See correction

Advance copy pending Issuance of Change to FAR Part 37

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

[Docket No. 7972; Amdt. 37-15]

PART 37—TECHNICAL STANDARD ORDER AUTHORIZATIONS

High Frequency Radio Communication Receiving Equipment; TSO-C32c

The purpose of this amendment is to revise the Technical Standard Order (TSO) for high frequency radio communication receiving equipment contained in § 37.159 of the Federal Aviation Regulations. This action was published as a notice of proposed rule making (32 F.R. 3171, Feb. 22, 1967) and circulated as Notice 67-3 dated February 14, 1967.

Notice 67-3 proposed to amend TSO-C32b by adding minimum performance standards for airborne receivers which operate in the single sideband mode and by relaxing the standards for audio frequency response, including the reduction of the upper limits of the audio output modulation frequency range from 3,000 cps to 2,500 cps. The notice also proposed the deletion of all references to other than FAA standards.

Although the comments received in response to the notice generally favored the proposed action, several minor changes were recommended. These comments, together with the changes to the proposal resulting therefrom are discussed below.

One of the comments received recommended that the input power requirements set forth in paragraph 3.6 as minimum performance standards under environmental conditions should be modified to make them compatible with MIL-STD-704 and should state the category because nearly all aircraft power generating systems now in use meet that standard. Since there are numerous substantive differences between the proposed requirement (which the FAA has used for many years) and the requirements of MIL-STD-704, it would not be appropriate to act on this recommendation without further notice. The FAA considers that further study of this military standard, as well as other existing industry standards, is necessary before any possible future rule-making action is undertaken.

Another comment recommended the addition of the following three new standards: (1) SSB receiver sensitivity of 1.0 microvolt (hard) for 10 db signal-plus-noise to noise ratio, (2) AM receiver sensitivity of 5 microvolt (hard) for 10 db signal-plus-noise to noise ratio over the entire HF frequency range, and (3) frequency stability of the SSB receiver should be at least 0.8 parts in 10^6 per day independent of the environmental stability referred to in the TSO. The comment, however, contained no data substantiating the need for these standards as minimum operational requirements for HF receivers. Therefore, since they go beyond the scope of the notice they have not been incorporated into the regulation. However, the FAA considers that the recommendations warrant further study for possible future rule-making action.

One commentator suggested that ±5 percent should be used as a common standard in proposed paragraph 1.2 of the appendix rather than ±2 for compatibility with general industry practice. Apparently the commentator has construed the first sentence of the paragraph as being an equipment standard which dictates equipment design. However, the sentence merely sets forth a test condition for the quality of input power to be supplied to the equipment during tests performed under the TSO. Control of frequency in a laboratory to the prescribed ±2 percent range is not difficult, and this range has been used in FAA equipment standards for many years. Furthermore, the test condition does not prohibit the use of equipment in an aircraft system having wider frequency variations, including the variations suggested by commentator. The FAA is not aware that the requirement creates a problem for the equipment manufacturers, and no change has been made to the final rule.

In response to several suggestions regarding the term "single sideband" in proposed paragraph 1.10 of the appendix, the words "below peak envelope power" have been added at the end of the paragraph. The change clarifies the requirement by specifying the reference to be used in measuring the stated carrier suppression without posing any additional hardship on industry.

Another commentator noted that proposed paragraphs 2.9a and 2.9b of the appendix are not compatible, and that there is a discrepancy between these test procedures for determining spurious responses and paragraph 2.3 (Gain) of the standard. The FAA agrees and the test procedure set forth in paragraph 2.9b has been changed to specify "receiver output" as the reference to be used in determining spurious responses rather than "rated output". The change eliminates the incompatibility without imposing any additional hardship on the manufacturer.

Interested persons have been afforded the opportunity to participate in the making of this amendment and all relevant material submitted has been fully considered.

(Secs. 313(a), 601, Federal Aviation Act of 1958; 49 U.S.C. 1354, 1421)

In consideration of the foregoing, § 37.159 of Part 37 of the Federal Aviation Regulations is amended to read as hereinafter set forth, effective November 24, 1967.

Issued in Washington, D.C. on October 16, 1967.

RICHARD S. SLIFF,
Acting Director,
Flight Standards Service.

§ 37.159 High Frequency (HF) radio communication receiving equipment operating within the radiofrequency range of 1.5 to 30 megacycles (TSO-C32c).

(a) *Applicability.* This technical standard order prescribes the minimum performance standards that airborne high frequency radio communication receiving equipment must meet in order to be identified with the applicable TSO marking. New models of equipment, which are to be so identified and that are manufactured on or after November 24, 1967, must meet the requirements of the "Federal Aviation Administration Standard, Airborne High Frequency Radio Communication Receiving Equipment Operating Within the Radio Frequency Range of 1.5 to 30 Megacycles" set forth at the end of this section, and the FAA Document for Environmental Test Procedures for Airborne Electronic Equipment, set forth in TSO-C87, effective February 1, 1966 (30 F.R. 15553, Dec. 17, 1965).

(b) *Marking.* (1) In addition to the markings specified in § 37.7, the equipment must be marked to indicate the environmental extremes over which it has been designed to operate. There are six environmental procedures outlined in the FAA document for environmental test procedures for airborne electronic equipment that have categories established. These must be identified on the nameplate by the words "Environmental Categories" or, as abbreviated, "Env. Cat." followed by six letters which identify the categories designated. Reading from left to right, the category designations must appear on the nameplate in the following order, so that they may be readily identified:

(i) Temperature—altitude category.
(ii) Vibration category.
(iii) Audiofrequency magnetic field susceptibility category.
(iv) Radiofrequency susceptibility category.
(v) Emission of spurious radiofrequency energy category.
(vi) Explosion category.

A typical nameplate identification follows: "Env. Cat. DBAAAX."

(2) Where a manufacturer desires to substantiate his equipment in dual categories for one environment, the nameplate must be marked with both categories in the space designated for that category by placing one letter above the other in the following manner:

A
"Env. Cat. DBAAAX"

(As published in the Federal Register /32 F.R. 14685/ on October 24, 1967)

(3) Each separate component of equipment (antenna, power supply, etc.), must be identified with at least the name of the manufacturer, the TSO number, and the environmental categories over which the equipment component is designed to operate.

(c) *Data requirements.* In accordance with § 37.5, the manufacturer must furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Administration, in the region in which the manufacturer is located, the following technical data:

(1) Six copies of the operating instructions and equipment limitations of the manufacturer;

(2) Six copies of the installation procedures with applicable schematic drawings, wiring diagrams, and specifications, and a listing of components (by part number) or possible combinations thereof which make up a system complying with this TSO. Indicate any limitations, restrictions, or other conditions pertinent to the installation; and

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

(d) *Previously approved equipment.* Airborne high frequency radio communications receiving equipment approved prior to November 24, 1967, may continue to be manufactured under the provisions of its original approval.

MINIMUM PERFORMANCE STANDARDS FOR AIRBORNE HIGH FREQUENCY RADIO COMMUNICATIONS RECEIVING EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE OF 1.5–30 MEGACYCLES

1.0 GENERAL STANDARDS

1.1 *Operation of controls.* The operation of controls intended for use during flight, in all possible combinations and sequences, must not result in a condition whose presence or continuation would be detrimental to the performance of the equipment. Controls which are not normally adjusted in flight must not be readily accessible to flight personnel.

1.2 *Effects of test.* Unless otherwise stated, the application of the specified tests must produce no subsequently discernible condition which would be detrimental to the continued performance of the equipment.

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 definition of terms, are set forth in Appendix A of this standard.

2.1 *Audiofrequency response.* The receiver audio output must not vary more than 8 db when the level of a standard AM signal is held constant at 50 μv and the modulation frequency varied over the range of 350 to 2,500 cps.

2.2 *AGC characteristics.* Between the limits of 10 μv and 500,000 μv input, the audio output must not vary more than 10 db.

2.3 *Gain.* A standard input signal (AM and SSB) of not more than 50 μv must produce a receiver output which is not less than the manufacturer's published rated output.

2.4 *Manual gain control.* The output of the receiver must be adjustable from rated output to at least 20 db below rated output over the rf input signal level range of 50 to 500,000 μv, modulated 85 percent at 1,000 cps.

2.5 *Distortion*—a. *Harmonic.* (1) If amplitude modulation (AM) mode of operation is provided, the combined noise and distortion in the receiver output signal must not exceed 20 percent at rated output when the receiver input signal is modulated 85 percent and its level varied over the range from 50 μv to 500,000 μv. This requirement must be met over the frequency range of 350 to 2,500 cps.

(2) If single sideband (SSB) mode of operation is provided, the combined noise and distortion in the receiver output must not exceed 20 percent at rated output when the receiver input signal level is varied over the range from 50 μv to 500,000 μv. This requirement must be met over the audiofrequency range from 350 to 2,500 cps.

b. *Intermodulation (SSB mode only).* With a standard two-tone test signal applied at levels from 50 μv to 500,000 μv, the 3d order products must be at least 25 db below either of the two test tones in the output.

2.6 *Noise level.* With the receiver gain adjusted to produce rated output when the input signal level is a 100 μv standard AM signal, the receiver output, without modulation of the input signal, must be at least 20 db below rated output. When the equipment is designed for operation from an alternating current power source, this standard must be met over the range of power source frequencies for which the equipment is designed.

2.7 *Sensitivity.* The level of an input signal required to produce a given signal-plus-noise to noise ratio must not exceed the following:

Operation mode (as applicable)	Input signal voltages		(S+N)/N (db)
	1.5 MC—3 MC	3 MC—30 MC	
CW telegraphy	10 μv	5 μv	10
Amplitude modulation	10 μv	5 μv	6
Single sideband	5 μv	3 μv	10

2.8 *Selectivity.* a. If amplitude modulation (AM) mode of operation is provided—

(1) The level of an input signal required to produce rated output must not vary more than 6 db over the frequency range from center response frequency −2.5 kc to center response frequency +2.5 kc (center response frequency is defined in Appendix A); and

(2) At frequencies ±10 kc from the center response frequency 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.

b. If single sideband (SSB) mode of operation is provided—

(1) The level of an input signal required to produce rated output must not vary more than 6 db over the frequency range from f_c+350 cps to f_c+2,500 cps [1]; and

(2) At frequencies f_c−2,150 cps and f_c+5,000 cps, 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.

2.9 *Spurious responses.* a. If amplitude modulation (AM) mode of operation is provided, the level of a standard AM signal input required to produce an output signal-plus-noise to noise ratio of 6 db must be at least 60 db greater than that required at the frequency of maximum response when the frequency of the input signal is varied over the range of 0.190 to 150 mc excluding the range within ±10 kc of the center response frequency.

[1] f_c=Specified Carrier Frequency.

b. If single sideband (SSB) mode of operation is provided, the level of an input signal required to produce an output signal-plus-noise to noise ratio of 10 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 150 mc, excluding the range from f_c−2,150 cps to f_c+5,000 cps.

2.10 *Cross modulation (AM only).* With the simultaneous application of an unmodulated carrier at the center response frequency (desired signal) and a standard AM signal ±10 kc from the center response frequency (undesired signal), the receiver output must be at least 10 db less than rated output under the following conditions:

Level of desired signal	*Level of undesired signal*
20 μv	100,000 μv
2,000 μv	1,000 μv

2.11 *Desensitization (AM only).* With a 10 μv standard AM signal input, the output of the receiver must not decrease more than 8 db in the presence of an unmodulated carrier having a level of 10,000 μv and a frequency varied between 1.5 mc and 30 mc, but not including the frequencies within 10 kc of the carrier frequency.

2.12 *Channel selection time.* The maximum time required to change from one channel to another, including the time required by an antenna coupler, must not exceed 30 seconds.

3.0 MINIMUM PERFORMANCE STANDARDS UNDER ENVIRONMENTAL CONDITIONS

Unless otherwise specified, the test procedures applicable to a determination of the performance of the equipment under environmental conditions are set forth in the Federal Aviation Administration Document for Environmental Test Procedures for Airborne Electronic Equipment set forth in TSO–C87.

3.1 *Temperature altitude*—a. *Low temperature.* When the equipment is subjected to this test as set forth in paragraph 4.1 of the FAA Environmental Test Procedures—

(1) The output power, with an rf input signal level of 50 μv, must not decrease by more than 2.2 db from that specified in paragraph 2.3 (gain);

(2) The receiver sensitivity must not decrease by more than 6 db below that specified in paragraph 2.7 (sensitivity); and

(3) All mechanical devices must perform their intended functions. The maximum time required to effect a change in operating frequency must not exceed 30 seconds. In the case of equipment designed to operate with an antenna coupler, the time required to change from one channel to another is the overall receiver coupler time.

b. *High temperature.* (1) Short-time Operating Temperature.

When the equipment is subjected to this test as set forth in paragraph 4.2 of FAA Environmental Test Procedures—

(i) All mechanical devices must operate satisfactorily; and

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

(2) High Operating Temperature.

When the equipment is subjected to this test as set forth in paragraph 4.2 of the FAA Environmental Test Procedures, the requirements of paragraphs 2.3 (gain) and 2.7 (sensitivity) must be met.

c. *Altitude.* When the equipment is subjected to this test as set forth in paragraph 4.3 of the FAA Environmental Test Procedures, the requirements of paragraphs 2.3 (gain) and 2.6 (noise) must be met.

d. *Decompression (when required).* When the equipment is subjected to this test as

set forth in paragraph 4.3 of the FAA Environmental Test Procedures—

(1) The receiver output must not decrease by more than 3 db from that specified in paragraph 2.3 (gain); and

(2) The receiver sensitivity must not be more than 6 db below that specified in paragraph 2.7 (sensitivity).

3.2 *Humidity.* a. After being subjected to this test as set forth in paragraph 5 of the FAA Environmental Test Procedures, and within 15 minutes after primary power is applied—

(1) The receiver output and sensitivity must be no more than 10 db below that specified in paragraphs 2.3 (gain) and 2.7 (sensitivity) respectively; and

(2) All mechanical devices must perform their intended functions.

b. Within 4 hours after primary power is applied, the requirements of paragraphs 2.3 (gain) and 2.6 (noise) must be met.

3.3 *Shock.* a. Following the application of the Operational Shocks, as indicated in paragraph 6 of the FAA Environmental Test Procedures, the requirements of paragraphs 2.3 (gain) and 2.6 (noise) must be met.

b. Following the application of the Crash Safety Shocks, the equipment under test must have remained in its mounting and no parts of the equipment or its mounting must have become detached and free of the shock test equipment. Paragraph 1.2 does not apply.

3.4 *Vibration.* When the equipment is subjected to this test as set forth in paragraph 7 of the FAA Environmental Test Procedures, the requirements of paragraph 2.5 (distortion) must be met.

3.5 *Temperature variation.* When the equipment is subjected to this test as set forth in paragraph 8 of the FAA Environmental Test Procedures, the following apply:

(a) If amplitude modulation (AM) mode of operation is provided, the center response frequency of the receiver must not deviate from the channel frequency by more than 500 cps plus 0.01 percent of the channel frequency.

(b) If single sideband (SSB) mode of operation is provided, the frequency in the audio output from a standard SSB signal must not change by more than 25 cps.

3.6 *Power input test*—a. *Power input variation.* When subjected to this test as found in paragraph 9.1 of the FAA Environmental Test Procedures, the requirements of paragraphs 2.3 (gain) and 2.7 (sensitivity) must be met.

b. *Low voltage.* (1) When the primary power voltage(s) of DC operated equipment is 80 percent and when that of AC operated equipment is 87½ percent of standard test voltage(s), the equipment must continue to operate electrically and mechanically. Degradation of performance is tolerable.

(2) DC operated equipment must 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 percent to 50 percent of standard test voltage(s).

(3) The gradual reduction of the primary power voltage(s) of DC operated equipment from 50 percent to 0 percent of standard test voltage(s) must produce no evidence of the presence of fire or smoke. Paragraph 1.2, "Effects of Tests," does not apply.

3.7 *Conducted voltage transient susceptibility.* a. Following the Intermittent Transient Test as set forth in paragraph 10 of the FAA Environmental Test Procedures, the requirements of paragraph 2.3 (gain) must be met.

b. During the repetitive Transients Test the output of the receiver must not be more than 1.5 db below that specified in paragraph 2.3 (gain). The requirements of paragraph 2.6 (noise level) must be met within 6 db.

3.8 *Conducted audiofrequency susceptibility.* When the equipment is subjected to this test as set forth in paragraph 11 of the FAA Environmental Test Procedures, the requirements of paragraph 2.5 (distortion) and 2.6 (noise level) must be met.

3.9 *Audiofrequency magnetic field susceptibility.* When the equipment is subjected to this test as set forth in paragraph 12 of the FAA Environmental Test Procedures the requirements of paragraph 2.5 (distortion) must be met.

3.10 *Radiofrequency susceptibility (radiated and conducted).* Adjust the receiver gain to produce rated output with a standard AM input signal of 100μv. Remove the modulation. Under these conditions, the audiooutput must be at least 14 db below rated output when—

a. The radiated radiofrequency susceptibility test is applied, as set forth in paragraph 13 of the FAA Environmental Test Procedures; and

b. The conducted radiofrequency susceptibility test is applied.

3.11 *Explosion test (when required).* When the equipment is subjected to this test, as set forth in paragraph 14 of the FAA Environmental Test Procedures, the equipment must not cause detonation of the explosive mixture within the test chamber.

3.12 *Emission of spurious radiofrequency energy.* The levels of conducted and radiated spurious radiofrequency energy emitted by the equipment must not exceed those levels specified in Appendix A of the FAA Environmental Test Procedures.

APPENDIX A

1.0 TEST CONDITIONS

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

1.1 *Power input voltage.* Unless otherwise specified, all tests must be conducted with the power input voltage adjusted to design voltage ±2 percent. The input voltage must be measured at the receiver input terminals.

1.2 *Power input frequency.* In the case of receivers designed for operation from an AC power source of essentially constant frequency (e.g., 400 cps), the input frequency must be adjusted to design frequency ±2 percent. In the case of equipment designed for operation from an AC power source of variable frequency (e.g., 300 to 1,000 cps), unless otherwise specified, tests must be conducted with the input frequency adjusted to within 5 percent of a selected frequency and within the range for which the equipment is designed.

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

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

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

1.6 *Connected load.* Unless otherwise specified, all tests must be performed with the equipment output connected to a load having the impedance value for which the equipment is designed.

1.7 *Signal source*—a. *Variable source impedance.* When the receiver input circuit is designed for a variable source impedance, the test antenna must consist of a capacitance of 250 μμf ±10 percent in series with a noninductive resistance of 50 ohms±10 percent. 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.

b. *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 must be the equivalent of an rf input voltage in series with an impedance having a resistance within 10 percent and a reactance of not more than 10 percent of the characteristic impedance of the transmission line for which the receiver is designed.

c. *Input voltages.* 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 must 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 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.

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.

1.8 *Standard Test Signals*—a. *Standard AM signal.* A standard AM signal is defined as an rf input signal modulated 30 percent at 1,000 cps.

b. *Standard SSB signal.* A standard SSB signal is defined as an rf input signal 1,000 cps displaced from the carrier frequencies and within the bandpass of the receiver.

c. *Standard two-tone test signal.* 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 3d order intermodulation products are within the audio passband, and can be resolved.

1.9 *Amplitude modulation.* The general term amplitude modulation as used in this standard, unless otherwise specified, applies to transmissions with the carrier transmitted at a level between 3 to 6 db below peak envelope power.

1.10 *Single sideband.* The general term single sideband as used in this standard, unless specified, applies to transmissions with the carrier suppressed at least 26 db below peak power.

1.11 *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.

2.0 TEST PROCEDURES

The test procedures set forth below are satisfactory for use in determining the performance of airborne radio communications receiving equipment operating within the radiofrequency range of 1.5–30 mc. Test procedures which provide equivalent information may be used.

2.1 *Audiofrequency response.* With a radiofrequency input signal of sufficient amplitude to produce an output signal-plus-noise to noise ratio of at least 25 db, adjust the receiver gain for one-half of rated output at 1,000 cps. Then, holding the signal level and the modulation percentage constant, vary the audiomodulation frequency through the range of 200–3,000 cps and record the output in db above and below one-

half rated output at the following frequencies: 200, 350, 500, 700, 1,000, 1,500, 2,000, and 3,000 cps and the frequencies of maximum and minimum response between 200 and 3,000 cps. This test must be made at an rf frequency within 15 percent of the lowest carrier frequency for which the equipment is designed.

2.2 *AGC characteristic.* Adjust the manual gain control to obtain that condition wherein varying the rf input signal level over the range from 10 μv to 500,000 μv produces a maximum output equal to rated output. Vary the rf input signal level over the range from 10 μv to 500,000 μv observing the output power at input signal levels of 10, 30, 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000, and 500,000 μv.

2.3 *Gain*—(a) *Amplitude modulation.* Apply a standard AM 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.

(b) *Single sideband.* 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.

2.4 *Manual gain control.* Apply to the receiver input at 5 μv rf signal modulated 85 percent at 1,000 cps. Adjust the manual gain control to produce rated output. Then readjust the control to its "minimum" gain position, increase the input to 500,000 μv and record the output in db below rated output.

2.5 *Distortion*—a. *Harmonic*—(1) *Amplitude modulation.* Apply to the receiver input a 50 μv rf signal modulated 85 percent at 1,000 cps. Adjust the manual gain control to produce rated output. With the receiver gain control fixed, maintain the rf signal input level at 50 μv, the percentage modulation at 85 percent, and determine the percentage of distortion present in the receiver output at modulation frequencies of 350, 1,000, and 2,500 cps.

Increase the rf input signal level successively to 100, 1,000, 10,000, 100,000, and 500,000 μv. At each rf input signal level, adjust the receiver manual gain control to produce rated output with the input signal modulated 85 percent at 1,000 cps. With the receiver gain control fixed, maintain the rf signal input level constant, the percentage modulation at 85 percent, and determine the percentage of distortion present in the receiver output at modulation frequencies of 350, 1,000, and 2,500 cps.

(2) *Single Sideband.* Apply to the receiver input a 50 μv rf standard single sideband signal. 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 cps. Determine the percentage of distortion for each frequency.

b. *Intermodulation (SSB mode).* Connect two signal generators to the receiver input by means of a combining unit. Apply a standard two-tone test signal successively at 20 μv, 1,000 μv, and 100,000 μv. In each case determine the relative amplitude of the 3d order distortion products.

2.6 *Noise level.* Apply to the receiver input a 100 μv standard AM signal and adjust the receiver gain for rated power output. Remove the modulation from the input signal and measure the receiver output in db below the rated power output level.

2.7 *Sensitivity*—a. *CW telegraphy.* Determine the level of the input signal required to produce a signal-plus-noise to noise ratio of 10 db. Adjust the beat-frequency oscillator so that the audio output frequency is approximately 1,000 cps (800–1,200 cps).

b. *Amplitude modulation.* Determine the level of the rf input signal required to produce a signal-plus-noise to noise ratio of 6 db.

c. *Single sideband.* Determine the level of a standard SSB input signal required to produce a signal-plus-noise to noise ratio of 10 db.

2.8 *Selectivity*—a. *Ampliture modulation.* Apply a standard AM 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. *Single sideband.* 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.

2.9 *Spurious responses*—a. *Amplitude modulation.* Apply a standard AM signal to the input, 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, vary the frequency of the input signal over the range of 0.190 to 150 mc, excluding the frequency band within ±10 kc of the center response frequency, and determine those frequencies at which the same receiver output is obtained. Conduct this test with the receiver tuned to within 10 percent 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 mc.

b. *Single sideband.* 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 10 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 to 150 mc excluding the frequency band from carrier frequency—2,150 cps to carrier frequency +5,000 cps and determine those frequencies at which the same or greater receiver output is obtained. Adjust the signal generator to obtain 1,000 cps on each spurious response. Check specifically on the image and IF frequencies.

2.10 *Cross modulation.* Connect the two signal generators and the receiver together by means of a combining unit.

Set the rf signal level of a standard AM signal to produce an open-circuit voltage at the output of the combining unit of 20 μv. Tune the receiver to the desired signal. Adjust the receiver gain to produce rated output or to produce maximum output if rated output cannot be obtained. Remove the modulation from the desired signal.

Apply an undesired standard 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 1,000 μv. Set the rf frequency successively 10 kc above and 10 kc below that of the desired signal and note the output of the receiver. Repeat the above procedure using a level of 2,000 μv for the desired signal and 100,000 μv for the undesired signal.

2.11 *Desensitization.* Connect the two signal generators and the receiver by means of a combining unit. Set the level of a standard AM 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. Remove the modulation from the undesired signal.

Vary the frequency of the undesired signal over the range of 1.5 to 30 mc, excluding the frequencies within 10 kc of the desired signal. Observe the level of the output.

Rules and Regulations

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

SUBBCHAPTER C—AIRCRAFT

[Docket No. 7972; Amdt. 37-15]

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Correction

In F.R. Doc. 67-12486 appearing at page 14685 of the issue for Tuesday, October 24, 1967, the following corrections should be made:

1. In § 37.159 the table in paragraph 2.10 of the standards is corrected to read as follows:

Level of desired signal	*Level of undesired signal*
20 μv	1,000 μv
2,000 μv	100,000 μv

2. In paragraph 1.10 of Appendix A, insert the word "otherwise" after the word "unless" and before the word "specified".

3. In paragraph 2.4 of Appendix A, strike out the word and figure "at 5" and insert the word and figure "a 50" in lieu thereof.