DEFENSE INFORMATION SYSTEMS AGENCY

JOINT INTEROPERABILITY TEST COMMAND
FORT HUACHUCA, ARIZONA

RTCA/DO-186A & ARINC CHARACTERISTIC 716-10 VERY HIGH FREQUENCY (VHF) AMPLITUDE MODULATION (AM) AIR TRAFFIC CONTROL (ATC) WAVEFORM CONFORMANCE TEST PROCEDURES

MAY 2003

RTCA/DO-186A & ARINC CHARACTERISTIC 716-10 VERY HIGH FREQUENCY (VHF) AMPLITUDE MODULATION (AM) AIR TRAFFIC CONTROL (ATC) WAVEFORM CONFORMANCE TEST PROCEDURES

MAY 2003

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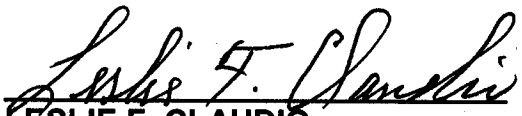

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INTRODUCTION

The Very High Frequency (VHF) Amplitude Modulation (AM) Air Traffic Control (ATC) waveform shall operate in the 117.975 megahertz (MHz) to 137.000 MHz frequency range utilizing 25 and/or 8.33 kilohertz (kHz) spacing.

Radio Technical Commission for Aeronautics/Design Objective (RTCA/DO)-186A and Aeronautical Radio Incorporated (ARINC) Characteristic 716-10 establish the minimum essential interoperability and performance requirements necessary for VHF AM ATC communications equipment. The VHF AM ATC conformance testing will determine the level of compliance to the requirements established by RTCA/DO-186A, and ARINC Characteristic 716-10. All requirements are listed in tables B-1 and B-2 of appendix B. The Unit Under Test (UUT) shall conform to receiver class D (receivers used in a 25 kHz channel separation environment not having offset carrier operation), and receiver class E (receivers used in an 8.33 kHz channel separation environment not having offset carrier operation). The UUT shall comply with transmitter class 4 (100 mile maximum range with 25 kHz channel separation), and transmitter class 6 (100 mile maximum range with 8.33 kHz channel separation).

If test item performance does not meet a requirement, the failure and its potential operational impact will be discussed. Any required capabilities that are not implemented will also be discussed.

The Joint Interoperability Test Command will conduct testing at Fort Huachuca, Arizona.

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SUBTEST 1. AUDIO FREQUENCY RESPONSE/TRANSMITTER MODULATION RESPONSE

1-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 1, and ARINC Characteristic 716-10, reference numbers 48, 59, 65, 74, and 82.

1-1.2 Criteria

a. Reference number 1. Audio output shall not vary more than 6 decibels (dB) when the level of an Radio Frequency (RF) signal modulated at 30 percent (%) is held constant at 1000 microvolts and the modulation frequency is varied over the audio-frequency range of 350 hertz (Hz) to 2500 Hz.

b. Reference number 48. The total frequency response should be within 3 dB from 312 Hz to 1200 Hz and the post detection response with respect to 1000 Hz should be within plus or minus (±) 6 dB from 300 Hz to 6.6 kilohertz (kHz).

c. Reference number 59. The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500 Hz. Attenuation beyond this range is desirable.

d. Reference number 65. The frequency response from the data input to the modulated carrier output should be flat within 6 dB from 600 Hz to 6.6 kHz.

e. Reference number 74. The total receiver frequency response should be within 3 dB from 312 Hz to 1200 Hz. The post detection response with respect to 1000 Hz should be within ± 6 dB from 300 Hz to 2.5 kHz.

f. Reference number 82. The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500. A sharp cut-off in response below 300 Hz and above 2500 Hz should be provided. Frequencies above 3200 Hz should be attenuated at least 50 dB.

1-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) Unit Under Test (UUT)

(3) Audio Breakout Box

(4) Audio Generator

(5) Attenuator

(6) Spectrum Analyzer

b. Test Configuration. Configure the equipment as shown in figures 1-1 and 1-2.

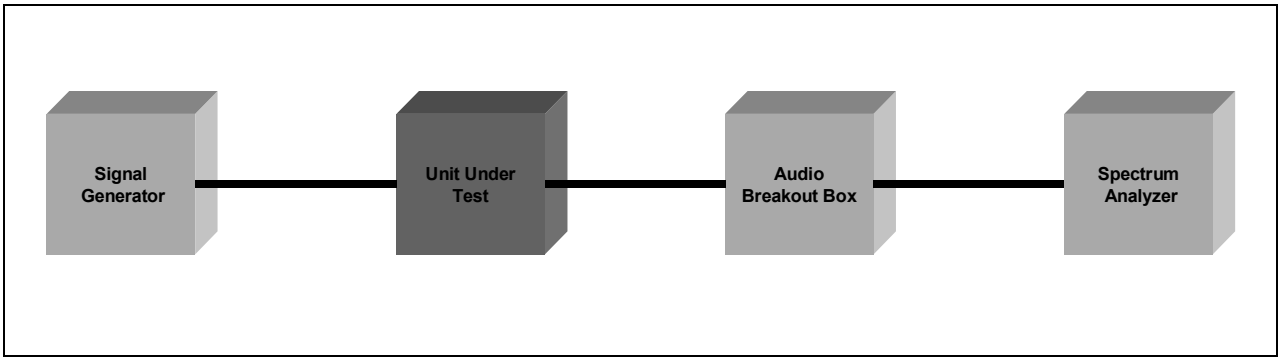

Figure 1-1. Frequency Response Test Equipment Configuration

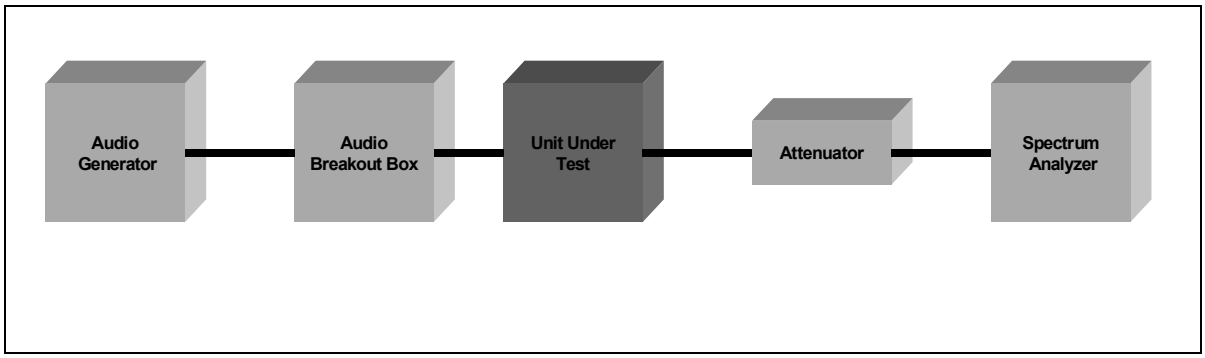

Figure 1-2. Transmitter Modulation Response Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 1-1.

Table 1-1. Audio Frequency Response/Transmitter Modulation Response Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 1.			
1	Connect the equipment.	As shown in figure 1-1.	
2	Configure the UUT.	Frequency: 119.000 MHz Plain Text (PT) Channel spacing: 25 kHz	
3	Configure the signal generator.	Level: 1000 μV Depth: 30% Rate: 350 Hz	
4	Configure the spectrum analyzer.	Center frequency: 1500 Hz Span: 10 kHz Resolution bandwidth: Auto DC coupled	

Table 1-1. Audio Frequency Response/Transmitter Modulation Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
6	Turn the RF and modulation of the signal generator to on.	Select max hold and wait for 5 seconds for the next step.	
7	Adjust audio tones on the signal generator.	Adjust tones from 350 Hz to 2500 Hz in 100 Hz increments with 2-second pauses between each frequency.	
8	Adjust the display line on the spectrum analyzer.	Adjust display line at the lowest audio tone peak. Annotate dB level at max audio tone peak.	
9	Calculate the difference between the highest and lowest audio tones displayed on the spectrum analyzer.	Record results.	
The following procedures are for reference numbers 48 and 74.			
10	Adjust audio tones on the signal generator.	Adjust the tones from 312 Hz to 1200 Hz in 100 Hz increments.	
11	Adjust the display line on the spectrum analyzer.	Adjust display line at the lowest audio tone peak. Record dB level at max audio tone peak.	
12	Calculate the difference between the highest and lowest audio tones displayed on the spectrum analyzer.	Record results. Record the level of the 1000 Hz tone.	
13	Change the rate on the signal generator to 300 Hz.	For the post detection response, ensure the level of the 300 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
14	Change the rate on the signal generator to 800 Hz.	For the post detection response, ensure the level of the 800 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
15	Change the rate on the signal generator to 1200 Hz.	For the post detection response, ensure the level of the 1200 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
16	Change the rate on the signal generator to 2000 Hz.	For the post detection response, ensure the level of the 2000 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
17	Change the rate on the signal generator to 3000 Hz.	For the post detection response, ensure the level of the 3000 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	

Table 1-1. Audio Frequency Response/Transmitter Modulation Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
18	Change the rate on the signal generator to 4000 Hz.	For the post detection response, ensure the level of the 4000 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
19	Change the rate on the signal generator to 5000 Hz.	For the post detection response, ensure the level of the 5000 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
20	Change the rate on the signal generator to 6000 Hz.	For the post detection response, ensure the level of the 6000 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
21	Change the rate on the signal generator to 6600 Hz.	For the post detection response, ensure the level of the 6600 Hz tone is within ±6 dB of the response obtained for 1000 Hz (step 12).	
22	For reference number 74: change the channel spacing of the UUT to 8.33 kHz.	Ensure response is within 6 dB for the frequency range 300 Hz to 2500 Hz.	
The following procedure is for reference numbers 59, 65, and 82.			
23	Set up equipment.	As shown in figure 1-2.	
24	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz	
25	Configure the audio generator.	300 Hz tone	
26	Configure the spectrum analyzer.	Center frequency: 119.000 MHz Span: 10 kHz Resolution bandwidth: Auto	
27	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
28	Key the UUT with the audio breakout box.	Adjust the amplitude on the spectrum analyzer for proper viewing.	
29	Select trace/view on the spectrum analyzer.	Select max hold and wait for 5 seconds for the next step.	
30	Adjust the audio tone on the audio generator.	Adjust tones from 300 Hz to 2500 Hz in 100 Hz increments with 2-second pauses between tone changes.	
31	Select display line on the spectrum analyzer.	Adjust the display line at the highest audio tone peak. Record dB level at max audio tone peak.	
32	Adjust the display line on the spectrum analyzer.	Set the display line on the lowest audio tone peak. Record the dB level at the lowest audio tone peak.	

Table 1-1. Audio Frequency Response/Transmitter Modulation Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
33	Calculate the difference between the highest and lowest audio tones displayed on the spectrum analyzer.	Ensure all tones are flat within 6 dB of the highest and lowest audio tones.	
34	For reference number 65, use the data input of the UUT.	Check the frequency range of 600 Hz to 6600 Hz in 100 Hz increments with 2-second pauses between tone changes.	
35	Select display line on the spectrum analyzer.	Adjust the display line at the highest audio tone peak. Record dB level at max audio tone peak.	
36	Adjust the display line on the spectrum analyzer.	Set the display line on the lowest audio tone peak. Record the dB level at the lowest audio tone peak.	
37	Calculate the difference between the highest and lowest audio tones displayed on the spectrum analyzer.	Record results. Ensure all tones are flat within 6 dB of the highest and lowest audio tones.	
38	For reference number 82, change the channel spacing of the UUT to 8.33 kHz.	Check the frequency range of 300 Hz to 2500 Hz in 100 Hz increments with 2-second pauses between tone changes.	
39	Select display line on the spectrum analyzer.	Adjust the display line at the highest audio tone peak. Record dB level at max audio tone peak.	
40	Adjust the display line on the spectrum analyzer.	Set the display line on the lowest audio tone peak. Record the dB level at the lowest audio tone peak.	
41	Calculate the difference between the highest and lowest audio tones displayed on the spectrum analyzer.	Record results. Ensure all tones are flat within 6 dB of the highest and lowest audio tones.	
42	Check frequencies below 300 Hz and above 2500 Hz.	Ensure a sharp cut-off in response. Record results. (see note 2)	
43	For frequencies above 3200 Hz:	Ensure tones are attenuated at least 50 dB. Record results.	

Note 1: Sections that are not applicable are shaded.
Note 2: Since no definition of a "sharp cut-off" in response was given, the value of 6 dB per octave/ 20 dB per decade was used.
Legend: dB - decibels; dBm - decibel referenced to 1 milliwatt; DC - Direct Current; Hz - hertz; kHz - kilohertz; MHz - megahertz; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; μV - microvolts; % - percent; ± - plus or minus

1-1.4 Presentation of Results. The results will be shown in table 1-2 indicating the requirement and measured value or indications of capability.

Table 1-2. Audio Frequency Response/Transmitter Modulation Response Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
1	2.2.1	a. Audio output shall not vary more than 6 dB when the level of an RF signal modulated at 30% is held constant at 1000 microvolts and the modulation frequency is varied over the audio-frequency range of 350-2500 Hz.	Less than 6 dB.			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
48	3.6.9.2	The total frequency response should be within 3 dB from 312 Hz to 1200 Hz and the post detection response with respect to 1000 Hz should be within ±6 dB from 300 Hz to 6.6 kHz.	Within 3 dB.			
			Within ±6 dB.			
59	3.7.5.3	The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500 Hz. Attenuation beyond this range is desirable.	Flat within 6 dB.			
65	3.7.8.3	The frequency response from the data input to the modulated carrier output should be flat within 6 dB from 600 Hz to 6.6 kHz.	Flat within 6 dB.			
74	4.3.4.2	The total receiver frequency response should be within 3 dB from 312 Hz to 1200 Hz. The post detection response with respect to 1000 Hz should be within ± 6 dB from 300 Hz to 2.5 kHz.	Within 3 dB.			
			Within ±6 dB.			
82	4.4.2.3	The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500. A sharp cut-off in response below 300 Hz and above 2500 Hz should be provided. Frequencies above 3200 Hz should be attenuated at least 50 dB.	Flat within 6 dB.			
			Sharp cut-off below 300 Hz and above 2500 Hz.			
			50 dB attenuation above 3200 Hz.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; kHz - kilohertz; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; ± - plus or minus

SUBTEST 2. AUTOMATIC GAIN CONTROL (AGC) CHARACTERISTICS

2-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 2.

2-1.2 Criteria. Reference number 2.

a. Audio output power shall not vary by more than 6 dB when the level of an RF input signal, modulated at 30% at 1000 Hz, is varied over the range from 10 microvolts to 100 millivolts.

b. When the level of an RF input signal, modulated 30% at 1000 Hz at the selected channel frequency, is suddenly reduced from 200 millivolts to 10 microvolts, the receiver audio output shall, within 0.25 second, return to and remain within 3 dB of the normal steady-state output obtained with an input of 10 microvolts.

c. If the receiver is included with the transmitter (transceiver), the receiver audio output shall recover from a transmit-to-receive transfer operation within 0.25 second. Recovery is defined as reaching and remaining within 3 dB of the normal steady-state output obtained with an RF input signal level of 10 microvolts modulated 30% at 1000 Hz.

2-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Attenuator

(3) Signal Generator

(4) Audio Breakout Box

(5) Audio Analyzer

(6) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figures 2-1, 2-2, and 2-3.

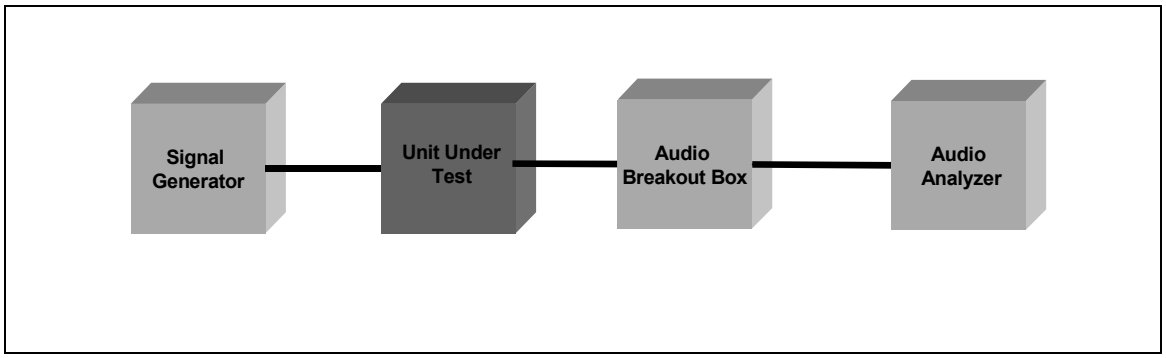

Figure 2-1. AGC Characteristics Test Equipment Configuration (part 1)

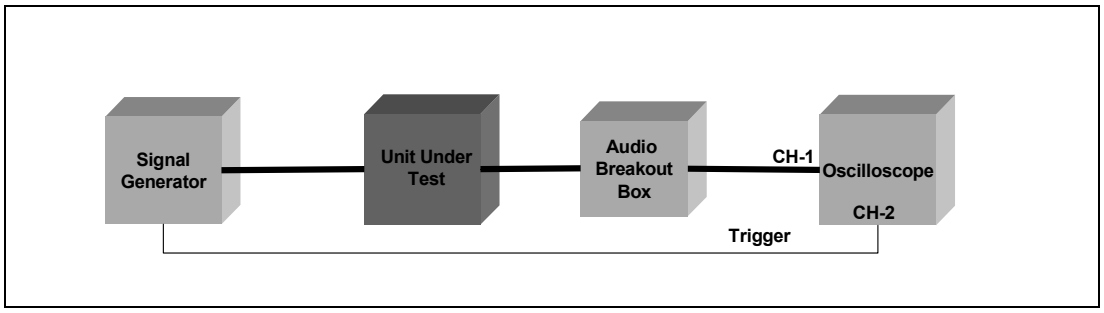

Figure 2-2. AGC Characteristics Test Equipment Configuration (part 2)

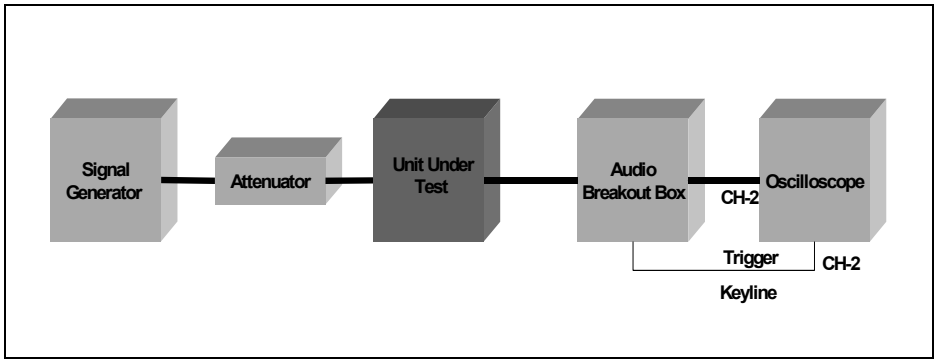

Figure 2-3. AGC Characteristics Test Equipment Configuration (part 3)

c. Test Conduct. Test procedures are listed in table 2-1.

Table 2-1. AGC Characteristics Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedures are for reference number 2.			
1	Connect the equipment.	As shown in figure 2-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Depth: 30% Rate: 1000 Hz Level: 10 μV	
3	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz, PT	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the audio analyzer.	Under measurement, select AC level (in dBm).	
6	Turn the RF and modulation to on.	Observe the audio analyzer.	
7	Record the level on the audio analyzer (in dBm).		
8	Step the signal generator level to 20 μV.	Record the level displayed on the audio analyzer.	
9	Step the signal generator level to 30 μV.	Record the level displayed on the audio analyzer.	
10	Step the signal generator level to 40 μV.	Record the level displayed on the audio analyzer.	
11	Step the signal generator level to 50 μV.	Record the level displayed on the audio analyzer.	
12	Step the signal generator level to 100 μV.	Record the level displayed on the audio analyzer.	
13	Step the signal generator level to 200 μV.	Record the level displayed on the audio analyzer.	
14	Step the signal generator level to 300 μV.	Record the level displayed on the audio analyzer.	
15	Step the signal generator level to 400 μV.	Record the level displayed on the audio analyzer.	
16	Step the signal generator level to 500 μV.	Record the level displayed on the audio analyzer.	
17	Step the signal generator level to 600 μV.	Record the level displayed on the audio analyzer.	
18	Step the signal generator level to 700 μV.	Record the level displayed on the audio analyzer.	

Table 2-1. AGC Characteristics Test Procedures

Step	Action	Settings/Action	Measured Value
19	Step the signal generator level to 800 μV.	Record the level displayed on the audio analyzer.	
20	Step the signal generator level to 900 μV.	Record the level displayed on the audio analyzer.	
21	Step the signal generator level to 1 mV.	Record the level displayed on the audio analyzer.	
22	Step the signal generator level to 10 mV.	Record the level displayed on the audio analyzer.	
23	Step the signal generator level to 20 mV.	Record the level displayed on the audio analyzer.	
24	Step the signal generator level to 30 mV.	Record the level displayed on the audio analyzer.	
25	Step the signal generator level to 40 mV.	Record the level displayed on the audio analyzer.	
26	Step the signal generator level to 50 mV.	Record the level displayed on the audio analyzer.	
27	Step the signal generator level to 60 mV.	Record the level displayed on the audio analyzer.	
28	Step the signal generator level to 70 mV.	Record the level displayed on the audio analyzer.	
29	Step the signal generator level to 80 mV.	Record the level displayed on the audio analyzer.	
30	Step the signal generator level to 90 mV.	Record the level displayed on the audio analyzer. Ensure the power output level does not vary by more than 6 dB from the reference level.	
31	Step the signal generator level to 100 mV.	Record the level displayed on the audio analyzer.	
32	Record results.	Ensure that all audio levels recorded in steps 7 through 31 are within 6 dB.	
33	Connect the equipment.	As shown in figure 2-2.	
34	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 200 mV Rate: 1000 Hz	
35	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz Enable the data link audio output.	
36	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	

Table 2-1. AGC Characteristics Test Procedures

Step	Action	Settings/Action	Measured Value
37	Configure the oscilloscope.	Channel 1: 1 V/div (audio output from the UUT) Channel 2: 2 V/div (RF output from the signal generator)	
38	Configure the oscilloscope to run.		
39	Turn the RF and modulation of the signal generator to on.		
40	Step the signal generator to 10 mV.	Use trigger to immediately stop the acquisition on the oscilloscope to capture the decay of the audio output.	
41	Select marker 1.	Place marker 1 at the point where the RF signal was reduced to 10 mV (trigger point).	
42	Select marker 2.	Place marker 2 at the point where the audio output is within 3 dB of its steady-state output.	
43	Record the time difference between markers 1 and 2.	Ensure the time is within 0.25 of a second or less. To get a more accurate picture of the signals, the horizontal scale can be adjusted.	
44	Connect the equipment.	As shown in figure 2-3.	
45	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10μV (after attenuation) Rate: 1000 Hz	
46	Use appropriate attenuation.	Since the UUT will be transmitting back into the signal generator, use appropriate level of attenuation so the effect on the signal generator is not noticeable or will not cause damage.	
47	Configure the UUT.	Frequency: 119.000 MHz Power: Low/PT Squelch: Off	
48	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout configuration.	
49	Configure the oscilloscope.	Channel 1: 1 V/div (audio from the breakout box) Channel 2: 2 V/div (keyline/trigger from the audio breakout box)	
50	Key the UUT.		
51	Program the oscilloscope to trigger when the keyline is toggled.	Unkey the UUT. Use the oscilloscope to measure the audio attack time.	
52	Select markers A and B.	Set marker A on the key (CH-2) and marker B on the audio signal where the output is within 3 dB of normal output.	
53	Measure the time difference between markers A and B. Record the time.	Ensure time difference is less than 0.25 seconds.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; CH - channel; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; mV - millivolts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division; μV - microvolts; % - percent

2-1.4 Presentation of Results. The results will be shown in table 2-2 indicating the requirement and measured value or indications of capability.

Table 2-2. AGC Characteristics Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
2	2.2.2	a. Audio output power shall not vary by more than 6 dB when the level of an RF input signal, modulated at 30% at 1000 Hz, is varied over the range from 10 microvolts to 100 millivolts.	Less than 6 dB.			
		b. When the level of an RF input signal, modulated 30% at 1000 Hz at the selected channel frequency, is suddenly reduced from 200 millivolts to 10 microvolts, the receiver audio output shall, within 0.25 second, return to and remain within 3 dB of the normal steady-state output obtained with an input of 10 microvolts.	Within 0.25 second and within 3 dB.			
		c. If the receiver is included with the transmitter (transceiver), the receiver audio output shall recover from a transmit-to-receive transfer operation within 0.25 second. Recovery is defined as reaching and remaining within 3 dB of the normal steady-state output obtained within an RF input signal level of 10 microvolts modulated 30% at 1000 Hz.	Within 0.25 second and within 3 dB.			

Legend: dB - decibels; Hz - hertz; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

SUBTEST 3. SENSITIVITY

3-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 3 and ARINC Characteristic 716-10, reference number 29.

3-1.2 Criteria

a. Reference number 3. The level of an RF input signal, modulated 30% at 1000 Hz, required to produce a signal-plus-noise-to-noise ratio of 6 dB shall not exceed 10 microvolts with an audio output power not lower than 10 dB below the declared audio output power. This requirement shall be met on all frequency channels for which the equipment is designed.

b. Reference number 29. With a 2 microvolt (hard) signal, amplitude modulated 30% at 1000 Hz, the signal-plus-noise-to-noise ratio should be 6 dB.

3-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Audio Analyzer

(4) Signal Generator

b. Test Configuration. Configure the equipment as shown in figure 3-1.

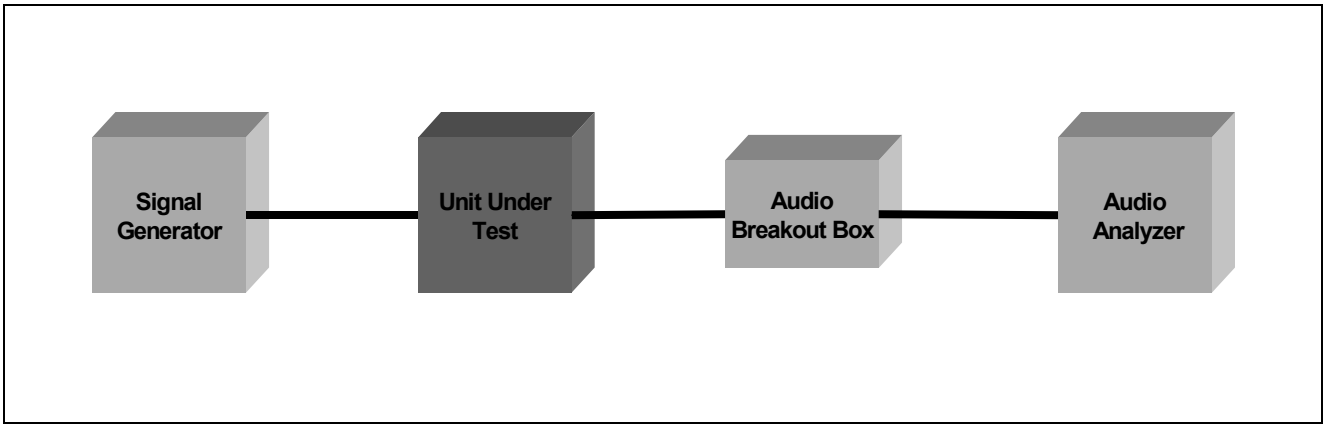

Figure 3-1. Sensitivity Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 3-1.

Table 3-1. Sensitivity Test Procedures

Step	Action	Settings/Action		Measured Value
The following procedures are for reference number 3.				
1	Set up equipment.	As shown in figure 3-1.		
2	Configure the signal generator.	Frequency: 118.000 MHz Depth: 30% Rate: 1000 Hz. Amplitude: 1 μV (-130 dBm)		
3	Configure the UUT.	Frequency: 118.000 MHz Mode: AM Manual gain: maximum setting PT		
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.		
5	Set the audio analyzer.	Under measurement, select SINAD.		
6	Turn signal generator RF and modulation to on.	Increase amplitude until UUT reaches declared audio output level (refer to manufacturer specifications if unknown).		
7	Record level displayed on audio analyzer.			
8	Adjust amplitude on the signal generator.	Adjust amplitude until 6 dB SINAD is displayed on the audio analyzer.		
9	Record amplitude on the signal generator.	Ensure amplitude required to produce 6 dB SINAD is 10 μV (-98 dBm) or less.		
10	Record audio output level as displayed on audio analyzer (in dB).	Ensure output power level is not more than 10 dB below the level obtained in step 7.		
11	Repeat steps 6 through 10 for the following frequencies.	118.005 MHz	121.000 MHz	
		118.010 MHz	122.000 MHz	
		118.025 MHz	123.000 MHz	
		118.030 MHz	124.000 MHz	
		118.040 MHz	125.000 MHz	
		118.050 MHz	126.000 MHz	
		118.060 MHz	127.000 MHz	
		118.070 MHz	128.000 MHz	
		118.075 MHz	129.000 MHz	
		118.080 MHz	130.000 MHz	
		118.090 MHz	131.000 MHz	
		118.100 MHz	132.000 MHz	
		118.200 MHz	133.000 MHz	
		118.300 MHz	134.000 MHz	
		118.400 MHz	135.000 MHz	
		118.500 MHz	136.000 MHz	
		118.600 MHz		
		118.700 MHz		
		118.800 MHz		
		118.900 MHz		
		119.000 MHz		
		120.000 MHz		

Table 3-1. Sensitivity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 29.			
12	Change the amplitude on the signal generator to 2 μV (-112 dBm).	Ensure SINAD reading on TIMS is 6 dB.	

Note: Sections that are not applicable to a particular section are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; PT - Plain Text; RF - Radio Frequency; SINAD - Signal-to-Noise and Distortion; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; μV - microvolts; % - percent

3-1.4 Presentation of Results. The results will be shown in table 3-2 indicating the requirement and measured value or indications of capability.

Table 3-2. Sensitivity Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
3	2.2.3	The level of an RF input signal, modulated 30% at 1000 Hz, required to produce a signal-plus-noise to noise ratio of 6 dB shall not exceed 10 microvolts with an audio output power not lower than 10 dB below the declared audio output power. This requirement shall be met on all frequency channels for which the equipment is designed.	10 microvolts or less.			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
29	3.6.1	With a 2 μV (hard) signal, amplitude modulated 30% at 1000 Hz, the signal-plus-noise-to-noise ratio should be 6 dB.	6 dB			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; μV - microvolt; % - percent

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SUBTEST 4. OUTPUT LEVEL CONTROL/AUDIO OUTPUT

4-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 4, and ARINC Characteristic 716-10, reference number 33.

4-1.2 Criteria

a. Reference number 4. If an output level control is provided, it shall be capable of reducing the output to at least 40 dB below the manufacturer's rated output.

b. Reference number 33. An audio output should be provided which is isolated from ground. A service control should be provided within the transceiver for adjustment of the output level. The adjustment should vary the output from 5 milliwatts (mW) to 40 mW into a 600 ohms (Ω) $\pm$20% resistive load. The nominal setting should be 10 mW at 1000 Hz. The output circuit should be able to endure a short circuit (zero ohms) and open circuit, and should operate normally after removal of the short or open.

4-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Transmission Impairment Measurement Set

(3) Signal Generator

(4) Audio Breakout Box

(5) Digital Multimeter

b. Test Configuration. Configure the equipment as shown in figure 4-1.

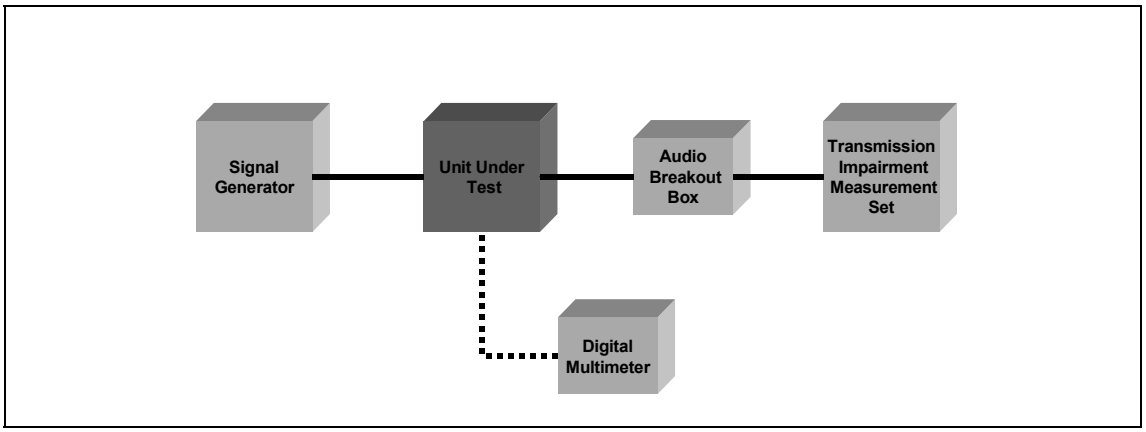

Figure 4-1. Output Level Control/Audio Output Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 4-1.

Table 4-1. Output Level Control/Audio Output Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 4.			
1	Connect the equipment.	As shown in figure 4-1.	
2	Configure the UUT.	Frequency: 118.000 MHz PT	
3	Configure the signal generator.	Frequency: 118.000 MHz Mode: AM Rate: 1004 Hz Depth: 30% Amplitude: -81 dBm (20 microvolts)	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout configuration.	
5	Configure the TIMS.	135 ohms (receive)	
6	On the signal generator, turn the RF on.		
7	Verify output level control.	Verify that the output level control can be adjusted to produce rated output. Refer to manufacturer specifications for UUT's rated output.	
8	Record results.	Record level displayed on TIMS.	
9	On the signal generator, turn the RF off.		
10	Readjust output level control.	Adjust output level control to lowest setting.	
11	Change signal generator.	Change signal generator amplitude to -27 dBm (10000 microvolts).	
12	On the signal generator, turn the RF on.		
13	Record results.	Ensure level displayed on TIMS is at least 40 dB below level displayed at rated output.	
14	Repeat steps 6 through 13 for the following frequencies:	120.000 MHz 122.000 MHz 125.000 MHz 126.000 MHz 128.000 MHz 130.000 MHz 131.000 MHz 132.000 MHz 134.000 MHz 137.000 MHz	
The following procedure is for reference number 33.			
15	Check 600 ohm audio output with the digital multimeter.	Ensure output is isolated from ground (balanced).	
16	Refer to manufacturer specifications.	Manufacturer should provide a service control adjustment to vary the output of the UUT from 5 mW to 40 mW onto a 600 ohm ±20% resistive load.	

Table 4-1. Output Level Control/Audio Output Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
17	Adjust the signal generator amplitude.	Adjust level to produce 10 mW output into the TIMS.	
18	Conduct short circuit test.	Short the audio pin of the breakout box.	
19	Record results.	Reconnect the audio pin and verify that the output circuit operates normally.	
20	Conduct open circuit test.	Disconnect the audio output of the UUT from the TIMS.	
21	Record results.	Reconnect the audio output of the UUT to the TIMS and verify that the output circuit operates normally.	

Note: Sections that are not applicable to a particular section are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; PT - Plain Text; RF - Radio Frequency; mW - milliwatt; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; % - percent

4-1.4 Presentation of Results.

The results will be shown in table 4-2.

Table 4-2. Output Level Control/Audio Output Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
4	2.2.4	If an output level control is provided, it shall be capable of reducing the output to at least 40 dB below the manufacturer's rated output.	At least 40 dB below.			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
33	3.6.5	An audio output should be provided which is isolated from ground. A service control should be provided within the transceiver for adjustment of the output level. The adjustment should vary the output from 5 mW to 40 mW into a 600 Ω ±20% resistive load. The nominal setting should be 10 mW at 1000 Hz. The output circuit should be able to endure a short circuit (zero ohms) and open circuit, and should operate normally after removal of the short or open.	Output isolated from ground.			
			Endure short and open circuit conditions.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; mW - milliwatt; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; Ω - ohms; % - percent; ± - plus or minus

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SUBTEST 5. DISTORTION

5-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 5, and ARINC Characteristic 716-10, reference numbers 39, 49, 60, 66, and 75.

5-1.2 Criteria

a. Reference number 5. The receiver output distortion shall not exceed 25% at rated power output when the receiver input signal is modulated 85% at an input level of 10,000 microvolts. This requirement shall be met over the frequency range of 350 to 2500 Hz.

b. Reference number 5. The receiver output distortion shall not exceed 15% at a level 10 dB below rated power output when the receiver input signal is modulated 30% at an input signal level of 10,000 microvolts. This requirement shall be met over the frequency range of 350 to 2500 Hz.

c. Reference number 39. With an input signal of 1000 μV modulated with 1000 Hz and the receiver gain adjusted to produce 40 mW into a 500 Ω resistive load, the total harmonic distortion should not exceed 7.5% with 30% modulation or 20% with 90% modulation (with the gain control reset to maintain the output at 40 mW), including any effects of the voice limiter.

d. Reference number 49. With an input signal of 1000 μV modulated 30% at 1000 Hz and the level adjusted to provide 0.5 volt (V) output into 600 Ω, the total distortion should not exceed 5.0%.

e. Reference number 60. With the speech processing de-energized or the speech processing service adjustment of section 3.5.5.2 set to “minimum,” the transmitter distortion indicated on an external monitor detector should not exceed 10% with full 90% sinusoidal modulation at any frequency in the range of 300 to 2500 Hz. The noise level should be at least 45 dB below the level of a carrier modulated 90% at 1000 Hz.

f. Reference number 66. The distortion at modulation levels up to 90% should not exceed 10% over the frequency range of 45 dB below the level of 90% modulation at 1000 Hz.

g. Reference number 75. With an input signal of 1,000 μV modulated 30% at 1000 Hz and with the level adjusted to provide a 0.5 V output into 600 Ω, the total distortion should not exceed 5.0%.

5-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) UUT

(3) Audio Breakout Box

(4) Resistors (500 and 600 ohm)

(5) Audio Analyzer

(6) Audio Generator

(7) Attenuator

(8) Power Splitter

(9) Modulation Analyzer

(10) Spectrum Analyzer

b. Test Configuration. Configure the equipment as shown in figures 5-1 and 5-2.

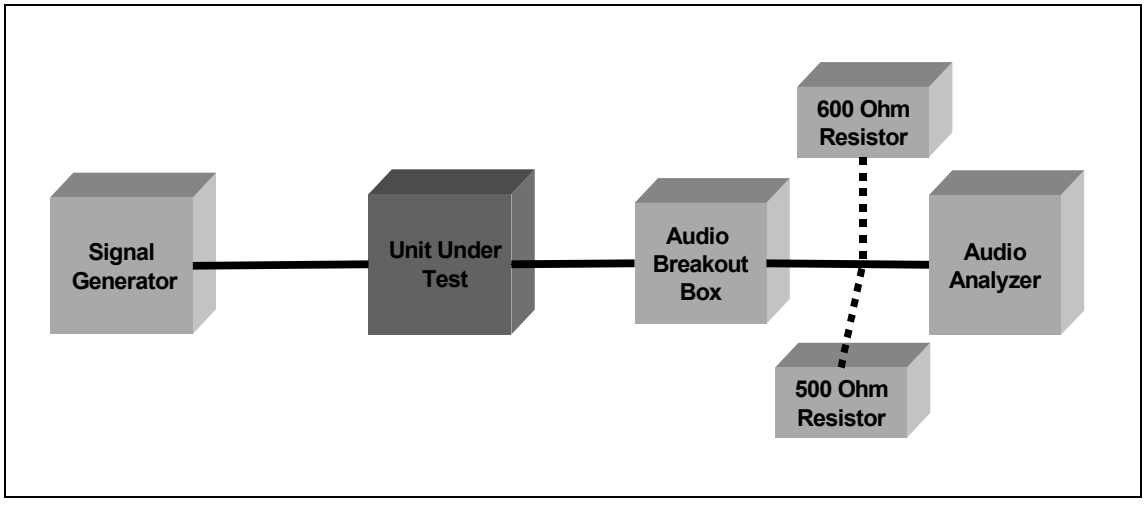

Figure 5-1. Distortion Test Equipment Configuration (receive)

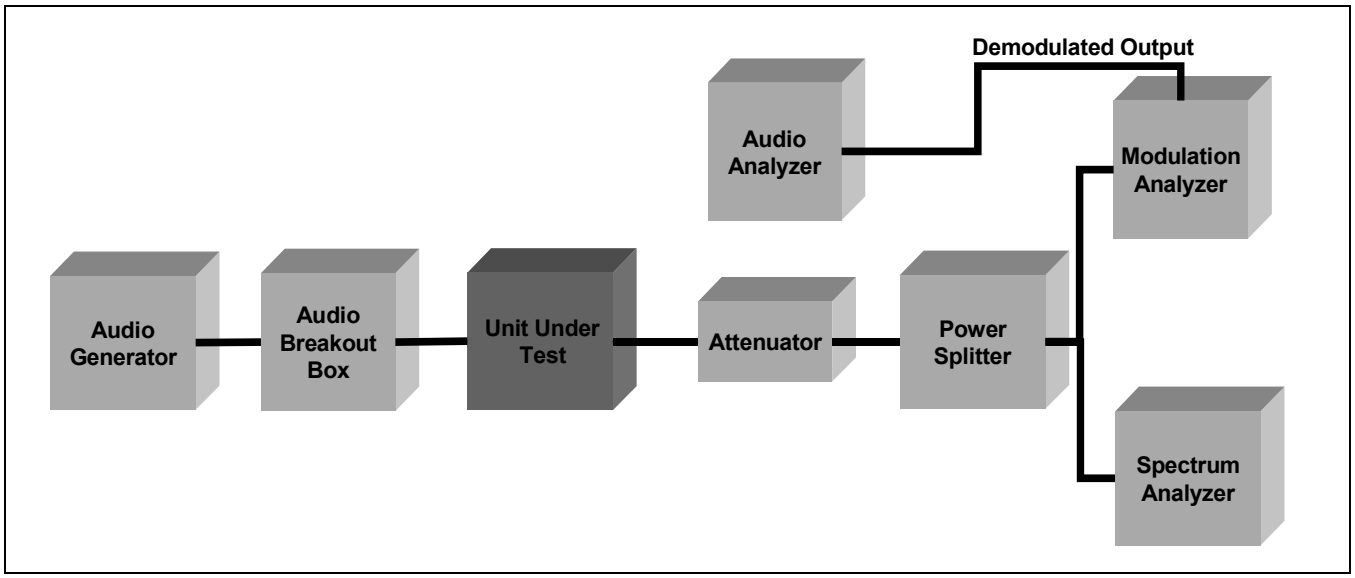

Figure 5-2. Distortion Test Equipment Configuration (transmit)

c. Test Conduct. Test procedures are listed in table C-5.1.

Table 5-1. Distortion Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 5.			
1	Connect the equipment.	As shown in figure 5-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz. Depth: 85% Level: 10 mV Rate: 350 Hz	
3	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz, PT	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set audio analyzer.	Under measurement, select AC level.	
6	Turn RF and modulation of signal generator to on.		
7	Adjust UUT manual gain control.	Adjust manual gain control to produce rated output power (refer to manufacturer specifications if unknown).	
8	Change setting on the audio analyzer.	Under measurement, select distortion ratio.	
9	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
10	Change the rate of the signal generator.	Change rate to 400 Hz.	
11	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	

Table 5-1. Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
12	Change the rate of the signal generator.	Change rate to 500 Hz.	
13	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
14	Change the rate of the signal generator.	Change rate to 1000 Hz.	
15	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
16	Change the rate of the signal generator.	Change rate to 1500 Hz.	
17	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
18	Change the rate of the signal generator.	Change rate to 2000 Hz.	
19	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
20	Change the rate of the signal generator.	Change rate to 2500 Hz.	
21	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 25%.	
22	Adjust UUT manual gain control.	Adjust manual gain control for an output level 10 dB below rated power output.	
23	Change the depth and rate of the signal generator.	Depth: 30% Change rate to 350 Hz.	
24	Change the rate of the signal generator.	Change rate to 400 Hz.	
25	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	
26	Change the rate of the signal generator.	Change rate to 500 Hz.	
27	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	
28	Change the rate of the signal generator.	Change rate to 1000 Hz.	
29	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	
30	Change the rate of the signal generator.	Change rate to 1500 Hz.	
31	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	

Table 5-1. Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
32	Change the rate of the signal generator.	Change rate to 2000 Hz.	
33	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	
34	Change the rate of the signal generator.	Change rate to 2500 Hz.	
35	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 15%.	
The following procedures are for reference numbers 39, 49, and 75.			
36	Refer to figure 5-1.	Insert 500 ohm resistor on output line of the audio breakout box.	
37	Adjust receiver gain.	Adjust gain to produce 40 mW (32 dBm).	
38	Reconfigure the signal generator.	Level: 1000 μV Depth: 30% Rate: 1000 Hz Frequency: 119.000 MHz	
39	Turn RF and modulation to on.	Observe the audio analyzer.	
40	Record distortion.	Ensure distortion does not exceed 7.5%.	
41	Change the signal generator.	Change the modulation depth to 90%.	
42	Adjust gain control.	Adjust gain to maintain 40 mW (32 dBm) output.	
43	Observe the audio analyzer.		
44	Record distortion.	Ensure distortion does not exceed 20%.	
45	Change the modulation depth of the signal generator.	Change depth to: 30%	
46	Refer to figure 5-1.	Insert 600 ohm resistor on output line of the audio breakout box.	
47	Adjust receiver gain.	Adjust gain to produce 0.5 V output.	
48	Observe the audio analyzer.		
49	Record distortion.	Ensure distortion does not exceed 5%.	
50	Change UUT channel spacing.	Change spacing to 8.33 kHz.	
51	Adjust receiver gain.	Adjust gain to produce 0.5 V output.	
52	Observe the audio analyzer.		
53	Record distortion.	Ensure distortion does not exceed 5%.	
The following procedures are for reference numbers 60 and 66.			
54	Connect the equipment.	As shown in figure 5-2.	
55	Configure the modulation analyzer.	Configure to measure AM depth.	
56	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz PT	
57	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	

Table 5-1. Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
58	Use appropriate attenuation.	Use appropriate level of attenuation as to provide safe input to the test equipment.	
59	Configure the spectrum analyzer.	Center frequency: 119.000 MHz Span: 1 MHz Resolution bandwidth: 9 kHz	
60	Configure the audio generator.	Transmit Rate: 300 Hz Level: To provide 90% modulation of the transmitter.	
61	Set the audio analyzer.	Under measurement, select distortion.	
62	Check modulation analyzer.	Ensure 90% modulation.	
63	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
64	Change the rate of the audio generator.	Change rate to 400 Hz.	
65	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
66	Change the rate of the audio generator.	Change rate to 500 Hz.	
67	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
68	Change the rate of the audio generator.	Change rate to 1000 Hz.	
69	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
70	Change the rate of the audio generator.	Change rate to 1500 Hz.	
71	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
72	Change the rate of the audio generator.	Change rate to 2000 Hz.	
73	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
74	Change the rate of the audio generator.	Change rate to 2500 Hz.	
75	Record the distortion level as displayed on the audio analyzer.	Ensure output distortion does not exceed 10%.	
76	Change the rate of the audio generator.	Change rate to 1000 Hz.	
77	Observe carrier frequency on the spectrum analyzer.	Select marker and place marker 1 on the peak of the carrier frequency.	

Table 5-1. Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
78	Select delta marker function.	Move marker 2 along the noise floor.	
79	Record level.	Record the levels of any noise that is not attenuated at least 45 dB down from the carrier.	

Note: Sections that are not applicable to a particular section are shaded.
Legend: AC - Alternating Current; AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; mV - millivolts; mW - milliwatts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V - volt; μV - microvolts; % - percent

5-1.4 Presentation of Results. The results will be shown in table 5-2 indicating the requirement and measured value or indications of capability.

Table 5-2. Distortion Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
5	2.2.5	a. The receiver output distortion shall not exceed 25% at rated power output when the receiver input signal is modulated 85% at an input level of 10,000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz.	Shall not exceed 25 %.			
		b. The receiver output distortion shall not exceed 15% at a level 10 dB below rated power output when the receiver input signal is modulated 30% at an input signal level of 10,000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz.	Shall not exceed 15%.			

Table 5-2. Distortion Results (continued)

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
39	3.6.5.6	With an input signal of 1000 μV modulated with 1000 Hz and the receiver gain adjusted to produce 40 mW into a 500Ω resistive load, the total harmonic distortion should not exceed 7.5% with 30% modulation or 20% with 90% modulation (with the gain control reset to maintain the output at 40 mW), including any effects of the voice limiter.	Should not exceed 7.5%.			
49	3.6.9.3	With an input signal of 1000 μV modulated 30% at 1000 Hz and the level adjusted to provide 0.5 V output into 600 Ω, the total distortion should not exceed 5.0%.	Should not exceed 5.0%.			
60	3.7.5.4	With the speech processing de-energized or the speech processing service adjustment of Section 3.5.5.2 set to "minimum," the transmitter distortion indicated on an external monitor detector should not exceed 10% with full 90% sinusoidal modulation at any frequency in the range 300 to 2500 Hz. The noise level should be at least 45 dB below the level of a carrier modulated 90% at 1000 Hz.	Should not exceed 10%.			
66	3.7.8.4	The distortion at modulation levels up to 90% should not exceed 10% over the frequency range of 45 dB below the level of 90% modulation at 1000 Hz.	Should not exceed 10%.			
75	4.3.4.3	With an input signal of 1,000 μV modulated 30% at 1000 Hz and with the level adjusted to provide a 0.5 V output into 600 Ω, the total distortion should not exceed 5.0%.	Should not exceed 5.0%.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; mW - milliwatts; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; V - volts; μV - microvolts; Ω - ohms; % - percent

SUBTEST 6. NOISE LEVEL

6-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 6.

6-1.2 Criteria. Reference number 6. The signal-plus-noise-to-noise ratio of the receiver output shall be at least 25 dB when an RF input signal modulated 30% at 1000 Hz is varied over the range of 200 to 10,000 microvolts. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.

6-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) UUT

(3) Audio Breakout Box

(4) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 6-1.

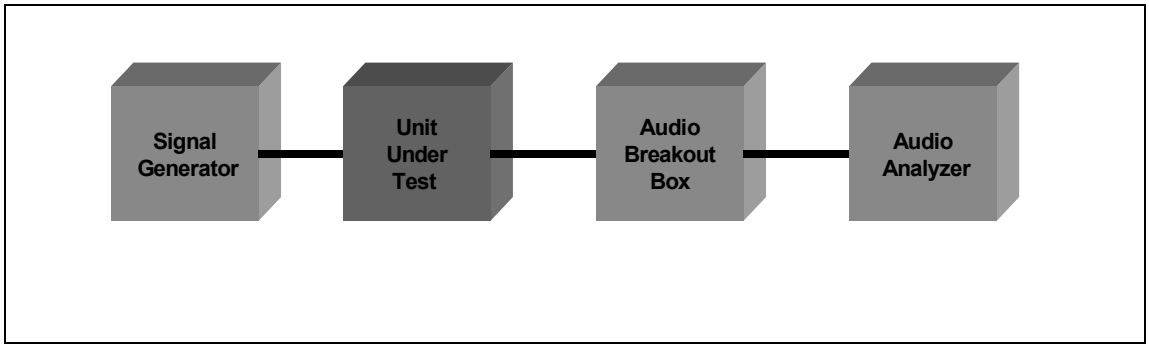

Figure 6-1. Noise Level Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 6-1.

Table 6-1. Noise Level Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 6.			
1	Connect the equipment.	As shown in figure 6-1.	
2	Configure the UUT.	Frequency: 118.000 MHz PT Power: Low	

Table 6-1. Noise Level Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
3	Configure signal generator.	Frequency: 118.000 MHz Depth: 30% Rate: 1000 Hz Level: -61 dBm (200 microvolts) AM	
4	Configure audio breakout box.	Refer to manufacturer specifications for proper audio pinout configuration.	
5	Set up audio analyzer.	Under measurement, select SINAD.	
6	Starting with –61 dBm (200 microvolts) level on signal generator.	Ensure SINAD of at least 25 dB on audio analyzer.	
7	Change level on signal generator to –59 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
8	Change level on signal generator to –57 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
9	Change level on signal generator to –55 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
10	Change level on signal generator to –53 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
11	Change level on signal generator to –51 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
12	Change level on signal generator to –49 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
13	Change level on signal generator to –47 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
14	Change level on signal generator to –45 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
15	Change level on signal generator to –43 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
16	Change level on signal generator to –41 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
17	Change level on signal generator to –39 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
18	Change level on signal generator to –37 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
19	Change level on signal generator to –35 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
20	Change level on signal generator to –33 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
21	Change level on signal generator to –31 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
22	Change level on signal generator to –29 dBm.	Ensure SINAD of at least 25 dB on audio analyzer.	
23	Change level on signal generator to –27 dBm (10,000 microvolts).	Ensure SINAD of at least 25 dB on audio analyzer.	
24	If using alternating current power source.	Ensure this requirement can be met over the range of power source frequencies for which the equipment is designed.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; PT - Plain Text; SINAD - Signal to Noise And Distortion; UUT - Unit Under Test; % - percent

6-1.4 Presentation of Results. The results will be shown in table 6-2 indicating the requirement and measured value or indications of capability.

Table 6-2. Noise Level Results

Reference Number	RTCA/DO 186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
6	2.2.6	The signal-plus-noise-to-noise ratio of the receiver output shall be at least 25 dB when an RF input signal modulated 30% at 1000 Hz is varied over the range of 200 to 10,000 microvolts. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.	At least 25 dB.			

Legend: dB - decibel; Hz - hertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; RF - Radio Frequency; % - percent

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SUBTEST 7. SELECTIVITY

7-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 7, and ARINC Characteristic 716-10, reference numbers 30 and 71.

7-1.2 Criteria. Reference number 7.

a. Nose Bandwidth

(1) Class D Receivers. The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 3 kHz from the assigned channel frequency.

Note: This presumes a ground-based transmitter having a tolerance of ± 0.002%

(2) Class E Receivers. The input signal level required to produce the reference Automatic Gain Control (AGC) voltage shall not vary more than 6 dB over the input signal frequency range of ± 2.778 kHz from the assigned channel frequency.

Note: This presumes a ground-based transmitter having a tolerance of ± 0.001% and 600 knot Doppler.

b. Skirt Bandwidth

(1) Class D Receivers. At frequencies displaced by 22 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency.

Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% for the adjacent channels.

(2) Class E Receivers. At frequencies displaced by 7.33 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency.

Note: This presumes a ground-based transmitter having a tolerance of ± 0.0001% for the adjacent channels.

c. Reference number 30. The nose passband and the stability of the receiver should be such that when a carrier modulated at 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved ± 8 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±17 kHz or more from its assigned frequency.

d. Reference number 71. The nose passband and the stability of the receiver should be such that when a carrier modulated 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved to ± 2.780 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±7.365 kHz or more from its assigned frequency.

Note: The nose passband is defined in order to receive the full speech bandwidth (± 2.5 kHz). This value is increased by the ground frequency tolerance (± 1 ppm) plus the Doppler effect (±140 Hz).

7-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) UUT

(3) Audio Breakout Box

(4) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 7-1.

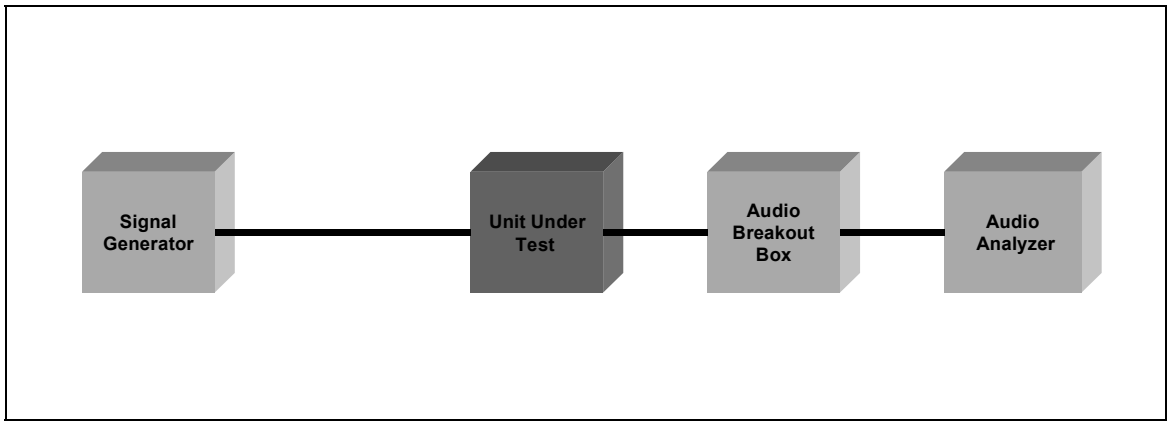

Figure 7-1. Selectivity Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 7-1.

Table 7-1. Selectivity Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 7.			
Nose bandwidth for class D receivers (25 kHz channel spacing).			
1	Set up the equipment.	As shown in figure 7-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm) Rate: 1000 Hz Depth: 30%	
3	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set the audio analyzer.	Under measurement, select AC level.	
6	Turn RF and modulation of the signal generator to on.	Observe the audio analyzer.	
7	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	
8	Change the frequency of the signal generator for -3 kHz from the assigned carrier.	118.997 MHz	
9	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 7.	
10	Record the level on the signal generator required to produce reference AGC voltage.	Ensure level is within 6 dB of reference level (-87 dBm).	
11	Change signal generator frequency for +3 kHz from the assigned frequency.	119.003 MHz	
12	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 7.	
13	Record the level on the signal generator required to produce reference AGC voltage.	Ensure level is within 6 dB of reference level (-87 dBm).	
Nose bandwidth for class E receivers (8.33 kHz channel spacing).			
14	Change channel spacing on the UUT.	8.33 kHz	
15	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm)	
16	Turn RF and modulation to on.	Observe the audio analyzer.	
17	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	
18	Change signal generator frequency for -2.778 kHz from the assigned frequency.	118.997.222 MHz	
19	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 17.	

Table 7-1. Selectivity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
20	Record the level on the signal generator required to produce reference AGC voltage.	Ensure level is within 6 dB of reference level (-87 dBm).	
21	Change signal generator frequency for +2.778 kHz of the assigned frequency.	119.002.778 MHz	
22	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 17.	
23	Record the level on the signal generator required to produce reference AGC voltage.	Ensure level is within 6 dB of reference level (-87 dBm).	
Skirt bandwidth for class D receivers (25 kHz channel spacing)			
24	Change channel spacing on the UUT.	25 kHz	
25	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm)	
26	Turn RF and modulation to on.	Observe the audio analyzer.	
27	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	
28	Change signal generator frequency for -22 kHz from the assigned frequency.	118.978 MHz	
29	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 27.	
30	Record the level on the signal generator required to produce reference AGC voltage.	The recorded level should be at least 60 dB greater than the level required for reference AGC voltage.	
31	Change signal generator frequency for +22 kHz from the assigned frequency.	119.022 MHz	
32	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 27.	
33	Record the level on the signal generator required to produce reference AGC voltage.	The recorded level should be at least 60 dB greater than the level required for reference AGC voltage.	
Skirt bandwidth for class E receivers (8.33 kHz channel spacing)			
34	Change channel spacing on the UUT.	8.33 kHz	
35	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm)	
36	Turn RF and modulation to on.	Observe the audio analyzer.	
37	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	

Table 7-1. Selectivity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
38	Change signal generator frequency for -7.33 kHz from the assigned frequency.	118.992.670 MHz	
39	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 37.	
40	Record the level on the signal generator required to produce reference AGC voltage.	The recorded level should be at least 60 dB greater than the level required for reference AGC voltage.	
41	Change signal generator frequency for +7.33 kHz from the assigned frequency.	119.007.330 MHz	
42	Adjust signal generator level.	Adjust level until the audio analyzer reads reference AGC voltage obtained in step 37.	
43	Record the level on the signal generator required to produce reference AGC voltage.	The recorded level should be at least 60 dB greater than the level required for reference AGC voltage.	
The following procedures are for reference numbers 30 and 71.			
44	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm) Depth: 30% Rate: 1000 Hz	
45	Turn RF and modulation to on.	Observe the audio analyzer.	
46	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	
47	Change signal generator frequency for -8.00 kHz from the assigned frequency.	118.992 MHz	
48	Observe the audio analyzer.		
49	Record results.	Ensure no more than 6 dB of attenuation compared to reference AGC voltage.	
50	Change signal generator frequency for +8.00 kHz from the assigned frequency.	119.008 MHz	
51	Observe the audio analyzer.		
52	Record results.	Ensure no more than 6 dB of attenuation compared to reference AGC voltage.	
53	Change signal generator frequency for -17.00 kHz from the assigned frequency.	118.983 MHz	
54	Observe the audio analyzer.		
55	Record results.	Ensure at least 60 dB of attenuation compared to reference AGC voltage.	
56	Change signal generator frequency for +17.00 kHz from the assigned frequency.	119.017 MHz	

Table 7-1. Selectivity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
57	Observe the audio analyzer.		
58	Record results.	Ensure at least 60 dB of attenuation compared to reference AGC voltage.	
59	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (-87 dBm)	
60	Turn RF and modulation to on.	Observe the audio analyzer.	
61	Record the AC level (in dBm) as displayed on the audio analyzer.	This will be the reference AGC voltage.	
62	Change signal generator frequency for -2.780 kHz from the assigned frequency.	118.997.220 MHz	
63	Observe the audio analyzer.		
64	Record results.	Ensure no more than 6 dB of attenuation compared to reference AGC voltage.	
65	Change signal generator frequency for +2.780 kHz from the assigned frequency.	119.002.780 MHz	
66	Observe the audio analyzer.		
67	Record results.	Ensure no more than 6 dB of attenuation compared to reference AGC voltage.	
68	Change signal generator frequency for -7.365 kHz from the assigned frequency.	118.993.635 MHz	
69	Observe the audio analyzer.		
70	Record results.	Ensure at least 60 dB of attenuation compared to reference AGC voltage.	
71	Change signal generator frequency for +7.365 kHz from the assigned frequency.	119.007.365 MHz	
72	Observe the audio analyzer.		
73	Record results.	Ensure at least 60 dB of attenuation compared to reference AGC voltage.	

Note: Sections that are not applicable are shaded.
Legend: AC - Alternating Current; AGC - Automatic Gain Control; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; RF - Radio Frequency; UUT - Unit Under Test; μV - microvolts; % - percent

7-1.4 Presentation of Results. The results will be shown in table 7-2 indicating the requirement and measured value or indications of capability.

Table 7-2. Selectivity Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
7	2.2.7	(4) Class D Receivers. The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 3 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002%.	Shall not vary more than 6 dB.			
		(5) Class E Receivers. The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 2.778 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.001% and 600 knot Doppler.	Shall not vary more than 6 dB.			
		(3) Class D Receivers. At frequencies displaced by 22 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% for the adjacent channels.	At least 60 dB.			
		(4) Class E Receivers. At frequencies displaced by 7.33 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.0001% for the adjacent channels.	At least 60 dB.			

Table 7-2. Selectivity Results (continued)

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
30	3.6.2	The nose passband and the stability of the receiver should be such that when a carrier modulated at 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved ±8 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±17 kHz or more from its assigned frequency.	No more than 6 dB.			
			At least 60 dB.			
71	4.3.1	The nose passband and the stability of the receiver should be such that when a carrier modulated 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved to ± 2.780 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±7.365 kHz or more from its assigned frequency. Note: The nose passband is defined in order to receive the full speech bandwidth (± 2.5 kHz). This value is increased by the ground frequency tolerance (± 1 ppm) plus the Doppler effect (±140 Hz).	No more than 6 dB.			
			At least 60 dB.			

Legend: ARINC - Aeronautical Radio Incorporated; AGC - Automatic Gain Control; dB - decibels; Hz - hertz; kHz - kilohertz; ppm - parts per million; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent; ± - plus or minus

SUBTEST 8. SPURIOUS RESPONSES

8-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 8.

8-1.2 Criteria. Reference number 8. The input signal level on an undesired frequency required to produce a detector-carrier (AGC) level equal to that required for a 6 dB signal-plus-noise-to-noise ratio as specified previously in paragraph 2.2.3 shall be not less than 10 millivolts when:

a. The undesired input signal frequency is within 108 to 137 MHz and is on any frequency within ± 8 kHz of any assignable channel other than the desired channel and the upper and lower adjacent channels.

b. The undesired input signal frequency is between 50 kHz and 1215 MHz excluding the band 108 to 137 MHz.

8-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) Audio Breakout Box

(3) Audio Analyzer

(4) UUT

b. Test Configuration. Configure the equipment as shown in figure 8-1.

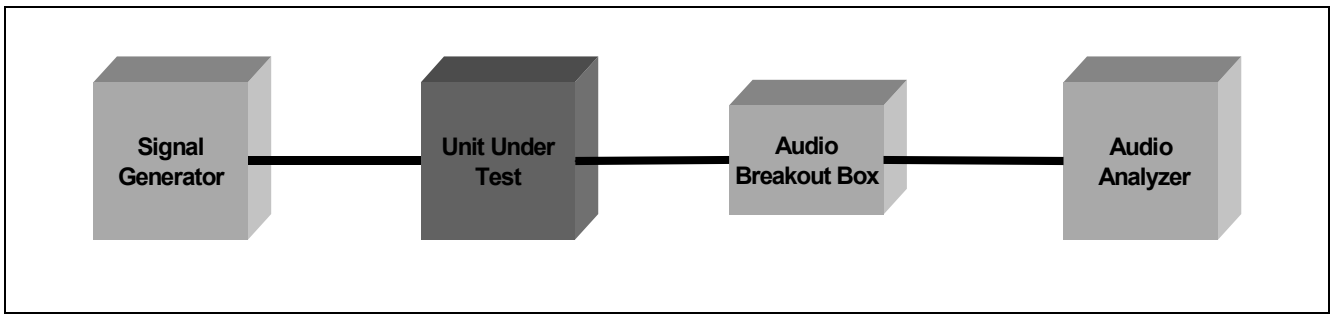

Figure 8-1. Spurious Response Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 8-1.

Table 8-1. Spurious Response Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 8.			
1	Connect the equipment.	As shown in figure 8-1.	
2	Configure the signal generator.	Frequency: 108.000 MHz Amplitude: 1 μV	
3	Configure the UUT.	Frequency: 119.000 MHz	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set the audio analyzer.	Under measurement, select SINAD.	
6	Turn RF and modulation to on.	Observe the audio analyzer.	
7	Adjust level of signal generator.	Adjust level until 6 dB SINAD is achieved on the audio analyzer.	
8	On the audio analyzer, switch measurement to AC level.	Record AGC voltage on the audio analyzer. This will be the reference output voltage.	
9	Change the frequency and amplitude of the signal generator.	Frequency: 50 Hz Level: 10 mV	
10	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
11	Change the frequency of the signal generator.	Frequency: 100 Hz	
12	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
13	Change the frequency of the signal generator.	Frequency: 200 Hz	
14	Record voltage level.	Observe the audio analyzer, and ensure voltage level does not equal or exceed the reference level voltage.	
15	Change the frequency of the signal generator.	Frequency: 300 Hz	
16	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
17	Change the frequency of the signal generator.	Frequency: 400 Hz	
18	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
19	Change the frequency of the signal generator.	Frequency: 500 Hz	
20	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
21	Change the frequency of the signal generator.	Frequency: 600 Hz	
22	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
23	Change the frequency of the signal generator.	Frequency: 700 Hz	
24	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
25	Change the frequency of the signal generator.	Frequency: 800 Hz	
26	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
27	Change the frequency of the signal generator.	Frequency: 900 Hz	
28	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
29	Change the frequency of the signal generator.	Frequency: 1000 Hz	
30	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
31	Change the frequency of the signal generator.	Frequency: 2000 Hz	
32	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
33	Change the frequency of the signal generator.	Frequency: 3000 Hz	
34	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
35	Change the frequency of the signal generator.	Frequency: 4000 Hz	
36	Record voltage level.	Observe the audio analyzer, and ensure voltage level does not equal or exceed the reference level voltage.	
37	Change the frequency of the signal generator.	Frequency: 5000 Hz	
38	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
39	Change the frequency of the signal generator.	Frequency: 6000 Hz	
40	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
41	Change the frequency of the signal generator.	Frequency: 7000 Hz	
42	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
43	Change the frequency of the signal generator.	Frequency: 8000 Hz	
44	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
45	Change the frequency of the signal generator.	Frequency: 9000 Hz	
46	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
47	Change the frequency of the signal generator.	Frequency: 10000 Hz	
48	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
49	Change the frequency of the signal generator.	Frequency: 20000 Hz	
50	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
51	Change the frequency of the signal generator.	Frequency: 30000 Hz	
52	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
53	Change the frequency of the signal generator.	Frequency: 40000 Hz	
54	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
55	Change the frequency of the signal generator.	Frequency: 50000 Hz	
56	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
57	Change the frequency of the signal generator.	Frequency: 100000 Hz	
58	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
59	Change the frequency of the signal generator.	Frequency: 200000 Hz	
60	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
61	Change the frequency of the signal generator.	Frequency: 300000 Hz	
62	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
63	Change the frequency of the signal generator.	Frequency: 400000 Hz	
64	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
65	Change the frequency of the signal generator.	Frequency: 500000 Hz	
66	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
67	Change the frequency of the signal generator.	Frequency: 1 MHz	
68	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
69	Change the frequency of the signal generator.	Frequency: 2 MHz	
70	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
71	Change the frequency of the signal generator.	Frequency: 3 MHz	
72	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
73	Change the frequency of the signal generator.	Frequency: 4 MHz	
74	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
75	Change the frequency of the signal generator.	Frequency: 5 MHz	
76	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
77	Change the frequency of the signal generator.	Frequency: 6 MHz	
78	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
79	Change the frequency of the signal generator.	Frequency: 7 MHz	
80	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
81	Change the frequency of the signal generator.	Frequency: 8 MHz	
82	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
83	Change the frequency of the signal generator.	Frequency: 9 MHz	
84	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
85	Change the frequency of the signal generator.	Frequency: 10 MHz	
86	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
87	Change the frequency of the signal generator.	Frequency: 20 MHz	
88	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
89	Change the frequency of the signal generator.	Frequency: 30 MHz	
90	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
91	Change the frequency of the signal generator.	Frequency: 40 MHz	
92	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
93	Change the frequency of the signal generator.	Frequency: 50 MHz	
94	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
95	Change the frequency of the signal generator.	Frequency: 60 MHz	
96	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
97	Change the frequency of the signal generator.	Frequency: 70 MHz	
98	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
99	Change the frequency of the signal generator.	Frequency: 80 MHz	
100	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
101	Change the frequency of the signal generator.	Frequency: 90 MHz	
102	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
103	Change the frequency of the signal generator.	Frequency: 100 MHz	
104	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
105	Change the frequency of the signal generator.	Frequency: 110 MHz	
106	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
107	Change the frequency of the signal generator.	Frequency: 118.942 MHz (-8 kHz from nearest assignable channel other than the adjacent channel.)	
108	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
109	Change the frequency of the signal generator.	Frequency: 118.958 MHz (+8 kHz from nearest assignable channel other than the adjacent channel.)	
110	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
111	Change the frequency of the signal generator.	Frequency: 119.042 MHz (-8 kHz from nearest assignable channel other than the adjacent channel.)	
112	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
113	Change the frequency of the signal generator.	Frequency: 119.058 MHz (+8 kHz from nearest assignable channel other than the adjacent channel.)	
114	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
115	Change the frequency of the signal generator.	Frequency: 120 MHz	
116	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
117	Change the frequency of the signal generator.	Frequency: 130 MHz	
118	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
119	Change the frequency of the signal generator.	Frequency: 140 MHz	
120	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
121	Change the frequency of the signal generator.	Frequency: 150 MHz	
122	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
123	Change the frequency of the signal generator.	Frequency: 200 MHz	
124	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
125	Change the frequency of the signal generator.	Frequency: 300 MHz	
126	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
127	Change the frequency of the signal generator.	Frequency: 400 MHz	
128	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
129	Change the frequency of the signal generator.	Frequency: 500 MHz	
130	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
131	Change the frequency of the signal generator.	Frequency: 600 MHz	
132	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
133	Change the frequency of the signal generator.	Frequency: 700 MHz	
134	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
135	Change the frequency of the signal generator.	Frequency: 800 MHz	
136	Record voltage level.	Observe the audio analyzer, and ensure voltage level does not equal or exceed the reference level voltage.	
137	Change the frequency of the signal generator.	Frequency: 900 MHz	
138	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
139	Change the frequency of the signal generator.	Frequency: 1000 MHz	
140	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Table 8-1. Spurious Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
141	Change the frequency of the signal generator.	Frequency: 1100 MHz	
142	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
143	Change the frequency of the signal generator.	Frequency: 1200 MHz	
144	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	
145	Change the frequency of the signal generator.	Frequency: 1215 MHz	
146	Record voltage level.	Observe the audio analyzer and ensure voltage level does not equal or exceed the reference level voltage.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; AGC - Automatic Gain Control; dB - decibels; Hz - hertz; kHz - kilohertz; MHz - megahertz; mV - millivolts; RF - Radio Frequency; SINAD - Signal-to-Noise and Distortion; UUT - Unit Under Test; μV - microvolts

8-1.4 Presentation of Results. The results will be shown in table 8-2 indicating the requirement and measured value or indications of capability.

Table 8-2. Spurious Response Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
8	2.2.8	The input signal level on an undesired frequency required to produce a detector-carrier (AGC) level equal to that required for a 6 dB signal-plus-noise-to-noise ratio as specified previously in paragraph 2.2.3 shall be not less than 10 millivolts when: a. The undesired input signal frequency is within 108 to 137 MHz and is on any frequency within ± 8 kHz of any assignable channel other than the desired channel and the upper and lower adjacent channels. b. The undesired input signal frequency is between 50 kHz and 1215 MHz excluding the band 108-137 MHz. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz.	Not less than 10 millivolts.			

Legend: AGC - Automatic Gain Control; dB - decibels; EUROCAE - European Organization for Civil Aviation Electronics; kHz - kilohertz; MHz - megahertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; VHF - Very High Frequency

SUBTEST 9. CROSS MODULATION

9-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 9, and ARINC Characteristic 716-10, reference numbers 32 and 72.

9-1.2 Criteria

a. Reference number 9. With the simultaneous application of an unmodulated carrier at desired channel frequency and a signal modulated 30% at 1000 Hz (undesired signal), the receiver output, due to cross modulation, shall be at least 10 dB less than rated output. The desired channel signal shall be at any level between 20 and 500 microvolts, and the interfering signal (undesired) at a level of 10,000 microvolts at any frequency within 100 to 156 MHz. For Class E receivers, this includes the frequencies equivalent to the second higher and second lower channels to which the receiver can be tuned, but excludes the frequency range between these two channels.

b. Reference number 32. The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

Undesired Signal Frequency	Minimum Undesired Signal Level Modulated 50% (Hard μV)	Desired Signal Level Unmodulated (Hard μV)
±25 kHz	10,000	10
±50 kHz	20,000	10
±100 kHz	60,000	10
±500 kHz	100,000	10
±1 MHz	200,000	10

With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed –10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0.1 V, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

Undesired Signal Level	Off Resonance
0.06 V	0.1 MHz
0.3 V	0.5 MHz
0.6 V	1.0 MHz
1.2 V	2.0 MHz

c. Reference number 72. The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

Undesired Signal Frequency	Minimum Undesired Signal Level Modulated 50% (Hard μV)	Desired Signal Level – Unmodulated (Hard μV)
± 8.33 kHz	10,000	10
± 25 kHz	10,000	10
± 50 kHz	20,000	10
± 100 kHz	60,000	10
± 500 kHz	100,000	10
± 1 MHz	200,000	10

With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed –10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0. 1 V, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

Undesired Signal Level	Off Resonance
0.06 V	0.1 MHz
0.3 V	0.5 MHz
0.6 V	1.0 MHz
1.2 V	2.0 MHz

9-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generators (2)

(2) Power Combiner

(3) UUT

(4) Audio Breakout Box

(5) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 9-1.

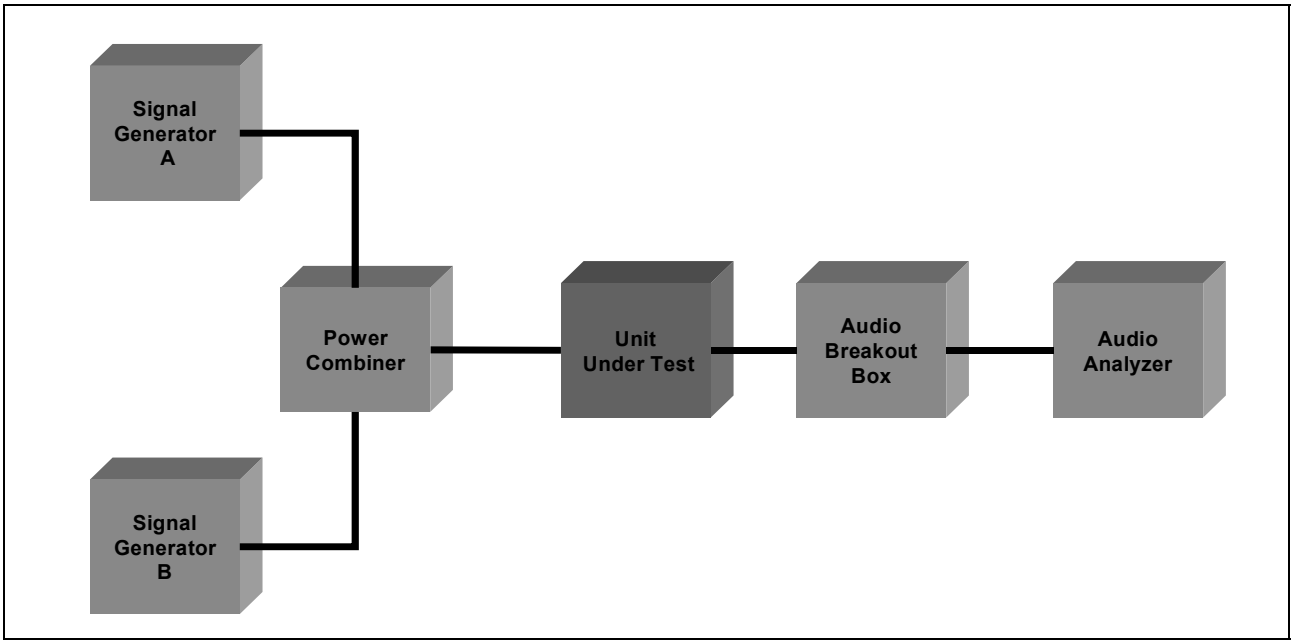

Figure 9-1. Cross Modulation Test Equipment Configuration

c. Test Conduct. Manual test procedures are listed in table 9-1.

Table 9-1. Cross Modulation Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 9.			
1	Connect the equipment.	As shown in figure 9-1.	
2	Configure signal generator A.	Frequency: Any between 100 to 156 MHz (off carrier). Amplitude: 10,000 μV (-27 dBm) Depth: 30% Rate: 1000 Hz Note: For Class E receivers this includes the frequencies equivalent to the second higher and lower frequencies to which the UUT can be tuned, but excludes the frequencies in between.	
3	Configure signal generator B.	Frequency: 118.000 MHz (on carrier) Amplitude: 20 μV to 500 μV	
4	Configure the UUT.	Frequency: 118.000 MHz AM Power: Low PT	
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
6	Set the audio analyzer.	Under measurement, select AC level.	

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
7	Determine rated output of the UUT.	With signal generators off, adjust manual gain control to maximum setting and record the AC voltage level (in dBm) as displayed on the audio analyzer, or refer to manufacturer specifications for rated output of the UUT.	
8	Turn signal generator A (off carrier) RF and modulation to on.		
9	Turn signal generator B (on carrier) RF only to on.		
10	Observe the audio analyzer.	Record the AC level (in dBm). Ensure the receiver output, due to cross modulation is at least 10 dB less than the output obtained in step 7.	
The following procedure is for reference number 32.			
11	Connect the equipment.	As shown in figure 9-1.	
12	Configure signal generator A (on carrier). (-25 kHz)	Frequency: 119.000 MHz Depth: 50% Rate: 1000 Hz Amplitude: 10 μV	
13	Configure signal generator B (off carrier).	Frequency: 118.975 MHz Depth: 50% Rate: 1000 Hz Amplitude: 10000 μV	
14	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz	
15	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
16	Set the audio analyzer.	Under measurement, select AC level.	
17	On signal generator A, turn RF and modulation to on.	Record audio output reference level in dBm as displayed on audio analyzer.	
18	Turn modulation of signal generator A to off.		
19	On signal generator B, turn RF and modulation to on.		
20	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
21	Change frequency on signal generator B. (+25 kHz)	119.025 MHz	
22	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
23	Change the frequency and amplitude on signal generator B. (-50 kHz)	Amplitude: 20000 μV Frequency: 118.950 MHz	
24	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
25	Change frequency on signal generator B. (+50 kHz)	119.050 MHz	
26	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
27	Change the frequency and amplitude on signal generator B. (-100 kHz)	Amplitude: 60000 μV Frequency: 118.900 MHz	
28	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
29	Change frequency on signal generator B. (+100 kHz)	119.100 MHz	
30	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
31	Change the frequency and amplitude on signal generator B. (-500 kHz)	Amplitude: 100000 μV Frequency: 118.500 MHz	
32	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
33	Change frequency on signal generator B. (+500 kHz)	119.500 MHz	
34	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
35	Change the frequency and amplitude on signal generator B. (-1 MHz)	Amplitude: 200000 μV Frequency: 118.000 MHz	
36	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 17.	
37	Change frequency on signal generator B. (+1 MHz)	120.000 MHz	
38	Change the depth of modulation on both signal generators A and B.	Change depth to 30%.	
39	Change the frequency and amplitude on signal generator B. (0.1 MHz off resonance)	Amplitude: 0.06 volts Frequency: 119.100 MHz	
40	Turn signal generator A to RF on (no modulation).		
41	Turn signal generator B RF and modulation to on.		
42	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
43	Vary the amplitude of signal generator A.	From 3 μV to 0.1 volt.	

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
44	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed –10 dBm on the audio analyzer.	
45	Change the frequency and amplitude on signal generator B. (0.5 MHz off resonance)	Amplitude: 0.3 V Frequency: 119.500 MHz	
46	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
47	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
48	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed –10 dBm on the audio analyzer.	
49	Change the frequency and amplitude on signal generator B. (1.0 MHz off resonance)	Amplitude: 0.6 V Frequency: 120.000 MHz	
50	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
51	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
52	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	
53	Change the frequency and amplitude on signal generator B. (2 MHz off resonance)	Amplitude: 1.2 V Frequency: 121.000 MHz	
54	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
55	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
56	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	
The following procedure is for reference number 72.			
57	Change UUT setting.	Channel spacing: 8.33 kHz	
58	Configure signal generator A (on carrier).	Frequency: 119.000 MHz Depth: 50% Rate: 1000 Hz Amplitude: 10 μV	
59	Configure signal generator B (off carrier). (-8.33 kHz)	Frequency: 118.991.670 MHz Depth: 50% Rate: 1000 Hz Amplitude: 10000 μV	
60	On signal generator A, turn RF and modulation to on.	Record audio output reference level in dBm as displayed on audio analyzer.	
61	Turn modulation of signal generator A to off.		

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
62	On signal generator B, turn RF and modulation to on.		
63	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
64	Change frequency on signal generator B. (+8.33 kHz)	119.008.330 MHz	
65	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
66	Change frequency on signal generator B. (-25 kHz)	118.975 MHz	
67	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
68	Change frequency on signal generator B. (+25 kHz)	119.025 MHz	
69	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
70	Change the frequency and amplitude on signal generator B. (-50 kHz)	Amplitude: 20000 μV Frequency: 118.950 MHz	
71	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
72	Change frequency on signal generator B. (+50 kHz)	119.050 MHz	
73	Change the frequency and amplitude on signal generator B. (-100 kHz)	Amplitude: 60000 μV Frequency: 118.900 MHz	
74	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
75	Change frequency on signal generator B. (+100 kHz)	119.100 MHz	
76	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
77	Change the frequency and amplitude on signal generator B (-500 kHz).	Amplitude: 100000 μV Frequency: 118.500 MHz	
78	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
79	Change frequency on signal generator B. (+500 kHz)	119.500 MHz	
80	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
81	Change the frequency and amplitude on signal generator B. (-1 MHz)	Amplitude: 200000 μV Frequency: 118.000 MHz	
82	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
83	Change frequency on signal generator B. (+1 MHz)	120.000 MHz	
84	Record level displayed on the audio analyzer.	Ensure the AC level is down at least 10 dB with respect to the reference level obtained in step 60.	
85	Change the depth of modulation on both signal generators A and B.	Change depth to 30%.	
86	Change the frequency and amplitude on signal generator B. (0.1 MHz off resonance)	Amplitude: 0.06 V Frequency: 119.100 MHz	
87	Turn signal generator A to RF on (no modulation).		
88	Turn signal generator B RF and modulation to on.		
89	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
90	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
91	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	
92	Change the frequency and amplitude on signal generator B. (0.5 MHz off resonance)	Amplitude: 0.3 V Frequency: 119.500 MHz	
93	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
94	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
95	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	
96	Change the frequency and amplitude on signal generator B. (1.0 MHz off resonance)	Amplitude: 0.6 V Frequency: 120.000 MHz	
97	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
98	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
99	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	

Table 9-1. Cross Modulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
100	Change the frequency and amplitude on signal generator B. (2.0 MHz off resonance)	Amplitude: 1.2 volts Frequency: 121.000 MHz	
101	Adjust the UUT audio gain control.	Adjust audio gain to achieve 100 mW output.	
102	Vary the amplitude of signal generator A.	From 3 μV to 0.1 V.	
103	Observe the level displayed on the audio analyzer.	While varying the level of signal generator A, ensure the output of the undesired signal (signal generator B) does not exceed -10 dBm on the audio analyzer.	

Note: Sections that are not applicable to a particular step are shaded
Legend: AC - Alternating Current; AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; mW - milliwatts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V - volts; % - percent; μV - microvolts

9-1.4 Presentation of Results. The results will be shown in table 9-2 indicating the requirement and measured value or indications of capability.

Table 9-2. Cross Modulation Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
9	2.2.9	With the simultaneous application of an unmodulated carrier at desired channel frequency and a signal modulated 30% at 1000 Hz (undesired signal), the receiver output, due to cross modulation, shall be at least 10 dB less than rated output. The desired channel signal shall be at any level between 20 and 500 microvolts, and the interfering signal (undesired) at a level of 10,000 microvolts at any frequency within 100-156 MHz. For Class E receivers, this includes the frequencies equivalent to the second higher and second lower channels to which the receiver can be tuned, but excludes the frequency range between these two channels. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz.	At least 10 dB less.			

Table 9-2. Cross Modulation Results (continued)

<table>
<tr><th rowspan="2">Reference Number</th><th rowspan="2">ARINC 716-10 Paragraph</th><th rowspan="2">Requirement</th><th colspan="2">Result</th><th colspan="2">Finding</th></tr>
<tr><th>Required Value</th><th>Required Value</th><th>Met</th><th>Not Met</th></tr>
<tr><td rowspan="2">32</td><td rowspan="2">3.6.4</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:
<table><tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level Un-modulated (Hard μV)</th></tr><tr><td>±25 kHz</td><td>10,000</td><td>10</td></tr><tr><td>±50 kHz</td><td>20,000</td><td>10</td></tr><tr><td>±100 kHz</td><td>60,000</td><td>10</td></tr><tr><td>±500 kHz</td><td>100,000</td><td>10</td></tr><tr><td>±1 MHz</td><td>200,000</td><td>10</td></tr></table></td><td>At least 10 dB down.</td><td></td><td></td><td></td></tr>
<tr><td>With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed –10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0.1 volt, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:
<table><tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr><tr><td>0.06 V</td><td>0.1 MHz</td></tr><tr><td>0.3 V</td><td>0.5 MHz</td></tr><tr><td>0.6 V</td><td>1.0 MHz</td></tr><tr><td>1.2 V</td><td>2.0 MHz</td></tr></table></td><td>Not to exceed -10 dB.</td><td></td><td></td><td></td></tr>
</table>

Table 9-2. Cross Modulation Results (continued)

<table>
<tr><th rowspan="2">Reference Number</th><th rowspan="2">ARINC 716-10 Paragraph</th><th rowspan="2">Requirement</th><th colspan="2">Result</th><th colspan="2">Finding</th></tr>
<tr><th>Required Value</th><th>Required Value</th><th>Met</th><th>Not Met</th></tr>
<tr><td rowspan="2">72</td><td rowspan="2">4.3.2</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

<table><tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level Un-modulated (Hard μV)</th></tr><tr><td>±8.33 kHz</td><td>10,000</td><td>10</td></tr><tr><td>±25 kHz</td><td>10,000</td><td>10</td></tr><tr><td>±50 kHz</td><td>20,000</td><td>10</td></tr><tr><td>±100 kHz</td><td>60,000</td><td>10</td></tr><tr><td>±500 kHz</td><td>100,000</td><td>10</td></tr><tr><td>±1 MHz</td><td>200,000</td><td>10</td></tr></table></td><td>At least 10 dB down.</td><td></td><td></td><td></td></tr>
<tr><td>With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed –10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0.1 V, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

<table><tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr><tr><td>0.06 V</td><td>0.1 MHz</td></tr><tr><td>0.3 V</td><td>0.5 MHz</td></tr><tr><td>0.6 V</td><td>1.0 MHz</td></tr><tr><td>1.2 V</td><td>2.0 MHz</td></tr></table></td><td>Not to exceed -10 dB.</td><td></td><td></td><td></td></tr>
</table>

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; EUROCAE - European Organization for Civil Aviation Electronics; Hz - hertz; MHz - megahertz; mW - milliwatts; V - volt; VHF - Very High Frequency; μV - microvolts; % - percent

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SUBTEST 10. INTERMODULATION

10-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 10.

10-1.2 Criteria. Reference number 10. With the receiver audio compressor disabled (if so equipped), the simultaneous application of two unmodulated undesired signals, within the range of 87.5 to 107.9 MHz, with levels at the receiver input terminals of -5 dBm, shall result in an audio quieting[1] (see note) of less than 6 dB.

[1] Audio quieting is defined as the reduction in audio output level below that audio output level obtained with no RF signal applied to the receiver.

10-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generators (2)

(3) Power Combiner

(4) Attenuator

(5) Spectrum Analyzer

(6) Audio Breakout Box

(7) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 10-1.

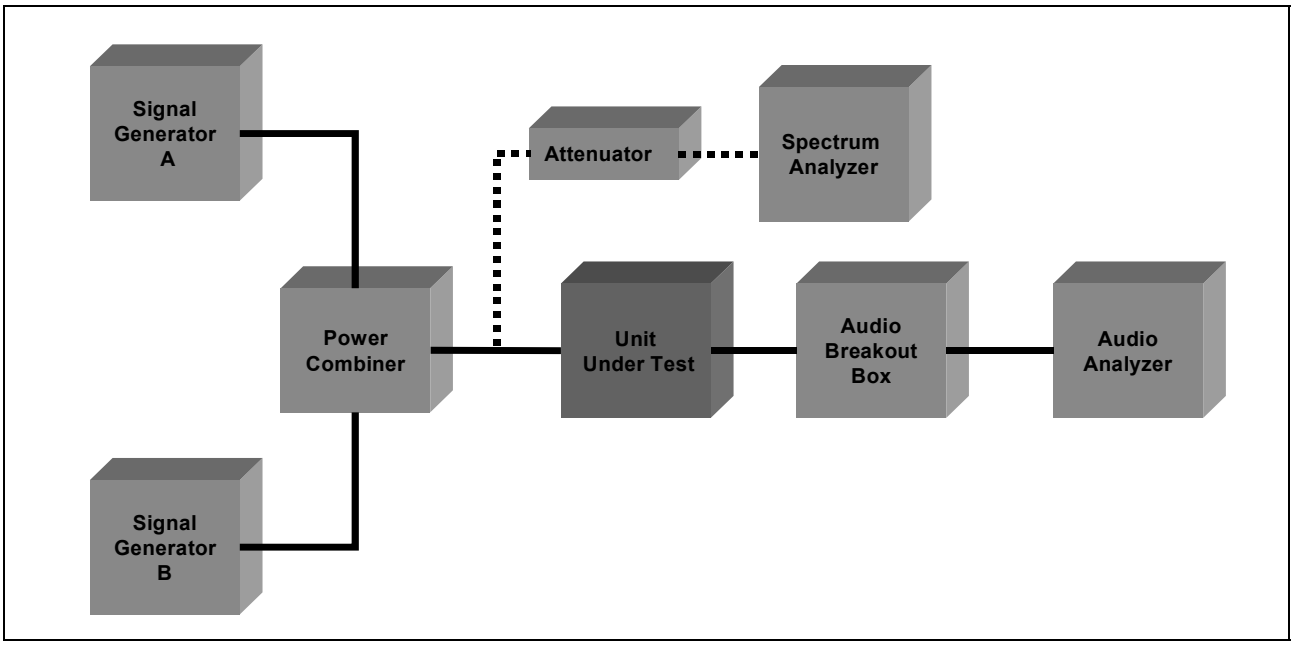

Figure 10-1. Intermodulation Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 10-1.

Table 10-1. Intermodulation Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 10.			
1	Connect the equipment.	As shown in figure 10-1.	
2	Configure signal generator A.	Frequency: 90 MHz	
3	Configure signal generator B.	Frequency: 105 MHz	
4	Configure the UUT.	Frequency: 118.000 MHz Audio compressor disabled (if equipped).	
5	Configure spectrum analyzer.	Center frequency: 118.000 MHz Span: 400 MHz Reference level: 0 dBm	
6	Configure audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
7	Set the audio analyzer.	Under measurement, select AC level.	
8	Connect the output of the power combiner to the spectrum analyzer.		
9	Turn the RF of signal generators A and B to on.	Adjust the amplitude of both signal generators to achieve a -5 dBm level. Both signals can be checked at the same time using the marker function to check the peaks.	
10	Turn the RF of both signal generators A and B to off.		
11	Disconnect the -5 dBm signal from the power combiner.	Reconnect the -5 dBm signal to the UUT.	
12	Check the audio output level of the UUT without RF.	Record level.	

Table 10-1. Intermodulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
13	Turn RF of both signal generators A and B to on. No modulation is needed.	Record AC level (in dBm) as displayed on the audio analyzer. Ensure audio quieting of less than 6 dB.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dB - decibels; dBm - decibels referenced to 1 milliwatt; MHz - megahertz; RF - Radio Frequency; UUT - Unit Under Test

10-1.4 Presentation of Results. The results will be shown in table 10-2 indicating the requirement and measured value or indications of capability.

Table 10-2. Intermodulation Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
10	2.2.10	With the receiver audio compressor disabled (if so equipped), the simultaneous application of two unmodulated undesired signals, within the range of 87.5 to 107.9 MHz, with levels at the receiver input terminals of -5 dBm, shall result in an audio Quieting[1] of less than 6 dB.	Less than 6 dB.			

Note: [1] Audio quieting is defined as the reduction in audio output level below that audio output level obtained with no RF signal applied to the receiver.
Legend: dB - decibels; dBm - decibel referenced to 1 milliwatt; MHz - megahertz; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 11. DESENSITIZATION

11-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 11.

11-1.2 Criteria. Reference number 11. With a -87 dBm signal at the receiver input modulated 30% with 1 kHz and at the desired channel frequency, the receiver signal-plus-noise-to-noise ratio shall not decrease to less than 6 dB:

a. In the presence of an unmodulated carrier having a level of -33 dBm at the receiver input terminals and at frequencies between 108 and 156 MHz, including the frequencies equivalent to the next higher and the next lower channels to which the receiver can be tuned, but excluding the frequency range between these two channels.

b. In the presence of an unmodulated carrier having a level of -7 dBm at the receiver input terminals and at any frequency within the 50 kHz through 1215 MHz, except for discrete spurious response frequencies. This excludes the frequencies within the range 87.5 - 156 MHz. At the discrete spurious response frequencies, the unmodulated carrier (undesired signal) shall have a level of -33 dBm at the receiver input terminals.

c. In the presence of an unmodulated carrier having a level of -5 dBm at the receiver input terminals and at frequencies between 87.5 and 107.9 MHz.

11-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generators (2)

(3) Spectrum Analyzer

(4) Power Combiner

(5) Audio Breakout Box

(6) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 11-1.

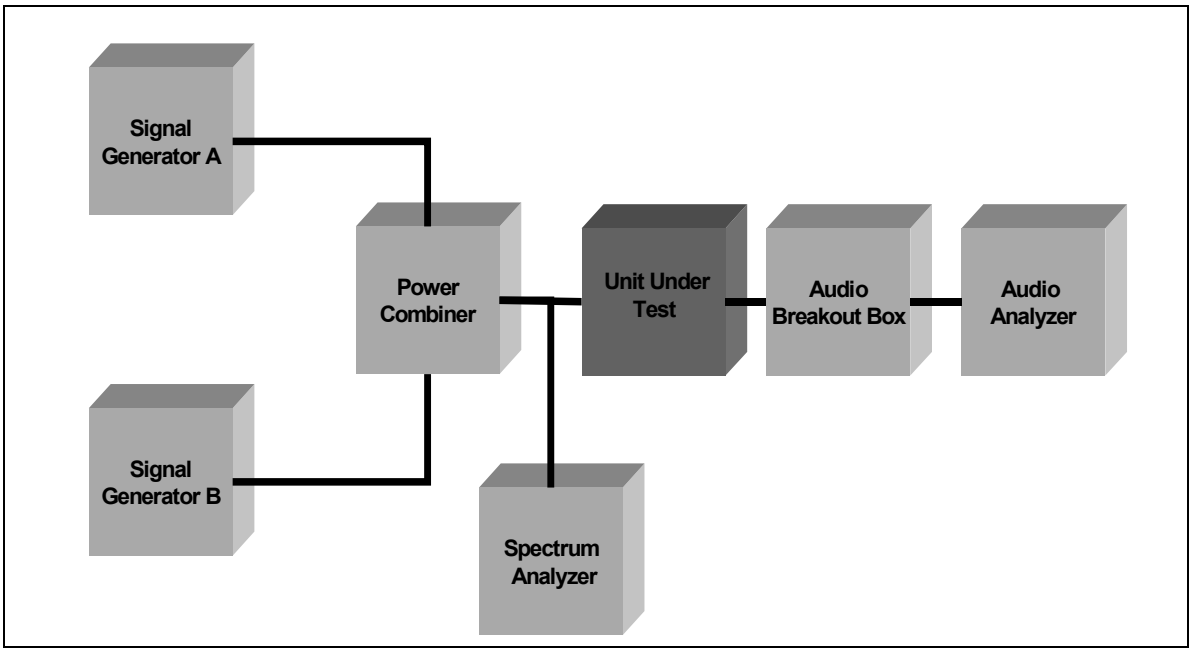

Figure 11-1. Desensitization Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 11-1.

Table 11-1. Desensitization Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 11.			
1	Connect the equipment.	As shown in figure 11-1.	
2	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz	
3	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
4	Configure the spectrum analyzer.	The spectrum analyzer will be used to check the actual power levels from the power combiner.	
5	Configure signal generator A (on carrier).	Frequency: 119.000 MHz Level: Adjust to produce -87 dBm output at the receiver terminals. Rate: 1000 Hz Depth: 30%	
6	Configure signal generator B (undesired signal).	Frequency: 108.000 MHz Level: Adjust to produce -33 dBm output at the receiver terminals. Modulation: Off	
7	Set the audio analyzer.	Under measurement, select SINAD.	
8	Turn RF and modulation of signal generator A to on.	Observe the audio analyzer.	
9	Record SINAD level.		
10	Turn RF of signal generator B to on.	Observe SINAD on the audio analyzer.	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
11	Record level.	Ensure SINAD does not decrease to less than 6 dB.	
12	Step the frequency of signal generator B.	109.000 MHz	
13	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
14	Step the frequency of signal generator B.	110.000 MHz	
15	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
16	Step the frequency of signal generator B.	115.000 MHz	
17	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
18	Step the frequency of signal generator B.	118.975 MHz (lower adjacent channel)	
19	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
20	Step the frequency of signal generator B.	119.025 MHz (upper adjacent channel)	
21	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
22	Step the frequency of signal generator B.	120.000 MHz	
23	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
24	Check all remaining frequencies to 156.000 MHz.	Ensure SINAD does not decrease to less than 6 dB.	
25	Change the amplitude of signal generator B (undesired signal).	Change level to produce -7 dBm output at the receiver terminals. Note: Discrete spurious response frequencies (found in subtest 8) will have a level of - 33 dBm at the receiver terminals.	
26	Change the frequency of signal generator B.	Frequency: 50 Hz	
27	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
28	Change the frequency of signal generator B.	Frequency: 100 Hz	
29	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
30	Change the frequency of signal generator B.	Frequency: 200 Hz	
31	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
32	Change the frequency of signal generator B.	Frequency: 300 Hz	
33	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
34	Change the frequency of signal generator B.	Frequency: 400 Hz	
35	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
36	Change the frequency of signal generator B.	Frequency: 500 Hz	
37	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
38	Change the frequency of signal generator B.	Frequency: 600 Hz	
39	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
40	Change the frequency of signal generator B.	Frequency: 700 Hz	
41	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
42	Change the frequency of signal generator B.	Frequency: 800 Hz	
43	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
44	Change the frequency of signal generator B.	Frequency: 900 Hz	
45	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
46	Change the frequency of signal generator B.	Frequency: 1000 Hz	
47	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
48	Change the frequency of signal generator B.	Frequency: 2000 Hz	
49	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
50	Change the frequency of signal generator B.	Frequency: 3000 Hz	
51	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
52	Change the frequency of signal generator B.	Frequency: 4000 Hz	
53	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
54	Change the frequency of signal generator B.	Frequency: 5000 Hz	
55	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
56	Change the frequency of signal generator B.	Frequency: 6000 Hz	
57	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
58	Change the frequency of signal generator B.	Frequency: 7000 Hz	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
59	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
60	Change the frequency of signal generator B.	Frequency: 8000 Hz	
61	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
62	Change the frequency of signal generator B.	Frequency: 9000 Hz	
63	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
64	Change the frequency of signal generator B.	Frequency: 10000 Hz	
65	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
66	Change the frequency of signal generator B.	Frequency: 20000 Hz	
67	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
68	Change the frequency of signal generator B.	Frequency: 30000 Hz	
69	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
70	Change the frequency of signal generator B.	Frequency: 40000 Hz	
71	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
72	Change the frequency of signal generator B.	Frequency: 50000 Hz	
73	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
74	Change the frequency of signal generator B.	Frequency: 100000 Hz	
75	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
76	Change the frequency of signal generator B.	Frequency: 200000 Hz	
77	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
78	Change the frequency of signal generator B.	Frequency: 300000 Hz	
79	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
80	Change the frequency of signal generator B.	Frequency: 500000 Hz	
81	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
82	Change the frequency of signal generator B.	Frequency: 1 MHz	
83	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
84	Change the frequency of signal generator B.	Frequency: 2 MHz	
85	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
86	Change the frequency of signal generator B.	Frequency: 3 MHz	
87	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
88	Change the frequency of signal generator B.	Frequency: 4 MHz	
89	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
90	Change the frequency of signal generator B.	Frequency: 5MHz	
91	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
92	Change the frequency of signal generator B.	Frequency: 6 MHz	
93	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
94	Change the frequency of signal generator B.	Frequency: 7 MHz	
95	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
96	Change the frequency of signal generator B.	Frequency: 8 MHz	
97	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
98	Change the frequency of signal generator B.	Frequency: 9 MHz	
99	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
100	Change the frequency of signal generator B.	Frequency: 10 MHz	
101	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
102	Change the frequency of signal generator B.	Frequency: 20 MHz	
103	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
104	Change the frequency of signal generator B.	Frequency: 30 MHz	
105	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
106	Change the frequency of signal generator B.	Frequency: 40 MHz	
107	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
108	Change the frequency of signal generator B.	Frequency: 50 MHz	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
109	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
110	Change the frequency of signal generator B.	Frequency: 60 MHz	
111	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
112	Change the frequency of signal generator B.	Frequency: 70 MHz	
113	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
114	Change the frequency of signal generator B.	Frequency: 80 MHz	
115	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
116	Change the frequency of signal generator B.	Frequency: 87 MHz	
117	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
118	Change the frequency of signal generator B.	Frequency: 157 MHz	
119	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
120	Change the frequency of signal generator B.	Frequency: 160 MHz	
121	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
122	Change the frequency of signal generator B.	Frequency: 200 MHz	
123	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
124	Change the frequency of signal generator B.	Frequency: 300 MHz	
125	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
126	Change the frequency of signal generator B.	Frequency: 400 MHz	
127	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
128	Change the frequency of signal generator B.	Frequency: 500 MHz	
129	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
130	Change the frequency of signal generator B.	Frequency: 600 MHz	
131	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
132	Change the frequency of signal generator B.	Frequency: 700 MHz	
133	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
134	Change the frequency of signal generator B.	Frequency: 800 MHz	
135	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
136	Change the frequency of signal generator B.	Frequency: 900 MHz	
137	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
138	Change the frequency of signal generator B.	Frequency: 1000 MHz	
139	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
140	Change the frequency of signal generator B.	Frequency: 1100 MHz	
141	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
142	Change the frequency of signal generator B.	Frequency: 1200 MHz	
143	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
144	Change the frequency of signal generator B.	Frequency: 1215 MHz	
145	Change the level of signal generator B.	Adjust to produce -5 dBm output at the receiver terminals.	
146	Change the frequency of signal generator B.	Frequency: 87.5 MHz	
147	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
148	Change the frequency of signal generator B.	Frequency: 88 MHz	
149	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
150	Change the frequency of signal generator B.	Frequency: 88.5 MHz	
151	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
152	Change the frequency of signal generator B.	Frequency: 89 MHz	
153	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
154	Change the frequency of signal generator B.	Frequency: 89.5 MHz	
155	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
156	Change the frequency of signal generator B.	Frequency: 90 MHz	
157	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
158	Change the frequency of signal generator B.	Frequency: 90.5 MHz	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
159	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
160	Change the frequency of signal generator B.	Frequency: 91 MHz	
161	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
162	Change the frequency of signal generator B.	Frequency: 91.5 MHz	
163	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
164	Change the frequency of signal generator B.	Frequency: 92 MHz	
165	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
166	Change the frequency of signal generator B.	Frequency: 92.5 MHz	
167	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
168	Change the frequency of signal generator B.	Frequency: 93 MHz	
169	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
170	Change the frequency of signal generator B.	Frequency: 93.5 MHz	
171	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
172	Change the frequency of signal generator B.	Frequency: 94 MHz	
173	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
174	Change the frequency of signal generator B.	Frequency: 94.5 MHz	
175	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
176	Change the frequency of signal generator B.	Frequency: 95.5 MHz	
177	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
178	Change the frequency of signal generator B.	Frequency: 96 MHz	
179	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
180	Change the frequency of signal generator B.	Frequency: 96.5 MHz	
181	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
182	Change the frequency of signal generator B.	Frequency: 97 MHz	
183	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
184	Change the frequency of signal generator B.	Frequency: 97.5 MHz	
185	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
186	Change the frequency of signal generator B.	Frequency: 98 MHz	
187	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
188	Change the frequency of signal generator B.	Frequency: 98.5 MHz	
189	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
190	Change the frequency of signal generator B.	Frequency: 99 MHz	
191	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
192	Change the frequency of signal generator B.	Frequency: 99.5 MHz	
193	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
194	Change the frequency of signal generator B.	Frequency: 100 MHz	
195	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
196	Change the frequency of signal generator B.	Frequency: 100.5 MHz	
197	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
198	Change the frequency of signal generator B.	Frequency: 101 MHz	
199	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
200	Change the frequency of signal generator B.	Frequency: 101.5 MHz	
201	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
202	Change the frequency of signal generator B.	Frequency: 102 MHz	
203	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
204	Change the frequency of signal generator B.	Frequency: 102.5 MHz	
205	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
206	Change the frequency of signal generator B.	Frequency: 103 MHz	
207	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
208	Change the frequency of signal generator B.	Frequency: 103.5 MHz	

Table 11-1. Desensitization Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
209	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
210	Change the frequency of signal generator B.	Frequency: 104 MHz	
211	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
212	Change the frequency of signal generator B.	Frequency: 104.5 MHz	
213	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
214	Change the frequency of signal generator B.	Frequency: 105 MHz	
215	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
216	Change the frequency of signal generator B.	Frequency: 105.5 MHz	
217	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
218	Change the frequency of signal generator B.	Frequency: 106 MHz	
219	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
220	Change the frequency of signal generator B.	Frequency: 106.5 MHz	
221	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
222	Change the frequency of signal generator B.	Frequency: 107 MHz	
223	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	
224	Change the frequency of signal generator B.	Frequency: 107.9 MHz	
225	Record level on the audio analyzer.	Ensure SINAD does not decrease to less than 6 dB.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; RF - Radio Frequency; SINAD - Signal to Noise and Distortion; UUT - Unit Under Test; % - percent

11-1.4 Presentation of Results. The results will be shown in table 11-2 indicating the requirement and measured value or indications of capability.

Table 11-2. Desensitization Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
11	2.2.11	With a –87 dBm signal at the receiver input modulated 30% with 1 kHz and at the desired channel frequency, the receiver signal-plus-noise-to-noise ratio shall not decrease to less than 6 dB: a. In the presence of an unmodulated carrier having a level of –33 dBm at the receiver input terminals and at frequencies between 108 and 156 MHz, including the frequencies equivalent to the next higher and the next lower channels to which the receiver can be tuned, but excluding the frequency range between these two channels. b. In the presence of an unmodulated carrier having a level of -7 dBm at the receiver input terminals and at any frequency within the 50 kHz through 1215 MHz, except for discrete spurious response frequencies. This excludes the frequencies within the range 87.5 - 156 MHz. At the discrete spurious response frequencies, the unmodulated carrier (undesired signal) shall have a level of -33 dBm at the receiver input terminals. c. In the presence of an unmodulated carrier having a level of –5 dBm at the receiver input terminals and at frequencies between 87.5 and 107.9 MHz.	Not less than 6 dB.			

Legend: dB - decibel; dBm - decibels referenced to 1 milliwatt; kHz - kilohertz; MHz - megahertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

SUBTEST 12. EMISSIONS OF RADIO FREQUENCY ENERGY

12-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-86A, reference number 12.

12-1.2 Criteria. Reference number 12.

a. Conducted and radiated spurious radio frequency energy emission levels shall not exceed those levels specified in section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment."

b. When the receiver is terminated with a resistive load equal to the nominal receiver input impedance, the level of any spurious emission into the load shall not exceed 2 nanowatts. This requirement shall be met over the frequency range of 25 kHz to 1215 MHz.

12-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Spectrum Analyzer

b. Test Configuration. Configure the equipment as shown in figure 12-1.

Figure 12-1. Emissions of Radio Frequency Energy Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 12-1.

Table 12-1. Emissions of Radio Frequency Energy Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 12.			
1	Connect the equipment.	As shown in figure 12-1.	
2	Configure the UUT.	Frequency: 120.000 MHz	
3	Configure the spectrum analyzer.	Center frequency: 25 kHz Span: 10 MHz Set display line: 2 nanowatts (-55 dBm)	
4	Select center channel on the spectrum analyzer.	Starting at 25 kHz, scroll through the band from 25 kHz to 1215 MHz.	
5	Observe the display line while scrolling through the band 25 kHz to 1215 MHz.	Take note of any spurs that appear above the display line (-55 dBm).	
6	For spurs that appear above the display line:	Turn the bandwidth average to on and select marker function. After 100 average occurs, check level of the spur.	
7	Record results.	Ensure all spurs do not exceed the display line (2 nanowatts, or -55 dBm).	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; kHz - kilohertz; MHz - megahertz; UUT - Unit Under Test

12-1.4 Presentation of Results. The results will be shown in table 12-2 indicating the requirement and measured value or indications of capability.

Table 12-2. Emissions of Radio Frequency Energy Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
12	2.2.12	a. Conducted and radiated spurious radio frequency energy emission levels shall not exceed those levels specified in section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment." b. When the receiver is terminated with a resistive load equal to the nominal receiver input impedance, the level of any spurious emission into the load shall not exceed 2 nanowatts. This requirement shall be met over the frequency range of 25 kHz to 1215 MHz.	Less than 2 nanowatts.			

Legend: kHz - kilohertz; MHz - megahertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

SUBTEST 13. CHANNEL SELECTION TIME

13-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 13.

13-1.2 Criteria. Reference number 13. When a channel is selected, the time required for the equipment audio output to reach and remain within 3 dB of steady-state output shall not exceed one second.

13-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generators (2)

(3) Audio Breakout Box

(4) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 13-1.

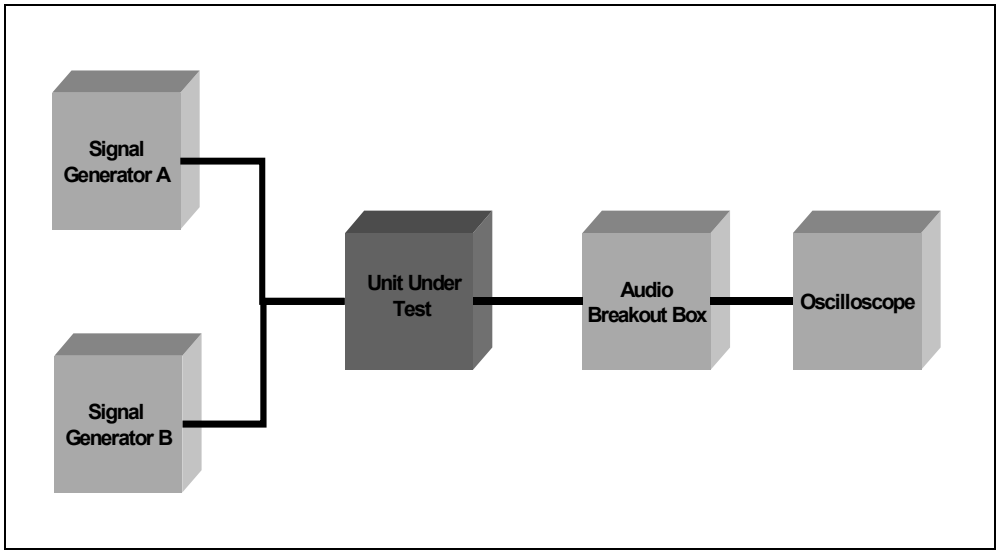

Figure 13-1. Channel Selection Time Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 13-1.

Table 13-1. Channel Selection Time Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 13.			
1	Connect the equipment.	As shown in figure 13-1.	
2	Configure signal generator A.	Frequency: 119.000 MHz Amplitude: -90 dBm Rate: 500 Hz	
3	Configure signal generator B.	Frequency: 120.000 MHz Amplitude: -90 dBm Rate: 2500 Hz	
4	Configure the UUT.	Channel 1: 119.000 MHz Channel 2: 120.000 MHz Channel spacing: 25 kHz	
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
6	Configure the oscilloscope.	Channel 1: 1 V/div Horizontal scale: 50 ms/div	
7	Turn the RF of both signal generators to on.		
8	Observe channel 1 of the UUT on the oscilloscope.	Observe the 500 Hz signal.	
9	Change the UUT to channel 2.	Immediately stop the acquisition where the audio signal changes from 500 Hz (channel 1) to 2500 Hz (channel 2).	
10	Select marker 1.	Place marker 1 on the end of the 500 Hz signal. Adjust horizontal scale as needed to provide better picture of the signal.	
11	Select marker 2.	Place marker 2 on the 2500 Hz signal at the point where the signal is within 3 dB of steady-state output. Adjust horizontal scale as needed to provide better picture of the signal.	
12	Record time difference between markers 1 and 2.	Ensure the time is less than 1 second. This is the channel changing time for the receiver.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; ms/div - milliseconds per division; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division

13-1.4 Presentation of results. The results will be shown in table 13-2 indicating the requirement and measured value or indications of capability.

Table 13-2. Channel Selection Time Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
13	2.2.13	When a channel is selected, the time required for the equipment audio output to reach and remain within 3 dB of steady-state output shall not exceed one second.	Less than 1 second.			

Legend: dB - decibel; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 14. ADJACENT CHANNEL REJECTION

14-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 14.

14-1.2 Criteria. Reference number 14. Class E Receivers Only. With the desired and interfering signals as specified below, the Adjacent Channel Rejection (ratio between the desired signal level and the lowest interfering signal level, in dB) shall be at least 45 dB.

Desired Signal
Level: adjusted to produce a signal-plus-noise-to-noise ratio of 20 dB
Modulation: modulated 60% at 1000 Hz
Frequency: selected

Interfering Signal
Level: adjusted so that the signal-plus-noise-to-noise ratio of the desired signal is degraded from 20 dB to 14 dB
Modulation: modulated 60% at 400 Hz
Frequency: first upper and lower 8.33 kHz adjacent channel

14-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generators (2)

(2) Power Combiner

(3) UUT

(4) Audio Breakout Box

(5) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 14-1.

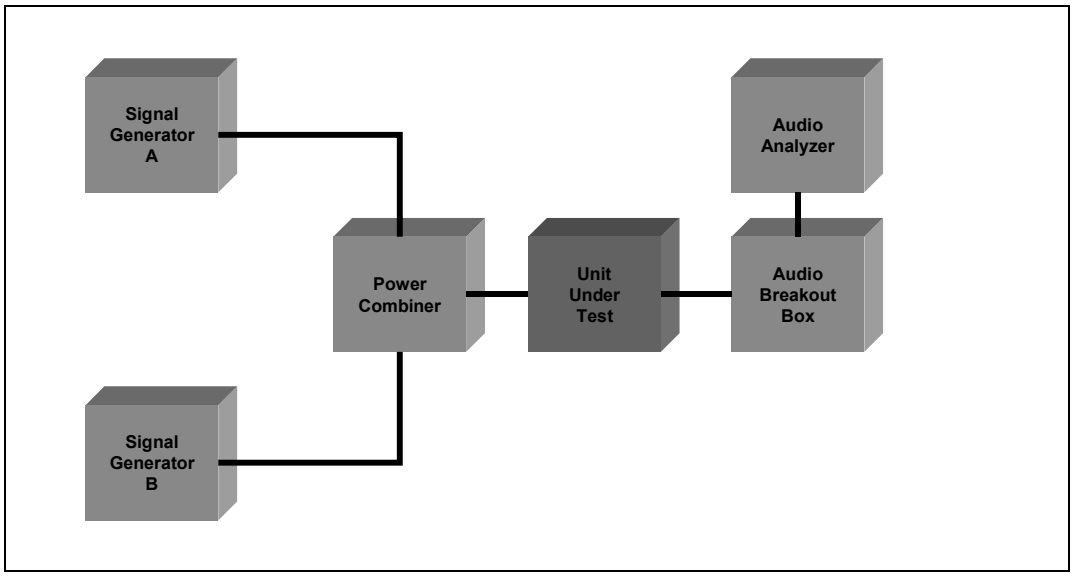

Figure 14-1. Adjacent Channel Rejection Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 14-1.

Table 14-1. Adjacent Channel Rejection Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 14.			
1	Connect the equipment.	As shown in figure 14-1.	
2	Configure the UUT.	Plain Text Frequency: 125.050 MHz Power: Low (1 watt or less) Squelch: Off	
3	Configure signal generator A (carrier frequency).	Frequency: 125.050 Depth: 60% Rate: 1000 Hz AM	
4	Configure signal generator B (lower adjacent channel).	Frequency: 125.0417 MHz Depth: 60% Rate: 400 Hz AM	
5	Configure audio breakout box.	Refer to manufacturer specifications for proper audio pinout configuration.	
6	Set audio analyzer.	Under measurement, select SINAD.	
7	Turn on and adjust signal generator A.	With signal generator B off, adjust level of signal generator A to produce SINAD reading of 20 dB on audio analyzer.	

Table 14-1. Adjacent Channel Rejection Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
8	Note the RF level of signal generator A.		
9	Adjust signal generator B.	On signal generator B, turn RF and modulation to on. Starting at lowest level possible, slowly increase level until the SINAD level on the audio analyzer drops from 20 dB to 14 dB.	
10	Note the RF level of signal generator B.	The adjacent channel rejection is the ratio between the desired level (signal generator A) and the interfering signal level (signal generator B) in dB.	
11	Record results for lower adjacent channel.	Ensure the adjacent channel rejection is at least 45 dB.	
12	Change frequency on signal generator B to upper adjacent channel.	Frequency: 125.0583 MHz	
13	Repeat steps 8 and 9.		
14	Record results for upper adjacent channel.	Ensure the adjacent channel rejection is at least 45 dB.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; Hz - hertz; MHz - megahertz; RF - Radio Frequency; SINAD - Signal to Noise and Distortion; UUT - Unit Under Test; % - percent

14-1.4 Presentation of Results. The results will be shown in table 14-2 indicating the requirement and measured value or indications of capability.

Table 14-2. Adjacent Channel Rejection Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
14	2.2.16	Class E Receivers Only. With the desired and interfering signals as specified below, the Adjacent Channel Rejection (ratio between the desired signal level and the lowest interfering signal level, in dB) shall be at least 45 dB.	At least 45 dB.			

Legend: dB - decibels; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 15. OUTPUT POWER

15-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 15, and ARINC Characteristic 716-10, reference number 54.

15-1.2 Criteria

a. Reference number 15. The transmitter output power shall be:

At least 16 watts for Class 3 and Class 5 transmitters.

At least 4 watts for Class 4 and Class 6 transmitters.

b. Reference number 54. When operated at rated input power, the transceiver carrier power output measured into a 52 Ω resistive load at the end of a 5-foot transmission line should be 25 to 40 watts on any operating frequency.

15-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Power Meter

b. Test Configuration. Configure the equipment as shown in figure 15-1.

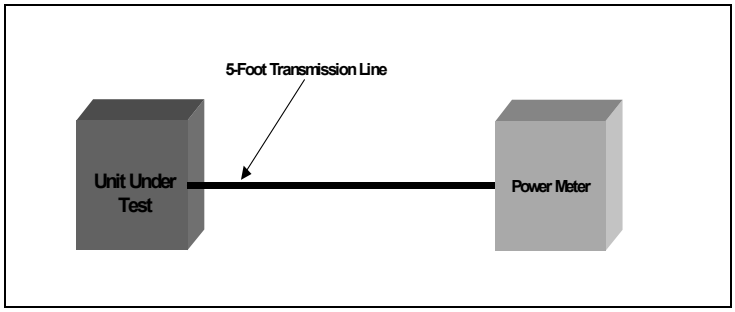

Figure 15-1. Output Power Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 15-1.

Table 15-1. Output Power Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 15.			
1	Connect the equipment.	As shown in figure 15-1.	
2	Configure the UUT.	Mode: AM Power: High Frequency: 125.000 MHz	
3	Configure power meter.	Select input channel. Zero the input channel.	
4	Key the UUT.	Ensure the following: At least 16 watts for Class 3 and Class 5 transmitters. At least 4 watts for Class 4 and Class 6 transmitters.	
The following procedure is for reference number 54.			
5	Key the UUT.	Ensure output measured is between 25 to 40 watts.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; MHz - megahertz; UUT - Unit Under Test

15-1.4 Presentation of Results. The results will be shown in table 15-2 indicating the requirement and measured value or indications of capability.

Table 15-2. Output Power Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
15	2.3.1	The transmitter output power shall be: a. At least 16 watts for Class 3 and Class 5 transmitters. b. At least 4 watts for Class 4 and Class 6 transmitters.	At least 16 watts.			
			At least 4 watts.			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
54	3.7.1	When operated at rated input power, the transceiver carrier power output measured into a 52 Ω resistive load at the end of a 5-foot transmission line should be 25 to 40 watts on any operating frequency. The transmitter should be capable of continuous operation with ARINC 600 cooling air. The transmitter should be designed to operate with a 52 Ω transmission line terminated in its characteristic impedance.	25 to 40 watts			

Legend: ARINC - Aeronautical Radio Incorporated; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; Ω - ohms

SUBTEST 16. RESIDUAL RADIATION AND LEAKAGE

16-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 16, and ARINC Characteristic 716-10, reference number 61.

16-1.2 Criteria

a. Reference number 16. When all primary power sources are connected to the transmitter and the microphone switch is "NOT KEYED," the transmitter RF power output at the selected frequency shall not exceed 0.02 picowatts.

b. Reference number 61. The transmitter output is not to exceed 0.02 picowatts at the selected frequency or more than 400 picowatts at any other frequency in the key up condition when terminated into a 50 Ω resistive load.

16-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Spectrum Analyzer

b. Test Configuration. Configure the equipment as shown in figure 16-1.

Figure 16-1. Residual Radiation Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 16-1.

Table 16-1. Residual Radiation Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedures are for reference numbers 16 and 61.			
1	Connect the equipment.	As shown in figure 16-1.	
2	Configure UUT.	Frequency: 118.0500 MHz Power: Low	
3	Configure the spectrum analyzer.	Center Frequency: 118.0500 MHz Span: 300 MHz Reference level: -40 dBm Resolution bandwidth: 3.0 kHz Video bandwidth: 3.0 kHz Average 100: On Marker 1: 125.0500 MHz	
4	With the UUT "NOT KEYED," observe marker 1 at 118.0500 MHz.	Ensure output of the UUT is 0.02 picowatts, (-107 dBm) or less after 100 averages occur.	
5	Move marker 1 to lower adjacent channel (118.0250 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
6	Move marker 1 to upper adjacent channel (118.0750 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
7	Change frequency on UUT.	125.0500 MHz	
8	Change center frequency on spectrum analyzer.	125.0500 MHz	
9	With the UUT "NOT KEYED," observe marker 1 at 125.0500 MHz.	Ensure output of the UUT is 0.02 picowatts, (-107 dBm) or less after 100 averages occur.	
10	Move marker 1 to lower adjacent channel (125.0250 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
11	Move marker 1 to upper adjacent channel (125.0750 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
12	Change frequency on UUT.	130.0500 MHz	
13	Change center frequency on spectrum analyzer.	130.0500 MHz	
14	With the UUT "NOT KEYED," observe marker 1 at 130.0500 MHz.	Ensure output of the UUT is 0.02 picowatts, (-107 dBm) or less after 100 averages occur.	
15	Move marker 1 to lower adjacent channel (130.0250 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
16	Move marker 1 to upper adjacent channel (130.0750 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
17	Change frequency on UUT.	133.000 MHz	
18	Change center frequency on spectrum analyzer.	133.000 MHz	
19	With the UUT "NOT KEYED," observe marker 1 at 133.000 MHz.	Ensure output of the UUT is 0.02 picowatts, (-107 dBm) or less after 100 averages occur.	
20	Move marker 1 to lower adjacent channel (133.0250 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
21	Move marker 1 to upper adjacent channel (133.0750 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	

Table 16-1. Residual Radiation Test Procedures

Step	Action	Settings/Action	Measured Value
22	Change frequency on UUT.	136.0500 MHz	
23	Change center frequency on spectrum analyzer.	136.0500 MHz	
24	With the UUT "NOT KEYED," observe marker 1 at 136.0500 MHz.	Ensure output of the UUT is 0.02 picowatts, (-107 dBm) or less after 100 averages occur.	
25	Move marker 1 to lower adjacent channel (136.0250 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	
26	Move marker 1 to upper adjacent channel (136.0750 MHz).	Ensure output of the UUT is 400 picowatts, (-64 dBm) or less after 100 averages occur.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; kHz - kilohertz; MHz - megahertz; UUT - Unit Under Test

16-1.4 Presentation of Results. The results will be shown in table 16-2 indicating the requirement and measured value or indications of capability.

Table 16-2. Residual Radiation Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
16	2.3.2	When all primary power sources are connected to the transmitter and the microphone switch is "NOT KEYED," the transmitter RF power output at the selected frequency shall not exceed .02 picowatts.	.02 picowatts or less			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
61	3.7.6	The transmitter output is not to exceed 0.02 picowatts at the selected frequency or more than 400 picowatts at any other frequency in the key up condition when terminated into a 50 A resistive load.	0.02 picowatts			
			400 picowatts			

Legend: A - Amperes; ARINC - Aeronautical Radio Incorporated; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 17. MODULATION CAPABILITY/MODULATION LEVEL

17-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 17, and ARINC Characteristic 716-10, reference numbers 58, 63, and 81.

17-1.2 Criteria

a. Reference number 17. The manufacturer shall declare the range of audio frequency input signal levels for which the transmitter shall achieve a modulation of not less than 70% at 1000 Hz.

b. Reference number 58. An input level of 0.25 volts root mean square (Vrms) at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be accomplished through the use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.

c. Reference number 63. A -10 dBm input at 1000 Hz should provide 70% modulation. A service adjustment independent of the microphone input adjustment should be provided to accommodate input levels up to + 10 dBm.

d. Reference number 81. An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be achieved through use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.

17-1.3 Test Procedures

a. Test Equipment Required

(1) Audio Generator

(2) UUT

(3) Modulation Analyzer

(4) Audio Breakout Box

(5) Attenuator

b. Test Configuration. Configure the equipment as shown in figure 17-1.

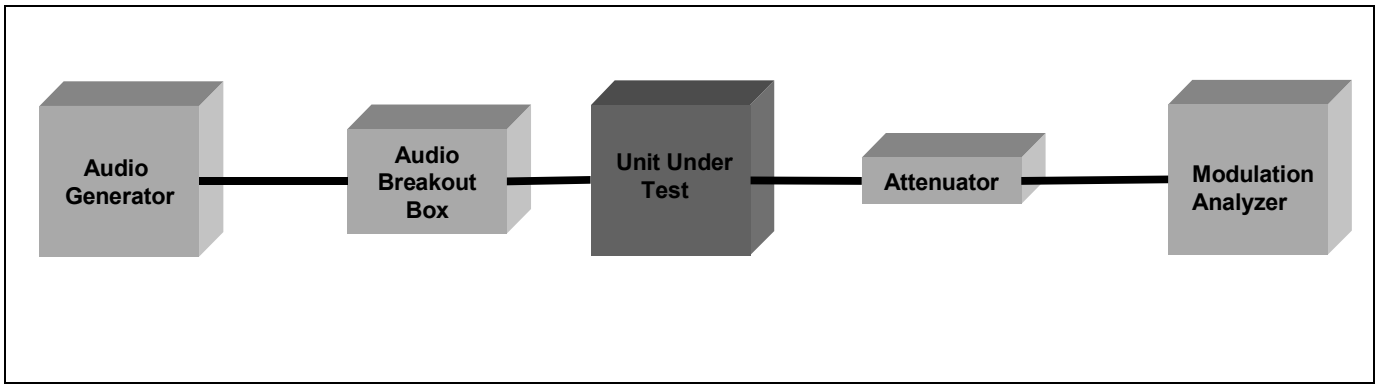

Figure 17-1. Modulation Capability/Modulation Level Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 17-1.

Table 17-1. Modulation Capability/Modulation Level Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 17, 58, 63, and 81.			
1	Connect the equipment.	As shown in figure 17-1.	
2	Configure the UUT.	Frequency: 119.000 MHz Mode: AM Channel Spacing: 25 kHz	
3	Configure the audio generator.	Rate: 1000 Hz Level: 0.25 Vrms	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the modulation analyzer.	Measure AM modulation depth.	
6	Use appropriate attenuation.	Use proper attenuation to provide safe input to test equipment.	
7	Refer to manufacturer specifications.	Ensure the manufacturer declares the range of audio frequency input signals for which the transmitter shall achieve a modulation if not less than 70% at 1000 Hz.	
8	Key the UUT.	Observe the modulation analyzer.	
9	Record results.	Ensure at least 90% modulation.	
10	Unkey the UUT.		
11	Refer to manufacturer specifications.	For input levels of 20 dB or higher, a service adjustment should be provided.	
12	Adjust audio generator.	Adjust for a –10 dBm level, 1000 Hz tone.	
13	Key the UUT.	Observe the modulation analyzer.	
14	Record results.	Ensure 70% modulation.	
15	Unkey the UUT.		
16	Refer to manufacturer specifications.	For input levels of up to 10 dBm, a service adjustment should be provided independent of the microphone input adjustment.	
17	Change channel spacing on the UUT.	Change spacing from 25 to 8.33 kHz.	
18	Adjust audio generator.	Adjust level to 0.25 Vrms.	

Table 17-1. Modulation Capability/Modulation Level Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
19	Key the UUT.	Observe the modulation analyzer.	
20	Record results.	Ensure at least 90% modulation.	
21	Unkey the UUT.		
22	Refer to manufacturer specifications.	For input levels of 20 dB or higher, a service adjustment should be provided.	

NOTE: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; UUT - Unit Under Test; Vrms - volts root mean square; % - percent

17-1.4 Presentation of Results. The results will be shown in table 17-2 indicating the requirement and measured value or indications of capability.

Table 17-2. Modulation Capability/Modulation Level Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
17	2.3.3	The manufacturer shall declare the range of audio frequency input signal levels for which the transmitter shall achieve a modulation of not less than 70% at 1000 Hz.				
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
58	3.7.5.1	An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be accomplished through the use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	At least 90% modulation.			
63	3.7.8.1	A -10 dBm input at 1000 Hz should provide 70% modulation. A service adjustment independent of the microphone input adjustment should be provided to accommodate input levels up to + 10 dBm.	70% modulation			

Table 17-2. Modulation Capability/Modulation Level Results (continued)

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
81	4.4.2.1	An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be achieved through use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	At least 90% modulation.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; Vrms - volts root mean square; % - percent

SUBTEST 18. AUDIO FREQUENCY DISTORTION

18-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 18.

18-1.2 Criteria. Reference number 18. The combined distortion and noise in the demodulated output of the transmitter shall not exceed 25% of the total demodulated output at the modulation frequencies of 350, 1000, and 2500 Hz, when the audio input level to the transmitter is maintained at the value producing at least 70% modulation at 1000 Hz.

18-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Audio Generator

(4) Modulation Analyzer

(5) Audio Analyzer

(6) Attenuator

b. Test Configuration. Configure the equipment as shown in figure 18-1.

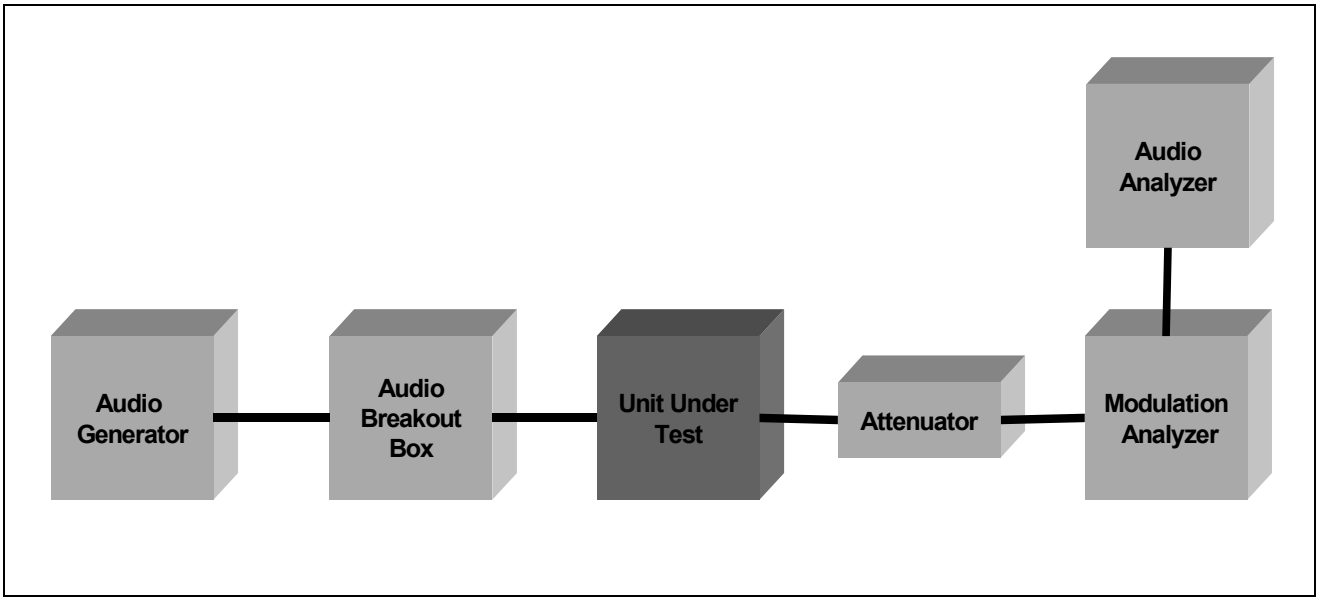

Figure 18-1. Audio Frequency Distortion Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 18-1.

Table 18-1. Audio Frequency Distortion Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 18.			
1	Connect the equipment.	As shown in figure 18-1.	
2	Use appropriate attenuation.	Use appropriate attenuation to provide safe input to the test equipment.	
3	Configure the UUT.	Frequency: 119.000 MHz Mode: AM, PT Power: Low	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the modulation analyzer.	Configure to measure AM modulation.	
6	Set the audio analyzer.	Under measurement, select distortion.	
7	Configure the audio generator.	Rate: 1 kHz Level: Adjust level to produce at least 70% modulation of the UUT as displayed on the modulation analyzer.	
8	Key the UUT.		
9	Check the audio analyzer.	Check for 1 kHz tone.	
10	Record level.	With distortion measurement on, ensure distortion level is less than 25%.	
11	Change audio generator rate.	Change the rate to 350 Hz.	
12	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
13	Change audio generator rate.	Change the rate to 2500 Hz.	
14	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
15	Change the frequency on the UUT.	Frequency: 123.000 MHz	
16	Change audio generator rate and level.	Rate: 1 kHz Level: Adjust level to produce at least 70% modulation of the UUT as displayed on the modulation analyzer.	
17	Key the UUT.		
18	Check the audio analyzer.	Check for 1 kHz tone.	
19	Record level.	With distortion measurement on, ensure distortion level is less than 25%.	
20	Change audio generator rate.	Change the rate to 350 Hz.	
21	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
22	Change audio generator rate.	Change the rate to 2500 Hz.	
23	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
24	Change the frequency on the UUT.	Frequency: 127.000 MHz	

Table 18-1. Audio Frequency Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
25	Change audio generator rate and level.	Rate: 1 kHz Level: Adjust level to produce at least 70% modulation of the UUT as displayed on the modulation analyzer.	
26	Key the UUT.		
27	Check the audio analyzer.	Check for 1 kHz tone.	
28	Record level.	With distortion measurement on, ensure distortion level is less than 25%.	
29	Change audio generator rate.	Change the rate to 350 Hz.	
30	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
31	Change audio generator rate.	Change the rate to 2500 Hz.	
32	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
33	Change the frequency on the UUT.	Frequency: 131.000 MHz	
34	Change audio generator rate and level.	Rate: 1 kHz Level: Adjust level to produce at least 70% modulation of the UUT as displayed on the modulation analyzer.	
35	Key the UUT.		
36	Check the audio analyzer.	Check for 1 kHz tone.	
37	Record level.	With distortion measurement on, ensure distortion level is less than 25%.	
38	Change audio generator rate.	Change the rate to 350 Hz.	
39	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
40	Change audio generator rate.	Change the rate to 2500 Hz.	
41	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
42	Change the frequency on the UUT.	Frequency: 135.000 MHz	
43	Change audio generator rate and level.	Rate: 1 kHz Level: Adjust level to produce at least 70% modulation of the UUT as displayed on the modulation analyzer.	
44	Key the UUT.		
45	Check the audio analyzer.	Check for 1 kHz tone.	
46	Record level.	With distortion measurement on, ensure distortion level is less than 25%.	
47	Change audio generator rate.	Change the rate to 350 Hz.	
48	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	
49	Change audio generator rate.	Change the rate to 2500 Hz.	

Table 18-1. Audio Frequency Distortion Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
50	Record the level of distortion as displayed on audio analyzer.	Ensure distortion level is less than 25%.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; Hz - hertz; kHz - kilohertz; MHz - megahertz; PT - Plain Text; UUT - Unit Under Test; % - percent

18-1.4 Presentation of Results. The results will be shown in table 18-2 indicating the requirement and measured value or indications of capability.

Table 18-2. Audio Frequency Distortion Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
18	2.3.4	The combined distortion and noise in the demodulated output of the transmitter shall not exceed 25% of the total demodulated output at the modulation frequencies of 350, 1000, and 2500 Hz, when the audio input level to the transmitter is maintained at the value producing at least 70% modulation at 1000 Hz.	Not to exceed 25%.			

Legend: Hz - hertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

SUBTEST 19. MODULATION FIDELITY

19-1.1 Objective. To determine the extent of compliance to the requirements of RtCA/DO-186A, reference number 19.

19-1.2 Criteria. Reference number 19. The output carrier percentage modulation shall not vary by more than 6 dB when the audio input signal is varied over the range of 350 to 2500 Hz, when the audio input signal level is maintained at the value which produces:

a. 70% modulation at the frequency of maximum response, or

b. More than 70% modulation at the frequency of maximum response when this value is immediately below that which clipping or limiting action occurs.

c. For Class 5 and 6 equipment, frequencies above 3200 Hz shall be attenuated in accordance with the requirements of paragraph 2.3.13, “Transmitter Occupied Spectrum for 8.33 kHz Mode.”

19-1.3 Test Procedures

a. Test Equipment Required

(1) Audio Generator

(2) UUT

(3) Audio Breakout Box

(4) Attenuator

(5) Modulation Analyzer

(6) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 19-1.

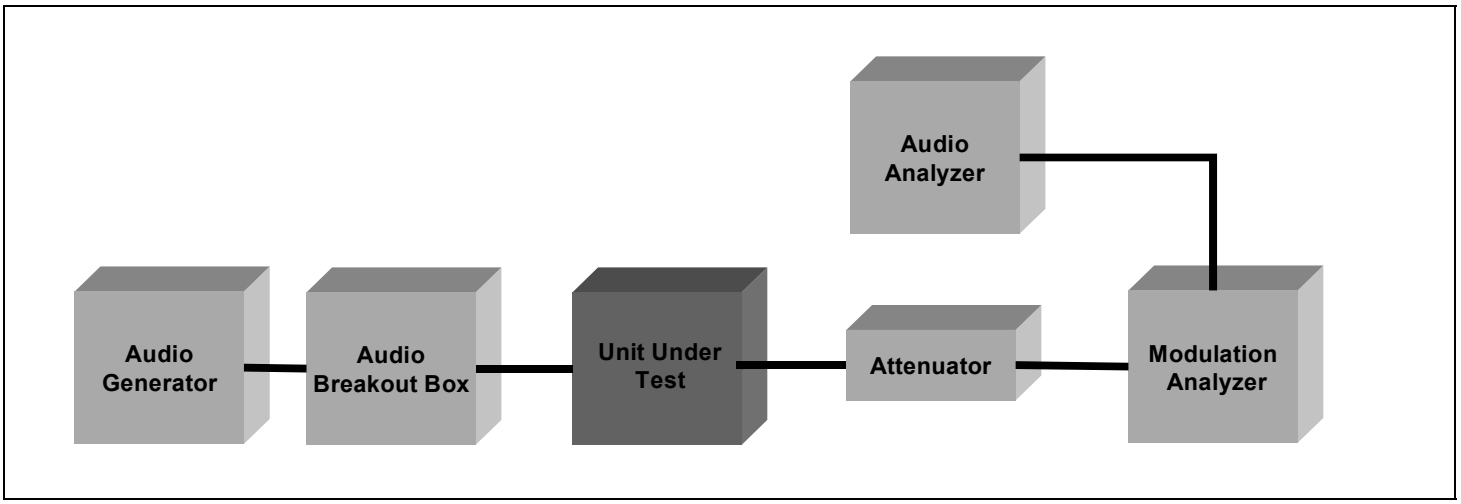

Figure 19-1. Modulation Fidelity Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 19-1.

Table 19-1. Modulation Fidelity Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 19.			
1	Connect the equipment.	As shown in figure 19-1.	
2	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
3	Configure the UUT.	Frequency: 119.000 MHz	
4	Use appropriate attenuation.	Select appropriate attenuation as to provide safe input to the test equipment.	
5	Configure the modulation analyzer.	Configure to measure AM. Connect modulated output to the audio analyzer.	
6	Set the audio analyzer.	Under measurement, select AC level.	
7	Configure the audio generator.	Configure to provide 70% modulation of the transmitter at the maximum response frequency (frequency between 350 Hz and 2500 Hz which produces maximum carrier modulation). This will be the test level.	
8	Record level.	Record reference level voltage as displayed on the audio analyzer (in dBm).	
9	Change the frequency of the audio generator.	Change to 350 Hz.	
10	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
11	Change the frequency of the audio generator.	Change to 400 Hz.	
12	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
13	Change the frequency of the audio generator.	Change to 500 Hz.	

Table 19-1. Modulation Fidelity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
14	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
15	Change the frequency of the audio generator.	Change to 600 Hz.	
16	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
17	Change the frequency of the audio generator.	Change to 700 Hz.	
18	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
19	Change the frequency of the audio generator.	Change to 800 Hz.	
20	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
21	Change the frequency of the audio generator.	Change to 900 Hz.	
22	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
23	Change the frequency of the audio generator.	Change to 1000 Hz.	
24	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
25	Change the frequency of the audio generator.	Change to 1200 Hz.	
26	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
27	Change the frequency of the audio generator.	Change to 1400 Hz.	
28	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
29	Change the frequency of the audio generator.	Change to 1600 Hz.	
30	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
31	Change the frequency of the audio generator.	Change to 1800 Hz.	
32	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
33	Change the frequency of the audio generator.	Change to 2000 Hz.	

Table 19-1. Modulation Fidelity Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
34	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
35	Change the frequency of the audio generator.	Change to 2200 Hz.	
36	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
37	Change the frequency of the audio generator.	Change to 2400 Hz.	
38	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
39	Change the frequency of the audio generator.	Change to 2500 Hz.	
40	Record level on the audio analyzer.	Ensure modulation output level does not vary by more than 6 dB from the reference level voltage.	
41	For Class 5 and 6 equipment, frequencies above 3200 Hz shall be attenuated.	Refer to figure B-1.1 for attenuated values.	

Note: Sections that are not applicable are shaded.
Legend: AC - Alternating Current; AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; UUT - Unit Under Test; % - percent

19-1.4 Presentation of Results. The results will be shown in table 19-2 indicating the requirement and measured value or indications of capability.

Table 19-2. Modulation Fidelity Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
19	2.3.5.1	The output carrier percentage modulation shall not vary by more than 6 dB when the audio input signal is varied over the range of 350 to 2500 Hz, when the audio input signal level is maintained at the value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that which clipping or limiting action occurs. c. For Class 5 and 6 equipment, frequencies above 3200 Hz shall be attenuated in accordance with the requirements of paragraph 2.3.13, “Transmitter Occupied Spectrum for 8.33 kHz Mode.”	Not more than 6 dB.			

Legend: dB - decibels; Hz - hertz; kHz - kilohertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

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SUBTEST 20. SIDETONE FIDELITY/SIDETONE

20-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 20, and ARINC Characteristic 716-10, reference number 56.

20-1.2 Criteria

a. Reference number 20. If the transmitter provides audio-frequency sidetone, sidetone response shall not vary more than 10 dB over the range of 350 to 2500 Hz when the audio input level to the transmitter is held constant at that value which produces:

70% modulation at the frequency of maximum response, or

More than 70% modulation at the frequency of maximum response when this value is immediately below that at which clipping or limiting action occurs.

b. Reference number 56. The sidetone output (shared with the audio output) should have a source impedance of less than 20 Ω, and should provide an output level of 40 mW into a 600 Ω ±20% resistive load when the transmitter is amplitude modulated 90% at 1000 Hz. A service adjustment independent of the receiver audio output service adjustment is to be provided to adjust the output level. The adjustment should provide for a variation from 5 mW to 40 mW. The RF power required to operate the sidetone should be obtained from a source as close as practical to the transmitter power output connection.

20-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Transmission Impairment Measurement Set

(3) Audio Breakout Box

(4) Attenuator

(5) Modulation Analyzer

(6) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 20-1.

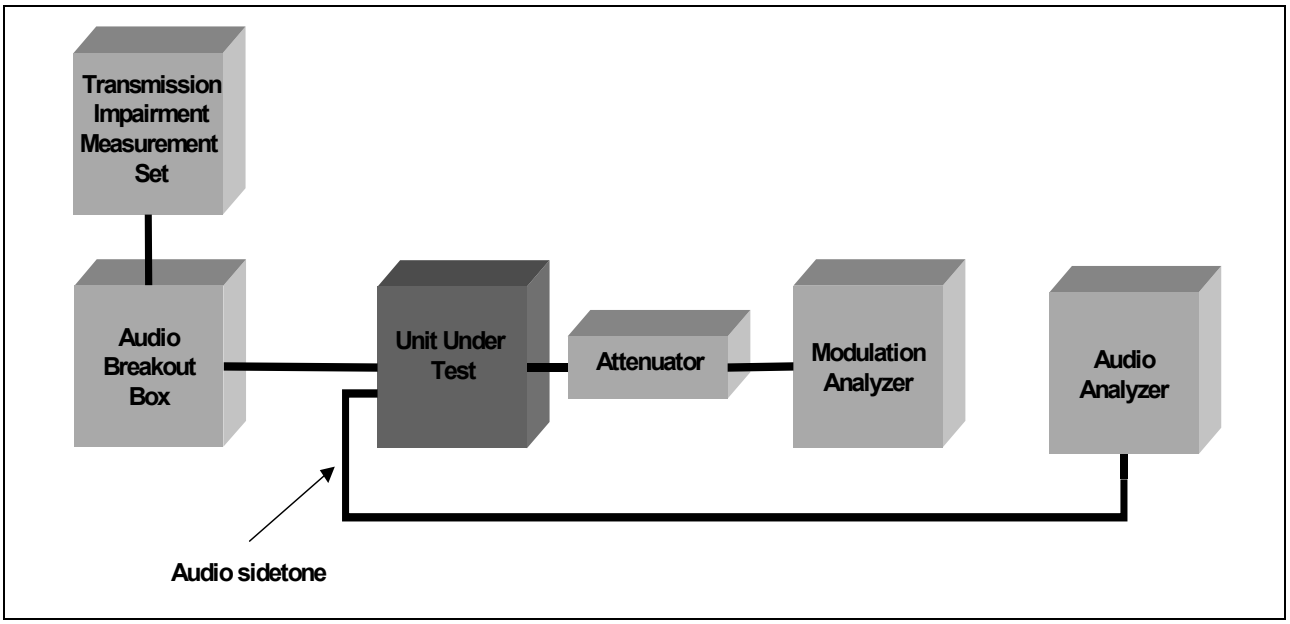

Figure 20-1. Sidetone Fidelity/Sidetone Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 20-1.

Table 20-1. Sidetone Fidelity/Sidetone Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 20.			
1	Connect the equipment.	As shown in figure 20-1.	
2	Configure UUT.	Frequency: 118.000 MHz Single Channel PT Power: Low Audio sidetone: On	
3	Configure the modulation analyzer.	Mode: AM	
4	Set the audio analyzer.	Under measurement, select AC voltage.	
5	Configure the TIMS.	Frequency: Maximum response frequency of UUT.	
6	Adjust the level of the TIMS.	Adjust the TIMS level to produce 70% modulation depth on the modulation analyzer. This level will be used for the test.	
7	Change frequency on the TIMS.	350 Hz	
8	Record the output level in dB as displayed on the audio analyzer.		
9	Change the frequency on the TIMS to 500 Hz.	Record level displayed on the audio analyzer.	
10	Change the frequency on the TIMS to 1000 Hz.	Record level displayed on the audio analyzer.	

Table 20-1. Sidetone Fidelity/Sidetone Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
11	Change the frequency on the TIMS to 1500 Hz.	Record level displayed on the audio analyzer.	
12	Change the frequency on the TIMS to 2000 Hz.	Record level displayed on the audio analyzer.	
13	Change the frequency on the TIMS to 2500 Hz.	Record level displayed on the audio analyzer.	
14	Record results.	Ensure that all audio sidetone levels recorded in steps 7 through 13 are within 10 dB.	
The following procedure is for reference number 56.			
15	Adjust the TIMS.	Frequency: 1000 Hz Level: To produce 90% modulation depth on the modulation analyzer.	
16	Key the UUT.	Record output level. Ensure output level of 40 mW (16 dBm) on the audio analyzer.	
17	Check for service adjustment.	Refer to manufacturer specifications to ensure that the UUT provides a service adjustment independent of the receiver audio output service adjustment that varies the audio sidetone output from 5 mW (9 dBm) to 40 mW (16 dBm).	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; mW - milliwatt; PT - Plain Text; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; Ω - ohms; % - percent

20-1.4 Presentation of Results. The results will be shown in table 20-2 indicating the requirement and measured value or indications of capability.

Table 20-2. Sidetone Fidelity/Sidetone Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
20	2.3.5.2	If the transmitter provides audio-frequency sidetone, sidetone response shall not vary more than 10 dB over the range of 350 to 2500 Hz when the audio input level to the transmitter is held constant at that value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that at which clipping or limiting action occurs.	Not more than 10 dB.			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
56	3.7.3	The sidetone output (shared with the audio output) should have a source impedance of less than 20 Ω, and should provide an output level of 40 mW into a 600 Ω ±20% resistive load when the transmitter is amplitude modulated 90% at 1000 Hz. A service adjustment independent of the receiver audio output service adjustment is to be provided to adjust the output level. The adjustment should provide for a variation from 5 mW to 40 mW. The RF power required to operate the sidetone should be obtained from a source as close as practical to the transmitter power output connection.	40 mW output			
			5 mW to 40 mW			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; mW - milliwatt; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; Ω - ohms; ± - plus or minus; % - percent

SUBTEST 21. CARRIER NOISE LEVEL

21-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 21.

21-1.2 Criteria. Reference number 21. The demodulated noise on the transmitter output, without audio modulation, shall be at least 35 dB below the demodulated output obtained when the carrier is modulated 70% at 1000 Hz. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.

21-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Transmission Impairment Measurement Set

(3) Attenuator

(4) Modulation Analyzer

(5) Spectrum Analyzer

(6) Audio Breakout Box

b. Test Configuration. Configure the equipment as shown in figure 21-1.

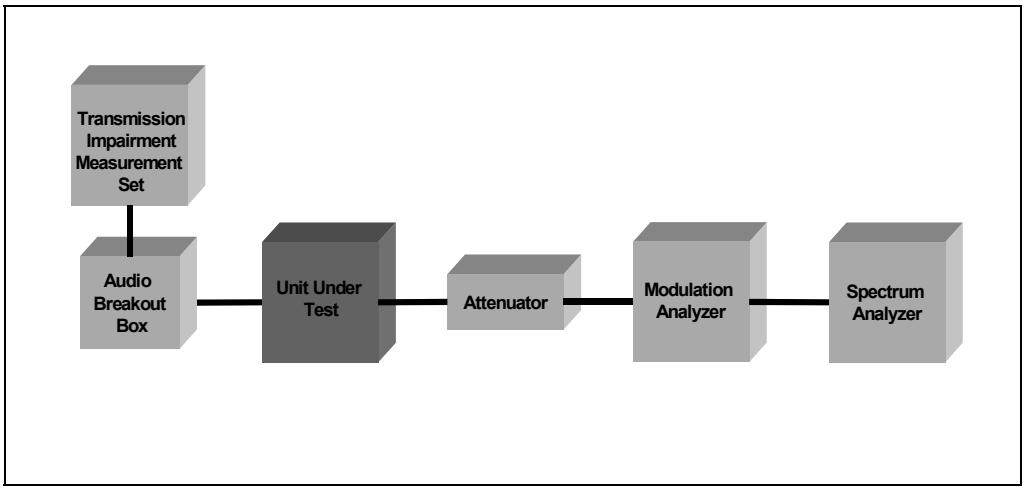

Figure 21-1. Carrier Noise Level Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 21-1.

Table 21-1. Carrier Noise Level Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 21.			
1	Connect the equipment.	As shown in figure 21-1.	
2	Use appropriate attenuation.	Select the appropriate level of attenuation.	
3	Configure UUT.	Frequency: 118.000 MHz PT Single Channel Squelch: Off Power: Low	
4	Configure breakout box.	Refer to manufacturer specifications for correct audio pinout.	
5	Configure TIMS.	Transmit (135 ohms) Tone: 1004 Hz Level: To produce 70% modulation on the modulation analyzer.	
6	Configure modulation analyzer.	AM mode.	
7	Configure the spectrum analyzer.	Center frequency: 2.5 kHz Frequency span: 5 kHz Amplitude reference level: -3 dBm Resolution bandwidth: 20 Hz Video bandwidth: 20 Hz Bandwidth/average: 100	
8	Adjust the output level of the TIMS.	Adjust the output level of the TIMS until 70% modulation is achieved on modulation analyzer displayed.	
9	With audio modulation from TIMS, key the UUT.	Record level of carrier noise with the audio modulation present.	
10	Set marker on the highest peak within the range of 300 Hz to 3000 Hz (except for the 1004 Hz tone).		
11	Disconnect audio input from TIMS, while the UUT is still keyed.	Ensure that the demodulated noise on the transmitter output, without audio modulation is at least 35 dB below the output obtained with audio modulation (step 9).	
12	Repeat steps 8 through 11 for the following frequencies.	120.000 MHz 125.000 MHz 130.000 MHz 136.000 MHz	
13	For equipment that is designed for operation from an alternating current power source:	Measurements for carrier noise will be made over the range of power source frequencies for which designed.	

Note: Sections that are not applicable are shaded.
Legend: AM - Amplitude Modulation; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; PT - Plain Text; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; % - percent

21-1.4 Presentation of Results. The results will be shown in table 21-2 indicating the requirement and measured value or indications of capability.

Table 21-2. Carrier Noise Level Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
21	2.3.6	The demodulated noise on the transmitter output, without audio modulation, shall be at least 35 dB below the demodulated output obtained when the carrier is modulated 70% at 1000 Hz. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.	At least 35 dB below.			

Legend: dB - decibels; Hz - hertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

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SUBTEST 22. EMISSIONS OF RADIO FREQUENCY ENERGY

22-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 22.

22-1.2 Criteria. Reference number 22.

a. Conducted and radiated spurious radio frequency energy emission levels shall not exceed those levels specified in section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment."

b. When the transmitter is terminated with a resistive load equal to the nominal transmitter output impedance, the level of any spurious emissions appearing across the load shall not exceed 25 microwatts at harmonically related frequencies.

c. Harmonic emission products shall be at least 60 dB below the rated RF output power i.e., minus 60 decibels below carrier (dBc). Harmonic emission products in the International Civil Aviation Organization (ICAO) Global Navigation Satellite System (GNSS) band extending from 1559 to 1610 MHz shall be no greater than minus 60 dB.

22-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Spectrum Analyzer

(3) Attenuator

b. Test Configuration. Configure the equipment as shown in figure 22-1.

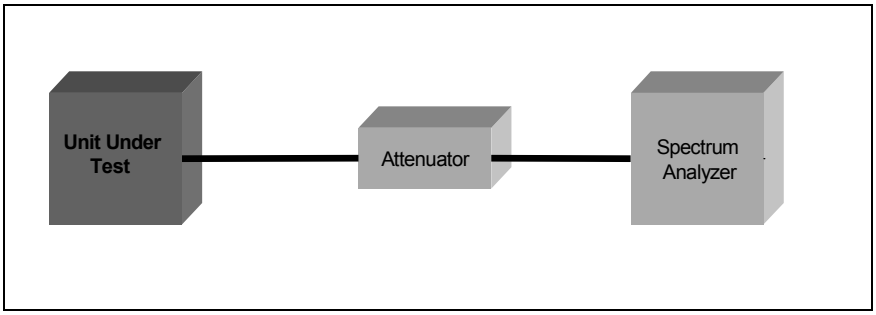

Figure 22-1. Emissions of Radio Frequency Energy Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 22-1.

Table 22-1. Emissions of Radio Frequency Energy Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 22.			
1	Connect the equipment.	As shown in figure 22-1.	
2	Configure the UUT.	Frequency: 120.000 MHz Power: 1 watt	
3	Use appropriate attenuation.	Select appropriate level attenuation as to provide a safe input to the test equipment.	
4	Configure the spectrum analyzer.	Center frequency: 25 kHz Span: 10 MHz Center frequency step: 10 MHz Select delta marker function	
5	Select center channel on the spectrum analyzer.	Starting at 25 kHz, scroll through the band from 25 kHz to 1215 MHz.	
6	Check levels at harmonically related frequencies.	240.000 MHz 360.000 MHz 480.000 MHz 600.000 MHz 720.000 MHz 840.000 MHz 960.000 MHz 1080 MHz 1200 MHz	
7	Record results.	Ensure all harmonic emission products are at least 60 dBc. Record frequencies that do not meet the specification.	
8	For the ICAO GNSS band, check the following band:	Check the band 1559 to 1610 MHz.	
9	Record results.	Ensure emission products are no greater than 60 dB.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; dBc - decibels below carrier; GNSS - Global Navigation Satellite System; ICAO - International Civil Aviation Organization; kHz - kilohertz; MHz - megahertz; UUT - Unit Under Test

22-1.4 Presentation of Results. The results will be shown in table 22-2 indicating the requirement and measured value or indications of capability.

Table 22-2. Emissions of Radio Frequency Energy Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
22	2.3.7	a. Conducted and radiated spurious radio frequency energy emission levels shall not exceed those levels specified in Section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment." b. When the transmitter is terminated with a resistive load equal to the nominal transmitter output impedance, the level of any spurious emissions appearing across the load shall not exceed 25 microwatts at harmonically related frequencies. c. Harmonic emission products shall be at least 60 dB below the rated RF output power, i.e., minus 60 dBc. Harmonic emission products in the ICAO Global Navigation Satellite System (GNSS) band extending from 1559 to 1610 MHz shall be no greater than minus 60 dB.	At least 60 dBc. No greater than 60 dB.			

Legend: dB - decibels; dBc - decibels below carrier; GNSS - Global Navigation Satellite System; ICAO - International Civil Aviation Organization; MHz - megahertz; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 23. CHANNEL SELECTION TIME

23-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 23.

23-1.2 Criteria. Reference number 23. The time required for the equipment to change from one channel to any other channel shall not exceed one second.

23-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Attenuator

(4) Oscilloscope

(5) Audio Generator

b. Test Configuration. Configure the equipment as shown in figure 23-1.

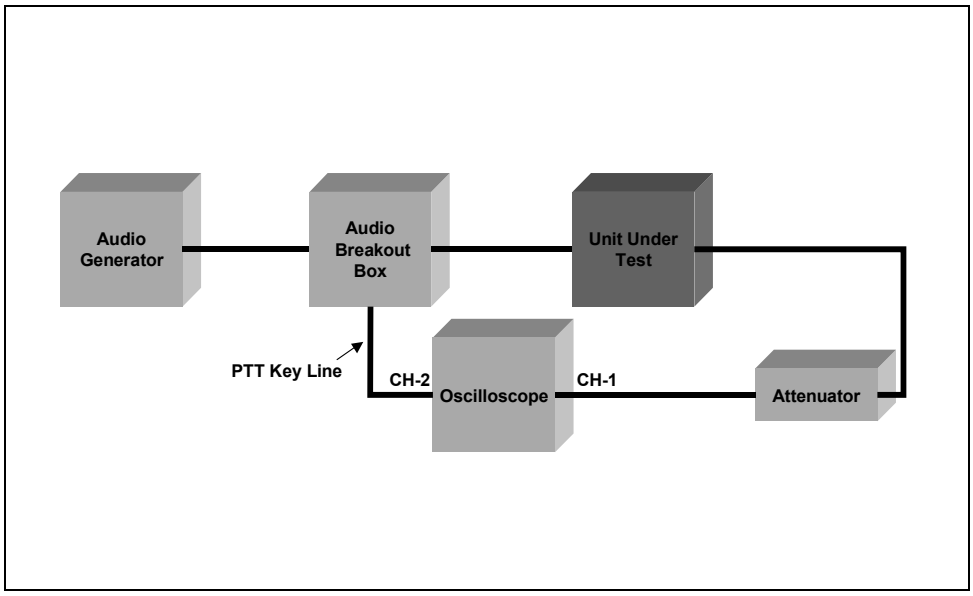

Figure 23-1. Channel Selection Time Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 23-1.

Table 23-1. Channel Selection Time Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 23.			
1	Set up equipment.	As shown in figure 23-1.	
2	Configure the audio generator.	Rate: 1000 Hz Amplitude: -75 dBm	
3	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout. The keyline output will go to channel 2 of the oscilloscope.	
4	Configure the UUT.	Channel 1 frequency: 119.000 MHz Channel 2 frequency: 120.000 MHz Channel spacing: 25 kHz Power: Low	
5	Use appropriate level of attenuation.	Use appropriate level of attenuation as to provide safe input to the test equipment.	
6	Configure the oscilloscope.	Channel 1 input: RF output of the UUT. Channel 2 input: Keyline output from audio breakout box. Channel 1: 1 V/div Channel 2: 2 V/div Trigger level: 2.83 V Trigger will come from channel 2.	
7	Key the UUT, using channel 1 frequency.		
8	Unkey the UUT.	Capture the release.	
9	Select marker 1.	Place marker 1 on unkey.	
10	Select marker 2.	Place marker 2 on the end of RF. Adjust horizontal scale as needed to obtain a clear picture of the actual end of the RF signal.	
11	Record the difference between markers.		
12	Key the UUT.	Select run on the oscilloscope.	
13	Change the channel of the UUT while transmitting to channel 2.		
14	Unkey the UUT and immediately rekey. This will cause the UUT to transmit on channel 2.	Capture the attack of the RF for the channel 2 (new channel).	
15	Place marker 1.	Place marker 1 on the keyline.	
16	Place marker 2.	Place marker 2 on the beginning of the RF. Adjust the horizontal scale as needed for an accurate picture of the RF.	
17	Record the difference between markers.		
18	Repeat steps 7 through 17.	Record release and attack times five times to get an average for each.	
19	Add release time and attack times (averages).	Record total time of averages. This is the channel changing time. Ensure the total time is less than 1 second.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; RF - Radio Frequency; UUT - Unit Under Test; V - volts; V/div - volts per division

23-1.4 Presentation of Results. The results will be shown in table 23-2 indicating the requirement and measured value or indications of capability.

Table 23-2. Channel Selection Time Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
23	2.3.8	The time required for the equipment to change from one channel to any other channel shall not exceed one second.	Less than 1 second.			

Legend: RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective

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SUBTEST 24. FREQUENCY TOLERANCE/FREQUENCY STABILITY

24-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 24, and ARINC Characteristic 716-10, reference numbers 55 and 80.

24-1.2 Criteria

a. Reference number 24.

Class 3 and Class 4 transmitters – The RF carrier frequency shall be within 0.003% of the selected channel frequency.

Class 5 and Class 6 transmitters – The RF carrier frequency shall be within 0.0005% 5 parts per million (ppm) of the selected channel frequency.

When modulated 70% at 1000 Hz, the frequency deviation due to unwanted frequency modulation of the carrier shall not exceed ± 3000 Hz.

b. Reference number 55. The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.003% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or the airline customer, exist in actual service.

c. Reference number 80. The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.0005% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or the airline customer, exist in actual service.

24-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Power Splitter

(3) Attenuators (2)

(4) Transmission Impairment Measurement Set

(5) Modulation Analyzer

(6) Frequency Counter

(7) Audio Breakout Box

b. Test Configuration. Configure the equipment as shown in figure 24-1.

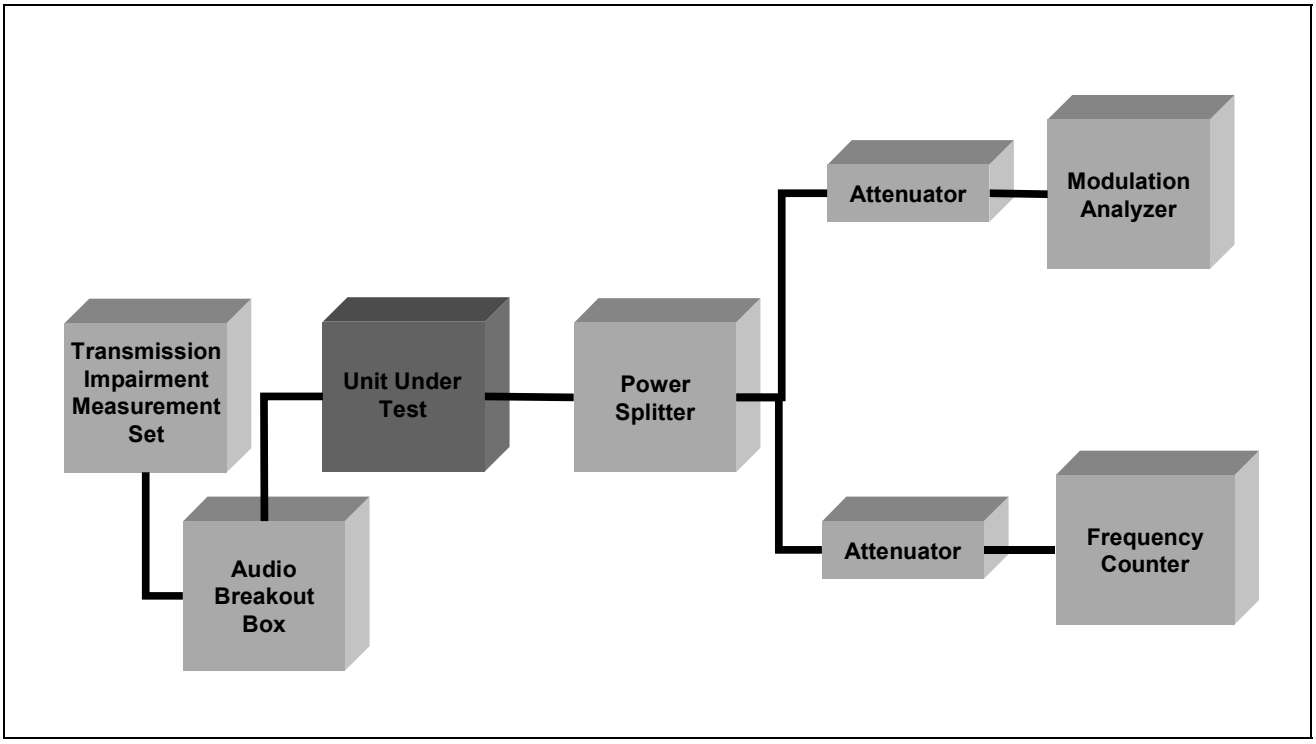

Figure 24-1. Frequency Tolerance/Frequency Stability Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 24-1.

Table 24-1. Frequency Tolerance/Frequency Stability Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 24, 55, and 80.			
1	Connect the equipment.	As shown in figure 24-1.	
2	Use appropriate attenuation.	Select the appropriate level of attenuation for the safe input of signal into test equipment.	
3	Configure the UUT.	Frequency: 118.000 MHz Single Channel PT Power: Low Channel spacing: 25 kHz	
4	Configure the TIMS.	1004 Hz tone	
5	Configure the modulation analyzer.	Measure the modulation depth in AM and frequency deviation in FM.	
6	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout of the UUT.	
7	Configure the frequency counter.	100 count, average.	
8	Key the UUT.	Adjust the level of the TIMS until 70% modulation depth is achieved on the modulation analyzer.	

Table 24-1. Frequency Tolerance/Frequency Stability Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
For Class 4 transmitters (25 kHz channel spacing)			
9	Observe the frequency counter.	Ensure the carrier frequency is within 0.003% (±3540 Hz) of 118.000 MHz.	
10	Change the frequency on the UUT to 121.000 MHz.		
11	Observe the frequency counter.	Ensure the carrier frequency is within 0.003% (±3630 Hz) of 121.000 MHz.	
12	Change the frequency on the UUT to 125.000 MHz.		
13	Observe the frequency counter.	Ensure the carrier frequency is within 0.003% (±3750 Hz) of 125.000 MHz.	
14	Change the frequency on the UUT to 129.000 MHz.		
15	Observe the frequency counter.	Ensure the carrier frequency is within 0.003% (±3870 Hz) of 129.000 MHz.	
16	Change the frequency on the UUT to 135.000 MHz.		
17	Observe the frequency counter.	Ensure the carrier frequency is within 0.003% (±4050 Hz) of 135.000 MHz.	
For Class 6 transmitters (8.33 kHz channel spacing)			
18	Set the UUT to 118.000 MHz and 8.33 kHz channel spacing.	Key the UUT.	
19	Observe the frequency counter.	Ensure the carrier frequency is within 0.0005% (5 ppm) (±590 Hz) of 118.000 MHz.	
20	Check the modulation analyzer.	With the modulation analyzer reading 70% modulation, switch to FM deviation and ensure that the deviation due to unwanted frequency modulation of the carrier does not exceed ±3000 Hz.	
21	Change the frequency on the UUT to 121.000 MHz.		
22	Observe the frequency counter.	Ensure the carrier frequency is within 0.0005% (5 ppm) (±605 Hz) of 121.000 MHz.	
23	Check the modulation analyzer.	With the modulation analyzer reading 70% modulation, switch to FM deviation and ensure that the deviation due to unwanted frequency modulation of the carrier does not exceed ±3000 Hz.	
24	Change the frequency on the UUT to 125.000 MHz.		
25	Observe the frequency counter.	Ensure the carrier frequency is within 0.0005% (5 ppm) (±625 Hz) of 125.000 MHz.	

Table 24-1. Frequency Tolerance/Frequency Stability Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
26	Check the modulation analyzer.	With the modulation analyzer reading 70% modulation, switch to FM deviation and ensure that the deviation due to unwanted frequency modulation of the carrier does not exceed ±3000 Hz.	
27	Change the frequency on the UUT to 129.000 MHz.		
28	Observe the frequency counter.	Ensure the carrier frequency is within 0.0005% (5 ppm) (±645 Hz) of 129.000 MHz.	
29	Check the modulation analyzer.	With the modulation analyzer reading 70% modulation, switch to FM deviation and ensure that the deviation due to unwanted frequency modulation of the carrier does not exceed ±3000 Hz.	
30	Change the frequency on the UUT to 135.000 MHz.		
31	Observe the frequency counter.	Ensure the carrier frequency is within 0.0005%(5 ppm) (±675 Hz) of 135.000 MHz.	
32	Check the modulation analyzer.	With the modulation analyzer reading 70% modulation, switch to FM deviation and ensure that the deviation due to unwanted frequency modulation of the carrier does not exceed ±3000 Hz.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; FM - Frequency Modulation; Hz - hertz; kHz - kilohertz; MHz - megahertz; ppm - parts per million; PT - Plain Text; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; % - percent; ± - plus or minus

24-1.4 Presentation of Results. The results will be shown in table 24-2 indicating the requirement and measured value or indications of capability.

Table 24-2. Frequency Tolerance/Frequency Stability Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
24	2.3.11	a. Class 3 and Class 4 transmitters – The RF carrier frequency shall be within 0.003% of the selected channel frequency. b. Class 5 and Class 6 transmitters – The RF carrier frequency shall be within 0.0005% (5 ppm) of the selected channel frequency. c. When modulated 70% at 1000 Hz, the frequency deviation due to unwanted frequency modulation of the carrier shall not exceed ± 3000 Hz.	Within 0.003%.			
			Within 0.0005% (5 ppm).			
			Less than 3000 Hz.			

Table 24-2. Frequency Tolerance/Frequency Stability Results (continued)

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
55	3.7.2	The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.003% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or the airline customer, exist in actual service.	±0.003% or less.			
80	4.4.1	The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.0005% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or other airline customer, exist in actual service.	± 0.0005% or less.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz; Hertz; ppm - parts per million; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics; V - volts; °C - degrees Celsius; ± - plus or minus; % - percent

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SUBTEST 25. TRANSMITTER OCCUPIED SPECTRUM FOR 8.33 kHz MODE

25-1.1 Objective. To determine the extent of compliance to the requirements of RTCA/DO-186A, reference number 25, and ARINC Characteristic 716-10, reference numbers 83 and 84.

25-1.2 Criteria

a. Reference number 25. For 8.33 kHz mode (Class 5 and Class 6 transmitters), the transmitter spectrum shall not exceed the limits shown in figure 2-1 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted as follows:

The level of the audio signal is adjusted to produce 70% modulation at 1000 Hz. Then the frequency of the audio signal is varied in the range 300 Hz - 10 kHz, at the constant above mentioned level between 300 and 800 Hz, and following a slope of 10 dB/octave between 800 Hz and 10 kHz.

b. Reference number 83. The transmitter distortion should be consistent with the specified transmitter occupied spectrum.

c. Reference number 84. The transmitted spectrum should not exceed the limits shown in attachment 11 (figure B-1.1) when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted to provide 90% modulation at 1000 Hz.

25-1.3 Test Procedures

a. Test Equipment Required

(1) Audio Generator

(2) Audio Breakout Box

(3) UUT

(4) Attenuators (2)

(5) Spectrum Analyzer

(6) Modulation Analyzer

b. Test Configuration. Configure the equipment as shown in figure 25-1.

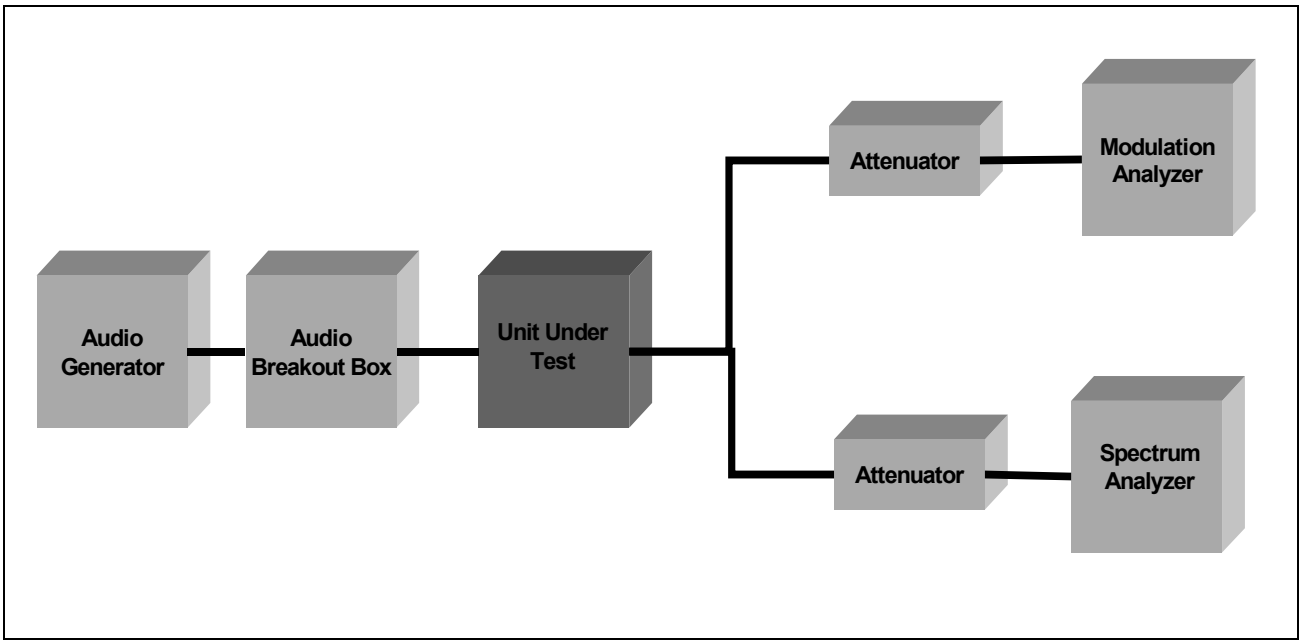

Figure 25-1. Transmitter Occupied Spectrum for 8.33 kHz Mode Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 25-1.

Table 25-1. Transmitter Occupied Spectrum for 8.33 kHz Mode Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 25, 83, and 84.			
1	Connect the equipment.	As shown in figure 25-1.	
2	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 8.33 kHz PT Power: Low	
3	Configure the modulation analyzer.	Configure to measure modulation level. Note: At frequencies specified in the transmitter occupied spectrum (figure B-1.1), record the distortion level.	
4	Configure the audio generator.	Frequency: 1000 Hz Level: For reference number 25, set level to produce 70% modulation of transmitter. Note: For reference number 96, set level to produce 90% modulation of transmitter.	
5	Record level.	Record the level that is required to produce 70% modulation of the transmitter. This will be the reference level.	
6	Configure the spectrum analyzer.	Center frequency: 119.000 MHz Resolution/video bandwidth: 30 Hz Reference level: -10 dB Bandwidth average 100: On	
7	Select appropriate attenuation.	Select the appropriate level of attenuation as to provide a safe input to the test equipment.	

Table 25-1. Transmitter Occupied Spectrum for 8.33 kHz Mode Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
8	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
9	Change the frequency of the audio generator.	300 Hz	
10	On the spectrum analyzer.	Select marker, and place marker on center frequency (119.000 MHz).	
11	On the marker menu.	Select delta.	
12	Ensure the following.	As specified in figure B-1.1.	
13	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
14	Record level at 2.5 kHz.		
15	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
16	Record level at 3.2 kHz.		
17	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
18	Record level at 5 kHz.		
19	Change the frequency of the audio generator.	400 Hz	
20	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
21	Record level at 2.5 kHz.		
22	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
23	Record level at 3.2 kHz.		
24	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
25	Record level at 5 kHz.		
26	Change the frequency of the audio generator.	600 Hz	
27	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
28	Record level at 2.5 kHz.		
29	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
30	Record level at 3.2 kHz.		
31	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
32	Record level at 5 kHz.		
33	Change the frequency of the audio generator.	800 Hz	
34	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
35	Record level at 2.5 kHz.		
36	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
37	Record level at 3.2 kHz.		
38	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
39	Record level at 5 kHz.		

Table 25-1. Transmitter Occupied Spectrum for 8.33 kHz Mode Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
40	Change frequency and amplitude of the audio generator.	Frequency: 1600 Hz (Octave of 800 Hz) Amplitude: Reference level +10 dB	
41	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
42	Record level at 2.5 kHz.		
43	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
44	Record level at 3.2 kHz.		
45	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
46	Record level at 5 kHz.		
47	Change frequency and amplitude of the audio generator.	Frequency: 3200 Hz (Octave of 1600 Hz) Amplitude: Reference level +20 dB	
48	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
49	Record level at 2.5 kHz.		
50	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
51	Record level at 3.2 kHz.		
52	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
53	Record level at 5 kHz.		
54	Change frequency and amplitude of the audio generator.	Frequency: 6400 Hz (Octave of 3200 Hz) Amplitude: Reference level +30 dB	
55	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
56	Record level at 2.5 kHz.		
57	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
58	Record level at 3.2 kHz.		
59	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
60	Record level at 5 kHz.		
61	Change frequency and amplitude of the audio generator.	Frequency: 10000 Hz (As per requirement) Amplitude: Reference level +40 dB	
62	Move marker 2 to 2.5 kHz from carrier.	Ensure at least 6 dB of attenuation.	
63	Record level at 2.5 kHz.		
64	Move marker 2 to 3.2 kHz from carrier.	Ensure at least 45 dB of attenuation.	
65	Record level at 3.2 kHz.		
66	Move marker 2 to 5 kHz from carrier.	Ensure at least 60 dB of attenuation.	
67	Record level at 5 kHz.		

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; Hz - hertz; kHz - kilohertz; MHz - megahertz; PT - Plain Text; UUT - Unit Under Test; % - percent

25-1.4 Presentation of Results. The results will be shown in table 25-2 indicating the requirement and measured value or indications of capability.

Table 25-2. Transmitter Occupied Spectrum for 8.33 kHz Mode Results

Reference Number	RTCA/DO-186A Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
25	2.3.13	For 8.33 kHz mode (Class 5 and Class 6 transmitters), the transmitter spectrum shall not exceed the limits shown in figure 2-1 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted as follows: The level of the audio signal is adjusted to produce 70% modulation at 1000 Hz. Then the frequency of the audio signal is varied in the range 300 Hz -10 kHz, at the constant above mentioned level between 300 and 800 Hz, and following a slope of 10 dB/octave between 800 Hz and 10 kHz.	-6 dB, 2.5 kHz -45 dB, 3.2 kHz -60 dB, 5 kHz			
Reference Number	**ARINC 716-10 Paragraph**	**Requirement**	**Result**		**Finding**	
			Required Value	**Measured Value**	**Met**	**Not Met**
83	4.4.2.4	The transmitter distortion should be consistent with the specified transmitter occupied spectrum.	Consistent with the transmitter occupied spectrum.			
84	4.4.2.5	The transmitted spectrum should not exceed the limits shown in Attachment 11 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted to provide 90% modulation at 1000 Hz.	-6 dB, 2.5 kHz -45 dB, 3.2 kHz -60 dB, 5 kHz			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; kHz - kilohertz; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; % - percent

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SUBTEST 26. FREQUENCY RANGE AND CHANNELING/CHANNEL CHANGING TIME FOR 25 AND 8.33 kHz SPACED CHANNELS

26-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference numbers 26 and 70.

26-1.2 Criteria

a. Reference number 26. The transceiver should be capable of operating on a total of 760 channels spaced 25 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 118.000 MHz and the highest assignable channel is centered on 136.975 MHz. Channel changing time should not exceed 60 milliseconds (ms).

b. Reference number 70. The transceiver should be capable of operating on 2280 channels spaced 8.33 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 117.99166 and the highest assignable channel is centered on 136.9833 MHz. Channel changing time should not exceed 60 ms.

26-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Generator

(3) Audio Breakout Box

(4) Attenuator

(5) Frequency Counter

(6) Spectrum Analyzer

(7) Oscilloscope

(8) Power Splitter

b. Test Configuration. Configure the equipment as shown in figures 26-1 and 26-2.

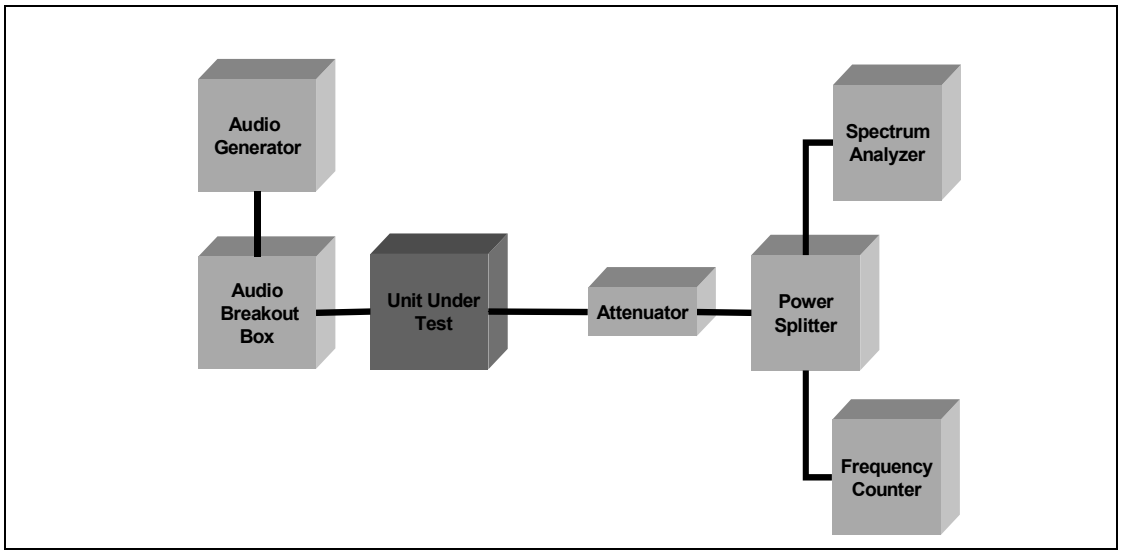

Figure 26-1. Frequency Range and Channeling Test Equipment Configuration

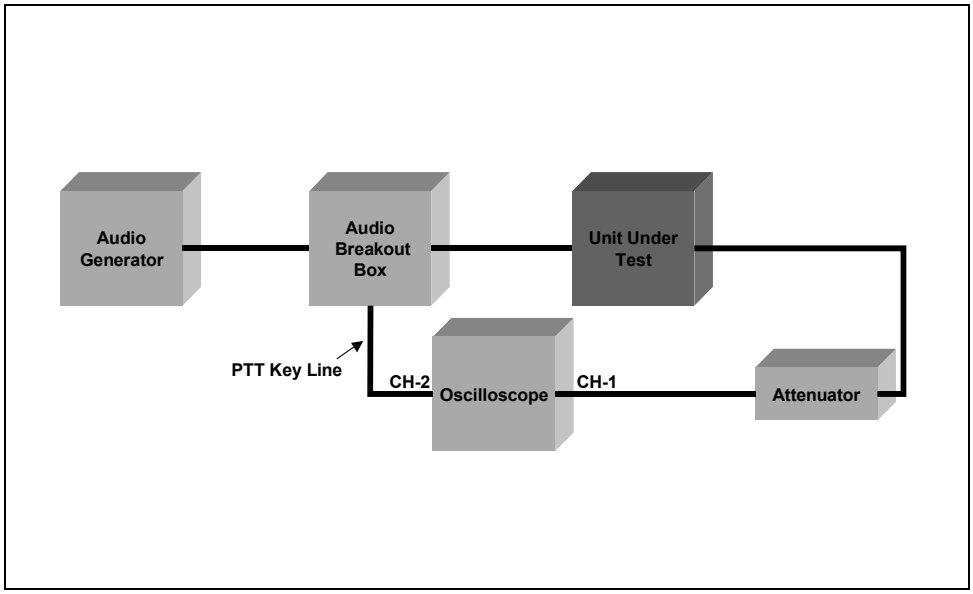

Figure 26-2. Channel Changing Time Equipment Configuration

c. Test Conduct. Test procedures are listed in table 26-1.

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 26 and 70.			
1	Set up equipment.	As shown in figure 26-1.	
2	For suppressed carrier UUT.	Use audio generator to drive the transmitter with a 1000 Hz tone.	

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
3	Select appropriate level of attenuation.	Use appropriate level of attenuation as to provide safe input to the test equipment.	
4	Configure the UUT.	Frequency: 118.000 MHz Power: Low, 25 kHz channel spacing	
5	Configure the frequency counter.	100 count, average.	
6	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
7	Configure the spectrum analyzer.	Center frequency: 2.5 kHz Span: 40 kHz	
8	Key the UUT.	Record the frequency on the frequency counter, and observe the spectrum analyzer to ensure the frequency is in the center of the occupied bandwidth.	
9	Unkey the UUT.	Change the frequency to 118.025 MHz.	
10	Key the UUT.	Record the frequency displayed on the frequency counter.	
11	Unkey the UUT.	Change the frequency to 118.050 MHz.	
12	Key the UUT.	Record the frequency displayed on the frequency counter.	
13	Unkey the UUT.	Change the frequency to 118.075 MHz.	
14	Key the UUT.	Record the frequency displayed on the frequency counter.	
15	Unkey the UUT.	Change the frequency to 118.100 MHz.	
16	Key the UUT.	Record the frequency displayed on the frequency counter.	
17	Unkey the UUT.	Change the frequency to 118.200 MHz.	
18	Key the UUT.	Record the frequency displayed on the frequency counter.	
19	Unkey the UUT.	Change the frequency to 118.300 MHz.	
20	Key the UUT.	Record the frequency displayed on the frequency counter.	
21	Unkey the UUT.	Change the frequency to 118.400 MHz.	
22	Key the UUT.	Record the frequency displayed on the frequency counter.	
23	Unkey the UUT.	Change the frequency to 118.500 MHz.	
24	Key the UUT.	Record the frequency displayed on the frequency counter.	
25	Unkey the UUT.	Change the frequency to 118.600 MHz.	
26	Key the UUT.	Record the frequency displayed on the frequency counter.	
27	Unkey the UUT.	Change the frequency to 118.700 MHz.	
28	Key the UUT.	Record the frequency displayed on the frequency counter.	
29	Unkey the UUT.	Change the frequency to 118.800 MHz.	
30	Key the UUT.	Record the frequency displayed on the frequency counter.	
31	Unkey the UUT.	Change the frequency to 118.900 MHz.	
32	Key the UUT.	Record the frequency displayed on the frequency counter.	

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
33	Unkey the UUT.	Change the frequency to 119.000 MHz.	
34	Key the UUT.	Record the frequency displayed on the frequency counter.	
35	Unkey the UUT.	Change the frequency to 120.000 MHz.	
36	Key the UUT.	Record the frequency displayed on the frequency counter.	
37	Unkey the UUT.	Change the frequency to 121.000 MHz.	
38	Key the UUT.	Record the frequency displayed on the frequency counter.	
39	Unkey the UUT.	Change the frequency to 122.000 MHz.	
40	Key the UUT.	Record the frequency displayed on the frequency counter.	
41	Unkey the UUT.	Change the frequency to 123.000 MHz.	
42	Key the UUT.	Record the frequency displayed on the frequency counter.	
43	Unkey the UUT.	Change the frequency to 124.000 MHz.	
44	Key the UUT.	Record the frequency displayed on the frequency counter.	
45	Unkey the UUT.	Change the frequency to 125.000 MHz.	
46	Key the UUT.	Record the frequency displayed on the frequency counter.	
47	Unkey the UUT.	Change the frequency to 126.000 MHz.	
48	Key the UUT.	Record the frequency displayed on the frequency counter.	
49	Unkey the UUT.	Change the frequency to 127.000 MHz.	
50	Key the UUT.	Record the frequency displayed on the frequency counter.	
51	Unkey the UUT.	Change the frequency to 128.000 MHz.	
52	Key the UUT.	Record the frequency displayed on the frequency counter.	
53	Unkey the UUT.	Change the frequency to 129.000 MHz.	
54	Key the UUT.	Record the frequency displayed on the frequency counter.	
55	Unkey the UUT.	Change the frequency to 130.000 MHz.	
56	Key the UUT.	Record the frequency displayed on the frequency counter.	
57	Unkey the UUT.	Change the frequency to 131.000 MHz.	
58	Key the UUT.	Record the frequency displayed on the frequency counter.	
59	Unkey the UUT.	Change the frequency to 132.000 MHz.	
60	Key the UUT.	Record the frequency displayed on the frequency counter.	
61	Unkey the UUT.	Change the frequency to 133.000 MHz.	
62	Key the UUT.	Record the frequency displayed on the frequency counter.	
63	Unkey the UUT.	Change the frequency to 134.000 MHz.	
64	Key the UUT.	Record the frequency displayed on the frequency counter.	
65	Unkey the UUT.	Change the frequency to 135.000 MHz.	

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
66	Key the UUT.	Record the frequency displayed on the frequency counter.	
67	Unkey the UUT.	Change the frequency to 136.000 MHz.	
68	Key the UUT.	Record the frequency displayed on the frequency counter.	
69	Change the channel spacing and frequency of the UUT.	Change the spacing to 8.33 kHz and the frequency to 118.000 MHz.	
70	Key the UUT.	Record the frequency on the frequency counter, and observe the spectrum analyzer to ensure the frequency is in the center of the occupied bandwidth.	
71	Unkey the UUT.	Change the frequency to 118.005 MHz.	
72	Key the UUT.	Record the frequency displayed on the frequency counter.	
73	Unkey the UUT.	Change the frequency to 118.010 MHz.	
74	Key the UUT.	Record the frequency displayed on the frequency counter.	
75	Unkey the UUT.	Change the frequency to 118.025 MHz.	
76	Key the UUT.	Record the frequency displayed on the frequency counter.	
77	Unkey the UUT.	Change the frequency to 118.030 MHz.	
78	Key the UUT.	Record the frequency displayed on the frequency counter.	
79	Unkey the UUT.	Change the frequency to 118.040 MHz.	
80	Key the UUT.	Record the frequency displayed on the frequency counter.	
81	Unkey the UUT.	Change the frequency to 118.050 MHz.	
82	Key the UUT.	Record the frequency displayed on the frequency counter.	
83	Unkey the UUT.	Change the frequency to 118.060 MHz.	
84	Key the UUT.	Record the frequency displayed on the frequency counter.	
85	Unkey the UUT.	Change the frequency to 118.070 MHz.	
86	Key the UUT.	Record the frequency displayed on the frequency counter.	
87	Unkey the UUT.	Change the frequency to 118.080 MHz.	
88	Key the UUT.	Record the frequency displayed on the frequency counter.	
89	Unkey the UUT.	Change the frequency to 118.090 MHz.	
90	Key the UUT.	Record the frequency displayed on the frequency counter.	
91	Unkey the UUT.	Change the frequency to 118.100 MHz.	
92	Key the UUT.	Record the frequency displayed on the frequency counter.	
93	Unkey the UUT.	Change the frequency to 118.200 MHz.	
94	Key the UUT.	Record the frequency displayed on the frequency counter.	
95	Unkey the UUT.	Change the frequency to 118.300 MHz.	

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
96	Key the UUT.	Record the frequency displayed on the frequency counter.	
97	Unkey the UUT.	Change the frequency to 118.400 MHz.	
98	Key the UUT.	Record the frequency displayed on the frequency counter.	
99	Unkey the UUT.	Change the frequency to 118.500 MHz.	
100	Key the UUT.	Record the frequency displayed on the frequency counter.	
101	Unkey the UUT.	Change the frequency to 118.600 MHz.	
102	Key the UUT.	Record the frequency displayed on the frequency counter.	
103	Unkey the UUT.	Change the frequency to 118.700 MHz.	
104	Key the UUT.	Record the frequency displayed on the frequency counter.	
105	Unkey the UUT.	Change the frequency to 118.800 MHz.	
106	Key the UUT.	Record the frequency displayed on the frequency counter.	
107	Unkey the UUT.	Change the frequency to 118.900 MHz.	
108	Key the UUT.	Record the frequency displayed on the frequency counter.	
109	Unkey the UUT.	Change the frequency to 119.000 MHz.	
110	Key the UUT.	Record the frequency displayed on the frequency counter.	
111	Unkey the UUT.	Change the frequency to 120.000 MHz.	
112	Key the UUT.	Record the frequency displayed on the frequency counter.	
113	Unkey the UUT.	Change the frequency to 121.000 MHz.	
114	Key the UUT.	Record the frequency displayed on the frequency counter.	
115	Unkey the UUT.	Change the frequency to 122.000 MHz.	
116	Key the UUT.	Record the frequency displayed on the frequency counter.	
117	Unkey the UUT.	Change the frequency to 123.000 MHz.	
118	Key the UUT.	Record the frequency displayed on the frequency counter.	
119	Unkey the UUT.	Change the frequency to 124.000 MHz.	
120	Key the UUT.	Record the frequency displayed on the frequency counter.	
121	Unkey the UUT.	Change the frequency to 125.000 MHz.	
122	Key the UUT.	Record the frequency displayed on the frequency counter.	
123	Unkey the UUT.	Change the frequency to 126.000 MHz.	
124	Key the UUT.	Record the frequency displayed on the frequency counter.	
125	Unkey the UUT.	Change the frequency to 127.000 MHz.	
126	Key the UUT.	Record the frequency displayed on the frequency counter.	
127	Unkey the UUT.	Change the frequency to 128.000 MHz.	
128	Key the UUT.	Record the frequency displayed on the frequency counter.	

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
129	Unkey the UUT.	Change the frequency to 129.000 MHz.	
130	Key the UUT.	Record the frequency displayed on the frequency counter.	
131	Unkey the UUT.	Change the frequency to 130.000 MHz.	
132	Key the UUT.	Record the frequency displayed on the frequency counter.	
133	Set up equipment.	As shown in figure 26-2.	
134	Configure the audio generator.	Rate: 1000 Hz Amplitude: -75 dBm	
135	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout. The keyline output will go to channel 2 of the oscilloscope.	
136	Configure the UUT.	Channel 1 frequency: 119.000 MHz Channel 2 frequency: 120.000 MHz Channel spacing: 25 kHz Power: Low	
137	Use appropriate level of attenuation.	Use appropriate level of attenuation as to provide safe input to the test equipment.	
138	Configure the oscilloscope.	Channel 1 input: RF output of the UUT. Channel 2 input: Keyline output from audio breakout box. Channel 1: 1 V/div Channel 2: 2 V/div Trigger level: 2.83 V Trigger will come from channel 2.	
139	Key the UUT, using channel 1 frequency.		
140	Unkey the UUT.	Capture the release.	
141	Select Marker 1.	Place marker 1 on Unkey.	
142	Select marker 2.	Place marker 2 on the end of RF. Adjust horizontal scale as needed to obtain a clear picture of the actual end of the RF signal.	
143	Record the difference between markers.		
144	Key the UUT.	Select run on the oscilloscope.	
145	Change the channel of the UUT while transmitting to channel 2.		
146	Unkey the UUT and immediately rekey. This will cause the UUT to transmit on channel 2.	Capture the attack of the RF for the channel 2 (new channel).	
147	Place marker 1.	Place marker 1 on the keyline.	
148	Place marker 2.	Place marker 2 on the beginning of the RF. Adjust the horizontal scale as needed for an accurate picture of the RF.	
149	Record the difference between markers.		

Table 26-1. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
150	Repeat steps 76 through 85.	Record release and attack times 5 times to get an average for each.	
151	Add release time and attack times (averages).	Record total time of averages. This is the channel changing time. Ensure the total time is less than 60 ms.	
152	Repeat steps 75 through 85.	Change the channel spacing of the UUT to 8.33 kHz.	
153	Record results.	Ensure channel changing time does not exceed 60 ms.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; ms - milliseconds; RF - Radio Frequency; UUT - Unit Under Test; V - volts; V/div - volts per division

26-1.4 Presentation of Results. The results will be shown in table 26-2 indicating the requirement and measured value or indications of capability.

Table 26-2. Frequency Range and Channeling/Channel Changing Time for 25 and 8.33 kHz Spaced Channels Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
26	3.1	The transceiver should be capable of operating on a total of 760 channels spaced 25 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 118.000 MHz and the highest assignable channel is centered on 136.975 MHz. Channel changing time should not exceed 60 ms.	760 channels. Channel changing time not to exceed 60 ms.			
70	4.1	The transceiver should be capable of operating on 2280 channels spaced 8.33 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 117.99166 and the highest assignable channel is centered on 136.9833 MHz. Channel changing time should not exceed 60 ms. A table of the Frequency Channel Pairing Plan is provided in Appendix 1 for the reader's convenience.	2280 channels. Channel changing time not to exceed 60 ms.			

Legend: Aeronautical Radio Incorporated; kHz - kilohertz; MHz - megahertz; ms - milliseconds

SUBTEST 27. TRANSMITTER FREQUENCY OFFSET

27-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 27.

27-1.2 Criteria. Reference number 27. The transceiver should be capable of double-channel operation, i.e., transmitting on a frequency higher by some whole number of megahertz than that on which its receiver is tuned. Sufficient flexibility should be provided to permit the same or a different value for this offset to be selected for each whole megahertz of receiving frequency. Double-channel operation should be effected by the grounding of the "Frequency Offset Enable" wire, either by the control panel or other source.

27-27.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Signal Generator

(4) Frequency Counter

(5) Audio Analyzer

(6) Push To Talk (PTT) Keyer

b. Test Configuration. Configure the equipment as shown in figures 27-1 and 27-2.

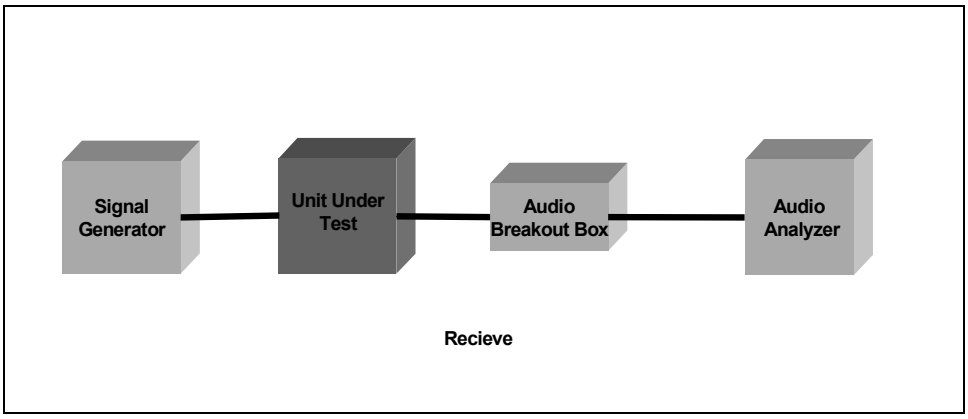

Figure 27-1. Transmitter Frequency Offset Test Equipment Configuration (receive)

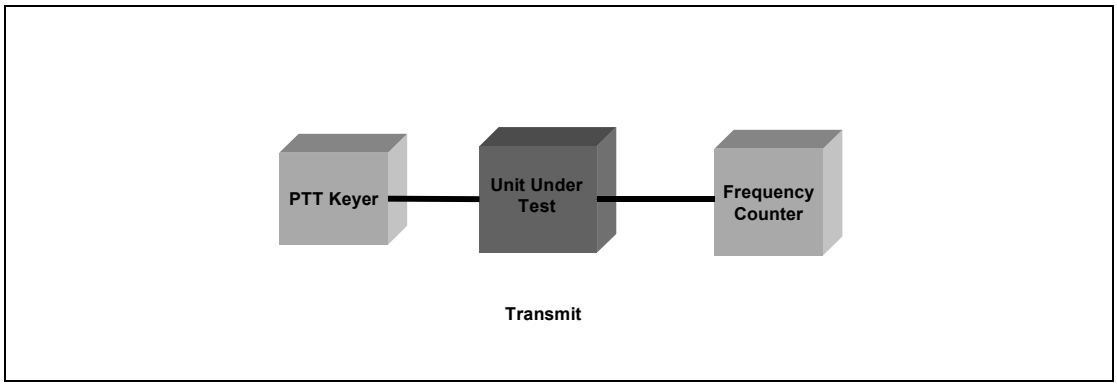

Figure 27-2. Transmitter Frequency Offset Test Equipment Configuration (transmit)

c. Test Conduct. Test Procedures are listed in table 27-1.

Table 27-1. Transmitter Frequency Offset Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 27.			
1	Set up equipment.	As shown in figure 27-1.	
2	Configure the UUT.	Receive frequency: 119.000 MHz Transmit frequency: 134.000 MHz Power: Low PT	
3	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
4	Configure the signal generator.	Frequency: 119.000 MHz Level: -60 dBm Rate: 1000 Hz Depth: 30%	
5	Set the audio analyzer.	Under measurement, select AC level.	
6	Turn signal generator RF and modulation to on.	Observe the audio analyzer.	
7	Record results.	Ensure that signal is being received by the UUT. Rate should be displayed on the audio analyzer.	
8	Change test configuration.	As shown in figure 27-2.	
9	Do not change frequencies of the UUT.		
10	Configure the frequency counter.	Set counter to average frequency.	
11	Key the UUT.	Observe the frequency counter.	
12	Record results.	Ensure frequency of 134.000 MHz is displayed on the frequency counter.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; % - percent

27-1.4 Presentation of Results. The results will be shown in table 27-2 indicating the requirement and measured value or indications of capability.

Table 27-2. Transmitter Frequency Offset Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
27	3.4	The transceiver should be capable of double-channel operation, i.e., transmitting on a frequency higher by some whole number of megahertz than that on which its receiver is tuned. Sufficient flexibility should be provided to permit the same or a different value for this offset to be selected for each whole megahertz of receiving frequency. Double-channel operation should be effected by the grounding of the "Frequency Offset Enable" wire, either by the control panel or other source.	Double-channel operation.			

Legend: ARINC - Aeronautical Radio Incorporated

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SUBTEST 28. TRANSMIT TO RECEIVE RECOVERY

28-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 28.

28-1.2 Criteria. Reference number 28. With the receiver squelch set to operate at 3 microvolts (μV), the receiver should recover after transmission to provide 90% of its output at an input level of 10 μV modulated 30% at 1000 Hz in less than 50 ms.

28-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generator

(3) Attenuator

(4) Audio Breakout Box

(5) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 28-1.

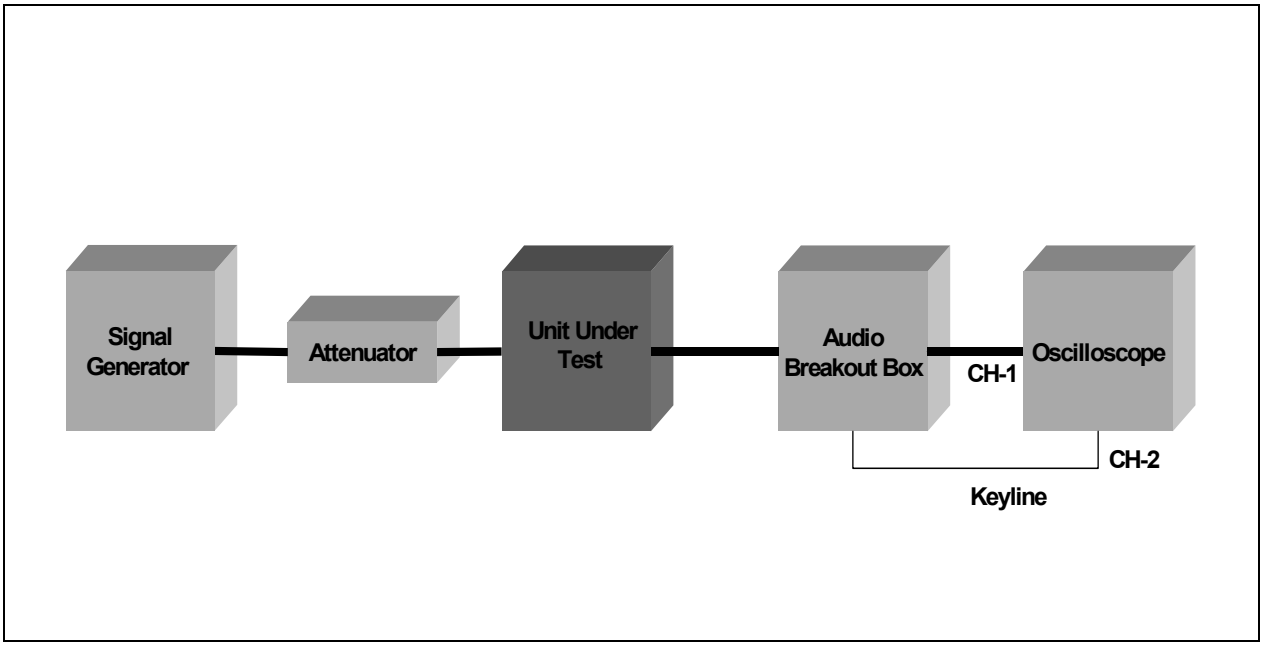

Figure 28-1. Transmit to Receive Recovery Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 28-1.

Table 28-1. Transmit to Receive Recovery Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 28.			
1	Set up the equipment.	As shown in figure 28-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 10 μV (after attenuation) Rate: 1000 Hz	
3	Use appropriate attenuation.	Since the UUT will be transmitting back into the signal generator, use appropriate level of attenuation so that the effect on the signal generator is not noticeable or will not cause damage.	
4	Configure the UUT.	Frequency: 119.000 MHz Power: Low Squelch: 3 μV or off	
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout configuration.	
6	Configure the oscilloscope.	Channel 1: Audio from the breakout box (1 V/div). Channel 2: Keyline from the audio breakout box (2 V/div).	
7	Key the UUT.	Observe the spectrum analyzer for the RF output of the UUT.	
8	Unkey the UUT.	Immediately stop the acquisition to capture the RF release and the audio attack.	
9	Select markers A and B.	Set marker A on the key (CH-2), and marker B on the audio signal where 90% output is achieved.	
10	Measure the time difference between markers A and B. Record the time.	Ensure time difference is less than 50 ms.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: CH - Channel; Hz - hertz; MHz - megahertz; ms - milliseconds; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division; μV - microvolts

28-1.4 Presentation of results. The results will be shown in table 28-2 indicating the requirement and measured value or indications of capability.

Table 28-2. Transmit to Receive Recovery Results

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
28	3.5	With the receiver squelch set to operate at 3 μV, the receiver should recover after transmission to provide 90% of its output at an input level of 10 μV modulated 30% at 1000 Hz in less than 50 ms.	90% output within 50 ms.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz; ms - milliseconds; μV - microvolts; % - percent

SUBTEST 29. UNDESIRED RESPONSE

29-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 31.

29-1.2 Criteria. Reference number 31. All spurious responses, including image, should be down at least 80 dB. All spurious responses within the frequency band of 118 to 136 MHz should be down at least 100 dB and preferably 120 dB.

29-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generators (2)

(3) Power Combiner

(4) Audio Breakout Box

(5) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 29-1.

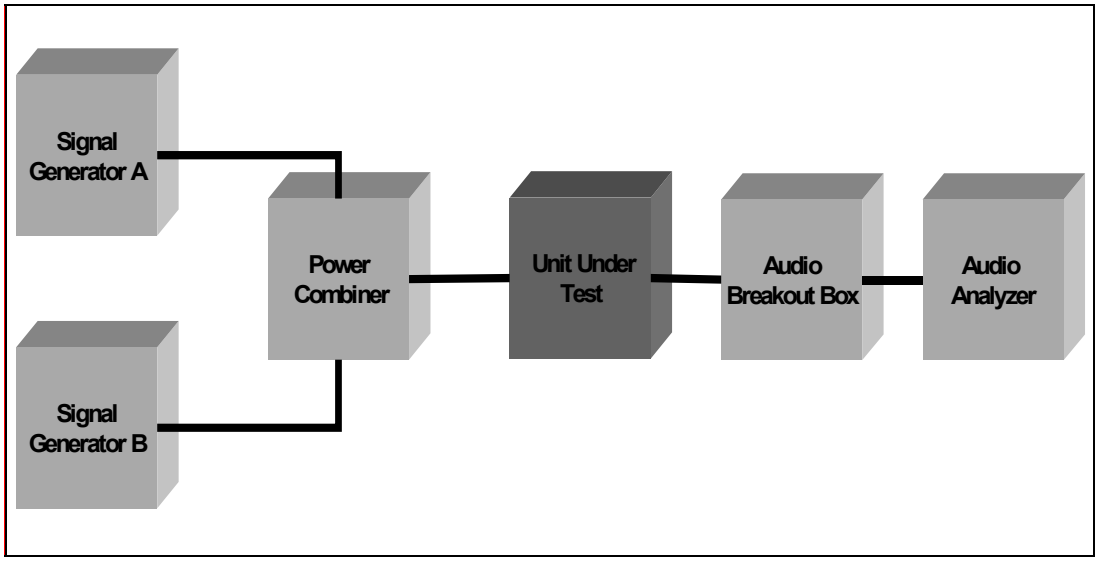

Figure 29-1. Undesired Response Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 29-1.

Table 29-1. Undesired Response Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 31.			
1	Set up the equipment.	As shown in figure 29-1.	
2	Configure signal generator A (desired signal).	Frequency: 119.000 MHz Amplitude: to produce 6 dB SINAD on the audio analyzer. Rate: 1000 Hz	
3	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz Squelch: Off PT	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set the audio analyzer.	Under measurement, select SINAD.	
6	Turn the RF and modulation of signal generator A to on.	Ensure a SINAD of 6 dB on the audio analyzer. Adjust amplitude as needed.	
7	Configure signal generator B (undesired signal).	Frequency: +5% of the carrier frequency = 124.950 MHz. Rate: 2500 Hz	
8	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
9	Record the level of signal generator B.	Ensure level is at least 100 dB above that of signal generator A (desired signal).	
10	Change signal generator B.	Frequency: -5% of the carrier frequency = 113.050 MHz (out of band).	
11	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
12	Record the level of signal generator B.	Ensure level is at least 80 dB above that of signal generator A (desired signal).	
13	Change signal generator B (undesired signal).	Frequency: +10% of the carrier frequency = 130.900 MHz. Rate: 2500 Hz	
14	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
15	Record the level of signal generator B.	Ensure level is at least 100 dB above that of signal generator A (desired signal).	
16	Change signal generator B.	Frequency: -10% of the carrier frequency = 107.100 MHz (out of band).	
17	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
18	Record the level of signal generator B.	Ensure level is at least 80 dB above that of signal generator A (desired signal).	
19	Change signal generator B (undesired signal).	Frequency: +35% of the carrier frequency = 160.650 MHz (out of band). Rate: 2500 Hz	
20	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
21	Record the level of signal generator B.	Ensure level is at least 80 dB above that of signal generator A (desired signal).	
22	Change signal generator B.	Frequency: -35% of the carrier frequency = 77.350 MHz (out of band).	

Table 29-1. Undesired Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
23	Adjust the amplitude of signal generator B.	Until 1 dB change in SINAD is observed on the audio analyzer.	
24	Record the level of signal generator B.	Ensure level is at least 80 dB above that of signal generator A (desired signal).	
The following procedures are for image frequencies:			
25	Consult manufacturer provided data, or contact manufacturer directly to determine the internal IF frequency (or frequencies) used by the UUT.	Record result.	
26	Set RF signal generator A to the selected test frequency plus 1 kHz.	Adjust output level for a 6 dB SINAD reading.	

Table 29-1. Undesired Response Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
27	Set RF signal generator B to the image frequency (see below) plus 1.000 kHz to make the signal audible. Adjust output level to -120 dBm. In single down conversion receivers, the image frequency is determined by subtracting twice the intermediate frequency from the test frequency: (Image Frequency = Test Frequency – 2IF). In up conversion receivers, the image frequency is determined by adding twice the IF to the test frequency if the IF is less than the local oscillator frequency: (Image Frequency = 2IF + Test Frequency). In up conversion receivers where the IF frequency is greater than the local oscillator frequency, the image frequency is determined by subtracting the test frequency from twice the IF: (Image = 2IF – Test Frequency). Dual-conversion receivers (i.e., receivers with two local oscillators) follow the same rules as given above. Since these radios use two IF frequencies, there will be three possible image frequencies. Two of these image frequencies come from the individual IF stages, and the third image frequency is the result of the combination of the two IF stages.	Increase the level of RF generator A in 1 dB steps until a 1 dB change is seen on the audio analyzer.	
28	Record the level of signal generator B.	Ensure level is at least 80 dB above that of signal generator A (desired signal).	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; IF - Intermediate Frequency; kHz - kilohertz; MHz - megahertz; PT - Plain Text; RF - Radio Frequency; SINAD - SIgnal to Noise and Distortion; UUT - Unit Under Test; % - percent

29-1.4 Presentation of results. The results will be shown in table 29-2 indicating the requirement and measured value or indications of capability.

Table 29-2. Undesired Response Results

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
31	3.6.3	All spurious responses, including image, should be down at least 80 dB. All spurious responses within the frequency band of 118 to 136 MHz should be down at least 100 dB and preferably 120 dB.	Spurious and image at least 80 dB. Within the band 118 to 136 MHz at least 100 dB down.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibel; MHz - megahertz

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SUBTEST 30. AUDIO SOURCE IMPEDANCE

30-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 34.

30-1.2 Criteria. Reference number 34. The audio output circuit should present less than 20 Ω impedance to the load circuit under all power-on conditions (signal and no-signal) when measured using the figure 1 and figure 2 methods of attachment 9 (figure 30-1). The audio output circuit should present less than 50 Ω impedance to the load circuit (measured using the figure 2 method of attachment 9) when no power is applied to the unit. The source impedance limits should apply over the frequency range of 100 Hz to 6000 Hz.

30-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Source

(3) Resistor

b. Test Configuration. Configure the equipment as shown in figure 30-1.

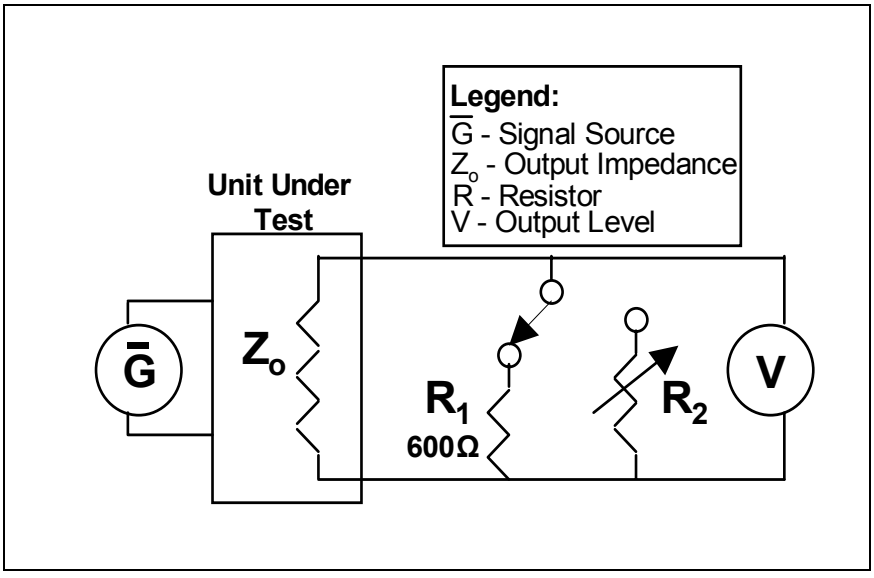

Figure 30-1. Audio Source Impedance Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 30-1.

Table 30-1. Audio Source Impedance Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 34.			
1	Set up equipment.	As shown in figure 30-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Level: -90 dBm Depth: 30% Rate: 100 Hz	
3	Configure the UUT.	Frequency: 119.000 MHz Channel Spacing: 25 kHz Adjust receiver gain for rated output.	
4	Select R_1.	Adjust manual gain control for desired output level V (up to rated output).	
5	Select R_2.	Adjust R_2 until V = 0.9 V	
6	Determine Z_o.	$Z_o = 60R_2 / 540 - R_2$	
7	Check the impedance for the following frequency range.	100 Hz to 6000 Hz in 300 Hz steps.	
8	Record results.	Audio output circuit should present less than 20 ohms of impedance for signal and no-signal.	
9	Record results when no power is applied to the UUT.	Audio output circuit should present less than 50 ohms of impedance.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; R - Resistor; UUT - Unit Under Test; V - volts; Z_o - Output Impedance; % - percent

30-1.4 Presentation of Results. The results will be shown in table 30-2 indicating the requirement and measured value or indications of capability.

Table 30-2. Audio Source Impedance Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
34	3.6.5.1	The audio output circuit should present less than 20 Ω impedance to the load circuit under all power-on conditions (signal and no-signal) when measured using the figure 1 and figure 2 methods of attachment 9. The audio output circuit should present less than 50 Ω impedance to the load circuit (measured using the figure 2 method of attachment 9) when no power is applied to the unit. The source impedance limits should apply over the frequency range of 100 Hz to 6000 Hz.	Less than 20 ohms. Less than 50 ohms.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz; Ω - ohms

SUBTEST 31. OUTPUT REGULATION

31-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 35.

31-1.2 Criteria. Reference number 35. With the output signal adjusted to 10 mW into 600 Ω at 1000 Hz, the output voltage should not change more than 2 decibels referenced to 1 volt (dBV) when the load is varied between 450 Ω and 2,500 Ω and by not more than 6 dBV when the load is varied between 200 Ω and 20,000 Ω. The above described output regulation should also be true when tested using 350 Hz and 2500 Hz signals.

31-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Transmission Impairment Measurement Set

(4) Signal Generator

(5) Variable Resistor

b. Test Configuration. Configure the equipment as shown in figure 31-1.

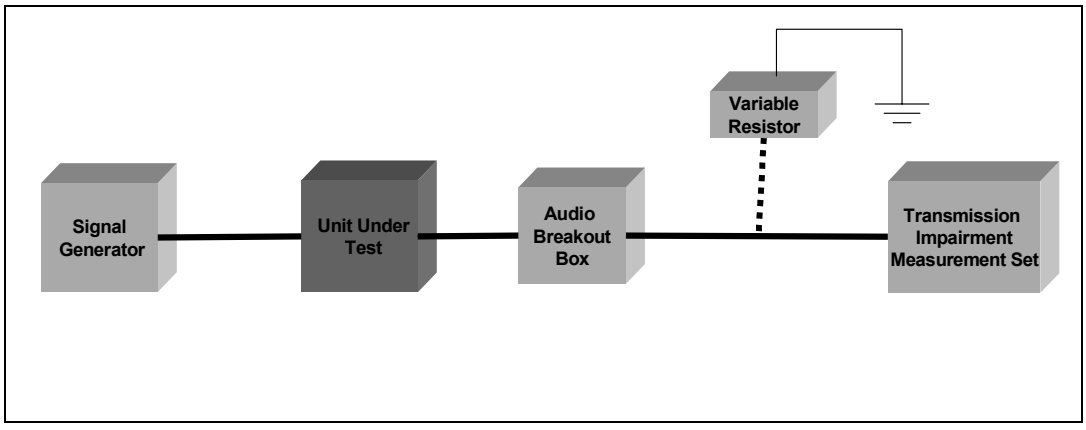

Figure 31-1. Output Regulation Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 31-1.

Table 31-1. Output Regulation Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 35.			
1	Set up equipment without resistor.	As shown in figure 31-1.	
2	Configure the signal generator.	Frequency: 118.000 MHz Dept: 30% Rate: 1000 Hz Amplitude: -120 dBm	
3	Configure the UUT.	Frequency: 119.000 MHz Mode: AM	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the TIMS.	Receive 600 ohms	
6	Turn RF and modulation to on.	Observe the TIMS.	
7	Adjust manual gain control on the UUT and the amplitude of the signal generator.	Adjust until an output of 10 mW (10 dB) is displayed on the TIMS, which will be used as a reference level.	
8	Select bridge on the TIMS.		
9	At the output of the audio breakout box.	Place 450 ohm resistor in parallel.	
10	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
11	Change the rate of the signal generator to 350 Hz.	Observe the TIMS.	
12	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
13	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
14	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
15	Change the rate of the signal generator to 350 Hz.		
16	Replace 450 ohm resistor with 510 ohm resistor.	Observe the TIMS.	
17	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
18	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
19	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
20	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	

Table 31-1. Output Regulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
21	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
22	Change the rate of the signal generator to 350 Hz.		
23	Replace 510 ohm resistor with 1000 ohm resistor.	Observe the TIMS.	
24	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
25	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
26	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
27	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
28	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
29	Change the rate of the signal generator to 350 Hz.		
30	Replace 1000 ohm resistor with 1500 ohm resistor.	Observe the TIMS.	
31	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
32	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
33	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
34	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
35	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
36	Change the rate of the signal generator to 350 Hz.		
37	Replace 1500 ohm resistor with 2000 ohm resistor.	Observe the TIMS.	
38	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
39	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
40	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	

Table 31-1. Output Regulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
41	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
42	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
43	Change the rate of the signal generator to 350 Hz.		
44	Replace 2000 ohm resistor with 2500 ohm resistor.	Observe the TIMS.	
45	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
46	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
47	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
48	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
49	Record the level on the TIMS.	The output voltage should not change more than 2 dBV (15 dBm) from reference level.	
50	Change the rate of the signal generator to 350 Hz.		
51	Replace 2500 ohm resistor with 200 ohm resistor.	Observe the TIMS.	
52	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
53	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
54	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
55	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
56	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
57	Change the rate of the signal generator to 350 Hz.		
58	Replace 200 ohm resistor with 300 ohm resistor.	Observe the TIMS.	
59	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
60	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	

Table 31-1. Output Regulation Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
61	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
62	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
63	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
64	Change the rate of the signal generator to 350 Hz.		
65	Replace 300 ohm resistor with 10,000 ohm resistor.	Observe the TIMS.	
66	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
67	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
68	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
69	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
70	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
71	Change the rate of the signal generator to 350 Hz.		
72	Replace 10,000 ohm resistor with 20,000 ohm resistor.	Observe the TIMS.	
73	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
74	Change the rate of the signal generator to 1000 Hz.	Observe the TIMS.	
75	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	
76	Change the rate of the signal generator to 2500 Hz.	Observe the TIMS.	
77	Record the level on the TIMS.	The output voltage should not change more than 6 dBV (19 dBm) from reference level.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; dB – decibels; dBm - decibels referenced to 1 milliwatt; dBV decibels referenced to 1 volt; Hz - hertz; MHz - megahertz; mW - milliwatt; RF - Radio Frequncy; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; % - percent

31-1.4 Presentation of Results. The results will be shown in table 31-2 indicating the requirement and measured value or indications of capability.

Table 31-2. Output Regulation Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
35	3.6.5.2	With the output signal adjusted to 10 mW into 600 Ω at 1000 Hz, the output voltage should not change more than 2 dBV when the load is varied between 450 Ω and 2,500 Ω and by not more than 6 dBV when the load is varied between 200Ω and 20,000 Ω. The above described output regulation should also be true when tested using 350 and 2500 Hz.	Not more than 2 dBV.			
			Not more than 6 dBV.			

Legend: ARINC - Aeronautical Radio Incorporated; dBV - decibels referenced to 1 volt; Hz - hertz; mW - milliwatt; Ω - ohms

SUBTEST 32. GAIN

32-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference numbers 36, 47, and 73.

32-1.2 Criteria

a. Reference number 36. The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 40 mW of output into 600 Ω ±20% resistive load.

b. Reference number 47. The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 volts alternating current (Vac) of output into a 600 Ω ±20% load.

c. Reference number 73. The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 Vac of output into a 600 Ω ± 20% load.

32-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) 600 ohm Resistor

(4) Digital Multimeter

(5) Signal Generator

b. Test Configuration. Configure the equipment as shown in figure 32-1.

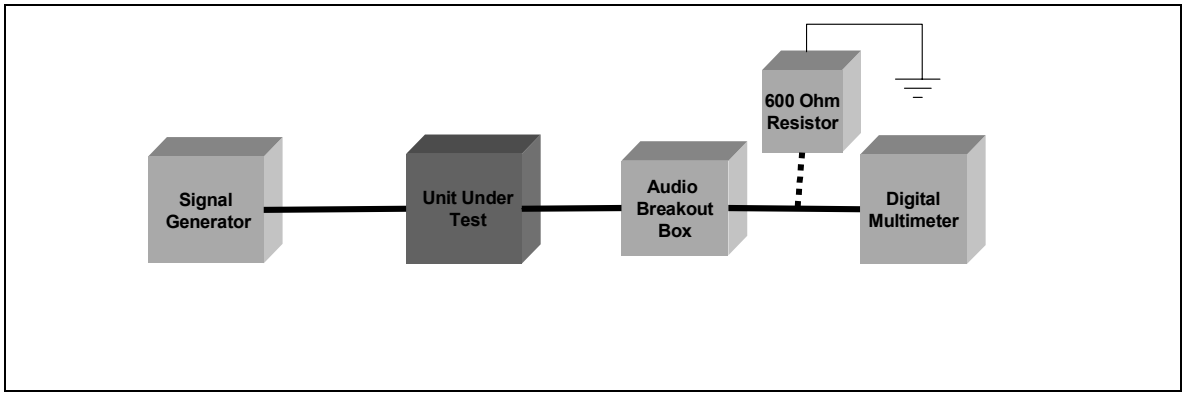

Figure 32-1. Gain Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 32-1.

Table 32-1. Gain Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 36 and 47.			
1	Set up equipment.	As shown in figure 32-1.	
2	Configure the signal generator.	Frequency: 118.000 MHz Dept: 30% Amplitude: 2μV (-112 dBm) Rate: 1000 Hz	
3	Configure the UUT.	Frequency: 118.000 MHz Mode: AM PT Power: Low Channel spacing: 25 kHz	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the digital multimeter.	Ensure multimeter has dBm measurement. If not, an audio analyzer with AC function can be used (high impedance input is required).	
6	Turn RF and modulation of the signal generator to on.	Observe the digital multimeter. Ensure receiver is able to produce at least 40 mW (16 dBm) of output.	
7	Switch multimeter to read Vac level.	Ensure the receiver produces at least 0.5 Vac of output.	
8	Turn RF and modulation to off.		
The following procedure is for reference number 73.			
9	Change the channel spacing on the UUT.	Channel spacing: 8.33 kHz	
10	Turn RF and modulation of the signal generator to on.	Observe the digital multimeter. Ensure receiver is able to produce at least 40 mW (16 dBm) of output.	
11	Switch multimeter to read Vac level.	Ensure receiver is able to produce at least 0.5 Vac of output.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; AM - Amplitude Modulation; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; mW - milliwatts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; Vac - volts alternating current; μV - microvolts; % - percent

32-1.4 Presentation of Results. The results will be shown in table 32-2 indicating the requirement and measured value or indications of capability.

Table 32-2. Gain Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
36	3.6.5.3	The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 40 mW of output into 600 Ω ±20% resistive load.	At least 40 mW.			
47	3.6.9.1	The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 Vac of output into a 600 Ω ±20% load.	At least 0.5 Vac.			
73	4.3.4.1	The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 Vac of output into a 600 Ω ± 20% load.	At least 0.5 Vac.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz; mW - milliwatts; Vac - volts alternating current; μV - microvolts; Ω - ohms; % - percent; ± - plus or minus

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SUBTEST 33. HUM LEVEL

33-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 37.

33-1.2 Criteria. Reference number 37. Hum and noise in the receiver output should be at least 40 dB below 10 mW output with a 1000 μV signal modulated 30% at 1000 Hz reference input.

33-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Signal Generator

(4) Spectrum Analyzer

b. Test Configuration. Configure the equipment as shown in figure 33-1.

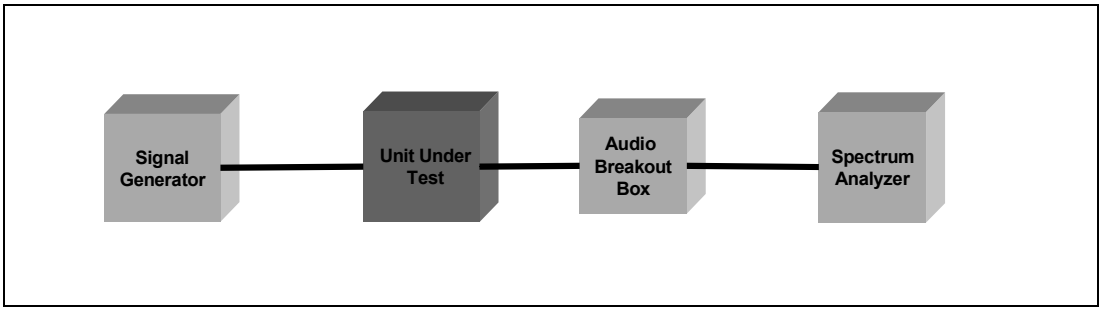

Figure 33-1. Hum Level Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 33-1.

Table 33-1. Hum Level Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 37.			
1	Set up equipment.	As shown in figure 33-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Level: 1000 μV Depth: 30%	

Table 33-1. Hum Level Test Procedures

Step	Action	Settings/Action	Measured Value
3	Configure the UUT.	Frequency: 119.000 MHz Channel Spacing: 25 kHz Receiver gain control: Set for 10 mW output.	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the spectrum analyzer.	Center frequency: 1 kHz Span: 3.2 kHz Coupling: DC Reference level: Adjust as needed.	
6	Turn RF and modulation to on.	Observe the spectrum analyzer.	
7	Place marker 1 on the 1 kHz tone.	Select delta marker function.	
8	Move marker 2 to 60 Hz.	This is the hum frequency.	
9	Record level of 60 Hz hum.	Ensure the level is at least 40 dB below marker 1 (1 kHz tone).	
10	Search the noise floor from 60 Hz to 3000 Hz.	All noise should be at least 40 dB below the 1 kHz tone.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; DC - Direct Current; Hz - hertz; kHz - kilohertz; MHz - megahertz; mW - milliwatt; RF - Radio Frequency; UUT - Unit Under Test; μV - microvolts; % - percent

33-1.4 Presentation of Results. The results will be shown in table 33-2 indicating the requirement and measured value or indications of capability.

Table 33-2. Hum Level Results

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
37	3.6.5.4	Hum and noise in the receiver output should be at least 40 dB below 10 mW output with a 1000 μV signal modulated 30% at 1000 Hz reference input.	At least 40 dB below.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; mW - milliwatt; μV - microvolts; % - percent

SUBTEST 34. VOICE PHASE SHIFT LIMIT

34-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 38.

34-1.2 Criteria. Reference number 38. The audio output level should not vary by more than 6 dB over the frequency range 300 Hz to 2500 Hz with respect to a reference level of up to 10 mW established at 1000 Hz with a constant input carrier level modulated 30%. A sharp cut-off in response below 300 Hz and above 2500 Hz is desirable. Frequencies above 3750 Hz should be attenuated at least 20 dB and preferably 40 dB.

34-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) UUT

(3) Audio Breakout Box

(4) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 34-1.

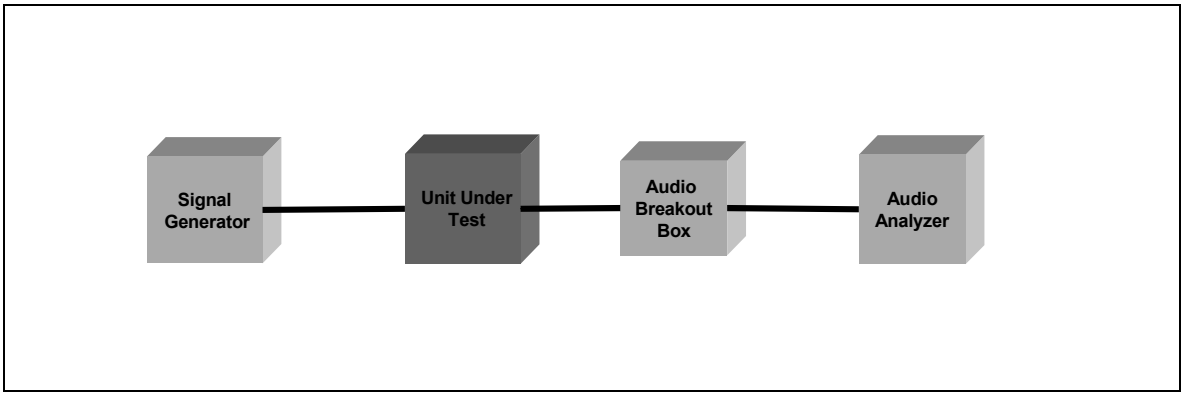

Figure 34-1. Voice Phase Shift Limit Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 34-1.

Table 34-1. Voice Phase Shift Limit Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 38.			
1	Set up equipment.	As shown in figure 34-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Depth: 30% Rate: 1000 Hz Level: To produce up to 10 mW output of receiver.	
3	Configure the UUT.	Frequency: 119.000 MHz Power: Low PT	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set the audio analyzer.	Under measurement, select AC level.	
6	Turn RF and modulation of the signal generator to on.	Observe the audio analyzer.	
7	Record level displayed on the audio analyzer (in dBm).	This is reference level voltage.	
8	Change rate on the signal generator.	Change to 300 Hz.	
9	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
10	Change rate on the signal generator.	Change to 400 Hz.	
11	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
12	Change rate on the signal generator.	Change to 500 Hz.	
13	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
14	Change rate on the signal generator.	Change to 600 Hz.	
15	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
16	Change rate on the signal generator.	Change to 700 Hz.	
17	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
18	Change rate on the signal generator.	Change to 800 Hz.	
19	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
20	Change rate on the signal generator.	Change to 900 Hz.	
21	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
22	Change rate on the signal generator.	Change to 1000 Hz.	
23	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
24	Change rate on the signal generator.	Change to 1100 Hz.	

Table 34-1. Voice Phase Shift Limit Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
25	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
26	Change rate on the signal generator.	Change to 1200 Hz.	
27	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
28	Change rate on the signal generator.	Change to 1300 Hz.	
29	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
30	Change rate on the signal generator.	Change to 1400 Hz.	
31	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
32	Change rate on the signal generator.	Change to 1500 Hz.	
33	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
34	Change rate on the signal generator.	Change to 1600 Hz.	
35	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
36	Change rate on the signal generator.	Change to 1700 Hz.	
37	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
38	Change rate on the signal generator.	Change to 1800 Hz.	
39	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
40	Change rate on the signal generator.	Change to 1900 Hz.	
41	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
42	Change rate on the signal generator.	Change to 2000 Hz.	
43	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
44	Change rate on the signal generator.	Change to 2100 Hz.	
45	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
46	Change rate on the signal generator.	Change to 2200 Hz.	
47	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
48	Change rate on the signal generator.	Change to 2300 Hz.	
49	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	

Table 34-1. Voice Phase Shift Limit Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
50	Change rate on the signal generator.	Change to 2400 Hz.	
51	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
52	Change rate on the signal generator.	Change to 2500 Hz.	
53	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
54	Check frequencies (rates) below 300 Hz.	Ensure sharp cut-off in response.	
55	Check frequencies (rates) above 2500 Hz.	Ensure sharp cut-off in response.	
56	For frequencies (rates) above 3750 Hz.	Ensure attenuation of at least 20 dB (preferably 40 dB).	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; mW - milliwatt; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; % - percent

34-1.4 Presentation of Results. The results will be shown in table 34-2 indicating the requirement and measured value or indications of capability.

Table 34-2. Voice Phase Shift Limit Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
38	3.6.5.5	The audio output level should not vary by more than 6 dB over the frequency range 300 Hz to 2500 Hz with respect to a reference level of up to 10 mW established at 1000 Hz with a constant input carrier level modulated 30%. A sharp cut-off in response below 300 Hz and above 2500 Hz is desirable. Frequencies above 3750 Hz should be attenuated at least 20 dB and preferably 40 dB.	Not more than 6 dB.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; mW - milliwatt; % - percent

SUBTEST 35. VOICE PHASE SHIFT LIMIT

35-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 40.

35-1.2 Criteria. Reference number 40. With 1000 μV modulated with 1000 Hz and the output level adjusted for 40 mW into 600 Ω resistive load, the audio output phase should not depart from that of the positive going modulation envelope at the receiver input by more than -30 degrees or +120 degrees.

35-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Signal Generator

(4) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 35-1.

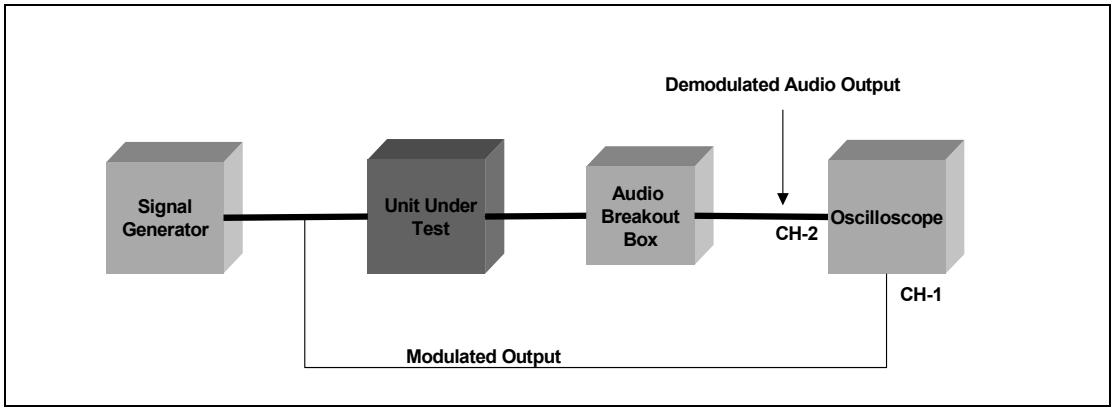

Figure 35-1. Voice Phase Shift Limit Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 35-1.

Table 35-1. Voice Phase Shift Limit Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 40.			
1	Set up equipment.	As shown in figure 35-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Level: 1000 μV Depth: 30% Rate: 1000 Hz	
3	Configure the UUT.	Frequency: 119.000 MHz Channel Spacing: 25 kHz Receiver gain control: set for 40 mW output into a 600 ohm load. PT Power: Low	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure up the oscilloscope.	Channel 1: Modulated output from the signal generator, set for 2 V/div. Channel 2: Demodulated audio output from the audio breakout box, set for 500 mV/div. Trigger: 1.8 V or adjust as needed. Set to 600 ohm load.	
6	Turn the RF and modulation of the signal generator to on.		
7	Configure the oscilloscope.	Under measure, select Phase.	
8	Select marker A.	Set marker A on the audio output phase.	
9	Select marker B.	Set marker B on peak of the positive going modulation envelope.	
10	Record results.	Ensure the phase does not depart by more than -30 degrees or +120 degrees.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: Hz - hertz; kHz - kilohertz; MHz - megahertz; mV/div - millivolts per division; mW - milliwatt; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V - volts; V/div - volts per division; μV - microvolts; % - percent

35-1.4 Presentation of Results. The results will be shown in table 35-2 indicating the requirement and measured value or indications of capability.

Table 35-2. Voice Phase Shift Limit Results

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
40	3.6.5.7	With 1000 μV modulated with 1000 Hz and the output level adjusted for 40 mW into 600 Ω resistive load, the audio output phase should not depart from that of the positive going modulation envelope at the receiver input by more than -30 degrees or +120 degrees.	Not more than -30 degrees or +120 degrees.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz; mW - milliwatt; μV - microvolts; Ω - ohms

SUBTEST 36. AUTOMATIC GAIN CONTROL

36-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 41.

36-1.2 Criteria. Reference number 41. The receiver amplitude modulation output should not vary more than 3 dB with input signals from 5 μV to 100,000 μV, and not more than 6 dB with input signals from 5 μV to 500,000 μV. Variation of percentage modulation should have negligible effect on the automatic gain control. The receiver should not overload with one volt of RF energy (hard) applied to antenna terminals.

36-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generator

(2) UUT

(3) Audio Breakout Box

(4) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 36-1.

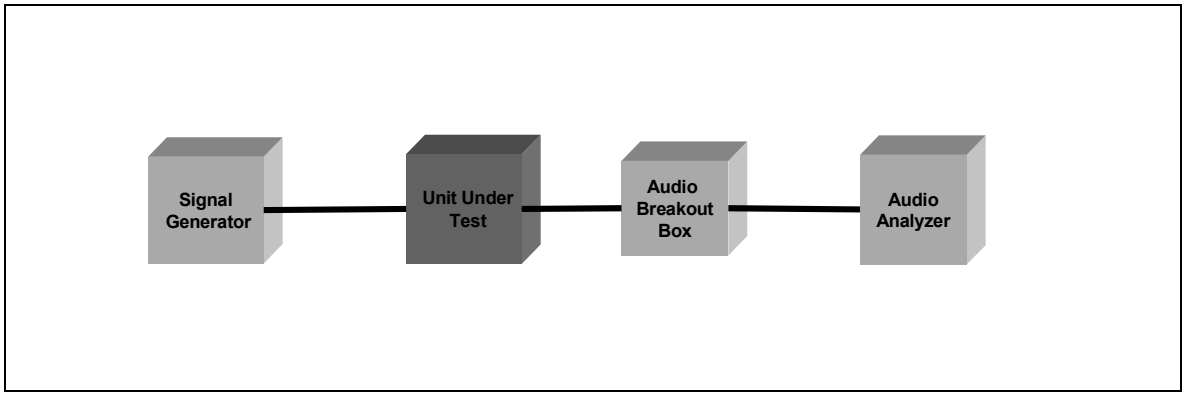

Figure 36-1. Automatic Gain Control Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 36-1.

Table 36-1. Automatic Gain Control Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 41.			
1	Set up equipment.	As shown in figure 36-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Depth: 30% Rate: 1000 Hz Level: 5 μV	
3	Configure the UUT.	Frequency: 119.000 MHz PT Power: Low	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Set the audio analyzer.	Under measurement, select AC level.	
6	Turn RF and modulation of the signal generator to on.	Observe the audio analyzer.	
7	Record level displayed on the audio analyzer (in dBm).	This is reference level voltage.	
8	Change the level of the signal generator.	Change to 10 μV.	
9	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
10	Change the level of the signal generator.	Change to 20 μV.	
11	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
12	Change the level of the signal generator.	Change to 30 μV.	
13	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
14	Change the level of the signal generator.	Change to 40 μV.	
15	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
16	Change the level of the signal generator.	Change to 50 μV.	
17	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
18	Change the level of the signal generator.	Change to 60 μV.	
19	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
20	Change the level of the signal generator.	Change to 70 μV.	
21	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
22	Change the level of the signal generator.	Change to 80 μV.	
23	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	

Table 36-1. Automatic Gain Control Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
24	Change the level of the signal generator.	Change to 90 μV.	
25	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
26	Change the level of the signal generator.	Change to 100 μV.	
27	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
28	Change the level of the signal generator.	Change to 200 μV.	
29	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
30	Change the level of the signal generator.	Change to 300 μV.	
31	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
32	Change the level of the signal generator.	Change to 400 μV.	
33	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
34	Change the level of the signal generator.	Change to 500 μV.	
35	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
36	Change the level of the signal generator.	Change to 600 μV.	
37	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
38	Change the level of the signal generator.	Change to 700 μV.	
39	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
40	Change the level of the signal generator.	Change to 800 μV.	
41	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
42	Change the level of the signal generator.	Change to 900 μV.	
43	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
44	Change the level of the signal generator.	Change to 1 mV.	
45	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
46	Change the level of the signal generator.	Change to 2 mV.	
47	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
48	Change the level of the signal generator.	Change to 3 mV.	

Table 36-1. Automatic Gain Control Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
49	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
50	Change the level of the signal generator.	Change to 4 mV.	
51	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
52	Change the level of the signal generator.	Change to 5 mV.	
53	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
54	Change the level of the signal generator.	Change to 6 mV.	
55	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
56	Change the level of the signal generator.	Change to 7 mV.	
57	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
58	Change the level of the signal generator.	Change to 8 mV.	
59	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
60	Change the level of the signal generator.	Change to 9 mV.	
61	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
62	Change the level of the signal generator.	Change to 10 mV.	
63	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
64	Change the level of the signal generator.	Change to 20 mV.	
65	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
66	Change the level of the signal generator.	Change to 30 mV.	
67	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
68	Change the level of the signal generator.	Change to 40 mV.	
69	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
70	Change the level of the signal generator.	Change to 50 mV.	
71	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
72	Change the level of the signal generator.	Change to 60 mV.	
73	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	

Table 36-1. Automatic Gain Control Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
74	Change the level of the signal generator.	Change to 70 mV.	
75	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
76	Change the level of the signal generator.	Change to 80 mV.	
77	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
78	Change the level of the signal generator.	Change to 90 mV.	
79	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
80	Change the level of the signal generator.	Change to 100 mV.	
81	Record level on the audio analyzer.	Ensure level does not vary by more than 3 dB from reference level.	
82	Change the level of the signal generator.	Change to 200 mV.	
83	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
84	Change the level of the signal generator.	Change to 300 mV.	
85	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
86	Change the level of the signal generator.	Change to 400 mV.	
87	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
88	Change the level of the signal generator.	Change to 500 mV.	
89	Record level on the audio analyzer.	Ensure level does not vary by more than 6 dB from reference level.	
90	Adjust modulation depth on the signal generator.	Check the audio analyzer. Variation of the modulation depth should have little effect on the output voltage.	
91	Adjust the level of the signal generator.	Adjust RF level to 1 volt at the receiver terminal.	
92	Record the result.	Ensure the receiver does not overload.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; mV - millivolts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; μV - microvolts; % - percent

36-1.4 Presentation of Results. The results will be shown in table 36-2 indicating the requirement and measured value or indications of capability.

Table 36-2. Automatic Gain Control Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
41	3.6.6	The receiver amplitude modulation output should not vary more than 3 dB with input signals from 5 μV to 100,000 μV, and not more than 6 dB with input signals from 5 μV to 500,000 μV. Variation of percentage modulation should have negligible effect on the automatic gain control. The receiver should not overload with one volt of RF energy (hard) applied to antenna terminals.	Not more than 3 dB. Not more than 6 dB.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; RF - Radio Frequency; μV - microvolts

SUBTEST 37. AGC VERSUS PULSE INTERFERENCE

37-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 43.

37-1.2 Criteria. Reference number 43. With the receiver sensitivity set to maximum and with a test signal of 3 to 1000 μV, modulated 30% at 1000 Hz, the resulting 1000 Hz output, should not decrease more than 2 dB for pulses having the same carrier level, or more than 10 dB for pulses with amplitudes 100 times the carrier level, introduced simultaneously with the standard test voltages.

37-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Signal Generators (2)

(4) Power Combiner

(5) Audio Analyzer

b. Test Configuration. Configure the equipment as shown in figure 37-1.

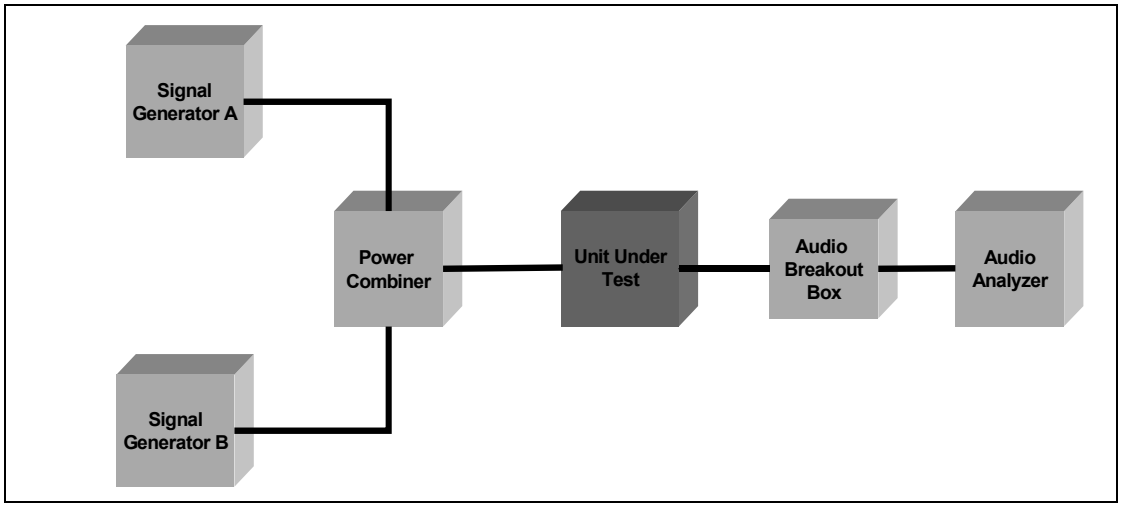

Figure 37-1. AGC Versus Pulse Interference Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 37-1.

Table 37-1. AGC Versus Pulse Interference Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 43.			
1	Set up equipment.	As shown in figure 37-1.	
2	Configure signal generator A (desired signal).	Frequency: 119.000 MHz Depth: 30% Rate: 1000 Hz Level: 3 μV	
3	Configure signal generator B (Pulse interference signal).	Frequency: 119.000 MHz Amplitude: 3 μV Pulse period: 1 ms Pulse width: 10± 2 μs	
4	Configure the UUT.	Frequency: 119.000 MHz Power: Low PT	
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
6	Set the audio analyzer.	Under measurement, select AC level.	
7	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
8	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
9	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 7.	
10	Change the level of signal generator B.	Change level to 100 times that of signal generator A (300 μV).	
11	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 7.	
12	Turn RF and modulation of signal generators A and B to off.		
13	Change the level of signal generators A and B.	Change level of signal generators to 6 μV.	
14	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
15	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
16	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 14.	
17	Change the level of signal generator B.	Change level to 100 times that of signal generator A (600 μV).	
18	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 14.	
19	Turn RF and modulation of signal generators A and B to off.		

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
20	Change the level of signal generators A and B.	Change level of signal generators to 8 μV.	
21	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
22	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
23	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 21.	
24	Change the level of signal generator B.	Change level to 100 times that of signal generator A (800 μV).	
25	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 21.	
26	Turn RF and modulation of signal generators A and B to off.		
27	Change the level of signal generators A and B.	Change level of signal generators to 10 μV.	
28	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
29	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
30	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 28.	
31	Change the level of signal generator B.	Change level to 100 times that of signal generator A (1 mV).	
32	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 28.	
33	Turn RF and modulation of signal generators A and B to off.		
34	Change the level of signal generators A and B.	Change level of signal generators to 20 μV.	
35	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
36	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
37	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 35.	
38	Change the level of signal generator B.	Change level to 100 times that of signal generator A (2 mV).	

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
39	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 35.	
40	Turn RF and modulation of signal generators A and B to off.		
41	Change the level of signal generators A and B.	Change level of signal generators to 30 μV.	
42	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
43	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
44	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 42.	
45	Change the level of signal generator B.	Change level to 100 times that of signal generator A (3 mV).	
46	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 42.	
47	Turn RF and modulation of signal generators A and B to off.		
48	Change the level of signal generators A and B.	Change level of signal generators to 40 μV.	
49	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
50	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
51	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 49.	
52	Change the level of signal generator B.	Change level to 100 times that of signal generator A (4 mV).	
53	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 49.	
54	Turn RF and modulation of signal generators A and B to off.		
55	Change the level of signal generators A and B.	Change level of signal generators to 50 μV.	
56	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
57	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
58	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 56.	
59	Change the level of signal generator B.	Change level to 100 times that of signal generator A (5 mV).	
60	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 56.	
61	Turn RF and modulation of signal generators A and B to off.		
62	Change the level of signal generators A and B.	Change level of signal generators to 100 μV.	
63	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
64	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
65	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 63.	
66	Change the level of signal generator B.	Change level to 100 times that of signal generator A (10 mV).	
67	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 63.	
68	Turn RF and modulation of signal generators A and B to off.		
69	Change the level of signal generators A and B.	Change level of signal generators to 200 μV.	
70	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
71	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
72	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 70.	
73	Change the level of signal generator B.	Change level to 100 times that of signal generator A (20 mV).	
74	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 70.	
75	Turn RF and modulation of signal generators A and B to off.		

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
76	Change the level of signal generators A and B.	Change level of signal generators to 300 μV.	
77	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
78	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
79	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 77.	
80	Change the level of signal generator B.	Change level to 100 times that of signal generator A (30 mV).	
81	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 77.	
82	Turn RF and modulation of signal generators A and B to off.		
83	Change the level of signal generators A and B.	Change level of signal generators to 400 μV.	
84	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
85	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
86	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 84.	
87	Change the level of signal generator B.	Change level to 100 times that of signal generator A (40 mV).	
88	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 84.	
89	Turn RF and modulation of signal generators A and B to off.		
90	Change the level of signal generators A and B.	Change level of signal generators to 500 μV.	
91	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
92	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
93	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 91.	
94	Change the level of signal generator B.	Change level to 100 times that of signal generator A (50 mV).	

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
95	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 91.	
96	Turn RF and modulation of signal generators A and B to off.		
97	Change the level of signal generators A and B.	Change level of signal generators to 600 μV.	
98	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
99	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
100	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 98.	
101	Change the level of signal generator B.	Change level to 100 times that of signal generator A (60 mV).	
102	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 98.	
103	Turn RF and modulation of signal generators A and B to off.		
104	Change the level of signal generators A and B.	Change level of signal generators to 700 μV.	
105	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
106	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
107	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 105.	
108	Change the level of signal generator B.	Change level to 100 times that of signal generator A (70 mV).	
109	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 105.	
110	Turn RF and modulation of signal generators A and B to off.		
111	Change the level of signal generators A and B.	Change level of signal generators to 800 μV.	
112	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	

Table 37-1. AGC Versus Pulse Interference Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
113	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
114	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 112.	
115	Change the level of signal generator B.	Change level to 100 times that of signal generator A (80 mV).	
116	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 112.	
117	Turn RF and modulation of signal generators A and B to off.		
118	Change the level of signal generators A and B.	Change level of signal generators to 900 μV.	
119	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
120	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
121	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 119.	
122	Change the level of signal generator B.	Change level to 100 times that of signal generator A (90 mV).	
123	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 119.	
124	Turn RF and modulation of signal generators A and B to off.		
125	Change the level of signal generators A and B.	Change level of signal generators to 1000 μV (1 mV).	
126	Turn the RF and modulation of signal generator A to on.	Record level displayed on the audio analyzer (in dBm).	
127	Turn the RF and modulation of signal generator B to on.	Observe the audio analyzer.	
128	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 2 dB from level obtained in step 126.	
129	Change the level of signal generator B.	Change level to 100 times that of signal generator A (100 mV).	
130	Record level displayed on the audio analyzer.	Ensure level does not decrease more than 10 dB from level obtained in step 126.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dB - decibels; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; ms - milliseconds; mV - millivolts; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; μs - microseconds; μV - microvolts; % - percent; ± - plus or minus

37-1.4 Presentation of Results. The results will be shown in table 37-2 indicating the requirement and measured value or indications of capability.

Table 37-2. AGC Versus Pulse Interference Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
43	3.6.7.1	With the receiver sensitivity set to maximum and with a test signal of 3 to 1000 μV, modulated 30% at 1000 Hz, the resulting 1000 Hz output, should not decrease more than 2 dB for pulses having the same carrier level, or more than 10 dB for pulses with amplitudes 100 times the carrier level, introduced simultaneously with the standard test voltages.	Should not vary by more than 2 dB for pulses with the same level or 10 dB for amplitude 100 times the carrier.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; Hz - hertz; μV - microvolts; % - percent

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SUBTEST 38. SQUELCH VERSUS PULSE INTERFERENCE

38-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 44.

38-1.2 Criteria. Reference number 44. The squelch should not open when pulses and unmodulated carrier on the same frequency are introduced, having the following levels in microvolts:

Squelch Threshold	Carrier Level	Pulse Peak Amplitude
5	0	3000
5	3	1000

38-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) PTT Handset

(3) Signal Generators (2)

(4) Power Combiner

b. Test Configuration. Configure the equipment as shown in figure 38-1.

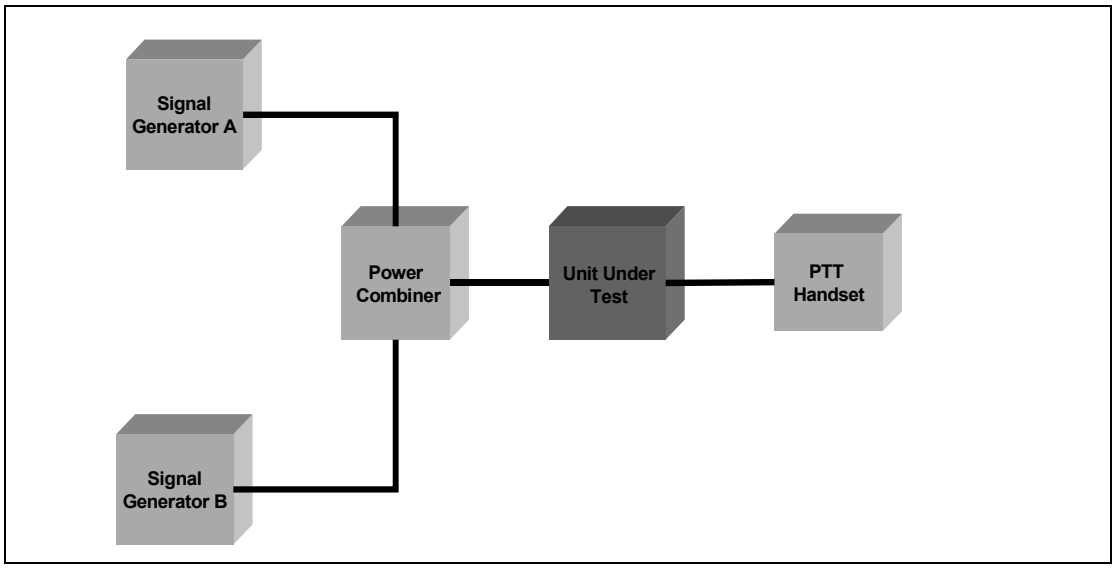

Figure 38-1. Squelch Versus Pulse Interference Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 38-1.

Table 38-1. Squelch Versus Pulse Interference Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 44.			
1	Set up equipment.	As shown in figure 38-1.	
2	Configure signal generator A (pulse interference).	Frequency: 119.000 MHz Pulse period: 1 ms Pulse width: 10 ± 2 μs Amplitude: Adjust as needed for 3 mV pulse peak amplitude.	
3	Configure signal generator B (unmodulated carrier).	Frequency: 119.000 MHz Amplitude: 0 μV	
4	Configure the UUT.	Frequency: 119.000 MHz Squelch threshold: 5 μV	
5	Turn the RF and modulation of signal generator A to on.		
6	Turn the RF of signal generator B to on with no modulation.	Listen to PTT handset.	
7	Record results.	Ensure squelch does not open.	
8	Change signal generator A.	Adjust the amplitude to achieve a pulse peak of 1000 μV.	
9	Change signal generator B.	Change unmodulated carrier amplitude to 3 μV.	
10	Listen to PTT handset and record results.	Ensure squelch does not open.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: MHz - megahertz; ms - milliseconds; mV - millivolts; PTT - Push-to-Talk; RF - Radio Frequency; UUT - Unit Under Test; μs - microseconds; μV - microvolts

38-1.4 Presentation of Results. The results will be shown in table 38-2 indicating the requirement and measured value or indications of capability.

Table 38-2. Squelch Versus Pulse Interference Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
44	3.6.7.2	The squelch should not open when pulses and unmodulated carrier on the same frequency are introduced, having the following levels in microvolts: Squelch Threshold / Carrier Level / Pulse Peak Amplitude 5 / 0 / 3000 5 / 3 / 1000	Squelch should not open.			

Legend: ARINC - Aeronautical Radio Incorporated

SUBTEST 39. PULSE NOISE OUTPUT

39-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 45.

39-1.2 Criteria. Reference number 45. With the receiver gain adjusted so that a test signal of 100 μV, modulated 30% at 1000 Hz, produces 10 mW output in a 600 Ω resistive load, substitution of pulse-type interference superimposed upon the 100 μV carrier in lieu of the 1000 Hz modulation should not produce more than 5 mW audio output with pulse peak amplitudes up to one volt.

39-1.3 Test Procedures

a. Test Equipment Required

(1) Signal Generators (2)

(2) Power Combiner

(3) UUT

(4) Audio Breakout Box

(5) Audio Analyzer

(6) Oscilloscope

(7) 600 ohm resistor

b. Test Configuration. Configure the equipment as shown in figure 39-1.

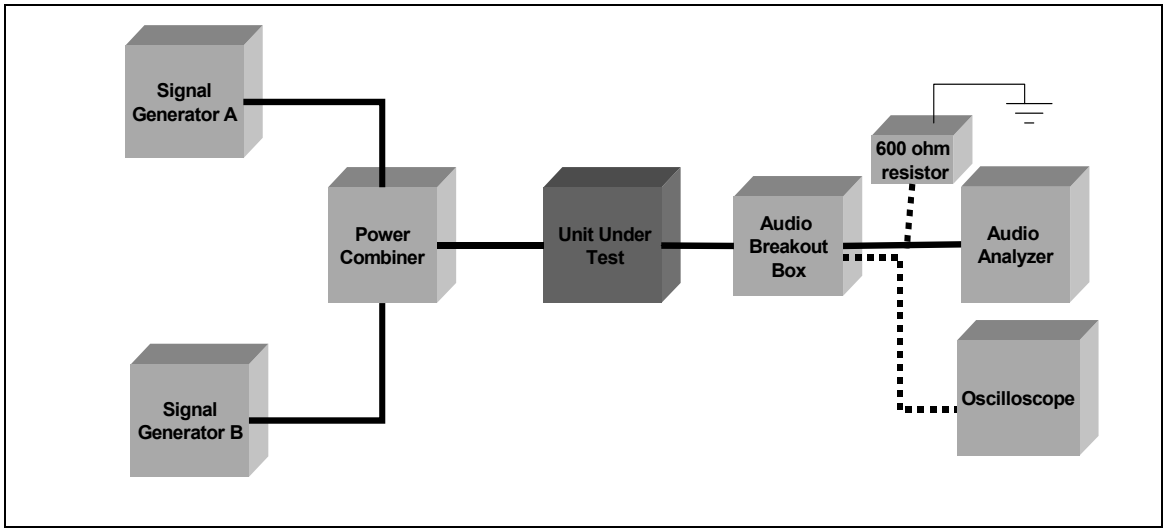

Figure 39-1. Pulse Noise Output Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 39-1.

Table 39-1. Pulse Noise Output Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 45.			
1	Set up equipment.	As shown in figure 39-1.	
2	Configure signal generator A.	Frequency: 119.000 MHz Rate: 1000 Hz Depth: 30% Level: 100 μV	
3	Configure signal generator B.	Frequency: 119.000 MHz Pulse period: 1 ms Pulse width: 10 ± 2 μs Level: 100 μV	
4	Configure the UUT.	Frequency: 119.000 MHz	
5	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
6	Set the audio analyzer.	Under measurement, select AC level. Insert 600 ohm resistor in parallel. High impedance input is required.	
7	Configure oscilloscope.	Configure to measure voltage on channel 1.	
8	Turn the RF and modulation of signal generator A to on.	Observe the audio analyzer.	
9	Adjust manual gain control.	Adjust manual gain control to obtain 10 mW (10 dBm) output.	
10	Turn the modulation of signal generator A to off.	Turn the RF and modulation of signal generator B to on (pulse interfering signal).	
11	Record results from the audio analyzer.	Ensure substitution of pulse interfering signal does not produce more than 5 mW (8 dBm) output.	
12	Check audio output on the oscilloscope.	Acquire audio output signal on the oscilloscope. Adjust horizontal and vertical scales to get an accurate picture of the audio signal.	
13	Stop the acquisition.	Using the marker bars, check the peak amplitude of pulses.	
14	Record results.	Ensure that the peak amplitude for any pulse does not exceed 1 volt.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AC - Alternating Current; dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; ms - milliseconds; mW - milliwatt; RF - Radio Frequency; UUT - Unit Under Test; μs - microseconds; μV - microvolts; % - percent; ± - plus or minus

39-1.4 Presentation of Results. The results will be shown in table 39-2 indicating the requirement and measured value or indications of capability.

Table 39-2. Pulse Noise Output Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
45	3.6.7.3	With the receiver gain adjusted so that a test signal of 100 μV, modulated 30% at 1000 Hz, produces 10 mW output in a 600 Ω resistive load, substitution of pulse-type interference superimposed upon the 100 μV carrier in lieu of the 1000 Hz modulation should not produce more than 5 mW audio output with pulse peak amplitudes up to one volt.	Should not produce more than 5 mW output.			

Legend: Hz - hertz; mW - milliwatt; μV - microvolts; Ω - ohms; % - percent

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SUBTEST 40. RECEIVER OPERATION IN THE PRESENCE OF INBAND TRANSMISSION

40-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 46.

40-1.2 Criteria. Reference number 46. The receiver design should be the best that the state-of-the-art can provide with respect to freedom from interference from transmitters in the 118.000 to 137.000 MHz band on the same aircraft. There should be no squelch tripping or degradation of receivers performance when a 25 watt transmitter tuned to a frequency 6 MHz or more removed from that to which the receiver is tuned is operated into an antenna space isolated from the receiver's antenna by 35 dB. If 45 dB of space isolation is provided between the two antennas, there should be no interference or squelch tripping when the transmission frequency is as close as 2 MHz to the receive frequency.

40-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Signal Generator

b. Test Configuration. Configure the equipment as shown in figure 40-1.

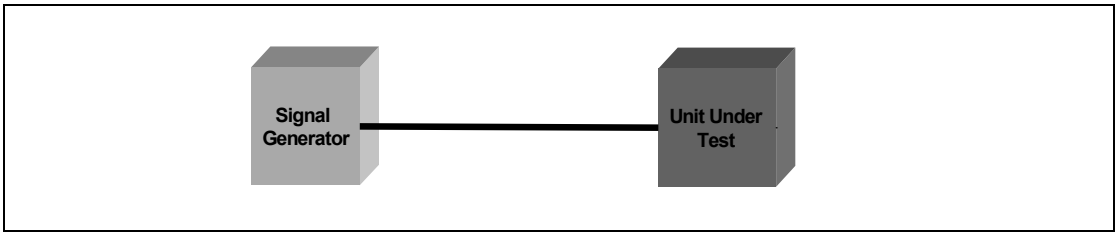

Figure 40-1. Receiver Operation in the Presence of Inband Transmission Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 40-1.

Table 40-1. Receiver Operation in the Presence of Inband Transmission Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 46.			
1	Set up equipment.	As shown in figure 40-1.	
2	Configure the UUT.	Frequency: 119.000 MHz, Squelch: On	
3	Configure the signal generator.	To simulate a 25 watt transmitter (44 dBm) with 35 dB of space isolation set the level to +9 dBm. Frequency: -6 MHz from the receiver channel = 113.000 MHz. Check +6MHz from the receiver channel = 125.000 MHz.	

Table 40-1. Receiver Operation in the Presence of Inband Transmission Test Procedures (continued)

Step	Action	Settings/Action			Measured Value	
4	Check the following frequencies, and ensure there is no tripping of the squelch.	UUT Frequency	-6 MHz	+6 MHz		
		128.000 MHz	122.000 MHz	134.000 MHz		
		137.000 MHz	131.000 MHz	143.000 MHz		
5	Configure the signal generator.	To simulate a 25 watt transmitter (44 dBm) with 45 dB of space isolation set the level to -1 dBm. Frequency: -2 MHz from the receiver channel = 117.000 MHz. Check +2MHz from the receiver channel = 121.000 MHz.				
6	Check the following frequencies, and ensure there is no tripping of the squelch.	UUT Frequency	-2 MHz	+2 MHz		
		128.000 MHz	126.000 MHz	130.000 MHz		
		137.000 MHz	135.000 MHz	139.000 MHz		

Note: Sections that are not applicable to a particular step are shaded.
Legend: dB - decibels; dBm - decibels referenced to 1 milliwatt; MHz - megahertz; UUT - Unit Under Test

40-1.4 Presentation of Results. The results will be shown in table 40-2 indicating the requirement and measured value or indications of capability.

Table 40-2. Receiver Operation in the Presence of Inband Transmission Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
46	3.6.7.4	The receiver design should be the best that the state-of-the-art can provide with respect to freedom from interference from transmitters in the 118.000 to 137.000 MHz band on the same aircraft. There should be no squelch tripping or degradation of receivers performance when a 25 watt transmitter tuned to a frequency 6 MHz or more removed from that to which the receiver is tuned is operated into an antenna space isolated from the receiver's antenna by 35 dB. If 45 dB of space isolation is provided between the two antennas, there should be no interference or squelch tripping when the transmission frequency is as close as 2 MHz to the receive frequency.	At least 40 dB below.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; MHz - megahertz

SUBTEST 41. RECEIVER PHASE SHIFT

41-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference numbers 50 and 76.

41-1.2 Criteria

a. Reference number 50. There should be no phase inversion through the receiver.

b. Reference number 76. There should be no phase inversion through the receiver.

41-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Transmission Impairment Measurement Set

(4) Signal Generator

(5) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 41-1.

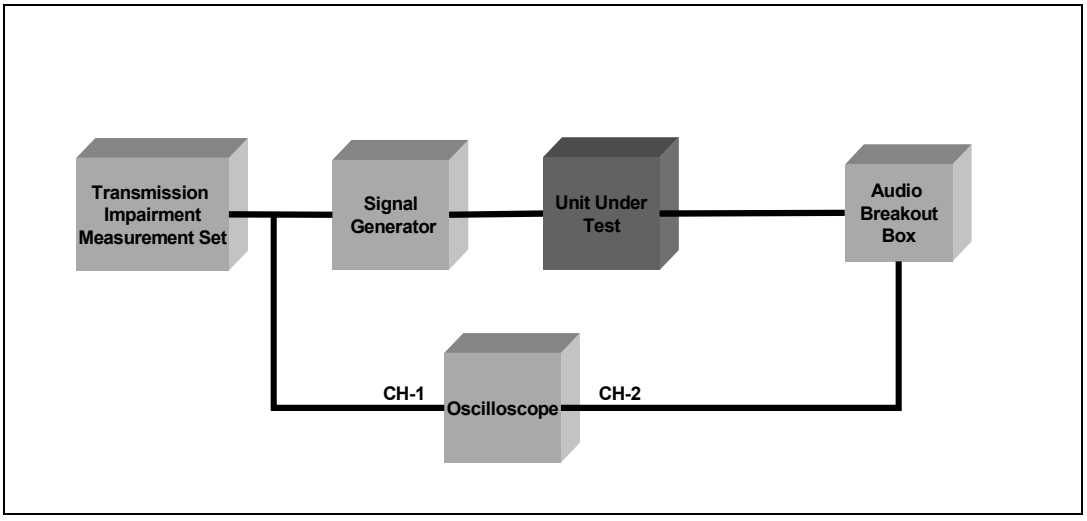

Figure 41-1. Receiver Phase Shift Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 41-1.

Table 41-1. Receiver Phase Shift Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 50 and 76.			
1	Set up equipment without resistor.	As shown in figure 41-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Dept: 30% Rate: External Amplitude: -50 dBm	
3	Configure the UUT.	Frequency: 119.000 MHz Mode: AM Channel spacing: 25 kHz	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the TIMS.	Transmit 1000 Hz	
6	Configure the oscilloscope.	Push the auto scale button for both input channels.	
7	Turn RF and modulation of signal generator to on.	Observe the oscilloscope.	
8	Compare signals from channels 1 and 2.		
9	Record results.	Ensure there is no phase inversion of the demodulated output when compared to the unmodulated input from the TIMS.	
10	Turn RF and modulation of signal generator to off.		
11	Change the UUT.	Set the channel spacing to 8.33 kHz.	
12	Turn RF and modulation of signal generator to on.	Observe the oscilloscope.	
13	Compare signals from channels 1 and 2.		
14	Record results.	Ensure there is no phase inversion of the demodulated output when compared to the unmodulated input from the TIMS.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AM - Amplitude Modulation; dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; RF - Radio Frequency; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test; % - percent

41-1.4 Presentation of Results. The results will be shown in table 41-2 indicating the requirement and measured value or indications of capability.

Table 41-2. Receiver Phase Shift Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
50	3.6.9.4	There should be no phase inversion through the receiver.	No phase inversion.			
76	4.3.4.4	There should be no phase inversion through the receiver.	No phase inversion.			

Legend: ARINC - Aeronautical Radio Incorporated

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SUBTEST 42. DIFFERENTIAL PHASE DELAY

42-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference numbers 51, 68, and 77.

42-1.2 Criteria

a. Reference number 51. The differential delay through the receiver to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds.

b. Reference number 68. The differential delay to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds through the transmitter.

c. Reference number 77. The differential delay through the receiver to audio frequencies (f) from 600 Hz to 2.5 kHz should be less than 1/(10f) seconds.

42-1.3 Test Procedures

a. Test Equipment Required

(1) Super Transmission Impairment Measurement Sets (2)

(2) Radio Frequency Attenuator

(3) UUT (2)

b. Test Configuration. Configure the equipment as shown in figure 42-1.

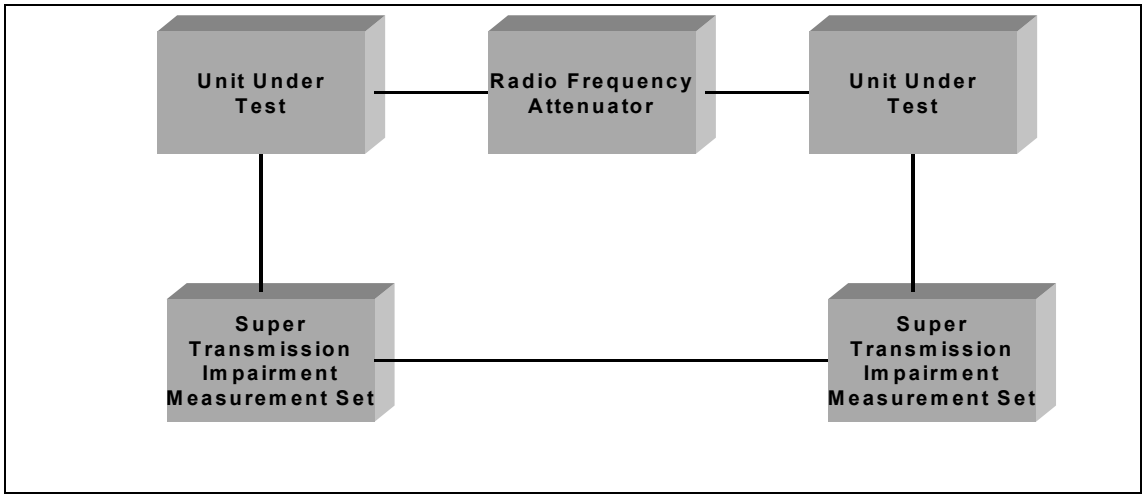

Figure 42-1. Differential Phase Delay Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 42-1.

Table 42-1. Differential Phase Delay Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 51, 68, and 77.			
1	Set up equipment.	See figure 42-1.	
2	Tune UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz	
3	Set up Super TIMS.	Connect the control path between the two Super TIMS as shown in figure 42-1. Level: 0 dBm Setup: MASTER SLAVE ON Test: ENVELOPE DELAY Program Sweep: 600 Hz to 6600 Hz in 100 Hz steps	
4	Measure total time delay at 600 Hz	Record result.	
5	Measure total time delay at 700 Hz.	Record result.	
6	Measure total time delay at 800 Hz.	Record result.	
7	Measure total time delay at 900 Hz.	Record result.	
8	Measure total time delay at 1000 Hz.	Record result.	
9	Measure total time delay at 1100 Hz.	Record result.	
10	Measure total time delay at 1200 Hz.	Record result.	
11	Measure total time delay at 1300 Hz.	Record result.	
12	Measure total time delay at 1400 Hz.	Record result.	
13	Measure total time delay at 1500 Hz.	Record result.	
14	Measure total time delay at 1600 Hz.	Record result.	
15	Measure total time delay at 1700 Hz.	Record result.	
16	Measure total time delay at 1800 Hz.	Record result.	
17	Measure total time delay at 1900 Hz.	Record result.	
18	Measure total time delay at 2000 Hz.	Record result.	
19	Measure total time delay at 2100 Hz.	Record result.	
20	Measure total time delay at 2200 Hz.	Record result.	
21	Measure total time delay at 2300 Hz.	Record result.	
22	Measure total time delay at 2400 Hz.	Record result.	
23	Measure total time delay at 2500 Hz.	Record result.	
24	Measure total time delay at 2600 Hz.	Record result.	
25	Measure total time delay at 2700 Hz.	Record result.	
26	Measure total time delay at 2800 Hz.	Record result.	
27	Measure total time delay at 2900 Hz.	Record result.	
28	Measure total time delay at 3000 Hz.	Record result.	
29	Measure total time delay at 3100 Hz.	Record result.	
30	Measure total time delay at 3200 Hz.	Record result.	
31	Measure total time delay at 3300 Hz.	Record result.	
32	Measure total time delay at 3400 Hz.	Record result.	
33	Measure total time delay at 3500 Hz.	Record result.	
34	Measure total time delay at 3600 Hz.	Record result.	
35	Measure total time delay at 3700 Hz.	Record result.	

Table 42-1. Differential Phase Delay Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
36	Measure total time delay at 3800 Hz.	Record result.	
37	Measure total time delay at 3900 Hz.	Record result.	
38	Measure total time delay at 4000 Hz.	Record result.	
39	Measure total time delay at 4100 Hz.	Record result.	
40	Measure total time delay at 4200 Hz.	Record result.	
41	Measure total time delay at 4300 Hz.	Record result.	
42	Measure total time delay at 4400 Hz.	Record result.	
43	Measure total time delay at 4500 Hz.	Record result.	
44	Measure total time delay at 4600 Hz.	Record result.	
45	Measure total time delay at 4700 Hz.	Record result.	
46	Measure total time delay at 4800 Hz.	Record result.	
47	Measure total time delay at 4900 Hz.	Record result.	
48	Measure total time delay at 5000 Hz.	Record result.	
49	Measure total time delay at 5100 Hz.	Record result.	
50	Measure total time delay at 5200 Hz.	Record result.	
51	Measure total time delay at 5300 Hz.	Record result.	
52	Measure total time delay at 5400 Hz.	Record result.	
53	Measure total time delay at 5500 Hz.	Record result.	
54	Measure total time delay at 5600 Hz.	Record result.	
55	Measure total time delay at 5700 Hz.	Record result.	
56	Measure total time delay at 5800 Hz.	Record result.	
57	Measure total time delay at 5900 Hz.	Record result.	
58	Measure total time delay at 6000 Hz.	Record result.	
59	Measure total time delay at 6100 Hz.	Record result.	
60	Measure total time delay at 6200 Hz.	Record result.	
61	Measure total time delay at 6300 Hz.	Record result.	
62	Measure total time delay at 6400 Hz.	Record result.	
63	Measure total time delay at 6500 Hz.	Record result.	
64	Measure total time delay at 6600 Hz.	Record result.	
65	Analyze data from steps 4 through 65.	Record the time delay difference over the passband.	
66	Repeat procedure.	Change the channel spacing of the UUT to 8.33 kHz.	

Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; TIMS - Transmission Impairment Measurement Set; UUT - Unit Under Test

42-1.4 Presentation of Results. The results will be shown in table 42-2 indicating the requirement and measured value or indications of capability.

Table 42-2. Differential Phase Delay Results

Reference Number	ARINC 716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
51, 77	3.6.9.4.2 4.3.4.4.2	The differential delay through the receiver to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds.	Less than 1/(10f)			
68	3.7.8.6	The differential delay to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds through the transmitter.	Less than 1/(10f)			

Note: Reference number 51 applies to a UUT with 25 kHz channel spacing, and reference number 77 applies to a UUT with 8.33 kHz channel spacing.
Legend: ARINC - Aeronautical Radio Incorporated; (f) - frequency; Hz - hertz; kHz - kilohertz

SUBTEST 43. AGC ATTACK TIME/DECAY TIME

43-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference numbers 52, 53, 78, and 79.

43-1.2 Criteria

a. ` Reference number 52. The data link audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV RF signal to the receiver input modulated 30% with 1000 Hz.

b. Reference number 53. The data link audio output should reach 90% of its steady-state value within 50 ms after the receiver RF input of 1000 μV, modulated 30% with 1000 Hz is step reduced to 10 μV.

c. Reference number 78. The audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1,000 μV RF signal to the receiver input modulated 30% with 1000 Hz.

d. Reference number 79. The audio output should reach 90% of its steady-state value within 50 ms after the receiver RF input of 1,000 μV, modulated 30% with 1000 Hz, is step reduced to 10 μV.

43-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Signal Generator

(4) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 43-1.

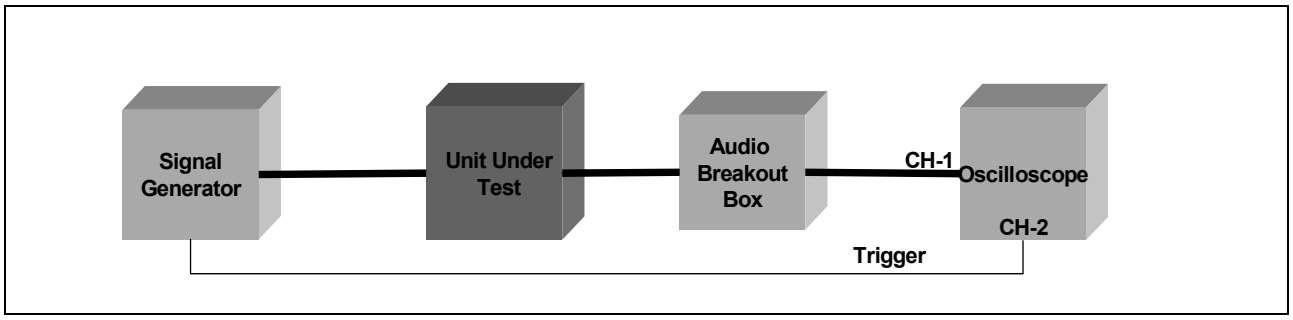

Figure 43-1. AGC Attack Time/Decay Time Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 43-1.

Table 43-1. AGC Attack Time/Decay Time Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference numbers 52, 53, 78, and 79.			
1	Set up equipment.	As shown in figure 43-1.	
2	Configure the signal generator.	Frequency: 119.000 MHz Amplitude: 1000 μV Rate: 1000 Hz	
3	Configure the UUT.	Frequency: 119.000 MHz Channel spacing: 25 kHz Enable the data link audio output. Power: Low PT	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
5	Configure the oscilloscope.	Channel 1: 1 V/div (audio output form the UUT). Channel 2: 2 V/div (RF output from the signal generator).	
6	Set the oscilloscope to run.		
7	Turn the RF and modulation of the signal generator to on.	Immediately stop the acquisition on the oscilloscope to capture the attack of the audio output.	
8	Select marker 1.	Place marker 1 at the point where the RF signal was applied.	
9	Select marker 2.	Place marker 2 at the point where the audio output reaches 90% of its steady-state output.	
10	Record the time difference between markers 1 and 2.	Ensure the time difference is 40 ms or less. To get a more accurate picture of the signals, the horizontal scale can be adjusted. This is the AGC attack time.	
11	Press run on the oscilloscope.	Configure the signal generator to step from 1000 μV to 10 μV.	
12	Step the signal generator to 10 μV.	Immediately stop the acquisition on the oscilloscope to capture the decay of the audio output.	
13	Select marker 1.	Place marker 1 at the point where the RF signal was reduced to 10 μV.	
14	Select marker 2.	Place marker 2 at the point where the audio output reaches 90% of its steady-state output.	
15	Record the time difference between markers 1 and 2.	Ensure the time difference is 50 ms or less. To get a more accurate picture of the signals, the horizontal scale can be adjusted. This is the AGC decay time.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: AGC - Automatic Gain Control; Hz - hertz; kHz - kilohertz; MHz - megahertz; ms - milliseconds; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division; μV - microvolts; % - percent

43-1.4 Presentation of Results. The results will be shown in table 43-2 indicating the requirement and measured value or indications of capability.

Table 43-2. Attack Time/Decay Time Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
52	3.6.9.5	The data link audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV RF signal to the receiver input modulated 30% with 1000 Hz.	Within 40 ms.			
53	3.6.9.6	The data link audio output should reach 90% of its steady-state value within 50 ms after the receiver RF input of 1000 μV, modulated 30% with 1000 Hz, is step reduced to 10 μV.	Within 50 ms.			
78	4.3.4.5	The audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1,000 μV RF signal to the receiver input modulated 30% with 1000 Hz.	Within 40 ms.			
79	4.3.4.6	The audio output should reach 90% of its steady-state value within 50 ms after the receiver RF input of 1,000 μV, modulated 30% with 1000 Hz, is step reduced to 10 μV.	Within 50 ms.			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz; ms - milliseconds; RF - Radio Frequency; μV - microvolts; % - percent

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SUBTEST 44. TRANSMITTER SPURIOUS RADIATION

44-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 57.

44-1.2 Criteria. Reference number 57. Any emissions on a harmonic of a desired frequency should be less than -46 dBW (dB below one watt). Any other emissions should be less than -65 dBW, and any emissions within the band 108 to 136 MHz should be down to at least -75 dBW and preferable to -105 dBW. Any spurious within the band 108.0 to 136.0 MHz, but more than 5 MHz from the carrier frequency, should be down to at least -105 dBW. This attenuation should be accomplished within the transmitter without the aid of external circuits.

44-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Attenuator

(3) Spectrum Analyzer

(4) PTT Keyer

b. Test Configuration. Configure the equipment as shown in figure 44-1.

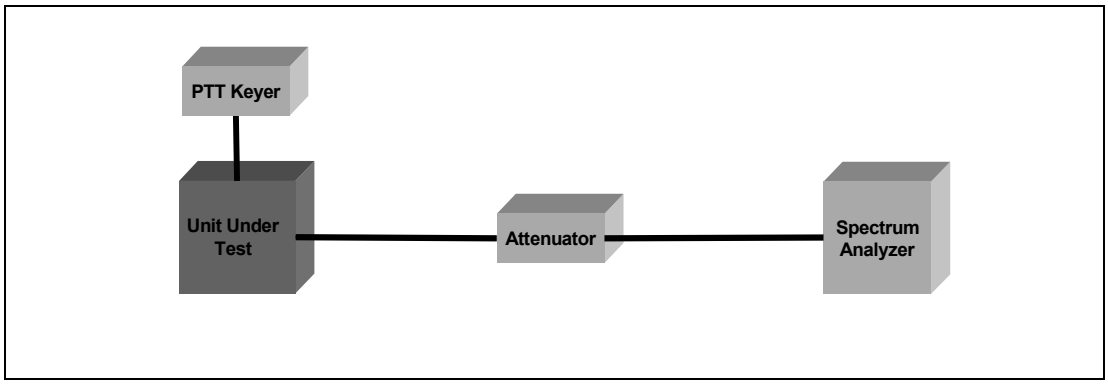

Figure 44-1. Transmitter Spurious Radiation Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 44-1.

Table 44-1. Transmitter Spurious Radiation Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 57.			
1	Set up equipment.	As shown in figure 44-1.	
2	Configure the UUT.	Frequency: 120.000 MHz Power: Low PT	
3	Use appropriate attenuation.	Select the appropriate amount of attenuation as to provide safe signal input to the test equipment.	
4	Configure the spectrum analyzer.	Center channel: 120.000 MHz Span: 300.000 MHz Resolution bandwidth: 100 kHz	
5	Key the UUT.	Observe the spectrum analyzer.	
6	Select marker function.	Place marker at harmonic of 120 MHz (240 MHz).	
7	Record level of harmonic.	Ensure harmonic is at least 16 dBm (-46 dBW) below carrier level.	
8	Check any other emissions. Record results.	Ensure emissions are at least -35 dBm (-65 dBW) below carrier level.	
9	Check within the band 108 to 136 MHz. Record results.	Ensure emissions are at least -45 dBm (-75 dBW) below carrier level. Of particular concern are the 12^{th} and 13^{th} harmonics of the following frequencies: (121.150, 121.175, 121.200, 131.200, 131.250, and 131.300 MHz) as stated in paragraph 3.2.2 of RTCA/DO-186A due to concern about GPS interference.	
10	Check spurious emission within the band 108 to 136 MHz, but more than 5 MHz from the carrier. Record results.	Ensure spurious emissions are at least 75 dBm (-105 dBW) below the carrier.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; dBW - decibels referenced to 1 watt; GPS - Global Positioning System; kHz - kilohertz; MHz - megahertz; PT - Plain Text; UUT - Unit Under Test

44-1.4 Presentation of Results. The results will be shown in table 44-2 indicating the requirement and measured value or indications of capability.

Table 44-2. Transmitter Spurious Radiation Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
57	3.7.4	Any emissions on a harmonic of a desired frequency should be less than -46 dBW (dB below one watt). Any other emissions should be less than -65 dBW, and any emissions within the band 108 to 136 MHz should be down to at least -75 dBW and preferable to -105 dBW. Any spurious within the band 108.0 to 136.0 MHz, but more than 5 MHz from the carrier frequency, should be down to at least -105 dBW. This attenuation should be accomplished within the transmitter without the aid of external circuits.	Less than -46 dBW. Less than -65 dBW. Less than -75 dBW. Less than -105 dBW.			

Legend: ARINC - Aeronautical Radio Incorporated; dB - decibels; dBW - decibels referenced to 1 watt; MHz - megahertz

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SUBTEST 45. DATA INPUT

45-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 62.

45-1.2 Criteria. Reference number 62. A balanced 600 Ω ± 20% input should be provided for data modulation of the transmitter.

45-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Impedance/Gain-Phase Analyzer

(3) Multimeter

b. Test Configuration. Configure the equipment as shown in figure 45-1.

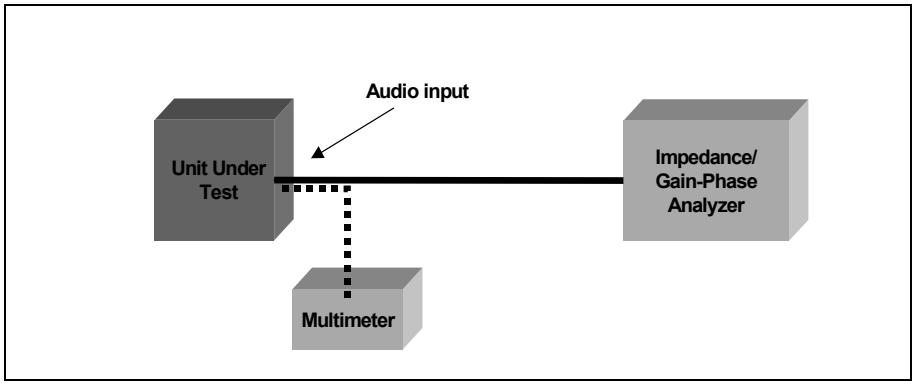

Figure 45-1. Data Input Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 45-1.

Table 45-1. Data Input Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 62.			
1	Set up equipment.	As shown in figure 45-1.	
2	Use the multimeter to verify that the data input is balanced and grounded.		

Table 45-1. Data Input Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
3	Use the Impedance /Gain-Phase Analyzer to measure the balanced terminal impedance at the data input connector across the data input frequency range.	Record the terminal impedance.	

Note: Sections that are not applicable to a particular step are shaded.

45-1.4 Presentation of Results. The results will be shown in table 45-2 indicating the requirement and measured value or indications of capability.

Table 45-2. Data Input Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
62	3.7.8	A balanced 600 Ω ±20% input should be provided for data modulation of the transmitter.	Balanced 600 ohm input.			

Legend: ARINC - Aeronautical Radio Incorporated; Ω - ohms; % - percent; ± - plus or minus

SUBTEST 46. LEVEL CONTROL

46-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 64.

46-1.2 Criteria. Reference number 64. Adequate compression should be provided to control the modulation level to less than 100% when input signals of 10 dBm and preferably +20 dBm above that producing 70% modulation, reference section 3.7.8.1, are applied.

46-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Audio Generator

(4) Attenuator

(5) Modulation Analyzer

b. Test Configuration. Configure the equipment as shown in figure 46-1.

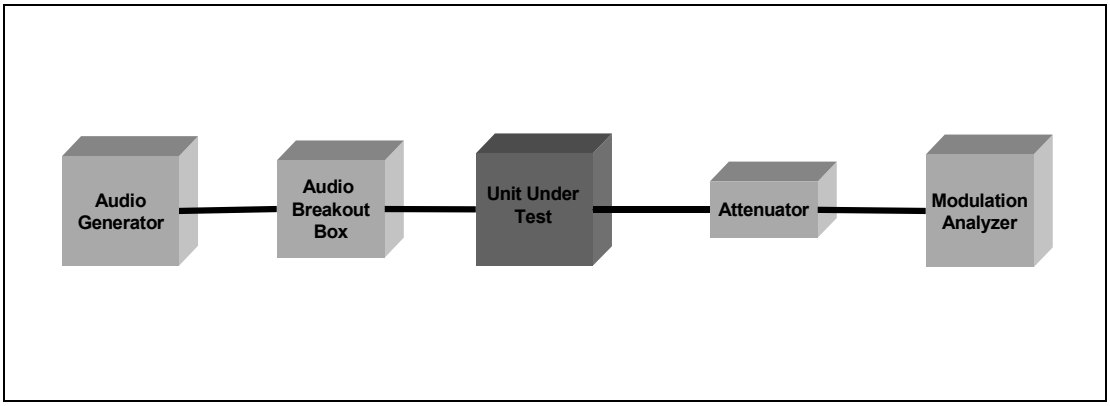

Figure 46-1. Level Control Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 46-1.

Table 46-1. Level Control Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 64.			
1	Set up equipment.	As shown in figure 46-1.	
2	Configure the UUT.	Frequency: 119.000 MHz Power: Low PT	
3	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout.	
4	Configure the audio generator.	Rate: 1000 Hz Amplitude: -10 dBm	
5	Configure the modulation analyzer.	Configure to measure modulation.	
6	Select attenuation.	Use appropriate level of attenuation so as to provide safe input into the test equipment.	
7	Key the UUT.	Ensure modulation of 70% on modulation analyzer.	
8	Adjust audio generator level to 0 dBm (+10 dBm above).	Observe the modulation analyzer.	
9	Record modulation level.	Ensure modulation level is held under 100%.	
10	Adjust audio generator level to +10 dBm (+20 dBm above).	Observe the modulation analyzer.	
11	Record modulation level.	Ensure modulation level is held under 100%.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; MHz - megahertz; PT - Plain Text; UUT - Unit Under Test; % - percent

46-1.4 Presentation of Results. The results will be shown in table 46-2 indicating the requirement and measured value or indications of capability.

Table 46-2. Level Control Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
64	3.7.8.2	Adequate compression should be provided to control the modulation level to less than 100% when input signals of 10 and preferably +20 dBm above that producing 70% modulation, reference Section 3.7.8.1, are applied.	Modulation less than 100%.			

Legend: ARINC - Aeronautical Radio Incorporated; dBm - decibels referenced to 1 milliwatt; % - percent

SUBTEST 47. PHASE SHIFT

47-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 67.

47-1.2 Criteria. Reference number 67. There should be no phase inversion through the transmitter. The transmitter modulated envelope peak should be 60 degrees of the positive peak of the audio applied as the high data input connector pin MPA5 as 1000 Hz.

47-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Audio Generator

(4) Oscilloscope

(5) Attenuator

b. Test Configuration. Configure the equipment as shown in figure 47-1.

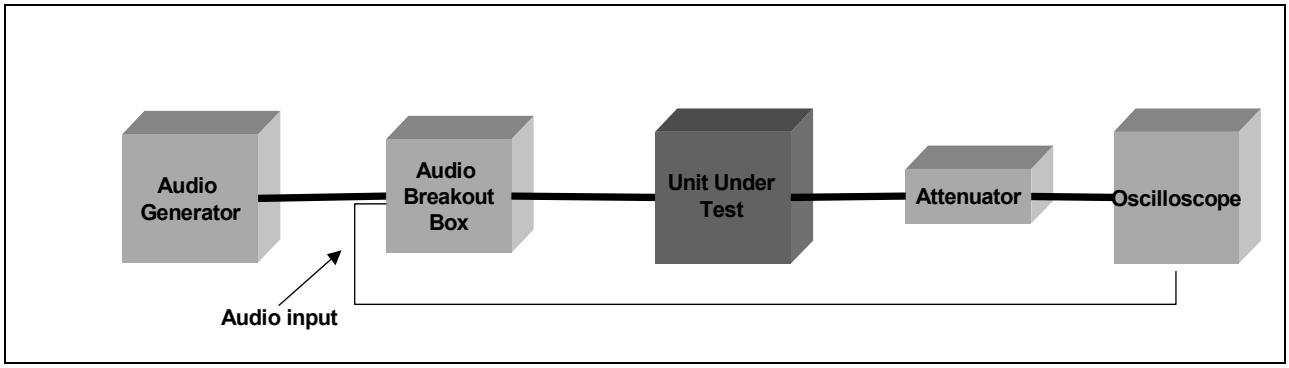

Figure 47-1. Phase Shift Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 47-1.

Table 47-1. Phase Shift Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 67.			
1	Set up equipment.	As shown in figure 47-1.	
2	Configure the audio generator.	Rate: 1000 Hz Level: -14 dBm	

Table 47-1. Phase Shift Test Procedures (continued)

Step	Action	Settings/Action	Measured Value
3	Configure the UUT.	Frequency: 119.000 MHz Channel Spacing: 25 kHz Power: Low	
4	Configure the audio breakout box.	Refer to manufacturer specifications for proper audio pinout. Connect test lead from the audio input of the UUT to the oscilloscope (channel 2).	
5	Configure the oscilloscope.	Channel 1: 1 V/div (RF from the UUT). Channel 2: 2 V/div (Audio input from the breakout box).	
6	Use appropriate attenuation.	Use the appropriate level of attenuation as to provide a safe input to the test equipment.	
7	Key the UUT.	Select the phase measurement on the oscilloscope.	
8	Record the phase.	Compare the transmitter modulated peak to the positive peak of the audio from the high data input. Ensure the phase is 60 degrees.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: dBm - decibels referenced to 1 milliwatt; Hz - hertz; kHz - kilohertz; MHz - megahertz; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division

47-1.4 Presentation of Results. The results will be shown in table 47-2 indicating the requirement and measured value or indications of capability.

Table 47-2. Phase Shift Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
67	3.7.8.5	There should be no phase inversion through the transmitter. The transmitter modulated envelope peak should be 60 degrees of the positive peak of the audio applied as the high data input connector pin MPA5 as 1000 Hz.	60 degrees			

Legend: ARINC - Aeronautical Radio Incorporated; Hz - hertz

SUBTEST 48. RECEIVE TO TRANSMIT TURN AROUND

48-1.1 Objective. To determine the extent of compliance to the requirements of ARINC Characteristic 716-10, reference number 69.

48-1.2 Criteria. Reference number 69. The modulated rf output should be at least 90% of the steady-state output within 50 ms after a key down condition is applied.

48-1.3 Test Procedures

a. Test Equipment Required

(1) UUT

(2) Audio Breakout Box

(3) Attenuator

(4) Oscilloscope

b. Test Configuration. Configure the equipment as shown in figure 48-1.

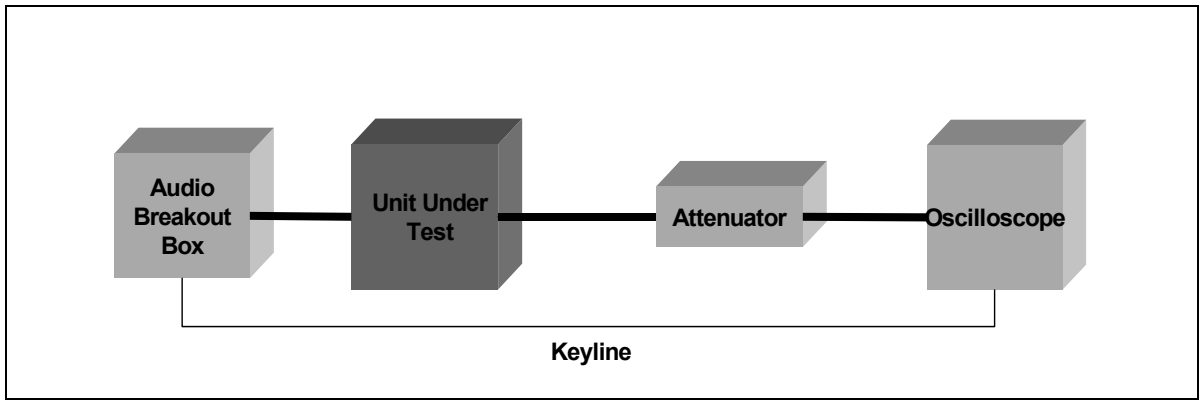

Figure 48-1. Receive to Transmit Turn Around Test Equipment Configuration

c. Test Conduct. Test procedures are listed in table 48-1.

Table 48-1. Receive to Transmit Turn Around Test Procedures

Step	Action	Settings/Action	Measured Value
The following procedure is for reference number 37.			
1	Set up equipment.	As shown in figure 48-1.	
2	Configure the audio breakout box.	Refer to manufacturer specifications for proper pinout configuration. Configure the box to key the UUT and provide a key output for the oscilloscope.	
3	Configure the UUT.	Frequency: 119.000 MHz Power: Low PT	
4	Configure the oscilloscope.	Channel 1: 1 V/div Channel 2: 2 V/div	
5	Key the UUT.	Stop acquisition to capture the transmitter attack.	
6	Select markers.	Set marker A on the key. Set marker B on the beginning of RF. Adjust the horizontal scale as needed to obtain an accurate picture of the RF signal.	
7	Record the time difference.	Record the time difference between markers A and B. Ensure the time is less than 50 ms.	

Note: Sections that are not applicable to a particular step are shaded.
Legend: MHz - megahertz; ms - milliseconds; PT - Plain Text; RF - Radio Frequency; UUT - Unit Under Test; V/div - volts per division

48-1.4 Presentation of Results. The results will be shown in table 48-2 indicating the requirement and measured value or indications of capability.

Table 48-2. Receive to Transmit Turn Around Results

Reference Number	ARINC-716-10 Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
69	3.7.10	The modulated RF output should be at least 90% of the steady-state output within 50 ms after a key down condition is applied.	90% within 50 ms.			

Legend: ARINC - Aeronautical Radio Incorporated; ms - milliseconds; RF - Radio Frequency

APPPENDIX A

ACRONYMS

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APPENDIX A

ACRONYMS

AC	Alternating Current
AGC	Automatic Gain Control
AM	Amplitude Modulation
ARINC	Aeronautical Radio Incorporated
ATC	Air Traffic Control
dB	decibel
dBc	decibels below carrier
dBm	decibels referenced to 1 milliwatt
dBV	decibels referenced to one volt
dBW	decibels referenced to one watt
DC	Direct Current
DO	Design Objective
ea	each
EUROCAE	European Organization for Civil Aviation Electronics
f	Frequency
FM	Frequency Modulation
GNSS	Global Navigation Satellite System
Hz	hertz
ICAO	International Civil Aviation Organization
IF	Intermediate Frequency
kHz	kilohertz
MHz	megahertz
ms	millisecond
ms/div	milliseconds per division
mV	millivolts
mV/div	millivolt per division
mW	milliwatt
ppm	parts per million
pps	Pulses per second
PT	Plain Text
PTT	Push To Talk

Acronyms (continued)

RF	Radio Frequency
RTCA	Radio Technical Commission for Aeronautics
SINAD	Signal to Noise and Distortion
TIMS	Transmission Impairment Measurement Set
UUT	Unit Under Test
V	volt
Vac	volts alternating current
V/div	volts per division
VHF	Very High Frequency
Vrms	volts root mean squared
μs	microsecond
μV	microvolt
Ω	ohm
%	percent
±	plus or minus

APPENDIX B

REQUIREMENTS MATRIX

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APPENDIX B

Table B-1. RTCA/DO-186A Requirements Matrix

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
	2.2	Receiver Performance-Standard Conditions	
1	2.2.1	Audio Frequency Response a. Audio output shall not vary more than 6 dB, when the level of an RF signal modulated at 30% is held constant at 1,000 microvolts and the modulation frequency is varied over the audio-frequency range of 350-2500 Hz.	1
2	2.2.2	Automatic Gain Control (AGC) Characteristics a. Audio output power shall not vary by more than 6 dB when the level of an RF input signal, modulated at 30% at 1000 Hz, is varied over the range from 10 microvolts to 100 millivolts. b. When the level of an RF input signal, modulated 30% at 1000 Hz at the selected channel frequency, is suddenly reduced from 200 millivolts to 10 microvolts, the receiver audio output shall, within 0.25 second, return to and remain within 3 dB of the normal steady-state output obtained with an input of 10 microvolts. c. If the receiver is included with the transmitter (transceiver), the receiver audio output shall recover from a transmit-to-receive transfer operation within 0.25 second. Recovery is defined as reaching and remaining within 3 dB of the normal steady-state output obtained within an RF input signal level of 10 microvolts modulated 30% at 1000 Hz.	2
3	2.2.3	Sensitivity (Signal-plus-Noise to Noise Ratio) The level of an RF input signal, modulated 30% at 1000 Hz, required to produce a signal-plus-noise to noise ratio of 6 dB shall not exceed 10 microvolts with an audio output power not lower than 10 dB below the declared audio output power. This requirement shall be met on all frequency channels for which the equipment is designed.	3
4	2.2.4	Output Level Control If an output level control is provided, it shall be capable of reducing the output to at least 40 dB below the manufacturer's rated output.	4
5	2.2.5	Distortion a. The receiver output distortion shall not exceed 25% at rated power output when the receiver input signal is modulated 85% at an input level of 10,000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz. b. The receiver output distortion shall not exceed 15% at a level 10 dB below rated power output when the receiver input signal is modulated 30% at an input signal level of 10,000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz.	5

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
6	2.2.6	Noise Level The signal-plus-noise to noise ratio of the receiver output shall be at least 25 dB when an RF input signal modulated 30% at 1000 Hz is varied over the range of 200 to 10,000 microvolts. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed	6
7	2.2.7	Selectivity a. Nose Bandwidth (4) Class D Receivers The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 3 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% (5) Class E Receivers The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 2.778 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.001% and 600 knot Doppler. b. Skirt Bandwidth (3) Class D Receivers At frequencies displaced by 22 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% for the adjacent channels. (4) Class E Receivers At frequencies displaced by 7.33 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.0001% for the adjacent channels.	7

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
8	2.2.8	Spurious Responses The input signal level on an undesired frequency required to produce a detector-carrier (AGC) level equal to that required for a 6 dB signal-plus-noise to noise ratio as specified previously in paragraph 2.2.3 shall be not less than 10 millivolts when: a. The undesired input signal frequency is within 108 to 137 MHz and is on any frequency within ± 8 kHz of any assignable channel other than the desired channel and the upper and lower adjacent channels. b. The undesired input signal frequency is between 50 kHz and 1215 MHz excluding the band 108-137 MHz. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz.	8
9	2.2.9	Cross Modulation With the simultaneous application of an unmodulated carrier at desired channel frequency and a signal modulated 30% at 1000 Hz (undesired signal), the receiver output, due to cross modulation, shall be at least 10 dB less than rated output. The desired channel signal shall be at any level between 20 and 500 microvolts, and the interfering signal (undesired) at a level of 10,000 microvolts at any frequency within 100-156 MHz. For Class E receivers, this includes the frequencies equivalent to the second higher and second lower channels to which the receiver can be tuned, but excludes the frequency range between these two channels. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz. [1] If an audio compressor is included in the equipment, it may be disabled when conducting the cross modulation test.	9
10	2.2.10	Intermodulation With the receiver audio compressor disabled (if so equipped), the simultaneous application of two unmodulated undesired signals, within the range of 87.5 to 107.9 MHz, with levels at the receiver input terminals of -5 dBm, shall result in an audio Quieting[1] of less than 6 dB. [1] Audio quieting is defined as the reduction in audio output level below that audio output level obtained with no RF signal applied to the receiver.	10

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
11	2.2.11	Desensitization With a –87 dBm signal at the receiver input modulated 30% with 1 kHz and at the desired channel frequency, the receiver signal-plus-noise to noise ratio shall not decrease to less than 6 dB: a. In the presence of an unmodulated carrier having a level of –33 dBm at the receiver input terminals and at frequencies between 108 and 156 MHz, including the frequencies equivalent to the next higher and the next lower channels to which the receiver can be tuned, but excluding the frequency range between these two channels. b. In the presence of an unmodulated carrier having a level of –7 dBm at the receiver input terminals and at any frequency within the 50 kHz through 1215 MHz, except for discrete spurious response frequencies. This excludes the frequencies within the range 87.5 - 156 MHz. At the discrete spurious response frequencies, the unmodulated carrier (undesired signal) shall have a level of -33 dBm at the receiver input terminals. c. In the presence of an unmodulated carrier having a level of –5 dBm at the receiver input terminals and at frequencies between 87.5 and 107.9 MHz.	11
12	2.2.12	Emissions of Radio Frequency Energy a. The conducted and radiated spurious radio frequency energy emissions shall not exceed those specified in Section 21.0 of RTCA/DO-160C, “Environmental Conditions and Test Procedures for Airborne Equipment.” b. When the receiver is terminated with a resistive load equal to the nominal receiver input impedance, the level of any spurious emission into the load shall not exceed 2 nanowatts. This requirement shall be met over the frequency range of 25 kHz to 1215 MHz. Notes: 1. EUROCAE has an additional requirement of 400 picowatts over the frequency range 108 to 137 MHz. 2. See installed equipment interference requirements of Paragraph 3.2.2 (of RTCA/DO-186A).	12
13	2.2.13	Channel Selection Time When a channel is selected, the time required for the equipment audio output to reach and remain within 3 dB of steady - state output shall not exceed one second.	13

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
14	2.2.16	Adjacent channel Rejection – Class E Receivers Only With the desired and interfering signals as specified below, the Adjacent Channel Rejection (ratio between the desired signal level and the lowest interfering signal level, in dB) shall be at least 45 dB. Desired Signal Level: adjusted to produce a signal-plus-noise to noise ratio of 20 dB. Modulation: modulated 60% at 1000 Hz Frequency: selected Interfering Signal Level: adjusted so that the signal-plus-noise to noise ratio of the desired signal is degraded from 20 dB to 14 dB. Modulation: modulated 60% at 400 Hz Frequency: first upper and lower 8.33 kHz adjacent channel.	14
	2.3	Transmitter Performance – Standard Conditions	
15	2.3.1	Output Power The transmitter output power shall be: a. At least 16 watts for Class 3 and Class 5 transmitters. b. At least 4 watts for Class 4 and Class 6 transmitters.	15
16	2.3.2	Residual Radiation When all primary power sources are connected to the transmitter and the microphone switch is “NOT KEYED,” the transmitter RF power output at the selected frequency shall not exceed .02 picowatts.	16
17	2.3.3	Modulation Capability The manufacturer shall declare the range of audio frequency input signal levels for which the transmitter shall achieve a modulation of not less than 70% at 1000 Hz.	17
18	2.3.4	Audio Frequency Distortion The combined distortion and noise in the demodulated output of the transmitter shall not exceed 25% of the total demodulated output at the modulation frequencies of 350, 1000 and 2500 Hz, when the audio input level to the transmitter is maintained at the value producing at least 70% modulation at 1000 Hz.	18
	2.3.5	Audio Frequency Response	

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
19	2.3.5.1	Modulation Fidelity The output carrier percentage modulation shall not vary by more than 6 dB when the audio input signal is varied over the range of 350 to 2500 Hz, when the audio input signal level is maintained at the value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that which clipping or limiting action occurs. c. For Class 5 and 6 equipment, frequencies above 3200 Hz shall be attenuated in accordance with the requirements of paragraph 2.3.13, “Transmitter Occupied Spectrum for 8.33 kHz Mode.”	19
20	2.3.5.2	Sidetone Fidelity If the transmitter provides audio-frequency sidetone, sidetone response shall not vary more than 10 dB over the range of 350 to2500 Hz when the audio input level to the transmitter is held constant at that value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that at which clipping or limiting action occurs.	20
21	2.3.6	Carrier noise level The demodulated noise on the transmitter output, without audio modulation, shall be at least 35 dB below the demodulated output obtained when the carrier is modulated 70% at 1000 Hz. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.	21
22	2.3.7	Emission of Radio Frequency Energy a. The conducted and radiated spurious radio frequency energy emissions shall not exceed those specified in Section 21.0 of RTCA/DO-160C, “Environmental Conditions and Test Procedures for Airborne Equipment.” b. When the transmitter is terminated with a resistive load equal to the nominal transmitter output impedance, the level of any spurious emissions appearing across the load shall not exceed 25 microwatts at harmonically related frequencies. c. Harmonic emission products shall be at least 60 dB below the rated RF output power i.e., minus 60 dBc. Harmonic emission products in the ICAO Global Navigation Satellite System (GNSS) band extending from 1559 to 1610 MHz shall be no greater than minus 60 dB.	22
23	2.3.8	Channel Selection Time The time required for the equipment to change from one channel to any other channel shall not exceed one second.	23

Table B-1. RTCA/DO-186A Requirements Matrix (continued)

Reference Number	RTCA/DO-186A Paragraph	Requirements	Subtest Number
24	2.3.11	Frequency Tolerance a. Class 3 and 4 transmitters – The RF carrier frequency shall be within 0.003% of the selected channel frequency. b. Class 5 and Class 6 transmitters – The RF carrier frequency shall be within 0.0005% (5 ppm) of the selected channel frequency. c. When modulated 70% at 1000 Hz, the frequency deviation due to unwanted frequency modulation of the carrier shall not exceed ± 3000 Hz.	24
25	2.3.13	Transmitter Occupied Spectrum for 8.33 kHz Mode For 8.33 kHz mode (Class 5 and Class 6 transmitters), the transmitter spectrum shall not exceed the limits shown in Figure B-1.1 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted as follows: The level of the audio signal is adjusted to produce 70% modulation at 1000 Hz. Then the frequency of the audio signal is varied in the range 300 Hz – 10 kHz, at the constant above mentioned level between 300 and 800 Hz, and following a slope of 10 dB/octave between 800 Hz and 10 kHz.	25

Legend: AGC - Automatic Gain Control; dB - Decibel; dBc - decibels below carrier; dBm - Decibel referenced to one milliwatt; EUROCAE - European Organization for Civil Aviation Electronics; GNSS - Global Navigation Satellite System; Hz - hertz; ICAO - International Civil Aviation Organization; kHz - kilohertz; MHz - megahertz; ppm - parts per million; RF - Radio Frequency; RTCA/DO - Radio Technical Commission for Aeronautics/Design Objective; VHF - Very High Frequency; % - percent; ± - plus or minus

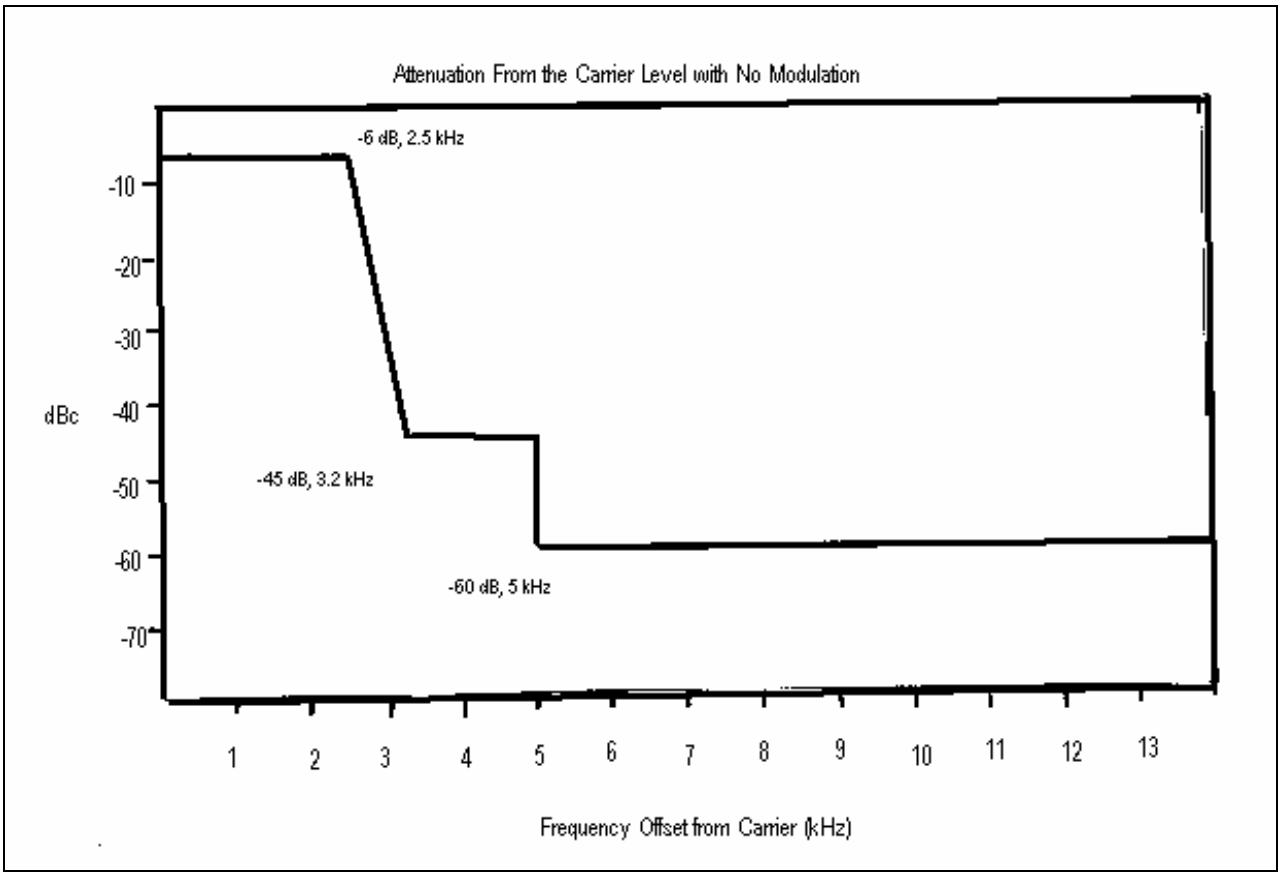

Figure B-1.1 Transmitter Spectrum Mask

Table B-2. ARINC Characteristic 716-10 Requirements Matrix

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
	3.0	Transceiver Unit Design	
26	3.1	Frequency Range and Channeling The transceiver should be capable of operating on a total of 760 channels spaced 25 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 118.000 MHz and the highest assignable channel is centered on 136.975 MHz. Channel changing time should not exceed 60 ms.	26
27	3.4	Transmitter Frequency Offset The transceiver should be capable of double-channel operation, i.e., transmitting on a frequency higher by some whole number of Megahertz than that on which its receiver is tuned. Sufficient flexibility should be provided to permit the same or a different value for this offset to be selected for each whole Megahertz of receiving frequency. Double-channel operation should be effected by the grounding of the "Frequency Offset Enable" wire, either by the control panel or other source.	27
28	3.5	Transmit to Receive Recovery With the receiver squelch set to operate at 3 μV, the receiver should recover after transmission to provide 90% of its output at an input level of 10 μV modulated 30% at 1000 Hz in less than 50 ms.	28
	3.6	Receiver Design	
29	3.6.1	Sensitivity With a 2 μV (hard) signal, amplitude modulated 30% at 1000 Hz, the signal-plus-noise-to-noise ratio should be 6 dB.	3
30	3.6.2	Selectivity The nose pass band and the stability of the receiver should be such that when a carrier modulated at 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved ±8 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ± 17 kHz or more from its assigned frequency.	7
31	3.6.3	Undesired Response All spurious responses, including image, should be down at least 80 dB. All spurious responses within the frequency band of 118 to 136 MHz should be down at least 100 dB and preferably 120 dB.	29

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

<table>
<tr><th>Reference Number</th><th>ARINC 716-10 Paragraph</th><th>Requirements</th><th>Subtest Number</th></tr>
<tr><td>32</td><td>3.6.4</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

<table>
<tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level Unmodulated (Hard μV)</th></tr>
<tr><td>±25 kHz</td><td>10,000</td><td>10</td></tr>
<tr><td>±50 kHz</td><td>20,000</td><td>10</td></tr>
<tr><td>±100 kHz</td><td>60,000</td><td>10</td></tr>
<tr><td>±500 kHz</td><td>100,000</td><td>10</td></tr>
<tr><td>±1 MHz</td><td>200,000</td><td>10</td></tr>
</table>

With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed -10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0.1 volt, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

<table>
<tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr>
<tr><td>0.06 volts</td><td>0.1 MHz</td></tr>
<tr><td>0.3 volts</td><td>0.5 MHz</td></tr>
<tr><td>0.6 volts</td><td>1.0 MHz</td></tr>
<tr><td>1.2 volts</td><td>2.0 MHz</td></tr>
</table>
</td><td>9</td></tr>
<tr><td>33</td><td>3.6.5</td><td>Audio Output
An audio output should be provided which is isolated from ground. A service control should be provided within the transceiver for adjustment of the output level. The adjustment should vary the output from 5 mW to 40 mW into a 600 Ω ±20% resistive load. The nominal setting should be 10 mW at 1000 Hz. The output circuit should be able to endure a short circuit (zero ohms) and open circuit, and should operate normally after removal of the short or open.</td><td>4</td></tr>
</table>

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
34	3.6.5.1	Audio Source Impedance The audio output circuit should present less than 20Ω impedance to the load circuit under all power-on conditions (signal and no-signal) when measured using the Figure 1 and Figure 2 methods of Attachment 9 (of ARINC Characteristic 716-10). The audio output circuit should present less than 50Ω impedance to the load circuit (measured using the Figure 2 method of Attachment 9) when no power is applied to the unit. The source impedance limits should apply over the frequency range of 100 Hz to 6000 Hz.	30
35	3.6.5.2	Output Regulation With the output signal adjusted to 10 mW into 600Ω at 1000 Hz, the output voltage should not change more than 2 dBV when the load is varied between 450Ω and 2500Ω and by not more than 6 dBV when the load is varied between 200Ω and 20,000Ω. The above described output regulation should also be true when tested using 350 and 2500 Hz signals.	31
36	3.6.5.3	Gain The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 40 mW of output into 600Ω ±20% resistive load.	32
37	3.6.5.4	Hum Level Hum and noise in the receiver output should be at least 40 dB below 10 mW output with a 1000 μV signal modulated 30% at 1000 Hz reference input.	33
38	3.6.5.5	Voice Phase Shift Limit The audio output level should not vary by more than 6 dB over the frequency range 300 Hz to 2500 Hz with respect to a reference level of up to 10 mW established at 1000 Hz with a constant input carrier level modulated 30%. A sharp cut-off in response below 300 Hz and above 2500 Hz is desirable. Frequencies above 3750 Hz should be attenuated at least 20 dB and preferably 40 dB.	34
39	3.6.5.6	Distortion With an input signal of 1000 μV modulated with 1000 Hz and the receiver gain adjusted to produce 40 mW into a 500Ω resistive load, the total harmonic distortion should not exceed 7.5% with 30% modulation or 20% with 90% modulation (with the gain control reset to maintain the output at 40 mW), including any effects of the voice limiter.	5
40	3.6.5.7	Voice Phase Shift Limit With 1000 μV modulated with 1000 Hz and the output level adjusted for 40 mW into 600Ω resistive load, the audio output phase should not depart from that of the positive going modulation envelope at the receiver input by more than -30 degrees or +120 degrees.	35

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

<table>
<tr><th>Reference Number</th><th>ARINC 716-10 Paragraph</th><th>Requirements</th><th>Subtest Number</th></tr>
<tr><td>41</td><td>3.6.6</td><td>Automatic Gain Control
The receiver amplitude modulation output should not vary more than 3 dB with input signals from 5 μV to 100000 μV, and not more than 6 dB with input signals from 5 μV to 500000 μV. Variation of percentage modulation should have negligible effect on the automatic gain control. The receiver should not overload with one volt of RF energy (hard) applied to antenna terminals.</td><td>36</td></tr>
<tr><td>42</td><td>3.6.7</td><td>Desensitization and Interference Rejection
Circuitry should be included for the prevention, insofar as practicable, of receiver desensitization due to pulse type interference. As the magnitude and character of the pulse interference levels expected in a typical installation in the future is not known, system performance specifications would be meaningless. Sections 3.6.7.1, 3.6.7.2, and 3.6.7.3 are typical of the degree of protection that is likely to be needed. The content of Sections 3.6.7.1, 3.6.7.2 and 3.6.7.3 apply when rf pulses having the following characteristics are introduced into the receiver through a 52-Ω dummy antenna:
Width of Pulse - 10± 2μs
Repetition Rate - 1000±100 pps
Waveform - Rise and decay time each less than 1 μs</td><td></td></tr>
<tr><td>43</td><td>3.6.7.1</td><td>AGC Versus Pulse Interference
With the receiver sensitivity set to maximum and with a test signal of 3 to 1000 μV, modulated 30% at 1000 Hz, the resulting 1000 Hz output, should not decrease more than 2 dB for pulses having the same carrier level, or more than 10 dB for pulses with amplitudes 100 times the carrier level, introduced simultaneously with the standard test voltages.</td><td>37</td></tr>
<tr><td>44</td><td>3.6.7.2</td><td>Squelch Versus Pulse Interference
The squelch should not open when pulses and unmodulated carrier on the same frequency are introduced, having the following levels in microvolts:
<table><tr><th>Squelch Threshold</th><th>Carrier Level</th><th>Pulse Peak Amplitude</th></tr><tr><td>5</td><td>0</td><td>3000</td></tr><tr><td>5</td><td>3</td><td>1000</td></tr></table></td><td>38</td></tr>
<tr><td>45</td><td>3.6.7.3</td><td>Pulse Noise Output
With the receiver gain adjusted so that a test signal of 100 μV, modulated 30% at 1000 Hz, produces 10 mW output in a 600Ω resistive load, substitution of pulse-type interference superimposed upon the 100 μV carrier in lieu of the 1000 Hz modulation should not produce more than 5 mW audio output with pulse peak amplitudes up to one volt.</td><td>39</td></tr>
</table>

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
46	3.6.7.4	Receiver Operation in the Presence of Inband Transmission The receiver design should be the best that the state-of-the-art can provide with respect to freedom from interference from transmitters in the 118.000 to 137.000 MHz band on the same aircraft. There should be no squelch tripping or degradation of receivers performance when a 25 watt transmitter tuned to a frequency 6 MHz or more removed from that to which the receiver is tuned is operated into an antenna space isolated from the receiver's antenna by 35 dB. If 45 dB of space isolation is provided between the two antennas, there should be no interference or squelch tripping when the transmission frequency is as close as 2 MHz to the receive frequency.	40
47	3.6.9.1	Gain The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 Vac of output into a 600Ω ±20% load.	32
48	3.6.9.2	Frequency Response The total frequency response should be within 3 dB from 312 Hz to 1200 Hz and the post detection response with respect to 1000 Hz should be within ±6 dB from 300 Hz to 6.6 kHz.	1
49	3.6.9.3	Distortion With an input signal of 1000 μV modulated 30% at 1000 Hz and the level adjusted to provide 0.5 V output into 600Ω, the total distortion should not exceed 5.0%.	5
50	3.6.9.4	Phase Shift There should be no phase inversion through the receiver.	41
51	3.6.9.4.2	Differential Phase Delay The differential delay through the receiver to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds.	42
52	3.6.9.5	AGC Attack Time The data link audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV rf signal to the receiver input modulated 30% with 1000 Hz.	43
53	3.6.9.6	AGC Decay Time The data link audio output should reach 90% of its steady-state value within 50 ms after the receiver rf input of 1000 μV, modulated 30% with 1000 Hz is step reduced to 10 μV.	43
	3.7	Transmitter Design	
54	3.7.1	Power Output When operated at rated input power, the transceiver carrier power output measured into a 52Ω resistive load at the end of a 5 foot transmission line should be 25 to 40 watts on any operating frequency.	15

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
55	3.7.2	Frequency Stability The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.003% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or the airline customer, exist in actual service.	24
56	3.7.3	Sidetone The sidetone output (shared with the audio output) should have a source impedance of less than 20Ω, and should provide an output level of 40 mW into a 600Ω ±20% resistive load when the transmitter is amplitude modulated 90% at 1000 Hz. A service adjustment independent of the receiver audio output service adjustment is to be provided to adjust the output level. The adjustment should provide for a variation from 5 mW to 40 mW. The rf power required to operate the sidetone should be obtained from a source as close as practical to the transmitter power output connection.	20
57	3.7.4	Transmitter Spurious Radiation Any emissions on a harmonic of a desired frequency should be less than -46 dBW (dB below one watt). Any other emissions should be less than -65 dBW, and any emissions within the band 108 to 136 MHz should be down to at least -75 dBW and preferable to -105 dBW. Any spurious within the band 108.0 to 136.0 MHz, but more than 5 MHz from the carrier frequency, should be down to at least -105 dBW. This attenuation should be accomplished within the transmitter without the aid of external circuits. NOTE: The specification for spurious radiation is stated in terms of absolute power level rather than amount of attenuation by virtue of several historical understandings reached as a result of interference on harmonics of aeronautical mobile frequencies. The absolute level of -45 dBW for harmonics is based on 60 dB attenuation of the harmonics in a 25 to 50 watt transmitter and is compatible with FCC requirements. This has been determined to be a maximum allowable level for operation. It should also be recognized that the ECAC recommended maximum level is -46 dBW for all spurious emissions except where 40 dB attenuation below the fundamental power output results in a lower power level. ECAC has also considered recommending -56 dBW as the maximum level for all spurious emissions in the band 108.0 to 136.0 MHz, regardless of the fundamental power output. For this reason, equipment manufacturers should regard the figures specified in this paragraph as “barely acceptable minima”, and aim to do rather better in their boxes.	44

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
58	3.7.5.1	Modulation Level An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be accomplished through the use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	17
59	3.7.5.3	Frequency Response The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500 Hz. Attenuation beyond this range is desirable.	1
60	3.7.5.4	Distortion With the speech processing de-energized or the speech processing service adjustment of Section 3.5.5.2 set to "minimum", the transmitter distortion indicated on an external monitor detector should not exceed 10% with full 90% sinusoidal modulation at any frequency in the range 300 to 2500 Hz. The noise level should be at least 45 dB below the level of a carrier modulated 90% at 1000 Hz.	5
61	3.7.6	Leakage The transmitter output is not to exceed 0.02 picowatts at the selected frequency or more than 400 picowatts at any other frequency in the key up condition when terminated into a 50 A resistive load.	16
62	3.7.8	Data Input A balanced 600Ω ±20% input should be provider for data modulation of the transmitter.	45
63	3.7.8.1	Modulation Level A -10 dBm input at 1000 Hz should provide 70% modulation. A service adjustment independent of the microphone input adjustment should be provided to accommodate input levels up to +10 dBm.	17
64	3.7.8.2	Level Control Adequate compression should be provided to control the modulation level to less than 100% when input signals of 10 and preferably +20 dBm above that producing 70 % modulation, reference Section 3.7.8. 1, are applied.	46
65	3.7.8.3	Frequency Response The frequency response from the data input to the modulated carrier output should be flat within 6 dB from 600 Hz to 6.6 kHz.	1
66	3.7.8.4	Distortion The distortion at modulation levels up to 90% should not exceed 10% over the frequency range of 45 dB below the level of 90% modulation at 1000 Hz.	5
67	3.7.8.5	Phase Shift There should be no phase inversion through the transmitter. The transmitter modulated envelope peak should be 60 degrees of the positive peak of the audio applied as the high data input connector pin MPA5 as 1000 Hz.	47

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
68	3.7.8.6	Differential Delay The differential delay to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds through the transmitter.	42
69	3.7.10	Receive to Transmit Turn Around The modulated rf output should be at least 90 % of the steady-state output within 50 ms after a key down condition is applied.	48
	4.0	Transceiver Unit Design for The 8.33 kHz Channel-Spaced Mode of Operation	
70	4.1	Frequency Range and Channelling The transceiver should be capable of operating on 2280 channels spaced 8.33 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 117.99166 and the highest assignable channel is centered on 136.9833 MHz. Channel changing time should not exceed 60 ms. A table of the Frequency Channel Pairing Plan is provided in Appendix 1 for the reader's convenience.	26
	4.3	Receiver Design	
71	4.3.1	Selectivity The nose passband and the stability of the receiver should be such that when a carrier modulated 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved to ± 2.780 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±7.365 kHz or more from its assigned frequency. Note: The nose passband is defined in order to receive the full speech bandwidth (± 2.5 kHz). This value is increased by the ground frequency tolerance (± 1 ppm) plus the Doppler effect (± 140 Hz).	7

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

<table>
<tr><th>Reference Number</th><th>ARINC 716-10 Paragraph</th><th>Requirements</th><th>Subtest Number</th></tr>
<tr><td>72</td><td>4.3.2</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

<table><tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level – Unmodulated (Hard μV)</th></tr><tr><td>± 8.33 kHz</td><td>10,000</td><td>10</td></tr><tr><td>± 25 kHz</td><td>10,000</td><td>10</td></tr><tr><td>± 50 kHz</td><td>20,000</td><td>10</td></tr><tr><td>± 100 kHz</td><td>60,000</td><td>10</td></tr><tr><td>± 500 kHz</td><td>100,000</td><td>10</td></tr><tr><td>± 1 MHz</td><td>200,000</td><td>10</td></tr></table>
With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed -10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0. 1 V, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

<table><tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr><tr><td>0.06 volts</td><td>0.1 MHz</td></tr><tr><td>0.3 volts</td><td>0.5 MHz</td></tr><tr><td>0.6 volts</td><td>1.0 MHz</td></tr><tr><td>1.2 volts</td><td>2.0 MHz</td></tr></table></td><td>9</td></tr>
<tr><td>73</td><td>4.3.4. 1</td><td>Gain
The receiver gain should be such that a 2 μV signal modulated 30 % at 1000 Hz produces at least 0.5 Vac of output into a 600Ω ± 20% load.</td><td>32</td></tr>
<tr><td>74</td><td>4.3.4.2</td><td>Frequency Response
The total receiver frequency response should be within 3 dB from 312 Hz to 1200 Hz. The post detection response with respect to 1000 Hz should be within ± 6 dB from 300 Hz to 2.5 kHz.</td><td>1</td></tr>
<tr><td>75</td><td>4.3.4.3</td><td>Distortion
With an input signal of 1000 μV modulated 30% at 1000 Hz and with the level adjusted to provide a 0.5 V output into 600Ω, the total distortion should not exceed 5.0%.</td><td>5</td></tr>
<tr><td>76</td><td>4.3.4.4</td><td>Phase Shift
There should be no phase inversion through the receiver.</td><td>41</td></tr>
</table>

Table B-2. ARINC Characteristic 716-10 Requirements Matrix (continued)

Reference Number	ARINC 716-10 Paragraph	Requirements	Subtest Number
77	4.3.4.4.2	Differential Phase Delay The differential delay through the receiver to audio frequencies (f) from 600 Hz to 2.5 kHz should be less than 1/10f seconds.	42
78	4.3.4.5	AGC Attack Time The audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV rf signal to the receiver input modulated 30% with 1000 Hz.	43
79	4.3.4.6	AGC Decay Time The audio output should reach 90% of its steady-state value within 50 ms after the receiver rf input of 1000 μV, modulated 30% with 1000 Hz is step reduced to 10 μV.	43
	4.4	Transmitter Design	
80	4.4.1	Frequency Stability The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.0005% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or other airline customer, exist in actual service.	24
81	4.4.2.1	Modulation Level An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be achieved through use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	17
82	4.4.2.3	Frequency Response The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500 Hz. A sharp cut-off in response below 300 Hz and above 2500 Hz should be provided. Frequencies above 3200 HZ should be attenuated at least 50 dB.	1
83	4.4.2.4	Distortion The transmitter distortion should be consistent with the specified transmitter occupied spectrum.	25
84	4.4.2.5	Transmitter Occupied Spectrum The transmitted spectrum should not exceed the limits shown in Attachment 11 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted to provide 90% modulation at 1000 Hz.	25

Legend: A - Amp; AGC - Automatic Gain Control; ARINC - Aeronautical Radio Incorporated; dB - decibels; dBm - decibels referenced to 1 milliwatt; dBV - decibels referenced to 1 volt; dBW - decibels referenced to 1 watt; ECAC - European Civil Aviation Conference; f - frequency; FCC - Federal Communications Commission; Hz - hertz; kHz - kilohertz; MHz - megahertz; ms - milliseconds; mW - milliwatts; ppm - parts per million; pps - pulses per second; RF - Radio Frequency; V - volt; Vac - volts alternating current; Vrms - volts root mean square; μs - microseconds; μV - microvolts; Ω - ohms; % - percent; ± - plus or minus

APPENDIX C

DATA COLLECTION FORMS

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RTCA DO-186A & ARINC Characteristic 716-10 Waveform Conformance Test Procedures Forms Control

CONTROL NUMBER:

DATE:
(DD/MM/YY)

Form Number	Serial Number	Equipment Nomenclature	Call Sign	Remarks

DATA ENTRY TECHNICIAN:	TEST DIRECTOR:
SIGNATURE:	SIGNATURE:

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RTCA DO-186A & ARINC Characteristic 716-10 Waveform Conformance Test Procedures Additional Remarks Form	CONTROL NUMBER: DATE: (DD/MM/YY)

Remarks

TEST TECHNICIAN:	DO NOT WRITE IN SHADED AREAS
DATA ENTRY TECHNICIAN:	TEST DIRECTOR:

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RTCA DO-186A & ARINC Characteristic 716-10 Waveform Conformance Test Procedures Event Log Form

CONTROL NUMBER:

DATE:
(DD/MM/YY)

TIME (Z)	INITIALS	EVENT

TEST TECHNICIAN:	DO NOT WRITE IN SHADED AREAS
DATA ENTRY TECHNICIAN:	TEST DIRECTOR:

PAGE OF PAGES

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RTCA DO-186A & ARINC Characteristic 716-10 Waveform Conformance Test Procedures Equipment Configuration Diagram Form	CONTROL NUMBER:
	DATE: (DD/MM/YY)

TEST TECHNICIAN:	DO NOT WRITE IN SHADED AREAS
DATA ENTRY TECHNICIAN:	TEST DIRECTOR:

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RTCA DO-186A & ARINC Characteristic 716-10 Waveform Conformance Test Plan

CONTROL NUMBER:

DATE:
(DD/MM/YY)

Time	Subtest	Action	Results	Met	Not Met

Test Technician	Do Not Write In Shaded Areas
Data Entry Technician	Test Director

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APPENDIX D
RTCA/DO-186A & ARINC CHARACTERISTIC 716-10 VERY HIGH FREQUENCY AMPLITUDE MODULATION AIR TRAFFIC CONTROL WAVEFORM CONFORMANCE TEST PROCEDURES RESULTS MATRIX

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Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.1	Audio Frequency Response a. Audio output shall not vary more than 6 dB, when the level of an RF signal modulated at 30% is held constant at 1000 microvolts and the modulation frequency is varied over the audio-frequency range of 350-2500 Hz.	1		
2.2.2	Automatic Gain Control (AGC) Characteristics a. Audio output power shall not vary by more than 6 dB when the level of an RF input signal, modulated at 30% at 1000 Hz, is varied over the range from 10 microvolts to 100 millivolts. b. When the level of an RF input signal, modulated 30% at 1000 Hz at the selected channel frequency, is suddenly reduced from 200 millivolts to 10 microvolts, the receiver audio output shall, within 0.25 second, return to and remain within 3 dB of the normal steady-state output obtained with an input of 10 microvolts. c. If the receiver is included with the transmitter (transceiver), the receiver audio output shall recover from a transmit-to-receive transfer operation within 0.25 second. Recovery is defined as reaching and remaining within 3 dB of the normal steady-state output obtained within an RF input signal level of 10 microvolts modulated 30% at 1000 Hz.	2		
2.2.3	Sensitivity (Signal-plus-Noise to Noise Ratio) The level of an RF input signal, modulated 30% at 1000 Hz, required to produce a signal-plus-noise to noise ratio of 6 dB shall not exceed 10 microvolts with an audio output power not lower than 10 dB below the declared audio output power. This requirement shall be met on all frequency channels for which the equipment is designed.	3		
2.2.4	Output Level Control If an output level control is provided, it shall be capable of reducing the output to at least 40 dB below the manufacturer's rated output.	4		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.5	Distortion a. The receiver output distortion shall not exceed 25% at rated power output when the receiver input signal is modulated 85% at an input level of 10000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz. b. The receiver output distortion shall not exceed 15% at a level 10 dB below rated power output when the receiver input signal is modulated 30% at an input signal level of 10000 microvolts. This requirement shall be met over the frequency range of 350-2500 Hz.	5		
2.2.6	Noise Level The signal-plus-noise to noise ratio of the receiver output shall be at least 25 dB when an RF input signal modulated 30% at 1000 Hz is varied over the range of 200 to 10000 microvolts. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed	6		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.7	Selectivity a. Nose Bandwidth (4) Class D Receivers The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 3 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% (5) Class E Receivers The input signal level required to produce the reference AGC voltage shall not vary more than 6 dB over the input signal frequency range of ± 2.778 kHz from the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.001% and 600 knot Doppler. b. Skirt Bandwidth (3) Class D Receivers At frequencies displaced by 22 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.002% for the adjacent channels. (4) Class E Receivers At frequencies displaced by 7.33 kHz on either side of the assigned channel frequency, the input signal level required to produce reference AGC voltage shall be at least 60 dB greater than the level required to produce reference AGC voltage at the assigned channel frequency. Note: This presumes a ground-based transmitter having a tolerance of ± 0.0001% for the adjacent channels.	7		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.8	Spurious Responses The input signal level on an undesired frequency required to produce a detector-carrier (AGC) level equal to that required for a 6 dB signal-plus-noise to noise ratio as specified previously in paragraph 2.2.3 shall be not less than 10 millivolts when: a. The undesired input signal frequency is within 108 to 137 MHz and is on any frequency within ± 8 kHz of any assignable channel other than the desired channel and the upper and lower adjacent channels. b. The undesired input signal frequency is between 50 kHz and 1215 MHz excluding the band 108-137 MHz. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz.	8		
2.2.9	Cross Modulation With the simultaneous application of an unmodulated carrier at desired channel frequency and a signal modulated 30% at 1000 Hz (undesired signal), the receiver output, due to cross modulation, shall be at least 10 dB less than rated output. The desired channel signal shall be at any level between 20 and 500 microvolts, and the interfering signal (undesired) at a level of 10000 microvolts at any frequency within 100-156 MHz. For Class E receivers, this includes the frequencies Equivalent to the second higher and second lower channels to which the receiver can be tuned, but excludes the frequency range between these two channels. Note: EUROCAE's VHF frequency range extends from 108 to 156 MHz. [1] If an audio compressor is included in the equipment, it may be disabled when conducting the cross modulation test.	9		
2.2.10	Intermodulation With the receiver audio compressor disabled (if so equipped), the simultaneous application of two unmodulated undesired signals, within the range of 87.5 to 107.9 MHz, with levels at the receiver input terminals of -5 dBm, shall result in an audio Quieting[1] of less than 6 dB. [1] Audio quieting is defined as the reduction in audio output level below that audio output level obtained with no RF signal applied to the receiver.	10		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.11	Desensitization With a –87 dBm signal at the receiver input modulated 30% with 1 kHz and at the desired channel frequency, the receiver signal-plus-noise to noise ratio shall not decrease to less than 6 dB: a. In the presence of an unmodulated carrier having a level of –33 dBm at the receiver input terminals and at frequencies between 108 and 156 MHz, including the frequencies equivalent to the next higher and the next lower channels to which the receiver can be tuned, but excluding the frequency range between these two channels. b. In the presence of an unmodulated carrier having a level of –7 dBm at the receiver input terminals and at any frequency within the 50 kHz through 1215 MHz, except for discrete spurious response frequencies. This excludes the frequencies within the range 87.5 - 156 MHz. At the discrete spurious response frequencies, the unmodulated carrier (undesired signal) shall have a level of -33 dBm at the receiver input terminals. c. In the presence of an unmodulated carrier having a level of –5 dBm at the receiver input terminals and at frequencies between 87.5 and 107.9 MHz.	11		
2.2.12	Emissions of Radio Frequency Energy a. The conducted and radiated spurious radio frequency energy emissions shall not exceed those specified in Section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment." b. When the receiver is terminated with a resistive load equal to the nominal receiver input impedance, the level of any spurious emission into the load shall not exceed 2 nanowatts. This requirement shall be met over the frequency range of 25 kHz to 1215 MHz.	12		
2.2.13	Channel Selection Time When a channel is selected, the time required for the equipment audio output to reach and remain within 3 dB of steady-state output shall not exceed one second.	13		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.2.16	Adjacent channel Rejection – Class E Receivers Only With the desired and interfering signals as specified below, the Adjacent Channel Rejection (ratio between the desired signal level and the lowest interfering signal level, in dB) shall be at least 45 dB. Desired Signal Level: adjusted to produce a signal-plus-noise to noise ratio of 20 dB. Modulation: modulated 60% at 1000 Hz Frequency: selected Interfering Signal Level: adjusted so that the signal-plus-noise to noise ratio of the desired signal is degraded from 20 dB to 14 dB. Modulation: modulated 60% at 400 Hz Frequency: first upper and lower 8.33 kHz adjacent channel.	14		
2.3.1	Output Power The transmitter output power shall be: a. At least 16 watts for Class 3 and Class 5 transmitters. b. At least 4 watts for Class 4 and Class 6 transmitters.	15		
2.3.2	Residual Radiation When all primary power sources are connected to the transmitter and the microphone switch is “NOT KEYED,” the transmitter RF power output at the selected frequency shall not exceed .02 picowatts.	16		
2.3.3	Modulation Capability The manufacturer shall declare the range of audio frequency input signal levels for which the transmitter shall achieve a modulation of not less than 70% at 1000 Hz.	17		
2.3.4	Audio Frequency Distortion The combined distortion and noise in the demodulated output of the transmitter shall not exceed 25% of the total demodulated output at the modulation frequencies of 350, 1000 and 2500 Hz, when the audio input level to the transmitter is maintained at the value producing at least 70% modulation at 1000 Hz.	18		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.3.5.1	Modulation Fidelity The output carrier percentage modulation shall not vary by more than 6 dB when the audio input signal is varied over the range of 350 to 2500 Hz, when the audio input signal level is maintained at the value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that which clipping or limiting action occurs. c. For Class 5 and 6 equipment, frequencies above 3200 Hz shall be attenuated in accordance with the requirements of paragraph 2.3.13, “Transmitter Occupied Spectrum for 8.33 kHz Mode.”	19		
2.3.5.2	Sidetone Fidelity If the transmitter provides audio-frequency sidetone, sidetone response shall not vary more than 10 dB over the range of 350 to2500 Hz when the audio input level to the transmitter is held constant at that value which produces: a. 70% modulation at the frequency of maximum response, or b. More than 70% modulation at the frequency of maximum response when this value is immediately below that at which clipping or limiting action occurs.	20		
2.3.6	Carrier noise level The demodulated noise on the transmitter output, without audio modulation, shall be at least 35 dB below the demodulated output obtained when the carrier is modulated 70% at 1000 Hz. When the equipment is designed for operation from an alternating current power source, this requirement shall be met over the range of power source frequencies for which the equipment is designed.	21		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

RTCA/DO-186A Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
2.3.7	Emission of Radio Frequency Energy a. The conducted and radiated spurious radio frequency energy emissions shall not exceed those specified in Section 21.0 of RTCA/DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment." b. When the transmitter is terminated with a resistive load equal to the nominal transmitter output impedance, the level of any spurious emissions appearing across the load shall not exceed 25 microwatts at harmonically related frequencies. c. Harmonic emission products shall be at least 60 dB below the rated RF output power i.e., minus 60 dBc. Harmonic emission products in the ICAO Global Navigation Satellite System (GNSS) band extending from 1559 to 1610 MHz shall be no greater than minus 60 dB.	22		
2.3.8	Channel Selection Time The time required for the equipment to change from one channel to any other channel shall not exceed one second.	23		
2.3.11	Frequency Tolerance a. Class 3 and 4 transmitters – The RF carrier frequency shall be within 0.003% of the selected channel frequency. b. Class 5 and Class 6 transmitters – The RF carrier frequency shall be within 0.0005% (5 ppm) of the selected channel frequency. c. When modulated 70% at 1000 Hz, the frequency deviation due to unwanted frequency modulation of the carrier shall not exceed ± 3000 Hz.	24		
2.3.13	Transmitter Occupied Spectrum for 8.33 kHz Mode For 8.33 kHz mode (Class 5 and Class 6 transmitters), the transmitter spectrum shall not exceed the limits shown in Figure 2-1 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted as follows: The level of the audio signal is adjusted to produce 70% modulation at 1000 Hz. Then the frequency of the audio signal is varied in the range 300 Hz - 10 kHz, at the constant above mentioned level between 300 and 800 Hz, and following a slope of 10 dB/octave between 800 Hz and 10 kHz.	25		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.1	Frequency Range and Channeling The transceiver should be capable of operating on a total of 760 channels spaced 25 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 118.000 MHz and the highest assignable channel is centered on 136.975 MHz. Channel changing time should not exceed 60 ms.	26		
3.4	Transmitter Frequency Offset The transceiver should be capable of double-channel operation, i.e., transmitting on a frequency higher by some whole number of Megahertz than that on which its receiver is tuned. Sufficient flexibility should be provided to permit the same or a different value for this offset to be selected for each whole Megahertz of receiving frequency. Double-channel operation should be effected by the grounding of the "Frequency Offset Enable" wire, either by the control panel or other source.	27		
3.5	Transmit to Receive Recovery With the receiver squelch set to operate at 3 μV, the receiver should recover after transmission to provide 90% of its output at an input level of 10 μV modulated 30% at 1000 Hz in less than 50 ms.	28		
3.6.1	Sensitivity With a 2 μV (hard) signal, amplitude modulated 30% at 1000 Hz, the signal-plus-noise-to-noise ratio should be 6 dB.	3		
3.6.2	Selectivity The nose pass band and the stability of the receiver should be such that when a carrier modulated at 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved ±8 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ± 17 kHz or more from its assigned frequency.	7		
3.6.3	Undesired Response All spurious responses, including image, should be down at least 80 dB. All spurious responses within the frequency band of 118 to 136 MHz should be down at least 100 dB and preferably 120 dB.	29		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

<table>
<tr><th rowspan="2">ARINC 716-10 Paragraph</th><th rowspan="2">Requirement</th><th rowspan="2">Subtest</th><th colspan="2">Findings</th></tr>
<tr><th>Met</th><th>Not Met</th></tr>
<tr><td>3.6.4</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

<table><tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level Unmodulated (Hard μV)</th></tr><tr><td>±25 kHz</td><td>10,000</td><td>10</td></tr><tr><td>±50 kHz</td><td>20,000</td><td>10</td></tr><tr><td>±100 kHz</td><td>60,000</td><td>10</td></tr><tr><td>±500 kHz</td><td>100,000</td><td>10</td></tr><tr><td>±1 MHz</td><td>200,000</td><td>10</td></tr></table>
With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed -10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0.1 volt, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

<table><tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr><tr><td>0.06 volts</td><td>0.1 MHz</td></tr><tr><td>0.3 volts</td><td>0.5 MHz</td></tr><tr><td>0.6 volts</td><td>1.0 MHz</td></tr><tr><td>1.2 volts</td><td>2.0 MHz</td></tr></table></td><td>9</td><td></td><td></td></tr>
<tr><td>3.6.5</td><td>Audio Output
An audio output should be provided which is isolated from ground. A service control should be provided within the transceiver for adjustment of the output level. The adjustment should vary the output from 5 mW to 40 mW into a 600 Ω ±20% resistive load. The nominal setting should be 10 mW at 1000 Hz. The output circuit should be able to endure a short circuit (zero ohms) and open circuit, and should operate normally after removal of the short or open.</td><td>4</td><td></td><td></td></tr>
</table>

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.6.5.1	Audio Source Impedance The audio output circuit should present less than 20Ω impedance to the load circuit under all power-on conditions (signal and no-signal) when measured using the Figure 1 and Figure 2 methods of Attachment 9 (of ARINC Characteristic 716-10). The audio output circuit should present less than 50Ω impedance to the load circuit (measured using the Figure 2 method of Attachment 9) when no power is applied to the unit. The source impedance limits should apply over the frequency range of 100 Hz to 6000 Hz.	30		
3.6.5.2	Output Regulation With the output signal adjusted to 10 mW into 600Ω at 1000 Hz, the output voltage should not change more than 2 dBV when the load is varied between 450Ω and 2500Ω and by not more than 6 dBV when the load is varied between 200Ω and 20000Ω. The above described output regulation should also be true when tested using 350 and 2500 Hz signals.	31		
3.6.5.3	Gain The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 40 mW of output into 600Ω ±20% resistive load.	32		
3.6.5.4	Hum Level Hum and noise in the receiver output should be at least 40 dB below 10 mW output with a 1000 μV signal modulated 30% at 1000 Hz reference input.	33		
3.6.5.5	Voice Phase Shift Limit The audio output level should not vary by more than 6 dB over the frequency range 300 Hz to 2500 Hz with respect to a reference level of up to 10 mW established at 1000 Hz with a constant input carrier level modulated 30%. A sharp cut-off in response below 300 Hz and above 2500 Hz is desirable. Frequencies above 3750 Hz should be attenuated at least 20 dB and preferably 40 dB.	34		
3.6.5.6	Distortion With an input signal of 1000 μV modulated with 1000 Hz and the receiver gain adjusted to produce 40 mW into a 500Ω resistive load, the total harmonic distortion should not exceed 7.5% with 30% modulation or 20% with 90% modulation (with the gain control reset to maintain the output at 40 mW), including any effects of the voice limiter.	5		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

<table>
<tr><th rowspan="2">ARINC 716-10 Paragraph</th><th rowspan="2">Requirement</th><th rowspan="2">Subtest</th><th colspan="2">Findings</th></tr>
<tr><th>Met</th><th>Not Met</th></tr>
<tr><td>3.6.5.7</td><td>Voice Phase Shift Limit
With 1000 μV modulated with 1000 Hz and the output level adjusted for 40 mW into 600Ω resistive load, the audio output phase should not depart from that of the positive going modulation envelope at the receiver input by more than -30 degrees or +120 degrees.</td><td>35</td><td></td><td></td></tr>
<tr><td>3.6.6</td><td>Automatic Gain Control
The receiver amplitude modulation output should not vary more than 3 dB with input signals from 5 μV to 100000 μV, and not more than 6 dB with input signals from 5 μV to 500000 μV. Variation of percentage modulation should have negligible effect on the automatic gain control. The receiver should not overload with one volt of RF energy (hard) applied to antenna terminals.</td><td>36</td><td></td><td></td></tr>
<tr><td>3.6.7.1</td><td>AGC Versus Pulse Interference
With the receiver sensitivity set to maximum and with a test signal of 3 to 1000 μV, modulated 30% at 1000 Hz, the resulting 1000 Hz output, should not decrease more than 2 dB for pulses having the same carrier level, or more than 10 dB for pulses with amplitudes 100 times the carrier level, introduced simultaneously with the standard test voltages.</td><td>37</td><td></td><td></td></tr>
<tr><td>3.6.7.2</td><td>Squelch Versus Pulse Interference
The squelch should not open when pulses and unmodulated carrier on the same frequency are introduced, having the following levels in microvolts:
<table><tr><th>Squelch Threshold</th><th>Carrier Level</th><th>Pulse Peak Amplitude</th></tr><tr><td>5</td><td>0</td><td>3000</td></tr><tr><td>5</td><td>3</td><td>1000</td></tr></table></td><td>38</td><td></td><td></td></tr>
<tr><td>3.6.7.3</td><td>Pulse Noise Output
With the receiver gain adjusted so that a test signal of 100 μV, modulated 30% at 1000 Hz, produces 10 mW output in a 600Ω resistive load, substitution of pulse-type interference superimposed upon the 100 μV carrier in lieu of the 1000 Hz modulation should not produce more than 5 mW audio output with pulse peak amplitudes up to one volt.</td><td>39</td><td></td><td></td></tr>
</table>

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.6.7.4	Receiver Operation in the Presence of Inband Transmission The receiver design should be the best that the state-of-the-art can provide with respect to freedom from interference from transmitters in the 118.000 to 137.000 MHz band on the same aircraft. There should be no squelch tripping or degradation of receivers performance when a 25 watt transmitter tuned to a frequency 6 MHz or more removed from that to which the receiver is tuned is operated into an antenna space isolated from the receiver's antenna by 35 dB. If 45 dB of space isolation is provided between the two antennas, there should be no interference or squelch tripping when the transmission frequency is as close as 2 MHz to the receive frequency.	40		
3.6.9.1	Gain The receiver gain should be such that a 2 μV signal modulated 30% at 1000 Hz produces at least 0.5 Vac of output into a 600Ω ±20% load.	32		
3.6.9.2	Frequency Response The total frequency response should be within 3 dB from 312 Hz to 1200 Hz and the post detection response with respect to 1000 Hz should be within ±6 dB from 300 Hz to 6.6 kHz.	1		
3.6.9.3	Distortion With an input signal of 1000 μV modulated 30% at 1000 Hz and the level adjusted to provide 0.5 V output into 600Ω, the total distortion should not exceed 5.0%.	5		
3.6.9.4	Phase Shift There should be no phase inversion through the receiver.	41		
3.6.9.4.2	Differential Phase Delay The differential delay through the receiver to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds.	42		
3.6.9.5	AGC Attack Time The data link audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV rf signal to the receiver input modulated 30% with 1000 Hz.	43		
3.6.9.6	AGC Decay Time The data link audio output should reach 90% of its steady-state value within 50 ms after the receiver rf input of 1000 μV, modulated 30% with 1000 Hz is step reduced to 10 μV.	43		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.7.1	Power Output When operated at rated input power, the transceiver carrier power output measured into a 52Ω resistive load at the end of a 5 foot transmission line should be 25 to 40 watts on any operating frequency.	15		
3.7.2	Frequency Stability The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.003% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or the airline customer, exist in actual service.	24		
3.7.3	Sidetone The sidetone output (shared with the audio output) should have a source impedance of less than 20Ω, and should provide an output level of 40 mW into a 600Ω ±20% resistive load when the transmitter is amplitude modulated 90% at 1000 Hz. A service adjustment independent of the receiver audio output service adjustment is to be provided to adjust the output level. The adjustment should provide for a variation from 5 mW to 40 mW. The rf power required to operate the sidetone should be obtained from a source as close as practical to the transmitter power output connection.	20		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.7.4	Transmitter Spurious Radiation Any emissions on a harmonic of a desired frequency should be less than -46 dBW (dB below one watt). Any other emissions should be less than -65 dBW, and any emissions within the band 108 to 136 MHz should be down to at least -75 dBW and preferable to -105 dBW. Any spurious within the band 108.0 to 136.0 MHz, but more than 5 MHz from the carrier frequency, should be down to at least -105 dBW. This attenuation should be accomplished within the transmitter without the aid of external circuits. NOTE: The specification for spurious radiation is stated in terms of absolute power level rather than amount of attenuation by virtue of several historical understandings reached as a result of interference on harmonics of aeronautical mobile frequencies. The absolute level of -45 dBW for harmonics is based on 60 dB attenuation of the harmonics in a 25 to 50 watt transmitter and is compatible with FCC requirements. This has been determined to be a maximum allowable level for operation. It should also be recognized that the ECAC recommended maximum level is -46 dBW for all spurious emissions except where 40 dB attenuation below the fundamental power output results in a lower power level. ECAC has also considered recommending -56 dBW as the maximum level for all spurious emissions in the band 108.0 to 136.0 MHz, regardless of the fundamental power output. For this reason, equipment manufacturers should regard the figures specified in this paragraph as “barely acceptable minima”, and aim to do rather better in their boxes.	44		
3.7.5.1	Modulation Level An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be accomplished through the use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	17		
3.7.5.3	Frequency Response The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500 Hz. Attenuation beyond this range is desirable.	1		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.7.5.4	Distortion With the speech processing de-energized or the speech processing service adjustment of Section 3.5.5.2 set to "minimum", the transmitter distortion indicated on an external monitor detector should not exceed 10% with full 90% sinusoidal modulation at any frequency in the range 300 to 2500 Hz. The noise level should be at least 45 dB below the level of a carrier modulated 90% at 1000 Hz.	5		
3.7.6	Leakage The transmitter output is not to exceed 0.02 picowatts at the selected frequency or more than 400 picowatts at any other frequency in the key up condition when terminated into a 50 A resistive load.	16		
3.7.8	Data Input A balanced 600Ω ±20% input should be provider for data modulation of the transmitter.	45		
3.7.8.1	Modulation Level A -10 dBm input at 1000 Hz should provide 70% modulation. A service adjustment independent of the microphone input adjustment should be provided to accommodate input levels up to +10 dBm.	17		
3.7.8.2	Level Control Adequate compression should be provided to control the modulation level to less than 100% when input signals of 10 and preferably +20 dBm above that producing 70 % modulation, reference Section 3.7.8. 1, are applied.	46		
3.7.8.3	Frequency Response The frequency response from the data input to the modulated carrier output should be flat within 6 dB from 600 Hz to 6.6 kHz.	1		
3.7.8.4	Distortion The distortion at modulation levels up to 90% should not exceed 10% over the frequency range of 45 dB below the level of 90% modulation at 1000 Hz.	5		
3.7.8.5	Phase Shift There should be no phase inversion through the transmitter. The transmitter modulated envelope peak should be 60 degrees of the positive peak of the audio applied as the high data input connector pin MPA5 as 1000 Hz.	47		
3.7.8.6	Differential Delay The differential delay to audio frequencies (f) from 600 Hz to 6.6 kHz should be less than 1/(10f) seconds through the transmitter.	42		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
3.7.10	Receive to Transmit Turn Around The modulated rf output should be at least 90 % of the steady-state output within 50 ms after a key down condition is applied.	48		
4.1	Frequency Range and Channeling The transceiver should be capable of operating on 2280 channels spaced 8.33 kHz apart in the internationally allocated band 117.975 to 137.000 MHz. There is a 12.5 kHz guard band on each end of the allocated band. Therefore, the lowest assignable channel is centered on 117.99166 and the highest assignable channel is centered on 136.9833 MHz. Channel changing time should not exceed 60 ms. A table of the Frequency Channel Pairing Plan is provided in Appendix 1 for the reader's convenience.	26		
4.3.1	Selectivity The nose passband and the stability of the receiver should be such that when a carrier modulated 30% at 1000 Hz is applied on any assigned carrier frequency there is no more than 6 dB attenuation when it is moved to ± 2.780 kHz from its assigned frequency. The skirt selectivity should be such that at least 60 dB of attenuation results when the modulated carrier departs ±7.365 kHz or more from its assigned frequency. Note: The nose passband is defined in order to receive the full speech bandwidth (± 2.5 kHz). This value is increased by the ground frequency tolerance (± 1 ppm) plus the Doppler effect (± 140 Hz).	7		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

<table>
<tr><th rowspan="2">ARINC 716-10 Paragraph</th><th rowspan="2">Requirement</th><th rowspan="2">Subtest</th><th colspan="2">Findings</th></tr>
<tr><th>Met</th><th>Not Met</th></tr>
<tr><td>4.3.2</td><td>Cross Modulation
The undesired cross modulation product should be down at least 10 dB with respect to the audio output when the desired signal is modulated 50% under the following conditions:

<table><tr><th>Undesired Signal Frequency</th><th>Minimum Undesired Signal Level Modulated 50% (Hard μV)</th><th>Desired Signal Level – Unmodulated (Hard μV)</th></tr><tr><td>± 8.33 kHz</td><td>10,000</td><td>10</td></tr><tr><td>± 25 kHz</td><td>10,000</td><td>10</td></tr><tr><td>± 50 kHz</td><td>20,000</td><td>10</td></tr><tr><td>± 100 kHz</td><td>60,000</td><td>10</td></tr><tr><td>± 500 kHz</td><td>100,000</td><td>10</td></tr><tr><td>± 1 MHz</td><td>200,000</td><td>10</td></tr></table>
With the simultaneous application to the input of the receiver of a 30% modulated off-resonance signal with an unmodulated desired signal, the audio output produced by the undesired signal should not exceed -10 dB with reference to the output produced by the desired signal only (when modulated 30%) under the conditions specified below. With the desired signal level varied from 3 μV to 0. 1 V, and the audio gain adjusted in each case for 100 mW output, the receiver should meet the above specification with the following undesired signals:

<table><tr><th>Undesired Signal Level</th><th>Off Resonance</th></tr><tr><td>0.06 volts</td><td>0.1 MHz</td></tr><tr><td>0.3 volts</td><td>0.5 MHz</td></tr><tr><td>0.6 volts</td><td>1.0 MHz</td></tr><tr><td>1.2 volts</td><td>2.0 MHz</td></tr></table></td><td>9</td><td></td><td></td></tr>
<tr><td>4.3.4. 1</td><td>Gain
The receiver gain should be such that a 2 μV signal modulated 30 % at 1000 Hz produces at least 0.5 Vac of output into a 600Ω ± 20% load.</td><td>32</td><td></td><td></td></tr>
<tr><td>4.3.4.2</td><td>Frequency Response
The total receiver frequency response should be within 3 dB from 312 Hz to 1200 Hz. The post detection response with respect to 1000 Hz should be within ± 6 dB from 300 Hz to 2.5 kHz.</td><td>1</td><td></td><td></td></tr>
</table>

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
4.3.4.3	Distortion With an input signal of 1000 μV modulated 30% at 1000 Hz and with the level adjusted to provide a 0.5 V output into 600Ω, the total distortion should not exceed 5.0%.	5		
4.3.4.4	Phase Shift There should be no phase inversion through the receiver.	41		
4.3.4.4.2	Differential Phase Delay The differential delay through the receiver to audio frequencies (f) from 600 Hz to 2.5 kHz should be less than 1/10f seconds.	42		
4.3.4.5	AGC Attack Time The audio output should reach 90% of its steady-state value within 40 ms after the step application of a 1000 μV rf signal to the receiver input modulated 30% with 1000 Hz.	43		
4.3.4.6	AGC Decay Time The audio output should reach 90% of its steady-state value within 50 ms after the receiver rf input of 1000 μV, modulated 30% with 1000 Hz is step reduced to 10 μV.	43		
4.4.1	Frequency Stability The transmitter frequency should not deviate from the assigned carrier frequency by more than ±0.0005% when any other environmental characteristic or other situations develop which might, in the opinion of the manufacturer or other airline customer, exist in actual service.	24		
4.4.2.1	Modulation Level An input level of 0.25 Vrms at 1000 Hz applied to the microphone input should provide at least 90% modulation of the transmitter. This modulation level may be achieved through use of a dynamic or carbon microphone. A service adjustment should be provided to allow accommodation of input levels up to 20 dB higher.	17		
4.4.2.3	Frequency Response The transmitter modulation response should be flat within 6 dB from 300 Hz to 2500. A sharp cut-off in response below 300 Hz and above 2500 Hz should be provided. Frequencies above 3200 HZ should be attenuated at least 50 dB.	1		
4.4.2.4	Distortion The transmitter distortion should be consistent with the specified transmitter occupied spectrum.	25		

Table D-1. RTCA/DO-186A & ARINC Characteristic 716-10 Results Matrix (continued)

ARINC 716-10 Paragraph	Requirement	Subtest	Findings	
			Met	Not Met
4.4.2.5	Transmitter Occupied Spectrum The transmitted spectrum should not exceed the limits shown in Attachment 11 when the transmitter is modulated by any frequency between 300 Hz and 10 kHz, the input level being adjusted to Provide 90% modulation at 1000 Hz.	25		

Legend: AGC - Automatic Gain Control; A - Amp; ARINC - Aeronautical Radio Incorporated; dB - Decibel; dBc - decibels below carrier; dBm - Decibel referenced to one milliwatt; dBV - decibels referenced to 1 volt; dBW - decibels referenced to 1 watt; ECAC - European Civil Aviation Conference; EUROCAE - European Organization for Civil Aviation Electronics; f - frequency; Hz - hertz; ICAO - International Civil Aviation Organization; kHz - kilohertz; MHz - megahertz; ms - milliseconds; mW - milliwatts; ppm - parts per million; pps - pulses per second; RF - Radio Frequency; RTCA - Radio Technical Commission for Aeronautics; VHF - Very High Frequency; V - volt; Vac - volts alternating current; Vrms – volts root mean square; μs - microseconds; μV - microvolts; Ω - ohms; % - percent; ± - plus or minus

APPENDIX E

REFERENCES

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APPENDIX E

REFERENCES

AERONAUTICAL RADIO INCORPORATED (ARINC) CHARACTERISTICS

E-1 ARINC 716-10, “Airborne VHF Communications Transceiver,” 15 January 1998

RADIO TECHNICAL COMMISSION FOR AERONAUTICS/DESIGN OBJECTIVE (RTCA/DO)

E-2 RTCA/DO-186A, “Minimal Operational Performance Standards For Airborne Radio Communications Equipment Operating Within The Radio Frequency Range 117.975 - 137.000 MHz,” 20 October 1995

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