a capacitance of 250 pF ±10% in series with a non-inductive resistance of 50Ω ±10%. The output resistance of the signal generator must be included in the resistance specified. The receiver input voltage levels specified herein are those equivalent to a voltage in series with the capacitance and resistance.

2. Fixed Source Impedance. When the receiver input circuit is designed for a specific source impedance, such as that provided by a transmission line, the circuit connected to the receiver input shall be the equivalent of an 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.

3. Input Voltages. In the case of a receiver designed for a transmission line having a nominal characteristic impedance of other than 52Ω, the

RF input voltage values shall be computed according to the following equation:

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

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 52Ω -

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.

The RF input voltage is defined as the open circuit voltage of the circuit connected to the receiver input. For two-tone inputs the voltage given is for each tone.

I. Standard Test Signals

1. Standard SSB Signal. Unless otherwise specified, a standard SSB signal is defined as an RF input signal with a displacement of 1000 Hz ±650 Hz from the carrier frequencies and within the band-pass of the receiver.

2. Standard Two-Tone Test Signal. Unless otherwise specified, a standard two-tone test signal as used in this standard consists of two RF signals, within the receiver passband, of equal amplitude, and so selected in frequency that the third order intermodulation products are within the audio pass-band, and can be resolved. The selected audio tone frequencies shall be nonharmonic related.

3. Standard AM Signal. Unless otherwise specified, a standard AM signal is defined as an RF input signal modulated 30% at 1000 Hz.

J. Single Sideband

The general term single sideband as used in this standard, unless otherwise specified, applies to transmissions with the carrier suppressed at least 26 dB below peak envelope power and the information transmitted higher

in frequency than the carrier (upper sideband).

K. Center Response Frequency

Center response frequency as used in this standard is defined as that frequency midway between the two frequencies at which the response is down 6 dB from maximum response.

PART II

DETAILED TEST PROCEDURES 1/

T-1 AGC CHARACTERISTICS

Equipment Required

Signal Generator (Hewlett-Packard Model 606B or equivalent)

Output Power Meter (General Radio Model 583A or equivalent)

Oscilloscope (Tektronics Model 543 or equivalent)

Measurement Procedure

A. Audio Variation

Adjust the audio output to obtain a level 3 dB below the manufacturer's rated output with an RF input signal level of 100,000 μv. Vary the RF input signal level over the range from 10 μv to 100,000 μv observing the output power at input signal levels of 10, 100, 1000, 10,000, 30,000 and 100,000 μv.

B. Attack Time

Apply a standard SSB signal to the receiver input through a coaxial relay or equivalent switching device. Connect an oscilloscope to the AGC bus, with the horizontal sweep of the oscilloscope triggered by the RF relay. Apply a 0 to 1000 μv RF step function to the receiver input, and note the time required for the AGC bus voltage to reach 90% of equilibrium. Repeat for 100 to 100,000 μv RF step function.

C. Decay Time

Apply a 1000 μv standard SSB signal to the receiver input and allow the AGC bus voltage to reach equilibrium. Remove the input signal and note time required for AGC bus to discharge within 90% of its steady state value. Repeat for 100,000 μv RF input

1/ See NOTE: on the cover of this Appendix

T-2 GAIN

Equipment Required

Same as T-1 less oscilloscope

Measurement Procedure

Apply a standard SSB signal to the input and, with the receiver gain control at maximum, increase the RF level of the input to the point where rated power output is obtained.

T-3 MANUAL GAIN CONTROL

Equipment Required

Same as T-1 less oscilloscope

Measurement Procedure

Apply to the receiver input a 10 μv standard SSB signal. Adjust the manual gain control to produce rated output. Then readjust the control to its "minimum" gain position, increase the input to 100,000 μv and record the output in dB below rated output.

T-4 DISTORTION

Equipment Required

Two (2) Signal Generators (Hewlett-Packard model 606B or equivalent)

Audio Oscillator (Hewlett-Packard Model 200CD or equivalent)

Audio Wave Analyzer (Hewlett-Packard Model 302A or equivalent)

Distortion Analyzer (Hewlett-Packard Model 331-A or equivalent)

Output Power Meter (General Radio Model 583A or equivalent)

Combining Unit (Weinschel Model 1506N or equivalent)

Measurement Procedure

A. Intermodulation Distortion

Connect two signal generators to the receiver input by means of a combining unit. Apply a standard two-tone test signal successively at 25 μv/Tone and 10,000 μv/Tone. Adjust the audio output to a level within 10 dB of the manufacturer's rated output. In each case determine the relative amplitude of the third order distortion products.

B. Harmonic Distortion

Apply to the receiver input a 50 μv RF AM signal modulated 85% at the specified audio frequencies. Adjust the gain control to produce rated output. Maintain the RF level control constant at 50 μv, and adjust the input signal frequency to produce successively in the output 350, 1,000 and 2,500 Hz Determine the percentage of distortion for each frequency. Repeat tests with RF input adjusted to 100,000 μv.

T-5 HUM AND NOISE LEVEL

Equipment Required

Signal Generator (Hewlett-Packard Model 606B or equivalent)

Output Power Meter (General Radio Model 583-A or equivalent)

Power Supply (compatible with AGC bus)

Measurement Procedure

Apply to the receiver input a 1000 μv standard SSB signal and adjust the receiver gain for rated power output. Remove the signal and reduce the IF gain a minimum of 60 dB by applying

a constant voltage to the AGC bus. If an RF gain control is provided, it may be used in lieu of the AGC blocking voltage. Measure the receiver output in dB below the rated power output level.

T-6 SENSITIVITY

Equipment Required

Signal Generator (Hewlett-Packard Model 606B or equivalent)

Distortion Analyzer (Hewlett-Packard Model 331-A or equivalent)

Output Power Meter (General Radio Model 583-A or equivalent)

Measurement Procedure

A. SSB Mode

Apply a 2 μv standard SSB signal to the receiver's input. Adjust the audio level 10 dB below the manufacturer's rated output. Connect a notch filter to the receiver audio output and null the audio tone. Measure noise level. Conduct this test with the receiver tuned to within 10% of at least the following frequencies within the range or ranges for which the receiver is designed - 1.5, 3, 5, 10, 20 and 30 MHz or the nearest available frequency.

B. AM Mode

Apply a 5 μV standard AM signal to the receiver's input. Adjust the audio level 10 dB below the manufacturer's rated output. Turn off signal generator modulation and measure noise level. Conduct this test with the receiver tuned to within 10% of at least the following frequencies within the range or ranges for which the receiver is designed - 1.5, 3, 5, 10, 20 and 30 MHz or the nearest available frequency.

T-7 SELECTIVITY

Equipment Required

Signal Generator (Hewlett-Packard Model 606B or equivalent)

Frequency Counter (Hewlett Packard Model 5328-010-030 or equivalent)1/

Output Power Meter (General Radio Model 583-A or equivalent)

Measurement Procedure

A. SSB Mode

Apply a standard SSB signal to the receiver input of such a level that the receiver operates below the knee of the AVC characteristic and note the output at the frequency of maximum response. Observe the frequencies on both sides of this frequency where the signal generator level must be increased 6 dB and 60 dB to produce the same output.

B. AM Mode

Apply to the receiver input a radio frequency signal of such a level that the receiver operates below the knee of the AVC characteristic and note the receiver output at center response frequency. Observe the frequencies on both sides of center response frequency where the signal generator level must be increased 6 dB and 60 dB to produce the same output.

T-8 SPURIOUS RESPONSES

Equipment Required

Signal Generator (Hewlett-Packard Model 606B or equivalent)

Distortion Analyzer (Hewlett-Packard Model 331-A or equivalent)

Output Power Meter (General Radio Model 583-A or equivalent)

1/ NOTE: Oven controlled standard. Requires 24 hours warm-up.

Measurement Procedure

Apply a standard SSB signal to the input and adjust the level of the input to produce a signal plus noise-to-noise ratio of 6 dB and note the receiver output. Increase the level of the input signal by 60 dB and vary the frequency of the input over the range of 0.190 MHz to 1260 MHz excluding the frequency band f_c-1500 to f_c + 4500 Hz.

Conduct this test with the receiver tuned to within 10% of at least the following frequencies within the range or ranges for which the receiver is designed: 1.5, 3, 5, 10, 20 and 30 MHz or nearest available frequencies.

It is permissible to connect a suitable low pass filter between the signal generator and the receiver input at submultiples of the receiver input frequency in order to attenuate harmonics of the signal generator which may mask the true performance of the receiver.

T-9 CROSS MODULATION

Equipment Required

Two (2) Signal Generators	(Hewlett-Packard Model 606B or equivalent)
Frequency Counter	(Hewlett-Packard Model 5328-010-030 or equivalent) 1/
Distortion Analyzer	(Hewlett-Packard Model 331-A or equivalent)
Output Power Meter	(General Radio Model 583-A or equivalent)
Combining Unit	(Weinschel Model 1506N or equivalent)

Measurement Procedure

Connect two signal generators and the receiver together by means of a combining unit.

1/ NOTE: Oven controlled standard. Requires 24 hours warm-up.

Set the RF signal level of a standard SSB signal to produce an open-circuit voltage at the output of the combining unit of 20 μv. Set frequency of the standard SSB signal such that a 1000 Hz audio tune is produced at the output of the receiver. Adjust the receiver gain to produce rated output. Connect a suitable notch filter to the receiver output and null the 1000 Hz audio tone.

Apply an undesired 400 Hz 85% modulated AM signal. Set the RF signal level of the undesired signal to produce an open-circuit voltage at the output of the combining unit of 1000 μv. Set the RF frequency successively 10 kHz above and 10 kHz below that of the desired signal and note the output of the receiver. Repeat the above procedure using a level of 2000 μv for the desired signal and 100,000 μv for the undesired signal.

T-10 DESENSITIZATION

Equipment Required

Same as T-9 less Distortion Analyzer

Measurement Procedure

Connect two signal generators and the receiver by means of a combining unit. Set the level of a standard SSB desired signal to produce an open-circuit voltage of 20 μv at the output of the combining unit. Tune the receiver to the desired signal. Adjust the gain of the receiver to produce rated output or to produce maximum output if rated output cannot be obtained. Set the RF signal level of the undesired signal to produce an open-circuit voltage at the output of the combining unit of 10,000 μv

Vary the frequency of the undesired signal over the range of 1.5 to 30 MHz, excluding the frequencies within f_c-3000 Hz to f_c + 6000 Hz wherever f_c is the carrier frequency. Observe the level of the output.

It is permissible to connect a suitable low pass filter between the undesired signal generator and the combining unit at sub-multiples of the receiver input frequency in order to attenuate harmonics of the undesired signal generator which may mask the true performance of the receiver.

T-11 FREQUENCY STABILITY

Equipment Required

Signal Generator	(Hewlett-Packard Model 606B or equivalent)
Frequency Counter	(Hewlett-Packard Model 5328-010-030 or equivalent) 1/
Output Power Meter	(General Radio Model 331-A or equivalent)

Measurement Procedure

Apply to the receiver input 1000 μv SSB signal having a frequency of f_c + 1000 Hz and adjust the receiver gain for rated power output. Place an audio frequency counter at the output of the receiver and measure the receiver output frequency

1/ NOTE: Oven controlled standard. Requires 24 hour warm-up.