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SUPERSEDING
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MILITARY SPECIFICATION

SOUND-LEVEL MEASURING AND ANALYZING EQUIPMENT

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers Sound-Level Measuring and Analyzing Equipment consisting of a Sound-Level Meter, an Octave-Band Analyzer and a Magnetic Tape Recorder. When used in conjunction this equipment forms a single type Sound-Level Measuring and Analyzing System.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-Z-325	Zinc Coating, Electrodeposited, Requirements for

Military

MIL-M-3171	Magnesium Alloy, Processes For Pretreatment and Prevention of Corrosion on
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for

FSC 6625

Military (Continued)

MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-C-5541	Chemicals, Films and Chemical Film Materials For Aluminum and Aluminum Alloys
MIL-A-8625	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-P-23408	Plating Tin-Cadmium (Electrodeposited)

STANDARDS

Military

MIL-STD-143	Specifications and Standards Order of Precedence For the Selection of
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-794	Parts and Equipment, Procedures For Packaging and Packing of

(Copies of specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other Publications - The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids shall apply.

American Standards Association (ASA) Standard

S1.10-1966 Calibration of Microphones

(Application for copies should be addressed to the American Standards Association, 10 East 40th Street, New York, New York 10016.)

3. REQUIREMENTS

3.1 Preproduction - The equipment furnished under this specification shall be products, which have been tested and meet the Quality Assurance Provisions specified herein.

3.4.1.3 Calibrated Attenuator - A calibrated attentuator shall be provided to attenuate the amplified signal in calibrated increments of 10 decibels (dB).

3.4.1.3.1 Range - The calibrated attenuator shall have an overall attenuation range of at least 80 dB.

3.4.1.3.2 Accuracy - The accuracy of the attenuator shall be ±0.5 dB per increment and such that the overall Sound-Level Meter accuracy requirement of 3.4.1.5 is met.

3.4.1.4 Indicator (Meter) - An indicator shall be provided which in conjunction with the calibrated attenuator will display the measured sound level in decibels.

3.4.1.4.1 Scale - The indicator scale shall be graduated in decibels with a minimum range of +10 and -5 dB. Positive graduations shall increase from the observer's left hand side of the scale. The zero indication of the decibel scale shall be such that the sum of the scale reading plus the reading of the calibrated attenuator, is the measured sound pressure level above a ZERO dB reference of 0.0002 microbar (20 micronewton/sq. meter).

3.4.1.4.2 Instantaneous Sound - The indicator and associated circuitry shall be equally responsive to instantaneous sound pressures both above and below ambient static pressure.

3.4.1.5 Sound-Level Meter Accuracy - With reference to ZERO dB, the instrument at 1000 Hz, shall be accurate to within ±1.5 dB over the entire dB range.

3.4.1.6 Frequency Response - The frequency response of the Sound-Level Meter shall be such that the Frequency Weighting Networks requirement of 3.4.1.9 is met. The response of the Sound-Level Meter to pure tone shall be linear (NOT overload), for a range of 10 dB above the highest meter reading for all attenuator settings.

3.4.1.7 Rule of Combination for Complex Sound - The Sound-Level Meter shall be calibrated to indicate the weighted root-mean-square (effective) sound pressure level of pure tones.

3.4.1.7.1 Complex Sounds - For complex sounds, the Sound-Level Meter shall indicate the weighted root-mean-square effective sound pressure level which is the square root of the average square of the weighted instantaneous sound pressure. (Note the averaging period is determined by the dynamic characteristics of the indicating instrument and associated circuit) (see 3.4.1.8).

3.4.1.7.2 Broad Band Random Noise - The broad band random noise of effective sound pressure level, equal to that of a pure tone which deflects the indicator pointer to 1.0 dB below full scale deflection, shall produce a deflection of 1.0 ±0.5 dB below full scale. The broad band random noise of effective sound pressure level, equal to that of a pure tone which deflects the indicator pointer to 10 dB below full scale deflection, shall produce a deflection of 10 ±0.5 dB below full scale. These conditions shall be met for all positions at the calibrated attenuator and gain controls.

3.4.1.8 Dynamic Characteristics -

3.4.1.8.1 Undamped Response (Fast Acting) - The deflection of the indicator pointer, when a sinusoidal 1000 Hz pulse of 0.2 second time duration is applied to the amplifier, shall be between 0 and 4.0 dB below the steady-state deflection caused by continuous application of the same signal. The overshoot of the indicator pointer when a sinusoidal 1000 Hz input is applied to the amplifier and held constant thereafter, shall exceed the ensuing steady-state deflection by an amount falling between 0.1 and 1.0 dB.

3.4.1.8.2 Damped Response (Slow Acting) - Facilities to produce a damped response of the indicator pointer, to aid in obtaining average sound level results, shall be incorporated. In the damped response mode, when the amplifier is pulsed with a sinusoidal 1000 Hz 0.5 second time duration signal, the indicator deflection shall fall between 2 dB and 6 dB below the deflection caused by the same continuous signal. The overshoot of the indicator pointer, when a sinusoidal 1000 Hz input is applied to the amplifier and held constant thereafter, shall not exceed the ensuing steady-state deflection by more than 1.5 dB.

3.4.1.8.2.1 Steady Sounds - On steady sounds the sound-level reading in the damped response mode shall be the same as for normal operation.

3.4.1.9 Frequency Weighting Networks - The Sound-Level Meter shall have three frequency weighting networks designed to alter the frequency response by a prescribed amount for comparison measurements. The networks shall be designated A, B, and C.

3.4.1.9.1 C Weighting Network - The Sound-Level Meter, including the microphone, shall have a frequency response which is constant in amplitude at all frequencies between 20 and 10,000 Hz, except for a gradual roll-off at the limits of this range. This response shall be for the C weighting network of the Sound-Level Meter. The exact values and tolerances for the C weighting network response curve shall be as specified in Table I and Figure 1.

3.4.1.9.2 B Weighting Network - The B weighting network shall change the response of the instrument with respect to the C weighting network, to that of the curve whose values are specified in Table II and Figure 1.

3.2 Selection of Government Documents - Except as provided in 3.2.1 and 3.2.2, specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.2.1 Standard Parts - With the exception of 3.2.2, MS and AN standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

3.2.2 Commercial Parts - Commercial parts having suitable properties shall be used, when on the date of invitations for bids, there are no suitable standard parts. In any case, commercial parts, such as screws, bolts, nuts, cotter pins, having suitable properties, may be used provided:

(a) They can be replaced by the standard parts (MS or AN) without alteration.

(b) The corresponding standard part numbers are referenced in the parts list and if practicable, on the contractor's drawings.

3.3 Materials - Materials shall conform to applicable specifications and shall be as specified herein. Materials for which there are no applicable specifications, or which are not specifically described herein, shall be of the best quality, of the lightest practicable weight, and suitable for the purpose intended.

3.3.1 Critical Materials - Noncritical materials shall be used where practicable. Where the use of a critical material is essential to meet specification requirements, the material used shall be the least critical of those which are adequate for the purpose.

3.3.2 Metals - Metals shall be corrosion resistant, or shall be suitably protected as specified herein to resist corrosion due to fuels, salt spray, or atmospheric conditions to which this equipment may be subjected when in storage or during normal service life.

3.3.2.1 Dissimilar Metals - The selection and use of dissimilar metals shall be as specified in MIL-STD-454 Requirement No. 16.

3.3.2.2 Magnesium Alloy Parts - Magnesium alloy parts shall be treated in accordance with MIL-M-3171. When abrasion resistance is a factor, an anodic treatment approved by the procuring activity shall be used.

3.3.2.3 Aluminum Alloy Parts - Unless otherwise specified, aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625. Small holes, pipe threads, and case inserts need not be anodized.

Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with MIL-C-5541.

3.3.2.4 Iron and Steel Parts - Iron and steel parts which are not in sealed cases shall be chromium, nickel, or zinc plated in accordance with QQ-C-320, QQ-N-290, or QQ-Z-325 respectively. Parts in a confined space in the presence of organic material shall be tin-cadmium plated in accordance with MIL-P-23408. The class and type of plating shall meet the requirements of 3.3.3.

3.3.3 Protective Treatment - When materials are used in the construction of the Sound-Level Measuring and Analyzing Equipment, that are subject to atmospheric or environmental conditions likely to cause corrosion in normal service life, they shall be protected against corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification. Finishes and protective coatings which will crack, chip, or scale during normal service life or are affected by extremes of atmospheric or environmental conditions, shall not be used.

3.3.4 Fungus - inert materials- Fungus-inert materials shall be selected and used in accordance with MIL-STD-454 Requirement No. 4.

3.3.5 Fumes and Vapors - Materials used in the construction of the Sound-Level Measuring and Analyzing Equipment shall not produce corrosive, deleterious, or toxic fumes or vapors under the conditions specified herein.

3.4 Design and Construction - The design and construction of the Sound-Level Measuring and Analyzing Equipment shall be for three individual portable units, a Sound-Level Meter, an Octave-Band Analyzer and a Magnetic Tape Recorder. The performance requirements of this specification shall be met whether the Sound-Level Meter, Octave-Band Analyzer and Magnetic Tape Recorder are used separately or as an interconnected system. The equipment shall be designed and constructed in accordance with MIL-E-5400, Class IA, except that the altitude shall be 25,000 ft. and the operating temperature range shall be -10° to +140°F.

3.4.1 Sound-Level Meter -

3.4.1.1 Microphone - The microphone shall be a dynamic, piezoelectric, or condenser type and shall have a frequency response with little variation with changes in ambient temperature, pressure and humidity.

3.4.1.2 Amplifier- The amplifier shall be such that will enable the Sound-Level Meter to meet the range, accuracy and frequency response requirements specified herein.

The lower 3 dB point of the B weighting network shall be approximately 160 Hz and the curve shall approach a roll-off slope of 6 dB per octave at frequencies below this point.

3.4.1.9.3 A Weighting Network - The A weighting network shall change the response of the instrument with respect to the C weighting network to that of the curve whose values are specified in Table III and Figure 1. The lower 3 dB point of the A weighting network shall be approximately 560 Hz and the curve shall approach a roll-off slope of 12 dB per octave at frequencies below this point.

3.4.1.9.4 Tolerances on Response Curves - The tolerances on the variation from the relative response for the A, B, and C weighting networks shall be as specified in Tables I, II and III.

TABLE I

SOUND-LEVEL METER RESPONSE
C WEIGHTING NETWORK

Frequency (dB)	Relative Response (dB)	Tolerance Variation from Relative Response (dB)
20	-6.3	+3.0, -∞
25	-4.5	+2.0, -2.5
32	-3.0	+1.5, -2.0
40	-2.0	+1.0, -1.5
50	-1.3	±1.0
63	-0.8	±1.0
80	-0.5	±1.0
100	-0.3	±1.0
125	-0.2	±1.0
160	-0.1	±1.0
200	0	±1.0
250	0	±1.0
320	0	±1.0
400	0	±1.0
500	0	±1.0
630	0	±1.0
800	0	±1.0
1000	0	±1.5
1250	-0.1	±1.5
1600	-0.1	±2.0
2000	-0.2	±2.5
2500	-0.3	+3.5, -3.0
3200	-0.5	+4.5, -3.5
4000	-0.8	+5.0, -4.0
5000	-1.3	+5.5, -4.5
6300	-2.0	+6.0, -5.0
8000	-3.0	+6.0, -6.0
10000	-4.3	+6.0, -∞

TABLE II

SOUND-LEVEL METER RESPONSE
B WEIGHTING NETWORK REFERENCED TO C WEIGHTING NETWORK

Frequency (Hz)	Relative Response (dB)	Tolerance, Variation from Relative Response (dB)
25	-16.1	±1.0
32	-14.1	±1.0
40	-12.2	±1.0
50	-10.4	±1.0
63	- 8.6	±1.0
80	- 6.9	±1.0
100	- 5.4	±1.0
125	- 4.1	±1.0
160	- 2.9	±0.5
200	- 2.1	±0.5
250	- 1.4	±0.5
320	- 0.9	±0.5
400	- 0.6	±0.5
500	- 0.3	±0.5
630	- 0.2	±0.5
800	- 0.1	±0.5
1000	0	±0.5
1250	0	±0.5
1600	0	±0.5
2000	0	±0.5
2500	0	±0.5
3200	0	±0.5
4000	0	±0.5
5000	0	±0.5
6300	0	±0.5
8000	0	±0.5

TABLE III

SOUND-LEVEL METER RESPONSE
A WEIGHTING NETWORK REFERENCED TO C WEIGHTING NETWORK

Frequency (Hz)	Relative Response (dB)	Tolerance, Variation from Relative Response (dB)
25	-40.3	±2.0
32	-36.2	±2.0
40	-32.5	±2.0
50	-28.9	±2.0
63	-25.3	±2.0
80	-21.8	±2.0
100	-18.8	±1.5
125	-16.0	±1.5
160	-13.1	±1.5
200	-10.8	±1.5
250	- 8.6	±1.5
320	- 6.5	±1.0
400	- 4.8	±1.0
500	- 3.3	±1.0
630	- 1.9	±1.0
800	- 0.8	±0.5
1000	0	±0.5
1250	+ 0.6	±0.5
1600	+ 1.1	±0.5
2000	+ 1.4	±0.5
2500	+ 1.5	±0.5
3200	+ 1.7	±0.5
4000	+ 1.8	±0.5
5000	+ 1.8	±0.5
6300	+ 1.8	±0.5
8000	+ 1.9	±0.5

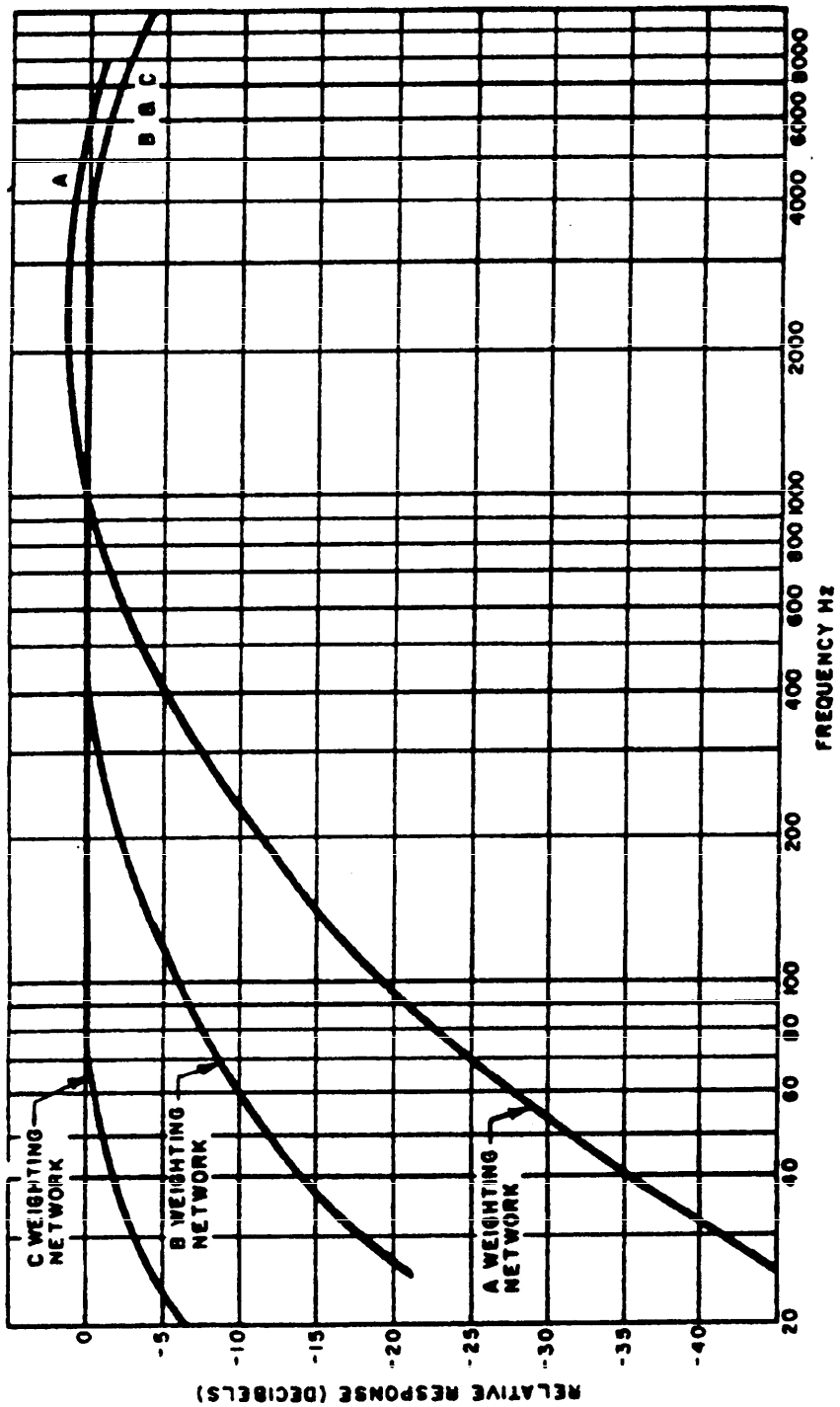

Figure 1. Random Incidence Response Curves for A, B, and C Weighting Networks

3.4.1.10 Sounds Arriving at Various Angles of Incidence - The Sound-Level Meter shall have the same sensitivity, within tolerances, for sounds arriving at the microphone at various angles of incidence. The maximum variation in response between sounds arriving at any angle of incidence to the microphone diaphragm, and sounds arriving at random incidence shall not exceed the limits specified in Table IV.

TABLE IV

MAXIMUM ALLOWABLE DEVIATION IN SOUND-LEVEL METER RESPONSE FOR SOUNDS ARRIVING AT THE MICROPHONE AT ANY ANGLE OF INCIDENCE, WITH RESPECT TO SOUNDS ARRIVING AT RANDOM INCIDENCE

Frequency (Hz)	Limit (dB)
500	±0.5
630	±0.5
800	±1
1000	±1.5
1250	±2
1600	±3
2000	±4
2500	±5
3200	±7
4000	±8
5000	±9
6300	±12
8000	±15

3.4.1.11 Internal Noise - The internal noise shall be specified by bands no wider than octave-bands in equivalent sound pressure levels for all attenuator settings. For all attenuator settings giving internal attenuations of 30 dB or more, the internal noise, when measured in octave-bands, shall be at least 40 dB below the maximum scale reading.

3.4.1.12 Microphonic Noise and Hum - When the Sound-Level Meter, with its microphone replaced by an equivalent impedance, is subjected to pure-tone sounds at a sound pressure level of 100 dB at each frequency between 100 and 5000 Hz, the output level in each octave shall be at least 30 dB below the full-scale meter reading with the attenuator set for 90 dB. The 100 dB level is referenced to ZERO dB.

3.4.1.13 Calibration - The free-field calibration of the Sound-Level Meter shall be made by comparison with a standard microphone under the test conditions set forth in American Standards Association's Standard No. S1.10-1966

except that instead of the open circuit voltages being given, the readings of the Sound-Level Meter shall be those of the indicating meter itself.

The manufacturer shall recommend the angle at which free-field measurements should be made with the instrument.

3.4.1.13.1 Random Field Calibration - The random field calibration shall be determined by one of two methods: (1) integration of free-field calibrations by measurements taken at a number of angles of incidence, and (2) calibration in a random field.

When the random field calibration is computed for measurements at various angles, the calibration shall be carried out as specified in 3.4.1.13.

Calibration in a random field shall be made by comparison with a standard microphone whose random field calibration is known.

3.4.1.14 Output Termination - The Sound-Level Meter shall have an output connection for use with auxiliary equipment. A maximum signal output of between 1 and 1.5 volts rms for any attenuator setting suitable for driving the "instrument" input of the Magnetic Tape Recorder shall be available at the output connection. The output impedance shall be less than 10,000 ohms.

3.4.1.15 Power Supply - The Sound-Level Meter power supply shall be a self-contained battery capable of supplying the required power to operate the instrument continuously for a minimum of 10 hours, without replacement or recharging.

3.4.1.15.1 Battery Type - The battery type shall be selected in accordance with MIL-STD-454 Requirement No. 27. If rechargeable type cells are used a charging device shall be supplied as an accessory.

3.4.1.15.2 Battery Condition Indicator - A battery condition indicator shall be built into the instrument to indicate a battery condition capable of supplying sufficient power to operate the Sound-Level Meter.

3.4.1.16 Effects of Wind - Provisions shall be incorporated to minimize the effects of wind on the Sound-Level Meter performance.

3.4.1.17 Auxiliary Calibration - Simplified procedures, tests or measurements which can be used to determine any change in the relative response of the instrument shall be designated. Devices to facilitate this requirement may be built into the Sound-Level Meter.

3.4.2 Octave-Band Analyzer -

3.4.2.1 Amplifier- The Octave-Band Analyzer amplifier shall meet the requirements of 3.4.1.2.

3.4.2.2 Band Pass Filter System -

3.4.2.2.1 Filter Type - The band pass filter system shall be a constant percentage increment type.

3.4.2.2.2 Filter Band Widths - The filter system shall consist of the band pass filters of Table V, type A or B as specified by the procuring activity. The pass bands shall be one octave each with the indicated geometric center frequencies and bandwidths. Type A is the preferred type.

TABLE V

Type A		Type B	
Band Width (Hz)	Geometric Center Frequency (Hz)	Band Width (Hz)	Geometric Center Frequency (Hz)
22.4 - 45	31.5	37.5 - 75	53
45 - 90	63	75 - 150	106
90 - 180	125	150 - 300	212
180 - 355	250	300 - 600	424
355 - 710	500	600 - 1200	848
710 - 1400	1000	1200 - 2400	1696
1400 - 2800	2000	2400 - 4800	3392
2800 - 5600	4000	4800 - 9600	6784
5600 - 11200	8000		

3.4.2.2.3 Insertion Loss vs Frequency of the Individual Filters - The minimum insertion loss for any filter is the minimum value that the insertion loss has, over the frequency range from zero to infinity. The insertion loss for the individual filters shall be as specified below and represented in Figure 2.

Between 1.10 times the lower nominal cutoff frequency and 0.9 times the upper nominal cutoff frequency, the insertion loss of the filter shall be within 3 dB of the minimum insertion loss.

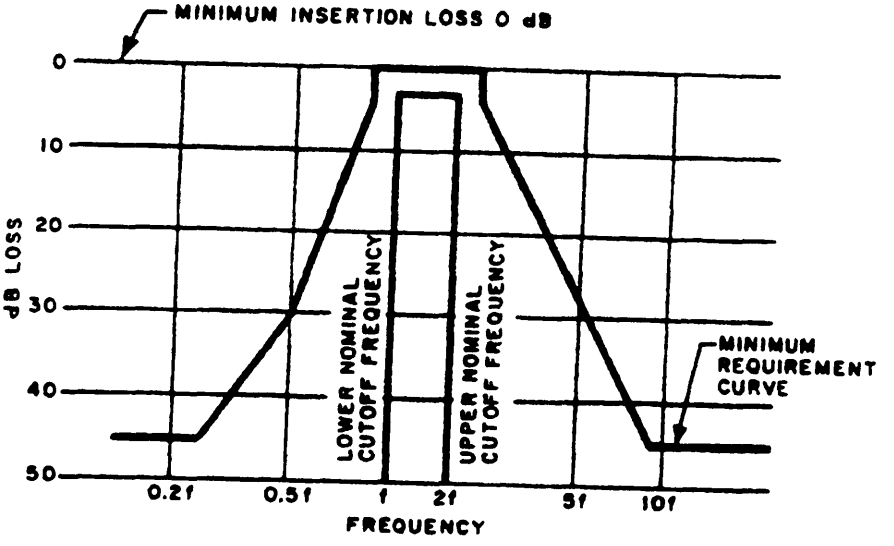

Figure 2. Insertion Loss (Minimum Requirement Curve)

At a frequency of 0.9 times the lower nominal cutoff frequency, the insertion loss of the filter shall be at least 4 dB greater than the minimum insertion loss.

At a frequency of 0.5 times the lower nominal cutoff frequency, the insertion loss of the filter shall be at least 30 dB greater than the minimum insertion loss.

At any frequency between 0.9 and 0.5 times the lower nominal cutoff frequency, the insertion loss of the filter shall exceed the minimum insertion loss by at least the ordinate of a curve which is a straight line when insertion loss in decibels in plotted against the logarithm of the frequency. This line joins the points: 4 dB at 0.9 times the nominal cutoff frequency, and 30 dB at 0.5 times the lower nominal cutoff frequency.

At any frequency between 0.5 and 0.25 times the lower nominal cutoff frequency, the insertion loss of the filter shall exceed the minimum insertion loss by at least the ordinate of a curve which is a straight line when insertion loss in decibels is plotted against the logarithm of the frequency. This line joins the points: 30 dB at 0.5 times the lower nominal cutoff frequency, and 45 dB at 0.25 times the lower nominal cutoff frequency.

At any frequency equal to or less than 0.25 times the lower nominal cutoff frequency, the insertion loss of the filter shall be at least 45 dB greater than the minimum insertion loss.

At a frequency of 1.10 times the upper nominal cutoff frequency, the insertion loss of the filter shall be at least 4 dB greater than the minimum insertion loss.

At any frequency between 1.10 and 4.51 times the upper nominal cutoff frequency, the insertion loss of the filter shall exceed the minimum insertion loss by at least the ordinate of a curve which is a straight line when insertion loss in decibels is plotted against the logarithm of the frequency. This line joins the points: 4 dB at 1.10 and 45 dB at 4.50 times the upper nominal cutoff frequency.

At any frequency equal to or greater than 4.50 times the upper nominal cutoff frequency, the insertion loss of the filter shall be at least 45 dB greater than the minimum insertion loss.

3.4.2.2.4 Minimum Insertion Loss Deviations - The minimum insertion loss of any band filter shall not differ from the minimum insertion loss of any other band filter, by more than 2 dB. If this difference exceeds 2 dB, conformance with this specification may be achieved by determining the difference by measurement to an accuracy of ±0.5 dB and supplying this correction information for the instrument.

3.4.2.2.5 Tolerances on Bandwidth - The ratio of the two frequencies at which the insertion loss of the filter is 4 dB greater than the minimum insertion loss, shall be no greater than 2.2 or no less than 1.8.

3.4.2.2.6 Selection of Filter - Provisions shall be incorporated in the filter set whereby any one of the separate band pass filters can be selected.

3.4.2.2.7 Removal of Filter from Circuit - Provisions shall be incorporated in the filter set whereby all band pass filters may be removed from the circuit, and the electrical signal at the input will be transferred to the output of the filter by means of a broad band circuit (including matching transformers or amplifiers if necessary). This circuit insertion loss shall be uniform within ±1 dB over the range from 30 to 4000 Hz and within ±3 dB over the range from 30 to 10,000 Hz. The insertion loss of this circuit in the nominal pass band of any of the bands shall be within 3 dB of the minimum insertion loss of that filter band.

3.4.2.3 Calibrated Attenuator - The calibrated attenuator shall meet the requirements of 3.4.1.3.

3.4.2.4 Indicator (Meter) - The indicator shall meet the requirements of 3.4.1.4.

3.4.2.5 Inputs -

3.4.2.5.1 Microphone - A high gain input for use with a microphone, shall be provided.

3.4.2.5.2 Sound-Level Meter - An input compatable with the Sound-Level Meter output, shall be provided. A cable for connecting the output of the Sound-Level Meter to the Octave-Band Analyzer shall be provided as an accessory.

3.4.2.6 Output Termination - The output termination shall meet the requirements of 3.4.1.14.

3.4.2.7 Power Supply - The power supply shall meet the requirements of 3.4.1.15.

3.4.3 Magnetic Tape Recorder -

3.4.3.1 Recording Medium - The recording medium shall be instrument quality, one-quarter inch magnetically coated 1 or 1-1/2 mil Mylar base tape wound on five or seven inch diameter standard National Association of Broadcasters' reels.

3.4.3.2 Tape Speed - The recorder shall be capable of recording and reproducing at two tape speeds, 7.5 ±0.1 ips (inches per second) and 15 ±0.2 ips.

The speeds shall be electronically stabalized and unaffected when tested in accordance with 4.6.6.1, 4.6.6.2, 4.6.7, 4.6.8. and 4.6.10.

3.4.3.3 Tracks - The recorder shall record the input signal on one track covering the full tape width.

3.4.3.4 Erasure - Erasure of the tape shall occur automatically during the recording process in such a manner that the full width of the tape shall be erased prior to reaching the recording head.

3.4.3.5 Frequency Response - The frequency response of the recorder-reproducer shall not vary more than ±1.5 dB over a frequency range of 30 to 10,000 Hz at a tape speed of 7.5 ips and 50 to 12,000 Hz at a tape speed of 15 ips.

3.4.3.6 Signal to Noise - The overall signal to noise ratio shall not be less than 45 dB.

3.4.3.7 Wow and Flutter - The wow and flutter components of the recorded signal shall not exceed ±0.2 percent peak-to-peak at 15 ips and ±0.4 percent peak-to-peak at 7.5 ips.

3.4.3.8 Inputs - Two separate switch selective inputs, each with its own gain control shall be provided. The inputs shall be such that both a microphone and an external instrument may be connected to the recorder at the same time, and the recording medium may be alternately switched from "microphone" to "instrument".

3.4.3.8.1 Microphone - The microphone input shall be a high gain input.

3.4.3.8.2 Instrument - The instrument input shall be compatable with the output of the Sound-Level Meter. A cable for connecting the output of the Sound-Level Meter to the "instrument" input of the Magnetic Tape Recorder shall be provided as an accessory.

3.4.3.9 Power Supply - The tape recorder power supply shall be either self-contained or an auxiliary power pack capable of supplying the required power to operate the recorder continuously for a minimum of 4 hours without the use of external power, replacement of batteries, or recharging.

3.4.3.9.1 Battery type - The battery type shall meet the requirements of 3.4.1.15.1.

3.4.3.9.2 Battery Condition Indicator - A battery condition indicator shall be built into the recorder or power pack to indicate a battery condition which is capable of supplying sulficient power to operate the recorder.

3.5 External Field Influence - Provisions shall be incorporated to minimize the effects of ambient magnetic and electric fields on the Sound-Level

Measuring and Analyzing Equipment performance. Complete metallic enclosures with additional shielding where required shall be used for instrument housing. Microphone wiring shall be shielded.

3.6 Temperature Range -

3.6.1 Operating - The Sound-Level Measuring and Analyzing Equipment shall meet the performance requirements of this specification at any temperature from -10° to 140° F.

3.6.2 Non-operating - With the batteries or power packs removed, the Sound-Level Measuring and Analyzing Equipment, shall not be damaged when exposed to any temperature between -40°F and 194°F.

3.7 Relative Humidity Range - The Sound-Level Measuring and Analyzing Equipment shall meet the performance requirements of this specification at any relative humidity between 0 and 90 percent.

3.8 Atmospheric Pressure Range - The Sound-Level Measuring and Analyzing Equipment shall meet the performance requirements of this specification at any atmospheric pressure down to 11.10 inches of mercury (25,000 ft).

3.9 Shock - The Sound-Level Measuring and Analyzing Equipment, while not operating, shall be capable of withstanding impact shocks of 15g acceleration of 11 ±1 milliseconds time duration, without damage.

3.10 Vibration - The Sound-Level Measuring and Analyzing Equipment shall meet the performance requirements of this specification while subjected to a sinusoidal vibration of 0.010 inch double amplitude at frequencies between 5 and 55 Hz.

3.11 Workmanship - Workmanship shall be in accordance with MIL-STD-454, Requirement No. 9.

4 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - Unless otherwise specidied in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of Inspection - Inspection of the Sound-Level Measuring and Analyzing Equipment shall be classified as follows:

(a) Preproduction Inspection - Preproduction inspection consists of examination and tests performed after award of contract on sample Sound-Level Measuring and Analyzing Equipment to determine that the equipment meets the requirements of this specification. The sample shall be representative in design, performance, and configuration of the equipment which will be produced on the manufacturer's production line.

(b) Quality Conformance Inspection - Quality conformance inspection consist of examination and tests performed on Sound-Level Measuring and Analyzing Equipment manufactured and submitted for acceptance, under contract.

4.3 Preproduction Inspection - The preproduction inspection of the Sound Level Measuring and Analyzing Equipment shall consist of all of the applicable examinations and tests of this specification, performed in the order specified under 4.6.

4.3.1 Preproduction Inspection Sample - The preproduction inspection sample shall consist of one Sound-Level Meter, one Octave-Band Analyzer, one Magnetic Tape Recorder and one set of accessories manufactured in accordance with this specification. The sample shall be forwarded, at the manufacturer's expense, for preproduction inspection, to the laboratory designated by the procuring activity.

4.3.1.1 Preproduction Inspection Sample Identification - The preproduction inspection sample shall be plainly identified by durable tags, securely attached, and marked with the following information:

Sample for Preproduction Inspection
(Name of equipment)
Submitted by (Manufacturer's name, date) for
Preproduction Inspection in accordance with
Specification MIL-S-3151 under contract number _____
or order number _____.
Manufacturer's Part Number _____.

4.4 Quality Conformance Inspection - The quality conformance inspection shall consist of the individual inspections of this specification.

4.4.1 Individual Inspections - Each item submitted for acceptance shall be subjected to the Individual Inspections. These inspections shall determine

compliance with the requirements of material, workmanship and operational adequacy. As a minimum each instrument accepted shall have passed the inspections indicated.

4.4.1.1 Sound-Level Meter Inspections -

Examination of product	4.6.1
Acoustic range	4.6.2
Calibrated attenuator and indicating meter	4.6.3
Temperature tests	4.6.6
Humidity tests	4.6.7
Atmospheric pressure tests	4.6.8
Shock	4.6.9
Vibration	4.6.10

4.4.1.2 Octave-Band Analyzer Inspections -

Examination of product	4.6.1
Calibrated attenuator and indicating meter	4.6.3
Filter insertion loss characteristic	4.6.4
Response of individual bands	4.6.5
Temperature tests	4.6.6
Humidity tests	4.6.7
Atmospheric pressure tests	4.6.8
Shock	4.6.9
Vibration	4.6.10

4.4.1.3 Magnetic Tape Recorder Inspections -

Examination of product	4.6.1
Temperature tests	4.6.6
Humidity tests	4.6.7
Atmospheric pressure tests	4.6.8
Shock	4.6.9
Vibration	4.6.10

4.5 Inspection Conditions -

4.5.1 Standard Conditions - Unless otherwise specified, all inspections required by this specification shall be made under the following conditions:

Temperature	Room ambient 25 ±5° C
Pressure	Normal atmospheric (approx. 29.92 inches Hg)
Humidity	Room ambient 40 to 90 percent relative humidity

4.5.2 Attitude - Unless otherwise specified the Sound-Level Measuring and Analyzing Equipment shall be tested in its normal operating position.

4.6 ~~Inspection Methods~~ -

4.6.1 Examination of Product - Each item of Sound-Level Measuring and Analyzing Equipment shall be examined to determine conformance with the requirements of this specification not covered by tests.

4.6.2 Acoustic Range - Unless specified otherwise by the procuring activity, the range of the Sound-Level Meter shall be tested by coupler calibration, to the requirements of 3.4.1.6.

4.6.3 Calibrated Attenuator and Indicating Meter - The accuracy of the calibrated attenuator shall be determined as follows. With the attenuator set at zero attenuation, introduce to the amplifier input, a sinusoidal 1000 Hz test voltage that will cause a measurable reading on the indicator. Increase the test voltage by exactly 5 dB. The reading on the indicator should increase by 5 ±0.5 dB. By use of the calibrated attenuator, attenuate this test signal by 10 dB. Increase the test signal by exactly 10 dB. The meter pointer should return to the same point within ±0.5 dB. Repeat this for all the settings of the attenuator.

4.6.4 Filter Insertion Loss Characteristics - The insertion loss characteristics of the filter sections and the broad band circuit shall be determined by connecting an oscillator to the input of the filter with a series impedance equal to one from which the filter set is normally expected to operate (Figure 3). The output of the audio oscillator shall be measured by a suitably accurate voltmeter. The Octave-Band Analyzer shall be terminated in its rated impedance and the output for the various filter sections shall be measured with the voltmeter. Measurements shall also be made with the source terminals 1 and 2 connected directly to terminals 3 and 4. The insertion loss is then the ratio in decibels of the two voltage measurements. The insertion loss of the filter section and the broad band circuit shall be within the limits specified in 3.4.2.2.3 and 3.4.2.2.7.

4.6.4.1 Voltage Level During Test - Initially, the operating voltage shall be kept below the maximum operating level but it shall be high enough so that noise in the system and stray pickup do not significantly effect the results. Further, tests shall then be made to determine the range of level over which the filter set will maintain its adherence to 3.4.2.2.3 and 3.4.2.2.7.

4.6.4.2 Substitution Method - A substitution method (Figure 4) is an acceptable alternate method for determining insertion loss. A calibrated adjustable attenuator properly terminated may be used to read insertion loss directly, when the attenuator is adjusted so that for a given signal the readings on the voltmeter

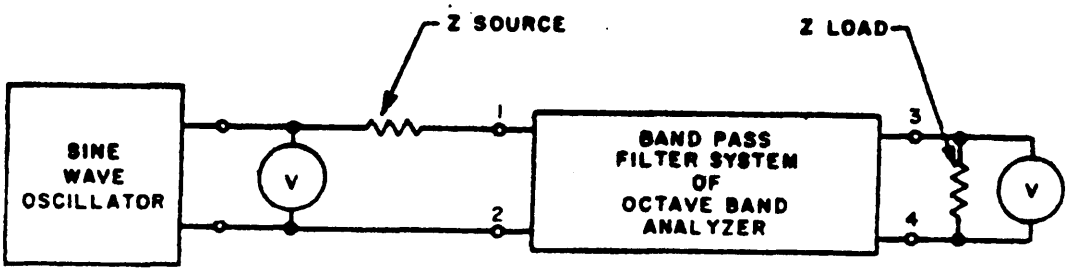

Figure 3. Insertion Loss Test Arrangement for Filter System of Octave Band Analyzer

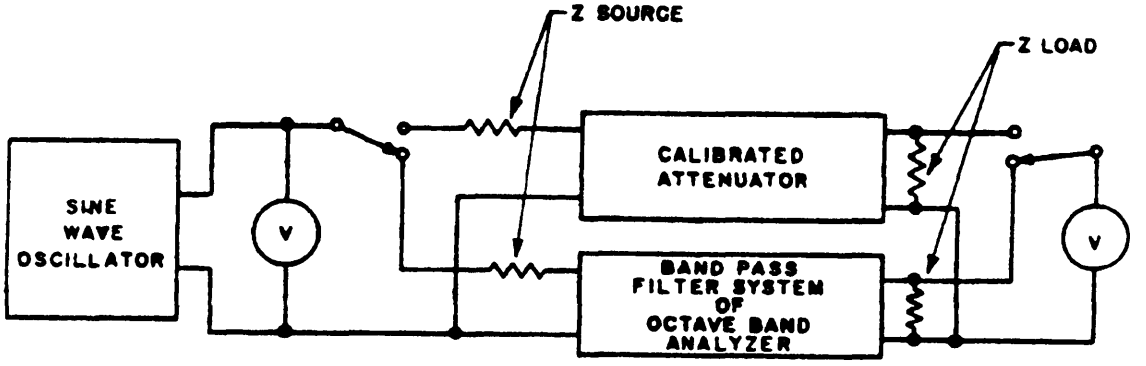

Figure 4. Alternate Insertion Loss Test Arrangement for Filter System of Octave Band Analyzer

produced by the filter and the attenuator, are identical. This substitution method avoids the need for accurately calibrated voltmeters with wide ranges of sensitivities.

4.6.5 Response of Individual Bands - When the response of the individual bands is checked at frequencies below the pass band, a suitable technique shall be employed for removing the effects of oscillator harmonics from the apparent response of the filter, unless the oscillator source voltage has less than 0.1 percent harmonic distortion. A tuned voltmeter or wave analyzer at the output of the filter is not to be used for removing these effects, since it would also be removing any distortion or noise introduced by the filter set, which should properly be ascribed as an analysis error of the set.

4.6.6 Temperature Tests -

4.6.6.1 High Temperature Operating - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272, High Temperature Tests Procedure II, except that the temperature shall be 140°F. At the time specified in the test procedure the equipment shall be operated continuously for at least one hour.

4.6.6.2 Low Temperature Operating - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272, Low Temperature Tests Procedure I, except that the temperature shall be -10°F. At the time specified in the test procedure the equipment shall be operated continuously for at least one hour.

4.6.6.3 Cycling, non-operating - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272, Temperature Shock Tests, Procedure I, except that the upper temperature shall be 194° F, and the time allowed for transfer between chambers may be extended to 8 hours. Batteries or power packs may be removed from the equipment and need not be subjected to this test. Within 24 hours after the completion at the temperature cycling, the equipment shall be returned to standard temperature, removed batteries or power packs shall be replaced, and the equipment shall be operated continuously for at least one hour.

4.6.7 Humidity Tests - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272, Humidity Tests Procedure I, except that the test temperature shall not exceed 140° F, the humidity shall be 90 percent and the number of cycles shall be 3. During each cycle at 90 percent humidity the equipment shall be operated continuously for at least one hour.

4.6.8 Atmospheric Pressure Tests - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272, Altitude Tests Procedure VI Condition C, except that the temperature shall be -10°F and the pressure 11.10 In. Hg(25000 ft.) The equipment shall be maintained under these conditions for at least 2 hours. At the conclusion of this period and while temperature

and pressure conditions are maintained the equipment shall be operated continuously for at least one hour.

4.6.9 Shock tests - The Sound-Level Measuring and Analyzing Equipment shall be tested in accordance with MIL-E-5272 Shock Tests Procedure V, except that the equipment shall not be operated during the test and the Equipment Crash-Safety portion of the test shall be excluded.

4.6.10 Vibration Tests - While interconnected as a system, the Sound-Level Measuring and Analyzing Equipment shall be mounted on a vibration table. All powered units shall be turned on and operated simulating actual usage conditions. While operating, the equipment shall be successively vibrated along each of three mutually perpendicular planes, for a period of 30 minutes in each plane. The vibration shall be sinusoidal 0.010 inch double amplitude varying in frequency from 5 to 55 and back to 5 Hz in 15 minute cycles. The rate of change in frequency shall be logarithmic. During the test all units shall be monitored to determine proper operation and performance.

4.7 Rejection - Failure of the equipment to meet the performance requirements of this specification when subjected to the tests specified herein, shall be cause for rejection.

5. PREPARATION FOR DELIVERY

5.1 Packaging - Each Sound-Level Measuring or Analyzing Instrument including its accessories if any, shall be individually packaged in accordance with MIL-STD-794 Level A, unless otherwise specified in the contract or purchase order.

5.2 Precautionary Marking - The following precautionary markings shall appear on two opposite sides of each package and shipping container.

FRAGILE
DELICATE INSTRUMENT
HANDLE WITH CARE

6. NOTES

6.1 Intended Use - This equipment is intended for use in determining the level and composition of acoustical noise in personnel occupied spaces of aircraft.

6.2 Ordering Data - Procurement documents should specify the following:

(a) Title, number and date of this specification

(b) Contract number

(c) Filter band widths and center frequencies (Type A or B 3.4.2.2.2)

(d) Disposition of test samples

(e) Level of packaging

Custodians:
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Air Force - 11

Review activities:
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Air Force - 11

User activities:
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Army - AV, GL

Preparing activity:
Navy - AS
(Project No. 6625-0229)

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	☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ OTHER *(Specify)*: _____
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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

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c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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