VI acoustics

Virtual Instruments for Acoustics

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ACCULAB REFERENCE SOUND SOURCE MANUAL

For Laboratory and Field Noise Measurement Applications ***since 1982***
ISO 6926 / ANSI S12.5 / AHRI-250 /AMCA 300 Compliant*

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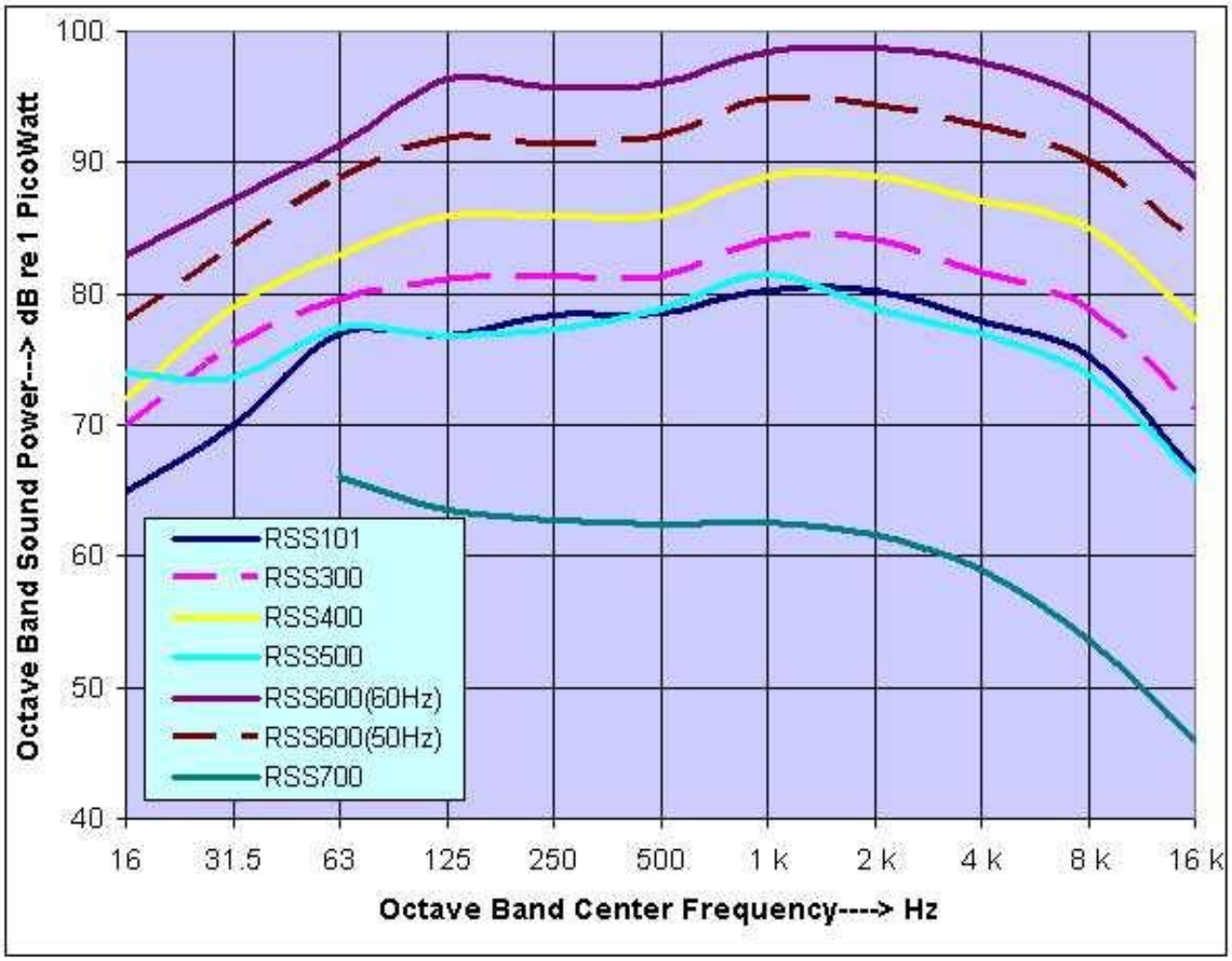
SPECIFICATIONS

NOMINAL ACOUSTICAL PERFORMANCE OVERVIEW

(See Nominal Sound Power Data section for tabular data)

Unit Type	RSS-101	RSS-400	RSS-500	RSS-600	RSS-700	RSS-101U
Applicability	Standard SPL	Higher SPL	Lower Frequency	Ultra SPL	Low SPL	Ultrasound
A-Wtd PWL dB re 1pW	86	93	86	105	65	*10kHz - 100kHz
PWL values assume 60 Hz AC power Units used with 50 Hz AC power will have lower power output						



CAUTION

1. **Keep hands and fingers, loose hanging clothing, jewelry, and access badges on lanyards well clear of fan wheel.** Clear a 6' (2m) diameter area of dust and loose paper objects since air flows out of the fan wheel perimeter onto the room floor during normal RSS operation.
2. **Plug into appropriate power source** (check specific unit specifications). The fan will start immediately. Extension cord length must be rated to support the current of your RSS.
3. **The RSS motor is thermally protected (TP):** If fan wheel ever fails to turn after electric power is applied, DISCONNECT electric power before investigating. Operation may be continuous for ambient air temperatures below 40º C. Run acoustical tests according to your program requirements. Nominal Sound Power data in 1/3-octave and octave bands is found on in this document. Check your current calibration report for data of your specific unit.
4. **Disconnect the RSS from electrical power when not in use.**
5. **Place RSS in its shipping container when not in use for extended periods.** (Storage on its side or in the RSS case will unload and prevent distortion of the resilient feet during long-term storage).

WARNING: STAY CLEAR OF UNIT WHEN OPERATING!

OPERATING INSTRUCTIONS:

WARNING: STAY CLEAR OF UNIT WHEN OPERATING!

UNPACKING-

Before placing the RSS into use, please observe the following Precautions.

1. **Remove the RSS from the case** by pulling it upward by its frame, never the fan wheel.
2. **Place it upright on its rubber feet** on a firm floor or bench. The feet isolator bolt heads should protrude above the steel plate by 1/8" – 3/16". Adjust as needed.
3. **Inspect fan wheel** for uniformity and firmness of shaft attachment. Before plugging into AC power check that the fan wheel turns freely and evenly by hand.

ACOUSTICAL APPLICATION-

Set the RSS on its feet at the desired location. Maintain its spacing from vertical surfaces according to your applicable acoustical test requirements. The floor under the RSS should be firm and not prone to act as a "sounding board" which can emit vibration induced sounds. The spring-isolated feet should prevent this for wood joist floors. If the RSS is set on an elevated flat horizontal surface that "baffle" surface should be at least 3' (1m) square or round to assure that the calibrated sound power is emitted into the test area. That baffle should not be so light (e.g. thin sheet metal) as to act as a sounding board despite the isolator spring action. If vibration induced sound is still found to be radiated from such a thin sheet, then use additional cushioning such as small foam rubber pads 1/2" to 1" thick under the feet of the RSS or use a more massive baffle plate in place of, or over, the sheet metal.

Check RPM with a tachometer or strobe and compare to the nominal values in this manual or the calibration documentation for your specific unit. If possible, operate the RSS on a variac and adjust the input voltage to match the nominal or calibrated RPM for the unit.

Generally, the RPM of an RSS will drop slightly after warming up for about 5 minutes. If the stabilized RPM is lower than expected, then the AC line voltage source may be too low, or if an extension cord is used, it may need to be shorter or have heavier gauge wire.

Operation at other RPM values can be corrected according to Corrections section of this document.

MAINTENANCE

FAN WHEEL SECURITY-After several hours of operation, inspect fan wheel for security of attachment to the shaft. There are two Allen-head screws, which secure the fan wheel to the 1/2" shaft. The first indication of looseness of these screws is a slight "rattling" sound emitted from the wheel during start-up or normal operation. Use a long 4mm hex (Allen) key carefully inserted through the fan blades to tighten these screws per the "FAN WHEEL REPLACEMENT" procedure, below.

FAN WHEEL CONDITION-The fan wheel geometry and RPM precisely determine the sound level emitted by the RSS. Fan wheel distortions and dust accumulation can alter the sound output. Dust can be removed with a dry clean brush. Be careful not to dislodge the ½" surge band located around the top inside of the fan wheel. Substantial fan wheel and surge band repairs may alter the sound field, and recalibration is advised.

FAN WHEEL REMOVAL-It is strongly advised that the fan wheel not be removed from the motor shaft. However, if maintenance procedures necessitate this, then proceed carefully as follows. Be aware that removal may require some effort since a burr may have been formed under an Allen screw on the motor shaft.

Extreme caution is necessary to avoid damaging the fan wheel, Allen screws and motor shaft. Loosen the Allen screws two turns counterclockwise. Press the fan wheel upward by hand with a few pounds (1 kG) force. If it does not come off immediately, then insert a 3/8" (9 - 12 mm) diameter rod down into the shaft hole and tap it *lightly* with a hammer while a second person lifts upward on the Fan wheel with 10 lbs (5 kG) force. When clear of the motor shaft, the wheel can be slipped upward and to the side to clear the frame. Retain and replace the lock washer spacer on the shaft. This spacer prevents contact of the Fan wheel to the motor support.

FAN WHEEL REPLACEMENT-

1. With a fine machinist's file, clear any burrs left by tightened Allen screws from the shaft's curved (not flat) surface.
2. Verify that the Allen screws are backed out far enough to clear both shaft flats.
3. Align the wheel with an Allen screw facing each flat. Slip the Fan wheel down the 1/2" motor shaft with less than 2 lbs (1 kG) force. If it binds, do **not** force it further
4. Remove it, thoroughly file all shaft burrs smooth.
5. Back out the Allen screws to clear the entire wheel bore
6. **By hand**, pass the back end of a 1/2" (12.7mm) drill bit up through motor end of the wheel bore.
7. Center the hub on the drill spiral. Rotate the drill to clear hub bore burrs
8. Try installing the Fan wheel on the shaft again. If it still does not go onto the shaft smoothly try step 4 and 6 again.

Align the fan wheel to face one set screw at the large shaft flat while the other screw falls on the lesser ground flat. Press the down on the fan wheel with about 2 pounds (1 kg) force and turn in the Allen screw on the larger flat of the shaft while rapidly rotating the fan wheel fore and aft a few degrees to assure that this Allen screw is seating on the flat's lowest point.

Torque this Allen screw to at least 30 to 40 inch-pounds (0.35 to 0.45 kg-m). Turn in the second Allen screw and torque it to 20 to 30 inch-pounds (0.25 to 0.35 kg-m). **Caution:** Allen key must be fully inserted into the Allen screw head for this final torque. Improper key seating or torque applied beyond these values will damage the Allen screw**

WARNING: STAY CLEAR OF UNIT WHEN OPERATING!

MOTOR ELECTRICAL SYSTEM-The electric motor is a capacitor start induction motor with an internally switched starting capacitor and with internal thermal protection. Service cord replacement is allowed. Use 16 gauge or heavier flexible copper service cords not more than 12 feet (3.5 m) long. Bayonet terminals are used. If installing replacement cord has lug nut connectors, use extreme caution in applying torque to the terminal screw connector-nuts. Rotation of the terminal studs will cause internal motor shorts and motor burnout. Jumper connections internal to the motor (e.g. red vs. black) shall not be changed during inspections or service wire replacement because the direction of rotation will change. **The direction of fan wheel rotation (counter - clockwise looking down into the unit) is mandatory for proper calibration**.

MOTOR SECURITY-The motor bolts and lock nuts need not normally be inspected unless repair or inspection requiring removal of the motor is performed. Upon re-assembly, torque the motor bolts and lock nuts to 8 ft-lb. (1.1 kg-m) before placing the RSS into routine use.

MOTOR LUBRICATION- Oil ports are **not** provided. This RSS motor has ball bearings that should operate quietly for at least 10 years. After 10 years if any squeaking sound is heard from the bearings, the motor end bells may be removed, and the bearings lubricated by massaging new grease into the bearing races.

CARRYING FRAME-The frame of the RSS is reinforced with lateral braces to prevent frame bending in shipment. The motor and fan should stand erect $\pm$ 3 degrees within the frame. If the motor bolts have loosened, then realign and tighten bolts per "**MOTOR SECURITY**" above. If the motor support or frame is bent, but the motor/fan wheel axis tilt is less than 4 degrees, no corrective action is necessary. Larger deformations or bent frame members should be corrected by good metal (steel) shop practices after removal motor/fan wheel as a unit by unfastening the four motor bolts. Take precautions to **NOT** apply any deforming forces to fan wheel during removal, storage, and replacement. Store motor/fan wheel on a short 1-1/2" thick board since fan wheel radius is 1-1/2" greater than motor shaft height. Replace motor/fan wheel per "**MOTOR SECURITY**".

SPRING ISOLATOR FEET: Each retainer bolt head projects above and clears the frame plate by 1/8" to 3/16" when the RSS stands on its feet. Adjust by rotating the bolt if needed.

PERIODIC ACOUSTICAL CHECK AND CALIBRATION: The RSS should produce a constant sound field indefinitely as long as proper electrical power is applied, and no damage has occurred to the unit. However, significant fan wheel or motor damage and/or dust accumulation can alter the sound power output. Dust can be removed as described in **FAN WHEEL CONDITION**.

Periodic acoustic checks of the RSS as described in ISO 6926/ANSI S12.5 section 5.6.3 at least every 6 months or any time the unit appears to have incurred damage. Units that are regularly transported to field locations may need to have the period check performed more frequently.

Recalibration according to ISO 6926 is advised when fan wheel or surge band damage have been repaired, when fan wheel RPM deviates constantly more that 1 % from the RPM reported at the calibration voltage or when more than ten (10) years have elapsed since the last calibration. Calibration should be performed in a laboratory operating in accordance with ISO 6926/ANSI S12.5, Free Field over a Reflecting Plane.

SERVICE DIFFICULTY, SHIPPING AND FACTORY REPAIRS: In case of difficulties, contact VIacoustics for further help and instructions. Do NOT load this bare-framed instrument surrounded by only bubbles or pellets, as the fan wheel can be damaged in this environment. It is recommended that RSS units be shipped in the robust carrying case/shipping container provided by VIacoustics.

WARNING: STAY CLEAR OF UNIT WHEN OPERATING!

CALIBRATION

Periodic acoustic checks of the RSS as described in ISO 6926/ANSI S12.5 section 5.6.3 at least every 6 months or any time the unit appears to have incurred damage. Units that are regularly transported to field locations may need to have the periodic check performed more frequently. A periodic check both before and after transporting the RSS assures that the RSS continues to operate at its calibrated sound power.

The periodic check should be conducted using at least four (4) fixed measurement positions relative to the RSS in the same test environment. If the standard deviation of the average of the sound pressure levels at the measurement positions of the periodic check measurements over time exceeds the values shown below, the RSS should be re-calibrated per ISO 6926/ANSI S12.5

1/3 OB Center Frequency (Hz)	Maximum Standard Deviation of Repeatability (dB)
50 Hz - 80 Hz	2.3
100 Hz – 160 Hz	1.1
200 Hz – 20 kHz (or max frequency of use)	0.6

Recalibration according to ISO 6926 is advised when fan wheel or surge band damage has been repaired, when fan wheel RPM deviates constantly more that 1 % from the RPM reported at the calibration voltage or when more than ten (10) years have elapsed since the last calibration. Calibration should be performed in a laboratory that is accredited per ISO 17025 and conducting the calibration in accordance with ISO 6926/ANSI S12.5, Free Field over a Reflecting Plane.

NOMINAL SOUND POWER DATA

	Nominal Sound Power (dB re 1 pW): RSS 101 Series ***ISO 6926 compliant in the 100 Hz - 8 kHz range**	
1/3 Octave Band (Hz)	**Sound Power 60 Hz AC**	**Standard Deviation**
50	75	0.3
63	72	0.6
80	70	0.1
100	70	0.1
125	71	0.2
160	72	0.1
200	72	0.1
250	72	0.1
315	72	0.2
400	72	0.2
500	73	0.2
630	73	0.2
800	73	0.3
1000	75	0.3
1250	76	0.2
1600	75	0.2
2000	75	0.2
2500	73	0.2
3150	72	0.2
4000	72	0.2
5000	72	0.3
6300	71	0.3
8000	69	0.2
10000	65	0.2
12500	62	0.2
16000	59	0.3
20000	57	0.4
dBA	**85**	**0.2**
RPM	**3553**	**0.2**

OTHER SPECIFICATIONS

Size: 240 x 240 x 410 mm (10" x 10" x 16")

Weight: 12 kg (26 lbs.)

Electrical Source: 115 V AC, 5.6 A - 230 V and 50 Hz options available

Nominal Sound Power (dB re 1 pW): RSS 400 Series		
1/3 Octave Band (Hz)	**Sound Power 60 Hz AC line frequency**	**Standard Deviation**
50	79	0.3
63	77	0.7
80	77	0.5
100	78	0.6
125	79	0.5
160	79	0.5
200	80	0.6
250	80	0.7
315	80	0.8
400	79	1.0
500	79	0.4
630	80	0.4
800	81	0.5
1000	83	0.4
1250	83	0.4
1600	84	0.5
2000	83	0.4
2500	82	0.4
3150	81	0.5
4000	80	0.5
5000	80	0.5
6300	79	0.5
8000	78	0.7
10000	75	1.2
12500	72	0.9
16000	69	1.3
20000	67	1.3
dBA	93	0.7
RPM	3425	46.5

OTHER SPECIFICATIONS

Size: 240 x 240 x 410 mm (10" x 10" x 16")
Weight: 12 kg (26 lbs.)
Electrical Source: 115 V AC, 8.5 A
230 V and 50 Hz options available

Nominal Sound Power (PWL): RSS 500 Series			
1/3 Octave Band (Hz)	**Sound Power (dB re 1 pW)**	**Octave Band (Hz)**	**Sound Power (dB re 1 pW)**
50	73		
63	73	63	78
80	73		
100	72		
125	72	125	77
160	72		
200	72		
250	72	250	77
315	73		
400	74		
500	74	500	79
630	75		
800	77		
1000	77	1000	82
1250	76		
1600	75		
2000	74	2000	79
2500	73		
3150	73		
4000	72	4000	77
5000	72		
6300	71		
8000	69	8000	74
10000	66		
12500	63		
16000	61	16000	66
20000	59		
A-Weighted PWL: 85.7 dB(A) re 1 pW			

OTHER SPECIFICATIONS

Size: 330 x 330 x 380 mm (13" x 13" x 15")
Weight: 13 kg (29 lbs.)
RPM: 1725
Electrical Source: 115 V AC, single phase, 60 Hz, 5.8 A
230 V and 50 Hz options available

Nominal Sound Power (PWL): RSS 600 Series			
1/3 Octave Band (Hz)	**Sound Power (dB re 1 pW)**	**Octave Band (Hz)**	**Sound Power (dB re 1 pW)**
50	87		
63	85	63	91
80	87		
100	90		
125	90	125	95
160	90		
200	90		
250	89	250	94
315	89		
400	89		
500	89	500	95
630	91		
800	92		
1000	93	1000	97
1250	93		
1600	93		
2000	93	2000	98
2500	93		
3150	93		
4000	92	4000	96
5000	90		
6300	90		
8000	88	8000	93
10000	86		
12500	84		
16000	82	16000	87
20000	80		
A-Weighted PWL: 104.4 dB(A) re 1 pW			

OTHER SPECIFICATIONS

Size: 330 x 330 x 380 mm (13" x 13" x 15")
Weight: 23 kg (50 lbs.)
RPM: 3470
Electrical Source: 230 V AC, single phase, 60 Hz, 13 A

Nominal Sound Power (PWL): RSS 700 Series			
1/3 Octave Band (Hz)	**Sound Power (dB re 1 pW)**	**Octave Band (Hz)**	**Sound Power (dB re 1 pW)**
50	62		
63	60	63	66
80	60		
100	59		
125	59	125	64
160	58		
200	58		
250	58	250	63
315	58		
400	58		
500	58	500	63
630	57		
800	58		
1000	58	1000	63
1250	58		
1600	57		
2000	57	2000	62
2500	57		
3150	55		
4000	54	4000	59
5000	53		
6300	51		
8000	49	8000	54
10000	46		
12500	43		
16000	41	16000	46
20000	37		
A-Weighted PWL: 67.8 dB(A) re 1 pW			

OTHER SPECIFICATIONS

Size: 240 x 240 x 410 mm (10" x 10" x 16")
Weight: 12 kg (26 lbs.)
Electrical Source: 115 V AC, 5.6 A or 230 V AC, 2.8 A
230 V and 50 Hz options available

CORRECTIONS

Nominal values are corrected for Reference Meteorological Conditions and have been adjusted for air absorption at the time of the calibration per ISO 3745/ANSI S12.55 Equation 19 and ISO 9613-1:1993. Actual RSS sound power level emitted at a test site will depend on temperature, barometric pressure, and humidity at the test site. Adjustments to the calibrated sound power can be calculated as described in ISO 3745 Equation 16 and ISO 9613-1.

The table below may be used to correct for variance between RPM read from a tachometer or strobe and the RPM stated in calibration documentation. Or, if available, a variable transformer may be used adjust the input AC voltage as to obtain the RPM stated in calibration documentation.

Frequency Range:	12 – 40 Hz	50 – 160 Hz	200 – 10,000 Hz
test RPM - cal RPM	Correction, dB		
+30	+o.1	+o.2	+o.3
+20	+o.1	+o.2	+o.2
+10	-0-	+o.1	+o.1
Cal RPM ( )	-0-	-0-	-0-
-10	-0-	-o.1	-o.1
-20	-o.1	-o.2	-o.2
-30	-o.1	-o.2	-o.3

1. Measure the RPM with an optical tachometer or strobe
2. If the observed RPM that occurred during your test departed more than 10 RPM from the value at calibration, then correct the sound power values according to the following table. The emitted sound power of the RSS unit increases at higher fan RPM and decreases at lower fan RPM.