National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

ISS ACOUSTIC REQUIREMENTS AND TESTING DOCUMENT

FOR

ISS NON-INTEGRATED EQUIPMENT

Prepared By
ISS Acoustics Engineering Group
Flight Crew Support Division
Space and Life Sciences Directorate

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

March 1999

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JSC 28322

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NASA APPROVAL:

_/s/Jay Greene_____
OA/ JAY GREENE
ISS

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HOUSTON, TEXAS

March 1999

CHANGE/REVISION LOG

Date	Authority	Pages Affected	Change #	Change Description
March 1999		All	Basic	Release of basic document

TABLE OF CONTENTS

Tables

Figures

1.0 SCOPE

This document establishes the acoustic design and testing requirements for non-integrated Equipment. This document establishes the acoustic design and testing requirements for ISS hardware that is either: loose within a Module or Element; temporarily attached to Module or Element structure for structural support; or installed, with stipulations that follow. In any of these cases, the specification applies to hardware whose basic function(s) are either autonomous or if installed, is not "integrated" into the Module/Element system. This document is authorized by ISS CR Number, 1475, which defines its implementation effectivity as follows:

> Implement the SSP Acoustic Requirements in JSC 28322 on all approved non-integrated hardware that is placed on contract after the approval date of this change.

The following definitions differentiate between requirements and other statements:

Shall: This is the only verb used for the binding requirements.

Will: This verb is used for stating facts or declaration of purpose.

1.1 Configuration Management

This Acoustic Requirement Document is a “stand-alone” acoustics document for non-integrated equipment, as designated. It is controlled by the ISSP DCB.

A change proposal to this Requirement Document is required to be submitted as a Change Request to the ISS Program Office.

1.2 Classification

Not Applicable

2.0 REFERENCE AND APPLICABLE DOCUMENTS

2.1 REFERENCE NASA Documents

(The following documents are provided as reference materials for background only. In case of conflict this document shall take precedence for the equipment discussed in paragraph 1.0 Scope.)

SSP 41000 Dec 98	System Specification For the International Space Station
SSP 41172 Mar 94	Qualification and Acceptance Environmental Test Requirements
SSP 50021 Aug 96	ISS Safety Requirements Document
SSP 50158 May 95	ISS Supporting Development Implementation Document

2.2 Applicable Government Documents

(The following documents, of the date and issue shown, are applicable to the extent specified

herein.)

ISO 5335.1	JSC Quality Manual
ISO 9614-2	Acoustics - Determination of Sound Power Levels of Noise Sources using Sound Intensity - Part 2: Measuring by Scanning, (1996)
ANSI S1.4	Specification for Sound Level Meters Amendment S1.4A-1985 ASA 47 R (1994)
ANSI S1.11	Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters; ASA 65-1986 R (1993)
ANSI S12.12-1992	Engineering Method for the Determination of Sound Power Levels of Noise Sources using Sound Intensity ASA 104
ANSI S12.23-1989 (R1996)	Method for the Designation of Sound Power Emitted by Machinery and Equipment
ANSI S12.31-1990 (R1996)	Precision Methods for Determination of Sound Power Levels of Broad-band Noise Sources in Reverberation Rooms
ANSI S12.32- 1990 (R1996)	Precision Methods for the Determination of Sound Power Levels of Discrete Frequency and Narrow-band Noise Sources in Reverberation Rooms
ANSI S12.33-1990	Engineering Methods for the Determination of Sound Power Levels of Noise Sources in a Special Reverberation Test Room
ANSI S12.34-1988 (R1993)	Engineering Methods for the Determination Sound Power Levels of Noise Sources for Essentially Free-field Conditions over a Reflecting Plane
ANSI-S12.35-1990 (R1996)	Precision Methods for the Determination of Sound Power Levels of Noise Sources in Anechoic and Hemi-anechoic Rooms
ANSI-S12.36-1990	Survey Methods for the Determination of Sound Power Levels of Noise Sources

3.0 ACOUSTIC DESIGN REQUIREMENTS FOR NON-INTEGRATED EQUIPMENT

The following are specific requirements that shall be implemented for International Space Station (ISS) Non-integrated Equipment.

3.1 Acoustic Noise Definitions

3.1.1 Significant Noise Source

A significant noise source is any individual item of equipment, or group of equipment items, which collectively function as an operating system, that generates an A-weighted sound pressure level (SPL) equal to or in excess of 37 decibels (dBA), measured at 0.6 meters distance from the noisiest part of the equipment.

3.1.2 Continuous Noise Source

A significant noise source, which exists for a cumulative total of eight hours or more in any 24-hour period, is considered a continuous noise source.

3.1.3 Intermittent Noise Source

A significant noise source, which exists for a cumulative total of less than eight hours in any 24-hour period, is considered an intermittent noise source.

3.1.4 Acoustic Reference

All sound pressure levels in decibels are referenced to 20 micropascals.

3.2 Acoustic Noise Limits

The acoustic limits that shall be utilized are provided in the tables that follow. The limits apply to non-integrated equipment that is independently operated outside a payload rack. In the case of such equipment, these limits apply to measurements taken at 0.6 meters distance from the loudest part of the non-integrated equipment. Sound pressure level measurements shall be made. Sound power determinations shall also be made if the non-integrated equipment does not comply with the SPL requirements. Testing in any configuration, which will later be changed, shall be addressed in the acoustic test plan required in paragraph 3.5 below. Qualification testing will be performed in accordance with appendix A. Acoustic testing at other times will be tailored to the complexity of the hardware, through the design review process. The noise limits shall not be exceeded for the following conditions: when the equipment is operating in the loudest mode of operation that can occur on orbit under nominal crew or hardware operation circumstances; during setup operations, or during operations where doors/panels are opened or removed on that unit.

Some non-integrated equipment, which has the potential to exceed these requirements, may require an Acoustic Noise Control Plan (ANCP). If there is disagreement as to whether an ANCP is necessary, the NASA Acoustic Lead in consultation with the Acoustic Working Group personnel, shall make the final determination as to the necessity to develop an ANCP.

3.2.1 Continuous Noise Limits

Non-integrated equipment, which generates continuous noise levels, shall not exceed the limits provided in TABLE 3.2.1-1, for all octave bands. This is equivalent to NC40.

Frequency Octave Band (Hz)	Maximum Sound Pressure Level (@ 60 cm, dB re 20 µPa SPL)
63	64
125	56
250	50
500	45
1000	41
2000	39
4000	38

8000	37

TABLE 3.2.1-1 Noise Limits for Continuous Operation (or use)

These levels apply to non-integrated equipment that is operated in the noisiest configuration or operating modes, as designated in paragraph 3.2.

3.2.2 Intermittent Noise Limits

If a non-integrated equipment item meets the intermittent noise source definition as defined in paragraph 3.1.3, then the non-integrated equipment shall comply with the limits provided in TABLE 3.2.2-1.

Maximum Noise Duration Per 24-hour Period	A-weighted SPL (dBA) (dB re 20 µPa)
8 Hours	≤ 49
7 Hours	≤ 50
6 Hours	≤ 51
5 Hours	≤ 52
4 Hours	≤ 54
3 Hours	≤ 57
2 Hours	≤ 60
1 Hour	≤ 65
30 Minutes	≤ 69
15 Minutes	≤ 72
5 Minutes	≤ 76
2 Minutes	≤ 78
1 Minute	≤ 79
Not Allowed	≥ 80

TABLE 3.2.2-1 Noise Limits for Intermittent Operation (or use)

The Noise Duration is the total time that the non-integrated equipment item produces intermittent noise above the NC-40 limit during a 24 hour time period. This cumulative or total duration is the governing factor in determining the allowable Intermittent Noise Limit. Regardless of the number of separate intermittent noise sources, various levels, and durations exhibited by an intermittent equipment item, the cumulative duration shall be used to determine the corresponding A-weighted SPL limit.

For example, if an

intermittent equipment item produces 65 dBA for 30 minutes in a start-up and warm-up mode and then settles down to 60 dBA for a one hour period of normal data acquisition, the total duration is 1.5 hours. Therefore, the requirement is that the noise can be no greater than 60 dBA (determined from TABLE 3.2.2-1). In this example, the non-integrated equipment item would not meet the requirement even though two individual equipment items, one that operated at 65 dBA for 30 minutes and another that operated at 60 dBA for one hour, would be acceptable (see FIGURE 3.2.2-1, page 5).

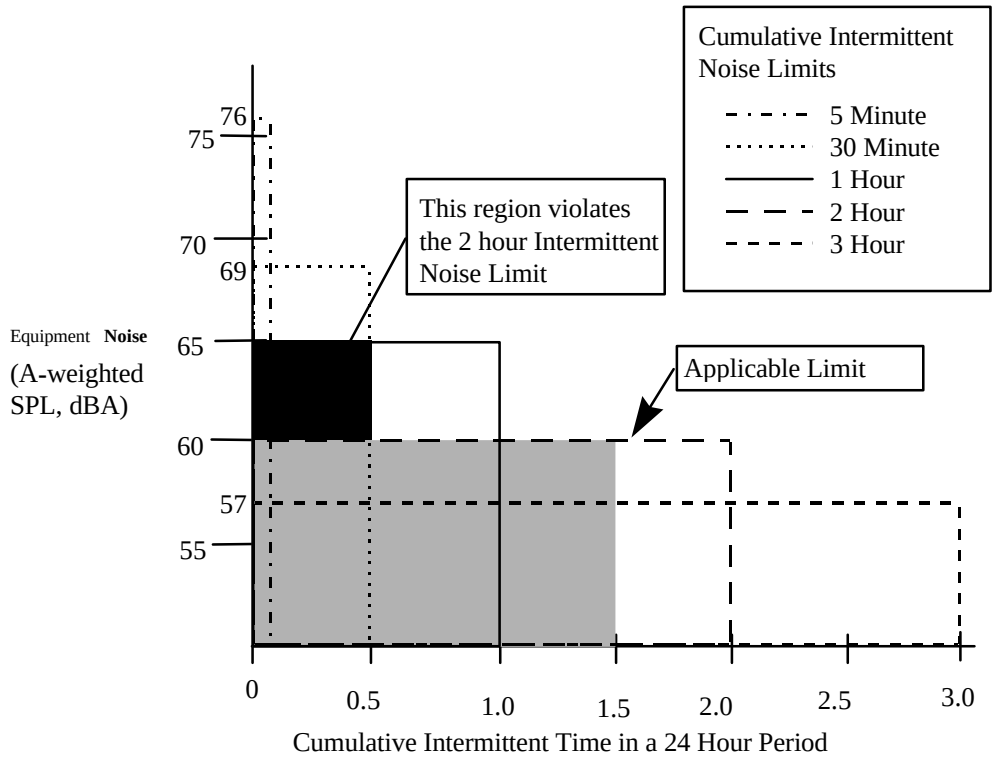

FIGURE 3.2.2-1 Intermittent Noise Example

3.2.3 Continuous non-integrated equipment With Intermittent Noise Features

Continuous non-integrated equipment, which exhibits intermittent acoustical characteristics, must meet both the continuous noise specification and the intermittent limits of paragraphs 3.2.1 and 3.2.2. The intermittent noise characteristics must be quantified in terms of:

1. when in the operation of the hardware item, the intermittent sound occurs;
2. duration;
3. a projected mission timeline(s) for items (1) and (2) and;
4. maximum A-weighted SPL measured at 0.6 meter distance from the loudest part of the equipment.

For example, any non-integrated equipment which operates less than eight hours in any one 24 hour period and generates a SPL equal to or in excess of 37 decibels (dBA) measured at 0.6 meter distance from the noisiest part of the equipment, is an Intermittent Noise Source. Non-integrated equipment which produces intermittent noise will need to ensure the cumulative time it generates intermittent noise within a 24 hour period satisfies the Intermittent Noise Limit requirements. Any non-integrated equipment which operates for more than eight hours in a 24 hour period and generates a SPL equal to or in excess of 37 decibels (dBA) measured at 0.6 meter distance from the noisiest part of the equipment is a Continuous Noise Source. Any non-

integrated equipment, which produces continuous noise, will be allowed to operate under certain conditions: 1.) if the non-integrated equipment noise level always stays below NC-40, or 2.) if the cumulative time it generates noise above NC-40 during a 24 hour period satisfies the Intermittent Noise Limit requirements (see FIGURE 3.2.3-1,below).

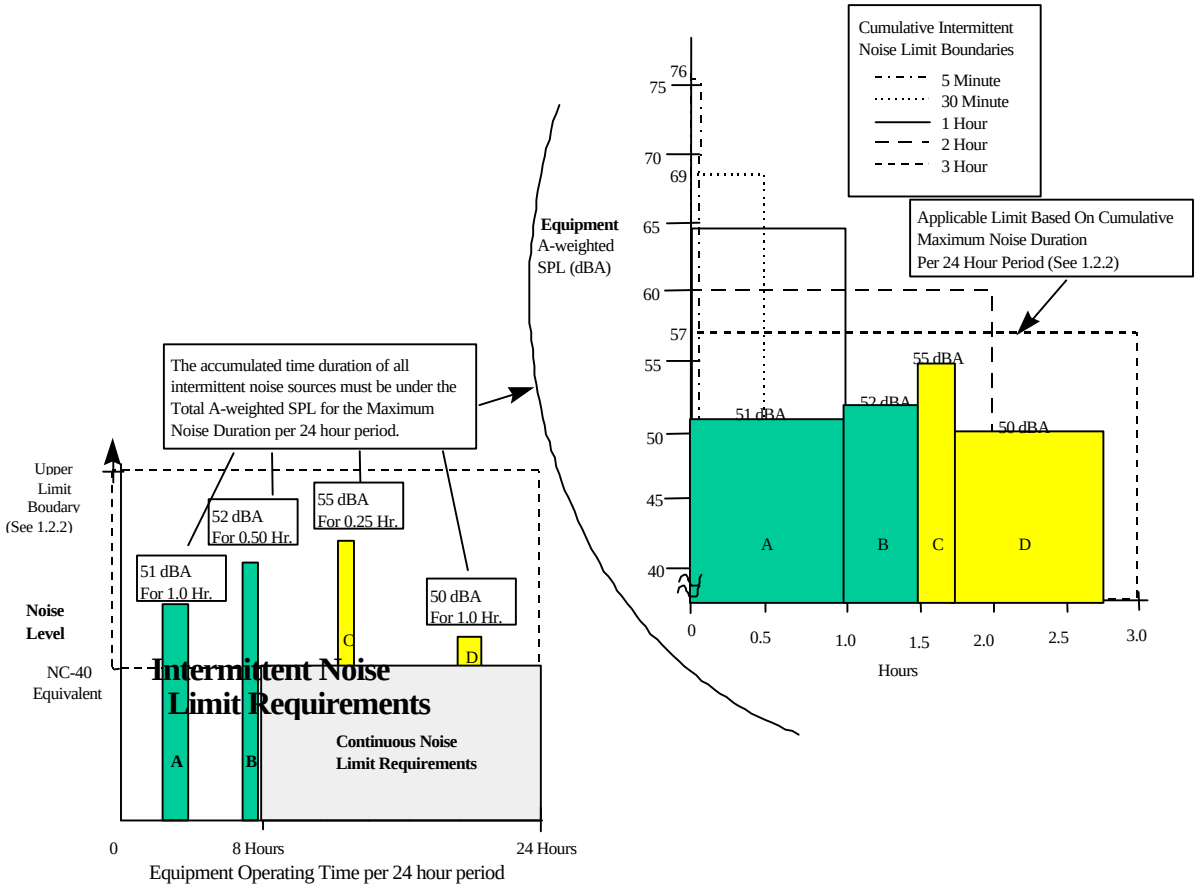

FIGURE 3.2.3-1 Non-integrated equipment Continuous Noise Source with Intermittent Noise Features

3.3 Acoustical Verification Measurements

Acoustic measurements of continuous and intermittent equipment shall be obtained by test and reported in accordance with procedures specified in Appendix A.

3.4 Sound Power Determination

The requirements, which have been previously designated, have been stated in terms of sound pressure levels. Non-integrated equipment that complies with these sound pressure level requirements will not have to be subjected to sound power determination. The additional acoustic measurement information (Sound Power (SP)) is required for mission planning and overall acoustic analysis purposes of non-integrated equipment that exceed acoustic requirements.

These non-integrated equipment sound power levels shall be submitted as part of the verification data package. Sound power determination shall be performed in accordance with the appropriate standards on acoustics.

Reference the following standards, listed as Government documents in paragraph 2.2. (ISO and ANSI documents)

3.5 Acoustic Test Plan

An acoustic noise measurement test plan for the non-integrated equipment, which defines the test configuration and operating modes, shall be generated. The testing should agree with the Acoustic Noise Control Plan, if applicable. Configurations to be tested shall be in compliance with the description of limits designated in section 3.2 above. Test plans shall be submitted for review by the ISS Acoustic Working Group, prior to testing.

3.6 Line replaceable Units (LRU'S)

In-flight replacement unit's (LRU'S) shall be allocated acoustic limits compatible with the equipment, as an assembly. These components will be screened to these limits prior to manifesting.

3.7 Precedence

In the event of conflict between requirements of higher level documents, the order of precedence shall be this document JSC 28322, then SSP 41000, System Specification for the International Space Station JSC

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General

4.1.1 Test and Verifications

Verification per ISO 5335.1 JSC Quality Manual

Appendix A

Noise Measurement Procedures

Appendix A - Noise Measurement Procedures for ISS Non-integrated Equipment

I Background

The NASA has recognized that quieter hardware will result if the hardware developer takes the following steps: be attentive to acoustic requirements throughout the length of the program; be selective in choosing quiet prime movers (fans, pumps, etc.); establish and implement noise control plans; and do noise testing from the onset of design and continue it periodically throughout the development stages. Non-integrated equipment developers must consider the acoustic benefits of vibration isolation, equipment positioning, packaging, partitioning, encapsulation and other noise control techniques. With this in mind, the International Space Station (ISS) noise specifications strive for simplicity and commonality to help ensure uniform application throughout the non-integrated equipment development community. The prime objective is to provide hardware that complies with the noise specifications, thereby avoiding noise problems that are deemed unacceptable and too expensive to fix after equipment is designed and manufactured.

It is necessary that ISS know beforehand what the acoustic noise will be at various locations within the ISS in order to know if the acoustic environment complies with the requirements. Non-integrated equipment noise sources plays an important role in this overall ISS noise assessment. Reasonable accuracy can be obtained if these testing procedures are implemented.

High-quality acoustic noise predictions can be made if non-integrated equipment developers make sound power measurements of their hardware. Procedures for making these measurements were given in Paragraph 3.4 of this document. Sound power measurements do not require that testing be conducted in a high-fidelity mockup since they are independent of the measuring room environment.

II Purpose

The purpose of this document is to provide guidelines for the measurement of the sound pressure levels (SPL) of ISS test articles. The testing requirements contained in this procedure refer to individual stand-alone non-integrated equipment. These noise measurements will be used to verify whether or not the non-integrated equipment meets the acoustic requirements defined in this document.

III Test Room Requirements

To measure the noise of the test article, a simple test area or room will be required. The purpose of the test room is to provide an isolated area with background noise levels sufficiently lower than the noise levels produced by the test article to be measured. Ideally the background levels from continuous sources such as air conditioning should be more than 15 dB below the maximum allowable noise levels specified for the test article. The test article to be measured should produce at least three decibels above the background in each octave band to be measured. If this condition can not be achieved, it is acceptable if the test article noise levels plus the background noise levels are below the maximum allowable values provided in the acoustical specification. Sources of undesirable intermittent background noise such as computers, telephones, talking, personnel traffic in the vicinity, office machines, and public address systems shall be eliminated.

The room dimensions shall be as large as possible and the inner surfaces of the walls, floors, and ceiling shall be as acoustically-absorbent as possible. The intention of this is to reduce the strength of reflected acoustic waves. It is highly desirable that the minimum width of the room be at least six meters and in all cases at least four meters. Large acoustically-reflective articles such as bookcases, tables, filing cabinets, etc. shall be removed from the room or placed more than three meters away from the test article.

IV Orientation and Placement of The Test Article

The test article shall be placed on a small table or shall stand about one meter high near the center of the room. See Figure 1. If possible, place the surface of the test article at least two meters from the nearest wall, but do not place the test article exactly in the center of the room. Position the test article surface to be measured flush with the edge of the test stand and orient the stand so that the side surfaces of the test article are not parallel with any of the room walls.

Ancillary equipment needed to power, configure, or monitor the test equipment shall be either quieter (10db or more) than the test article or placed in another room and connected by long cable feed-through or under closed doors.

V Test Equipment and Calibration

A precision sound level meter shall be used to make the noise measurements. The Sound Level Meter shall comply with the Type 1 instruments described in the American National Standard Institute (ANSI) S1.4, Specification for Sound Level Meters Amendment S1.4A-1985 ASA 47 R(1994). For example, a Bruel & Kjaer Type 2230 SLM would be a suitable instrument. The

SLM provides a microphone preamplifier and the A-weighting filter that is needed; however, the B&K 2230 does not provide octave-band resolution without connecting it to another device such as an octave filter set or a real-time frequency analyzer. Octave filter sets such as the B&K Type 1625 shall meet requirements established in ANSI S1.11, Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters; ASA 65-1986 R(1993). The SLM and filter set/real-time frequency analyzer shall have been certified by a recognized calibration laboratory within the prior 12 months. Immediately before and immediately after noise measurements are made on the test article, the SLM shall be calibrated with a calibrator or piston-phone that has also been certified by a recognized calibration lab during the prior 12 months.

VI Configuration of the Test Article

The test article shall be configured as specified in an approved test plan and shall be representative of how it will be operated in the ISS. The test plan will be provided to the ISS Acoustics Working Group to review the proper test configuration, before conducting the measurements.

The test article shall be operated in the mode or setting that will occur on-orbit that produces the maximum noise. The operational modes or configurations for the test article will normally be specified in a test plan previously approved by the ISS Acoustics Working Group. If this mode is not known beforehand, it can be determined by operating the test article in several candidate modes at nominally-expected parameters and making noise measurements with a hand-held sound level meter (using A-weighting), at 0.6 meters from the loudest part of the test article. These data shall be included in the data packet.

VII Data Acquisition

Acoustic data acquisition shall be performed under Quality Assurance observation and inspection. Quality Assurance inspection of the testing within this procedure shall be in accordance with the standard inspection practices of the organization performing the measurements. The person conducting the testing shall be familiar with basic techniques used to range the equipment to optimize signal-to-noise ratios without clipping data, know how to make meaningful background noise measurements, and understand the fundamentals of physical acoustics.

Using a hand-held SLM in the A-weighting mode, the test conductor shall conduct a roving survey of the non-integrated equipment at 0.6 meters away from the surface of the test article to determine the noisiest location. This location will usually be cooling fan inlets and outlets or

near pumps. In the case of measuring noise from an outlet, a microphone wind screen shall be used to prevent air turbulence noise at the microphone diaphragm.

After determining the location of maximum noise, the SLM shall be placed on a camera tripod with the microphone 0.6 meters from and pointed directly at the maximum noise area of the test article. The SLM microphone orientation switch shall be in the frontal or free-field position. The test article shall be operated in the mode to be measured.

If octave-band readings are made directly from the SLM, care shall be taken to ensure that the octave bands are not also being A-weighted by the SLM, and the SLM operator shall position himself about 0.5 meter directly behind the SLM. The octave-bands 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz shall be obtained with linear (no weighting or filtering) response. The SLM shall be set to read root-mean-square (rms), SPL, Slow meter response (1 sec integration). In cases where the SLM readout is consistently fluctuating over several decibels, the maximum value of the data fluctuations shall be reported. The linear overall (OA) and the A-weighted overall (A-wtd) readings shall also be obtained. In all readings, the lowest full-scale range setting that does not clip any of the signal to be measured shall be used.

After recording a set of readings at 0.6 meters with the test article producing noise, the test article shall be switched off in order to record the background noise with the SLM ranged at the same full-scale settings used when measuring the test article. If there are other operational modes to be measured, the test article shall be operated in each of the other modes and to obtain acoustic data. The data parameters shall be documented.

The AC output from the SLM can be connected directly to a real time spectrum analyzer with octave analysis capability to greatly facilitate the data acquisition process. A real time spectrum analyzer will permit all the frequency bands to be obtained simultaneously rather than sequentially and permit printing out all the desired data in tabular form on hard copies. If a real time spectrum analyzer is to be used it will also have to be calibration-lab certified within the past 12 months and be calibrated from the SLM with a known reference signal. Many Sound Level Meters such as the B&K 2230 will output a 1000 Hz reference tone for this purpose or a piston-phone may be used. The real time spectrum analyzer input range shall be set as low as possible without data clipping to read the output of the SLM in the OA mode, 0.6 meters from the test article when it is producing maximum noise.

Background noise measurements shall be read without reconfiguring the real time spectrum analyzer because the electronic background levels will in most cases be higher than the acoustic background levels in a quiet room if the real time spectrum analyzer has been ranged to measure

a fairly loud piece of equipment. The intention is to determine how much electronic and acoustic background exist at the settings used when making measurements of the test article. The dynamic range of the instrumentation will be sufficient to adequately measure the noise at all operational modes without changing ranges on either the SLM or the real time spectrum analyzer.

VIII Data Reporting

An example data packet format is provided at the end of this procedure to provide a sample to indicate typically how the data shall be documented. In the example it is assumed that the non-integrated equipment operates continuously and therefore must be less than NC-40 at 60 centimeters from the front of the non-integrated equipment. The following type of information shall be reported:

a. If the test article measures less than 37 dBA at 0.6 of a meter from the loudest part, part b. below is not required.

b. Adjusted octave band data (in a tabular format) measured at 0.6 of a meter from the front of the test article (or the noisiest surface). Round all SPL data to the nearest integral dB (0.5 dB shall be rounded up).

The raw octave-band data must be adjusted because it may contain unwanted amounts of background noise and the OA and A-weighted data as read from the SLM or the real time spectrum analyzer will include energy outside the frequency range of interest (where ISS acoustic requirements are concerned.)

Background adjustments for each octave band may be accomplished by employing the following equation:

$$L_{test\ article} = 10\ LOG_{10}(10^{(L_{tot}/10)} - 10^{(L_{bkg}/10)})$$

where L_{tot} = total noise measured when test article was on and

where L_{bkg} = measured background noise when test article was off.

Once background noise corrections have been made, new OA and A-weighted values need to be computed using the following equations:

$$O.A. = 10\ LOG_{10}\ (10^{(L_{63}/10)} + 10^{(L_{125}/10)} + 10^{(L_{250}/10)} + 10^{(L_{500}/10)} + 10^{(L_{1000}/10)} + 10^{(L_{2000}/10)} + 10^{(L_{4000}/10)} + 10^{(L_{8000}/10)})$$

where L_{63} = the SPL in the 63 Hz octave band and

$$A\text{-wtd} = 10\ LOG_{10}\ (10^{((L_{63} - 26.2)/10)} + 10^{((L_{125} - 16.1)/10)} + 10^{((L_{250} - 8.6)/10)} + 10^{((L_{500} - 3.2)/10)} + 10^{(L_{1000}/10)} + 10^{((L_{2000} + 1.2)/10)} + 10^{((L_{4000} + 1)/10)} + 10^{((L_{8000} - 1.1)/10)})$$

c. Raw data including background measurements.

d. Name and telephone number of test conductor.

e. Dates of testing.

f. Non-integrated equipment Part Number and Serial Numbers.

g. Type of test equipment used and calibration dates.

h. Duty cycles and duration of each mode of operation of the test article that will occur on orbit.

i. Test procedure (e.g., TPS) indicating Quality Assurance acceptances.

j. A sketch or figure of the test setup in the test room shall be included if the test conductor thinks it would help clarify under what circumstances the data were obtained.

k. Data from pre-test measurements to determine the loudest position and mode of operation.

l. A copy of the approved test plan and a list of any deviations with justifications.

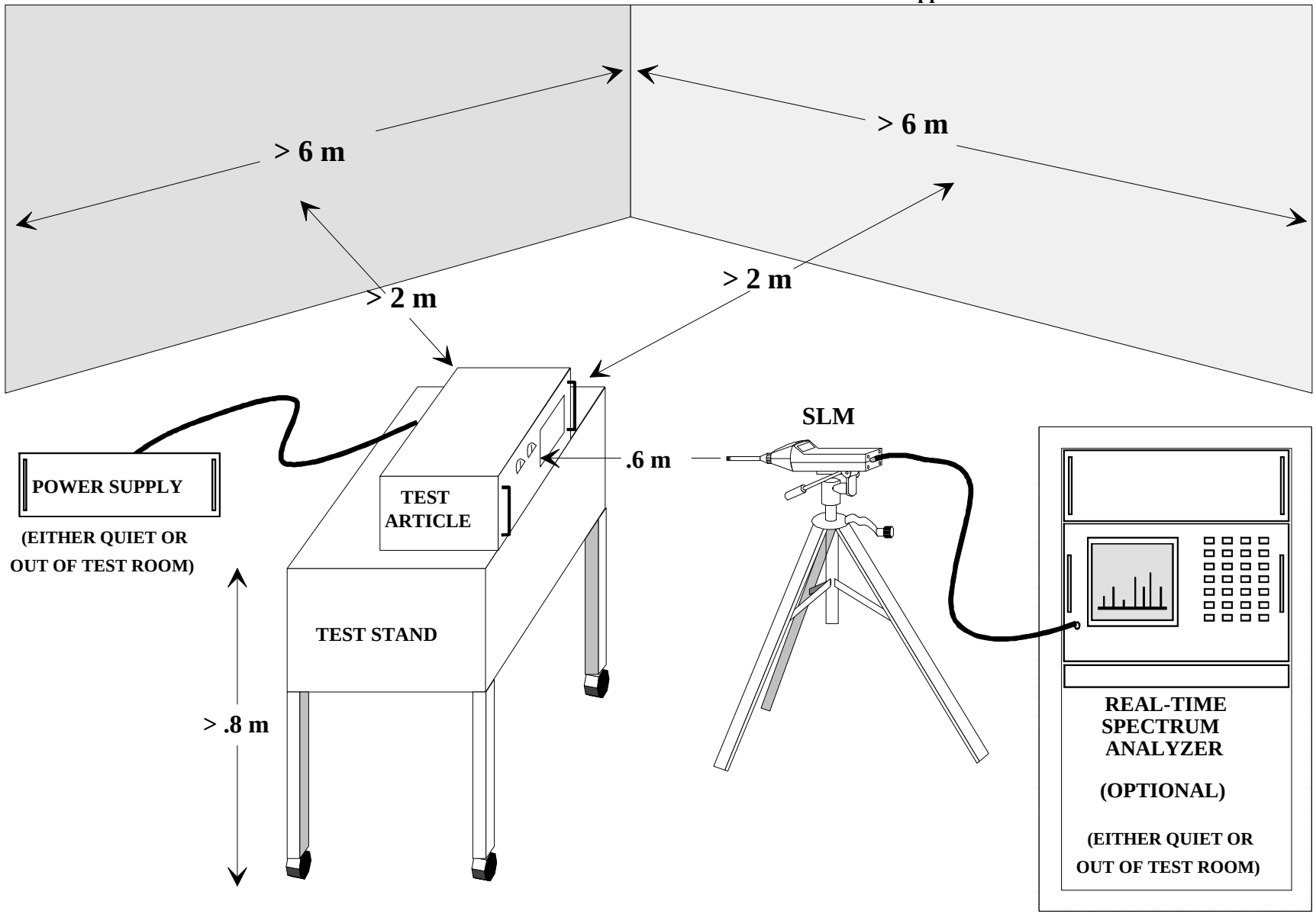

FIGURE 1 - TYPICAL TEST SETUP

VATF
Acoustic Data Packet

Test Article:	**Non-integrated Equipment**
Parts Number:	**SED39128357-301**
S/N:	**1001**
Flight:	**STS-81 Mid-deck**
Test:	**Acoustic Noise Emission**
Laboratory:	**Acoustic Quiet Room**
Facility TPS No:	**FA9720003**
Test Date:	**23 April 1997**
Report Date:	**24 April 1997**
Test Engineer:	**James L. Warnix, (281) 483-6384**

Vibration & Acoustic Test Facility
Structures & Mechanics Division
Johnson Space Center
Houston Texas

TASK PERFORMANCE SHEET

NASA - LYNDON B. JOHNSON SPACE CENTER

1 TYPE	A	CONFIGURATION		2. TPS FA9720003	3. 01 OF 02		
	PERMANE	TEMPORARY		4. MOD SHEET(S) NUMBER(S)	5. ORG ES4	6. SYSTEM ISS	7. PROJECT SD3
	B	NONCONFIGURATION	X				

8. PART NAME non-integrated Equipment	9. PART NO./DRAWING NO. SED39128357-301	10. 1001	11. TIME/CYCLE ☐ YES ☒ NO
12. APPLICABLE DOCUMENTS	13. CONTRACT NAS9-19100	14. HAZ. TEST ☐ YE ☒ N	15. ENG. ☐ YE ☒ N

16. SHORT TITLE OF TPS

Noise Emission Test of non-integrated Equipment

OPER SEQ.	17. OPERATIONS *(Print, Type, or Write Legibly)*	VERIFICATIO 18.	19.
1.	Calibrate a B&K Type 2230 Sound Level Meter (SLM) using a B&K 4228 piston-phone, and calibrate the Ono-Sokki SR-5300 real-time octave-band analyzer using the SLM's reference signal.		
2.	Turn off air handlers and other equipment as needed to reduce the background noise levels.		
3.	Determine the noisiest (A-weighted) location on the front 60 cm ± 1 cm from the test article front panel and record the data below: Front: _____ dBA Left Side (facing front): _____ dBA Back: _____ dBA Top: _____ dBA Right Side (facing front): _____ dBA Bottom: _____ dBA		
4.	Range the data acquisition equipment for maximum signal-to-noise ratio with the microphone 60 cm ± 1 cm from the noisiest location with the equipment operating in its noisiest mode.		

20. ORIGINATOR James L. Warnix	DATE 4/23/97	21. FINAL ACCEPTANCE STAMP AND DATE

APPROVALS *(Printed or Typed and Signed)*

22. TEST PROJECT ENGINEER **J. Warnix**	DATE	23. QUALITY ENGINEER	DATE
24		25	
26		27	

JSC Form 1225 (Rev Aug 96) (MS Word Aug 96)

TASK PERFORMANCE SHEET CONTINUATION PAGE NASA - LYNDON B. JOHNSON SPACE CENTER	TPS NO.	FA9720003
	MOD NO.	

OPER SEQ.	17. OPERATIONS (Print, Type, or Write Legibly)	VERIFICATION 18.	19. QA
5.	Analyze 30 seconds of noise and obtain octave-band data from 63 Hz through 8kHz at a distance of 60 cm ± 1 cm from the front of the equipment and the noisiest side if it is not the front for the following condition: All electronics ON and all fans ON.		
6.	Record background noise at each data measurement position.		
7.	Close this TPS.		

JSC Form 1225A (Rev Aug 96) (MS Word Aug 96)

Non-integrated Equipment
Acoustic Certification Test

Part Number: 39128357-301 | Serial Number: 1001
Test Location: VATF Quiet Room | Test Date: 6 Jan 97

Operational Mode: ON with all fans ON

OCTAVE BAND (Hz)	60 cm. from Front of Unit			60 cm. Acoustic Requirement
	Total Noise	Background Noise	Corrected Noise	
63	45.5	44.7	38	**64**
125	41.0	34.9	40	**56**
250	41.2	25.8	41	**50**
500	41.9	20.5	42	**45**
1k	39.2	14.5	39	**41**
2k	37.5	11.3	37	**39**
4k	34.0	11.9	34	**38**
8k	25.8	12.2	26	**37**
OA	50	45	48	**65**
A-wtd	45	24	45	**49**