426A12

Outdoor Preamplifier and Power Supply
Technical Reference Manual

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Larson Davis Model 426A12

Outdoor Preamplifier and Power Supply

(Including 426A12-FF and 426A12-RI)

Technical Reference Manual

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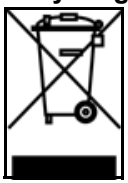

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CHAPTER

1 Introduction

About This Manual

This manual has two chapters and one appendix covering the following topics:

Chapters

- **Chapter 1 - Introduction:** Orients the user to the contents of this user manual and the 426A12 features, functions and measurement capabilities
- **Chapter 2 - Setup and Operation:** Describes the setup and operation of the 426A12
- **Appendix A - Technical Specifications:** Provides a listing of acoustic, electronic, environmental and physical characteristics of the 426A12

Description

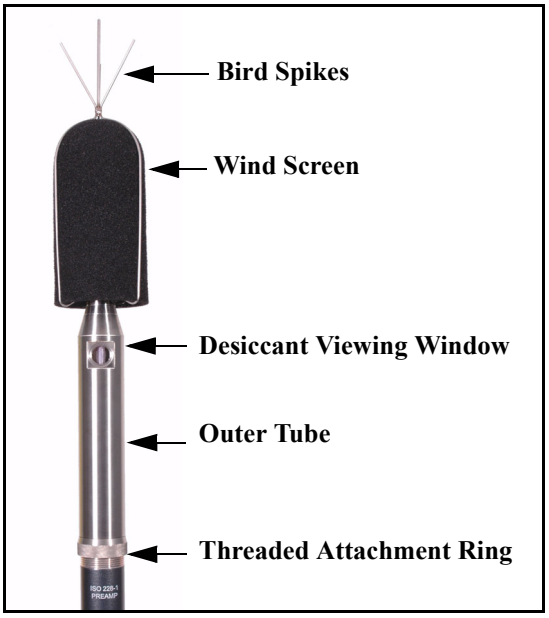


FIGURE 1-1 426A12 Outdoor Microphone Preamplifier and Power Supply

The Larson Davis 426A12 Outdoor Microphone Preamplifier has been designed for permanent outdoor use in any weather condition. It is constructed of stainless steel to resist corrosion, and its profile minimizes both wind resistance and acoustic reflections. It includes a rain hat, wind screen, bird spikes and an electrostatic actuator which can be controlled remotely for on-site calibration checks. With the proper choice of microphone, it can provide frequency response characteristics consistent with precision sound level meter requirements for free-field or random incidence measurements. Equipped with A, C and Z-weighting filters, the 426A12 is ideal for use with any electronic sound measurement system.

Replaceable desiccant cartridges prevent moisture from reaching the microphone through the vent. The saturation status of the desiccant cartridges can be determined remotely using signals from internal temperature and humidity sensors, as well as visually through an observation window.

The mounting thread is G 1½" (ISO 228-1) metric. An adaptor pipe coupler 426A12-NPT is available for 1½" NPT pole or tripod mounts.

Application

The 426A12 is typically a major component of a remote noise monitoring site as shown in FIGURE 1-2.

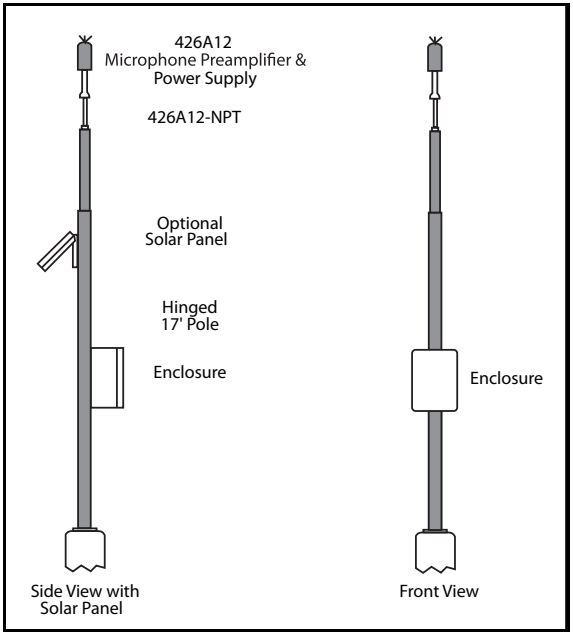


FIGURE 1-2 Remote Noise Monitoring Site

Features

The PCB Piezotronics 426A12 Outdoor Preamplifier and Power Supply provides the following features

- **Use with any electronic sound measurement system**
- **Free-field or random incidence response**
- **Rugged stainless steel construction**
- **Single channel power and signal conditioning**
- **Selectable Z, A or C-Weighting**
- **0 and 200 V microphone polarization voltage**

- **Selectable gain: 0 or 20 dB**
- **Electrostatic actuator for calibration check**
- **Internal temperature and humidity sensors for desiccant status**
- **Replaceable desiccant with indicator visible through window**
- **Easy access for desiccant change**
- **Bird spikes, rain hat and wind screen**
- **Instantaneous overload detection**
- **Ability to work with long cables on the output**
- **TEDS-IEEE 1451.4**

Standard Accessories

- **WS009-F: Foam Insert for WS009**
- **EPS2112 Rainhat/Electrostatic Actuator**
- **DSC004 Desiccant Pack: Includes 10 each Indicating Desiccants and 10 each Desiccant Bags in a quart metal can**
- **CCS034 Hard Case for 426A12**
- **CER-426A12 Calibration and Certification of 426A12 and microphone with Temperature and Humidity test data**

Optional Accessories

Microphone

The 426A12 is a preamplifier without a microphone. Packages including microphones are available as follows:

426A12-FF

The 426A12-FF consist of both a 426A12 and a 377B02 50 mV/Pa free-field prepolarized microphone.

426A12-RI

The 426A12-RI consist of both a 426A12 and a 2565 50 mV/Pa random incidence 200 Volt microphone.

Sound Level Meter

- **Model 831 Sound Level Meter**

Interface Unit

- **831-INT Interface Unit: Integrates 426A12 with Model 831 sound level meter, modem, batteries, solar power panel and sensors for measurement of wind speed, wind direction, temperature and humidity**

Power Supplies

Used with Model 831 and 831-INT

- **PSA030 AC Supply**
  Input: 100 Vac to 240 Vac
  Output: 15 Vdc, 3 A
  Cables CBL152 and CBL153 required for < 20' separation from 426A12 to Model 831

Used with Model 831 Only

- **PSA027 AC Supply**
  Input: 100 Vac to 240 Vac
  Output: 12 Vdc, 1.25 A
  Cables CBL152 and CBL154 required for < 20' separation from 426A12 to Model 831

Used with Model 831 Only When the Distance Between the 426A12 and the Model 831 is between 20' and 500'

- **PSA030 AC Supply**
  Input: 100 Vac to 240 Vac
  Output: 15 Vdc, 3 A
  Cables CBL152-XXX, CBL171 and EHXXX required

Pole

- **TRP019: Aluminum tilt-down pole, 17'**

Tripods and Mounting Adaptors

- **TRP020 Portable Heavy Duty Tripod with 6', 10', 15' and 20' heights, mounting adaptors included**
- **TRP003 9' Tripod**
- **ADP091 Adaptor for 426A12 to TRP003**

- **426A12-NPT G 1½”x27” (ISO 228-1) to NPT Thread Adaptor for 426A12 to TRP019**

Cables

Used with Model 831 and 831-INT

- **CBL152: Signal Cable, 426A12 to Model 831, 20’**
- **CBL153: Control Cable, 426A12 to 831-INT, 20’**

Used with Model 831 Only

- **CBL152: Signal Cable, 426A12 to Model 831, 20’**
- **CBL154: Control and Power Cable, 426A12 to Model 831, 20’**

Used with Model 831 Only for < 500’ between 426A12 and Model 831

- **CBL152-XXX Signal Cable, 426A12 to Model 831, XXX’**
- **CBL171 Control Cable, LEMO to Model 831, 2’**
- **EXHXXX Control Cable, 426A12 to CBL171, XXX’**

Calibrators

- **CAL200: Class 1 Sound Level Calibrator, 94/114 dB @ 1 kHz**
- **CAL250: Class 1 Sound Level Calibrator, 114 dB @ 250 Hz**

Replacement Parts

- **CCS034: Replacement hard carry case with foam inserts**
- **CCS034-F: Replacement foam inserts for carry case**
- **WS009 Birdspikes with Foam Windscreen**
- **WS009-F Replacement Foam Windscreen**
- **DSC004 Desiccant Pack (10 Sets)**
- **EPS2112 Rainhat/Electrostatic Actuator**

CHAPTER

2 Setup

Removing the Windscreen and Birdspikes

Loosen the black plastic thumb screw at the base of the bird spikes. Carefully raise the birdspikes off over the rain hat and electrostatic actuator cable. The windscreen can now be easily removed from the birdspikes for replacement. With the windscreen and birdspikes removed, the upper portion of the 426A12 will look as shown in FIGURE 2-1.

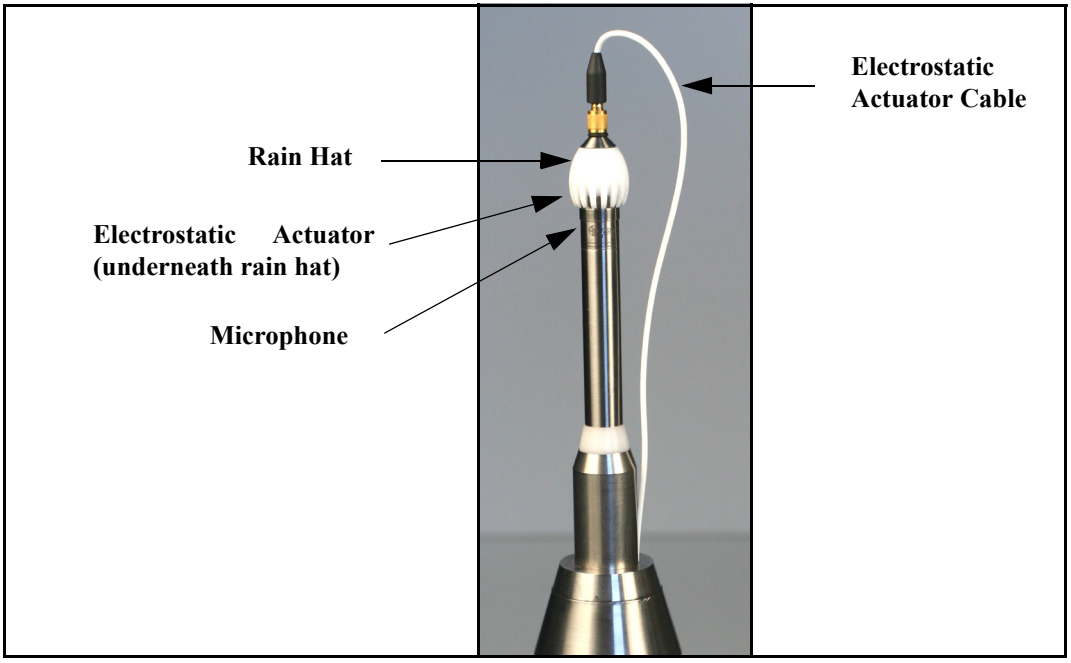


FIGURE 2-1 426A12 With Windscreen Removed

Opening the 426A12

Caution: To avoid an electric shock from voltages within the preamplifier, verify that the power has been removed from the 426A12. Disconnecting the control cable from the 426A12 will remove the power from it.

The 426A12 must be opened to perform the following activities:

- Set the jumper to select microphone bias voltage
- Set the jumper to select frequency weighting
- Set the jumper to select gain
- Adjust the electrostatic actuator level
- Change the desiccant

Caution: Take care when handling the 426A12 when open, due to sensitivity of some components to electrostatic discharge (ESD). Care should be taken when removing the outer shell of the 426A12 to avoid damaging the rainhat.

After the birdspikes have been removed, the outer tube (with the desiccant observation window in it) can be removed by slowly pulling upward on it to remove it up over the rainhat and the electrostatic actuator (EA) cable. This will provide access to the internal circuit board as shown in FIGURE 2-2.

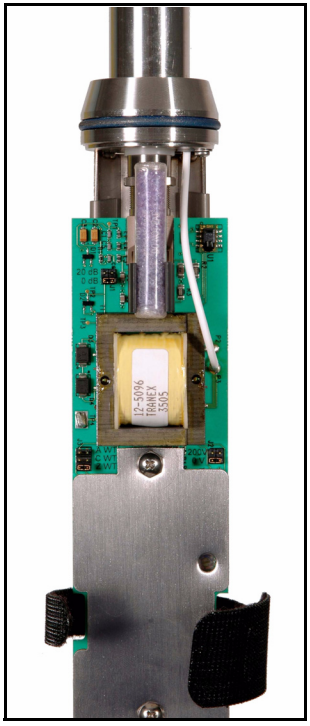


FIGURE 2-2 Circuit Board of 426A12

Placing Jumpers

The microphone bias voltage, frequency weighting and gain are set by the placement of jumpers on jumper blocks on the circuit board. Upon delivery, these will be set as follows:

- Microphone Bias Voltage:
  - 0 Volts for the 377B02 microphone
  - 200 Volts for the 2565 microphone
- Frequency Weighting: Z-Weighting
- Gain: 0 dB

The jumper blocks for setting these parameters are located on the circuit board as shown in FIGURE 2-3.

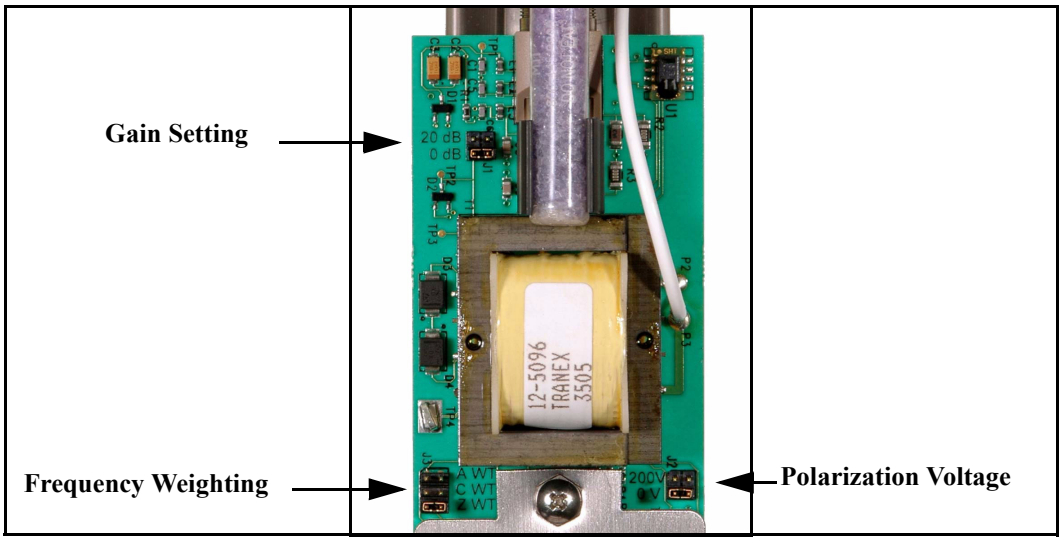


FIGURE 2-3 Position of Jumper Blocks

Microphone Bias Voltage

If the polarization voltage is not set correctly, the microphone will not have the correct sensitivity.

The 426A12 can be used with both prepolarized microphones, which require no polarization voltage, and traditional condenser microphones, which do require a polarization voltage. The 426A12 can provide a 200 volt polarization voltage for condenser microphones.

The jumper block controlling the microphone bias voltage is shown set to 0 V in FIGURE 2-4.

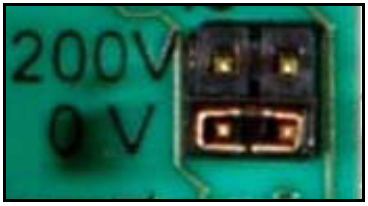


FIGURE 2-4 Microphone Bias Voltage Setting

Frequency Weighting

The 426A12 provides the user with a choice of three frequency weightings:

- A-Weighting
- C-Weighting
- Z-Weighting

The jumper block controlling the frequency weighting is shown set to Z-weighting in FIGURE 2-5.

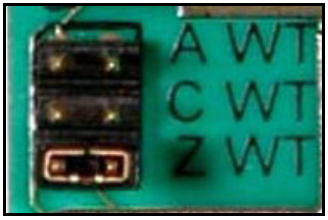


FIGURE 2-5 Frequency Weighting Setting

For other weightings, move the jumper to the two pins adjacent to the desired weighting.

Used with Model 831

When using the 426A12 with the Model 831 and similar sound level meters having internal frequency weighing filters, it is recommended that Z-weighting be selected so that measurements made using the A and/or C-weighting filters in the Model 831 will be indicated as such on the data being displayed and saved.

Used in Stand-Alone Applications

When the 426A12 is used as a front end in measurement systems which do not provide A or C frequency weighting, select the A, C or Z-weighting filter as appropriate for the measurement results desired.

Gain

The 426A12 offers the user the choice of two gain values:

- 0 dB Gain
- 20 dB Gain

The jumper block controlling the gain is shown set to 0 dB Gain in FIGURE 2-6.

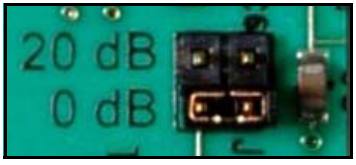


FIGURE 2-6 Gain Setting

Placing Desiccant

The 426A12 has two separate desiccants as shown in FIGURE 2-7.:

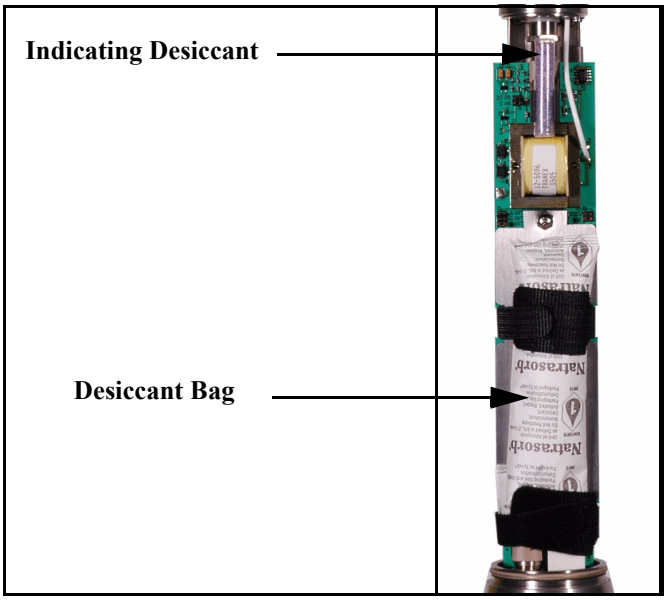


FIGURE 2-7 Desiccants

- An indicating desiccant capsule placed at the top of the circuit board so that its color can be observed through the desiccant viewing window shown in FIGURE 1-1 "426A12 Outdoor Microphone Preamplifier and Power Supply" on page 1-2. This capsule's color is blue when the desiccant is good and will turn pink to indicate that the desiccant needs to be replaced.
- A large desiccant bag for absorbing moisture from the air entering the 426A12 from the outside

Indicating Desiccant

The indicating desiccant capsule is held in place by a clip at its bottom end, as shown in FIGURE 2-8.

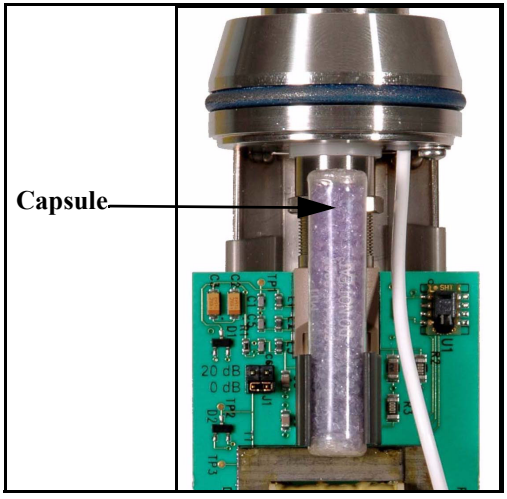


FIGURE 2-8 Indicating Desiccant Capsule

The capsule is removed from the clip by pulling up and out on the top of the capsule. A new capsule is replaced by starting the bottom of the capsule into the clip and sliding it down and back.

Desiccant Bag

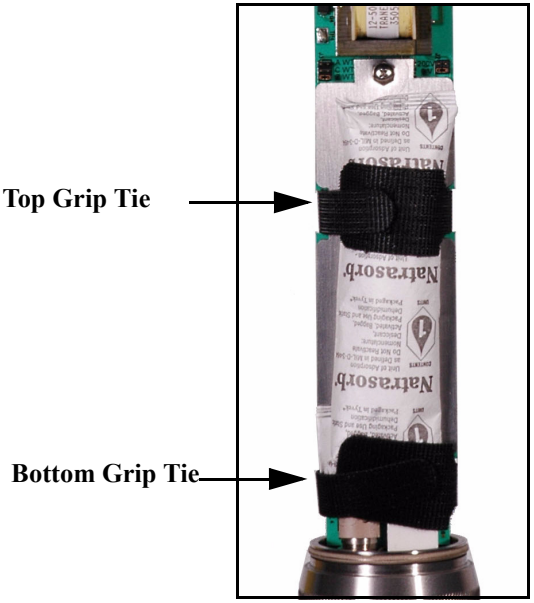


FIGURE 2-9 Desiccant Bag

The white desiccant bag is removed by pulling the top grip tie apart. The bag can then be removed. A new one is placed into the bottom grip tie and the top grip tie secured around the top of the bag. Replace the outer tube over the electrostatic actuator cable and rain hat. Orient the tube with the window over the indicating desiccant capsule. Pull the outer tube carefully down over the remainder of the preamplifier, desiccants and o-ring seals. Replace the birdspikes with the windscreen over the electrostatic actuator cable. Tighten the black plastic thumb screw at the base of the birdspikes.

Electrostatic Actuator Level Adjustment

The electrostatic actuator level can be adjusted by turning the potentiometer accessible through the hole in the metal plate supporting the 426A12 circuit board, as shown in FIGURE 2-10.

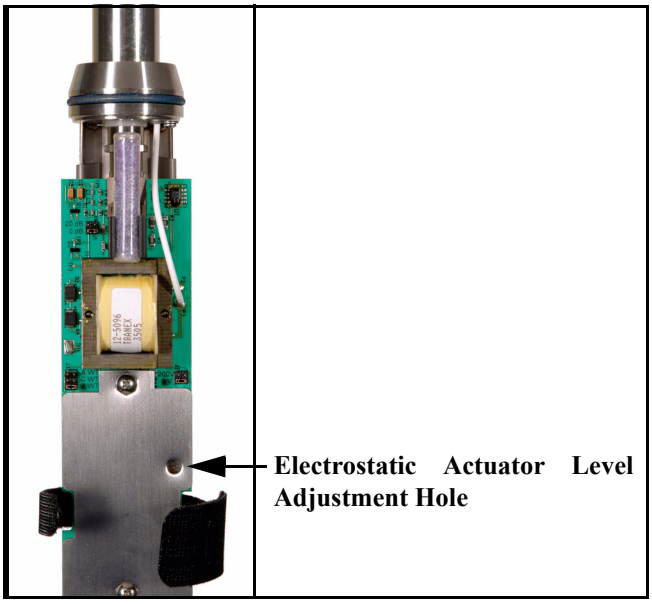


FIGURE 2-10 Electrostatic Actuator Level Adjustment

Rotating the potentiometer clockwise will increase the level. The level is set at the factory for the best overall performance.

Mounting the 426A12

The 426A12 is designed to be mounted on the top of a 1½" diameter vertical pipe section having G 1½" ISO 228-1 threads on the exterior of the upper end. The adaptor coupler 426A12-NPT is used to mount the 426A12 on a TRP019 tilt-down pole or a TRP020 tripod. It has a G 1½" (ISO 228-1) thread on the top end and a 1½" NPT thread on the bottom end. The ADP091 is used to mount the 426A12 onto the TRP003 tripod. It has the G 1½" thread on the top and holes on the bottom for the TRP003 to snap onto. It is recommended that the pole or tripod be connected to earth ground to provide some lightning protection.

Wiring

The 426A12 has connectors for both a signal cable, shown in FIGURE 2-11, which will typically be connected to the input of a sound level meter or other measuring device, and a control cable. The control cable is used to control the electrostatic actuator and to read the temperature and humidity sensors, overload indications, TEDS and supply power for the 426A12 preamplifier.

The signal cable and control cable should be passed through the pole or tripod, then through the 426A12-NPT or ADP091, and connected to the corresponding connectors at the base of the 426A12 prior to attaching it physically to the top of the 426A12-NPT or ADP091.

The outer tube can be held to prevent rotation while the threaded attachment ring is rotated to tighten the 426A12 to the mounting pipe.

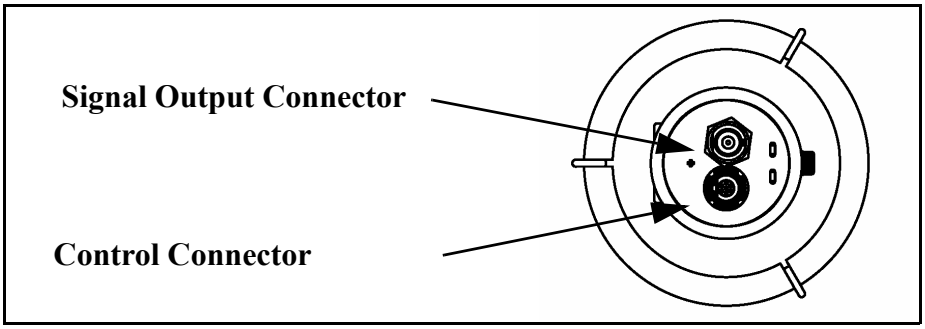


FIGURE 2-11 Signal and Control Cable Connectors

Used with Model 831 and 831-INT

When the 426A12 is used with the Larson Davis Model 831 and 831-INT, the following cables should be used:

- **Signal Cable:** CBL152, connected to the input of the Model 831, 20’
- **Control Cable:** CBL153, connected to the 831-INT control connector, 20’

Used with Model 831 Only

When the 426A12 is used with the Larson Davis Model 831 alone, the following cables should be used:

- **Signal Cable:** CBL152, connected to the input of the Model 831, 20’.
- **Control Cable:** CBL154, connected to the Model 831 I/O Connector and 12 volt power supply (such as the PSA027 or a 12 volt battery). The CBL154 has a 5.5 x 2.5 mm DC power jack with center positive. CBL154 is 20’ long.

Used with Model 831 Only For < 500’ Between 426A12 and Model 831

- **Signal Cable:** CBL152-XXX, connected to the input of the Model 831 with XXX indicating the length of the cable, up to 500’.
- **Control Cable:** CBL171 connected to the Model 831 I/O connector and a 15 Volt power supply such as the Larson Davis PSA030. CBL171 is 2’ long with a male 7-pin LEMO connector. The power connector is a 5.5

x2.1 mm DC power jack with center positive. The Control Cable is extended with the EXHXXX to the 426A12 where XXX is the cable length in feet, up to 500'.

Microphone Calibration

Acoustic Calibration

NOTE: To avoid a possible electric shock from the high voltage on the electrostatic actuator cable, verify that the electrostatic actuator has been turned off before following this procedure.

A sound level calibrator is used to apply an acoustical signal of known amplitude and frequency to the microphone. With the birdspikes and windscreen removed, the electrostatic actuator cable can be removed. Remove the cable by unscrewing the gold knurled nut. Unscrew the white rainhat to remove it from the microphone. Carefully attach the grid cap to the microphone without touching the diaphragm (*upon delivery the grid cap is in the microphone box, which is stored in the CCS034 case*). Place the calibrator over the microphone. Apply the calibrator slowly to avoid applying a sudden large pressure change to the diaphragm. To activate the Calibration function on the Model 831, press the TOOLS key and highlight the Calibrate icon. Press the ENTER key to open the Calibrate tool. The user may select a calibrator from the list or enter new information about a calibrator. Larson Davis recommends the Larson Davis Model CAL200 calibrator set to 114 dB. The equivalent free-field level of -0.12 dB at 1 kHz should be applied for 1/2" free-field microphones.

Performing the Acoustic Calibration

For calibration using an instrument other than the Model 831, see the manufacturers documentation for calibration.

Turn on the calibrator. Highlight the Calibrate button on the Model 831 and press the ENTER key. The Calibrating message box appears. The present sound level (114.0 dB), the difference between the calibration level and the present sound level (Δ) and an indication of stability are displayed in this message box. When the pointer in the stability indicator is vertical, the sound level is stable. After a few seconds, when the calibration is completed, a message box appears that shows the amount of change being made to the calibration. To accept the calibration press the ENTER key. To reject this calibration, highlight No and press the ENTER key. Carefully remove the Calibrator and the grid cap from the microphone. Carefully attach the rainhat and the

electrostatic actuator cable. Place the birdspikes and windscreen back on the preamplifier.

E.A. Check

After performing an acoustic calibration it is then important to measure the standard level generated by the electrostatic actuator (E.A.) system. The sound pressure level produced by the E.A. is typically in the range 91 to 97 dB, and will depend upon the rain hat and the characteristics of the microphone. However, for a specific system, it does generate a precision level that is used to determine changes in the system calibration, whether in the microphone, instrumentation, cabling or in the E.A. itself. After every installation of the rain hat, an initial E.A. measurement must be performed to establish the standard E.A. level.

Performing the E.A. Check

To do the E.A. Check, highlight E.A Check on the Model 831 and press the ENTER key to initiate a calibration check, which will produce the display with the present level (91- 97 dB), and an indication of stability. This display will also indicate the difference between the present level and the present Standard E.A. level. To save as the new standard E.A. level highlight “Yes” and press the ENTER key. This level will then appear in the E.A. Level box in the lower portion of the screen. Subsequently, after the Standard E.A. Level has been established, and as long as no changes have been made to the rain hat, select “No” so that the standard E.A. level is not changed, the difference is stored in the E.A. check history. As long as the difference between the measured level and the Standard E.A. Level is acceptably small, the system is performing well. All E.A. checks that do not time-out will be stored in the calibration history.

APPENDIX

A Technical Specifications

The technical specifications in this chapter are subject to change without notice. Please refer to calibration and test results for data on a specific unit. All values are at 20°C, 50% RH, 12 V supply, < 3 m (10') cable and an input from a 50 Ohm generator through an ADP005 unless otherwise stated.

Note that values specified in this chapter are typical unless tolerances are provided.

Standards Met by Weighting Filters

A and C-weight

IEC60651 (2001) and ANSI S1.4 (R2001) "Sound Level Meters" Type 1

A, C and Z-weight

IEC61672-1 (2002) "Sound Level Meters" Class 1

Electrical Frequency Response

Frequency response with input through ADP005 (18 pF) from a 50 Ohm generator (0 dB and 20 dB gains and 1 Vrms Output)

The frequency response is selected using an internal jumper

Z-Weight

10 Hz to 63 kHz (± 0.2 dB)

-3 dB at 1 Hz typical and > 126 kHz

A-Weight

40 Hz to 20 kHz (± 0.3 dB)

10 Hz to 32 Hz (± 0.7 dB)

C-Weight

25 Hz to 20 kHz (± 0.3 dB)

10 Hz to 20 Hz (± 0.6 dB)

A and C-weight Compared to Z-Weight @ 1 kHz

< 0.12 dB

Acoustical Frequency Response

Frequency Range	Free-field Response (0 degree) with 377B02 Microphone	Random Response with 2565 Microphone
4 Hz to 20 Hz	+ 1 dB, - 3 dB	+ 1 dB, - 3 dB
20 Hz to 5 kHz	± 1 dB	± 1 dB
5 kHz to 12.5 kHz	+ 1 dB, -2 dB	+ 2 dB, - 1 dB
12.5 kHz to 16 kHz	+ 0 dB, - 5 dB	+ 1 dB, - 4 dB

Table A-1: Acoustical Frequency Response Limits with the 250 Hz Level as the Reference

With 377B02 1/2” Free-field Microphone

Frequency Sweep

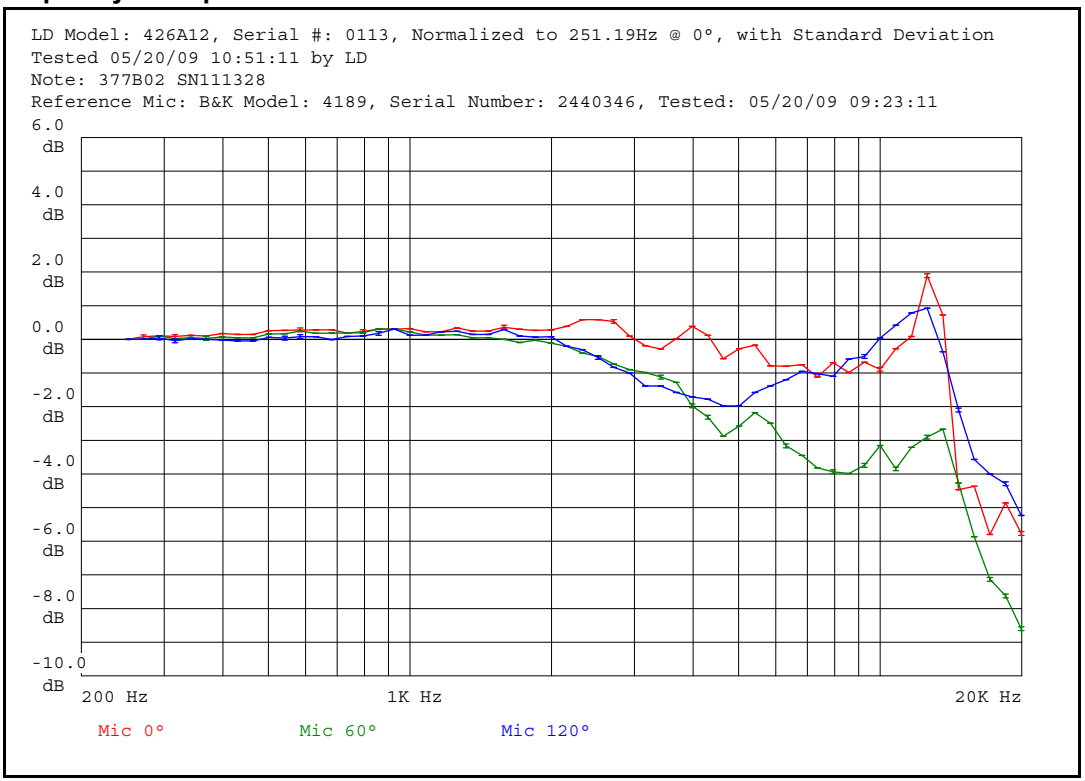


FIGURE A-1 426A12 with 377B02 Microphone: 0, 60 and 120 degrees

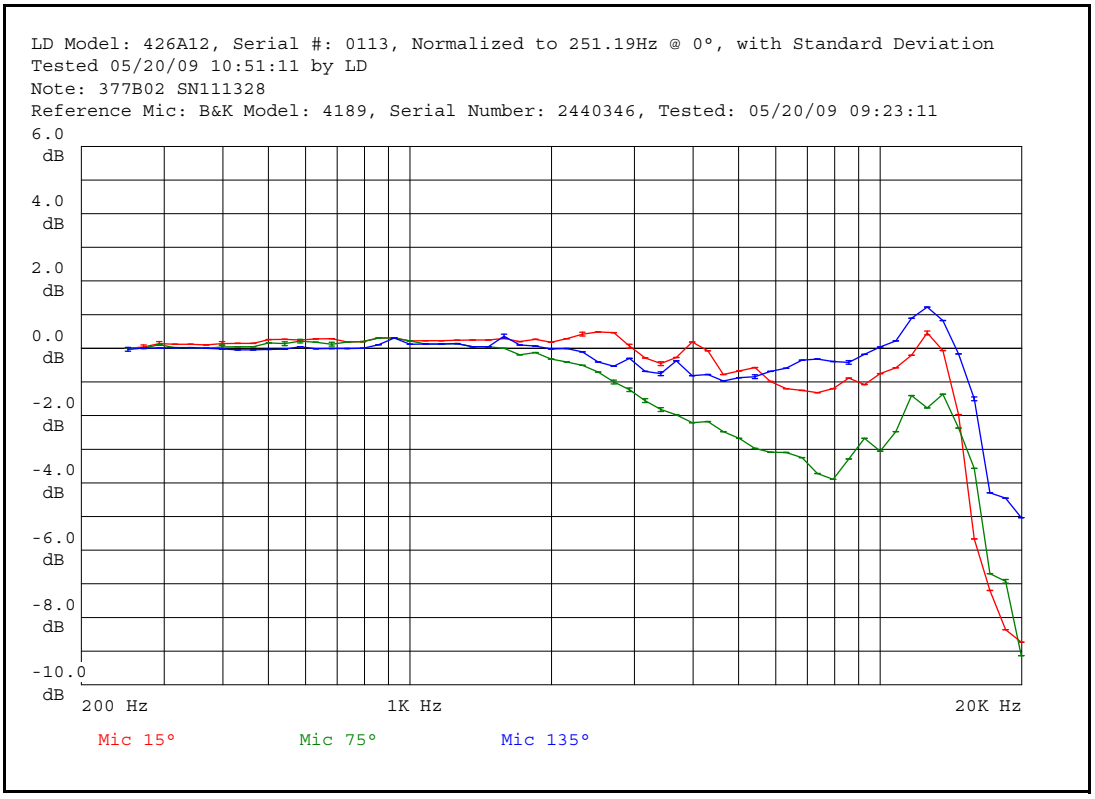


FIGURE A-2 426A12 with 377B02 Microphone: 15, 75 and 135 degrees

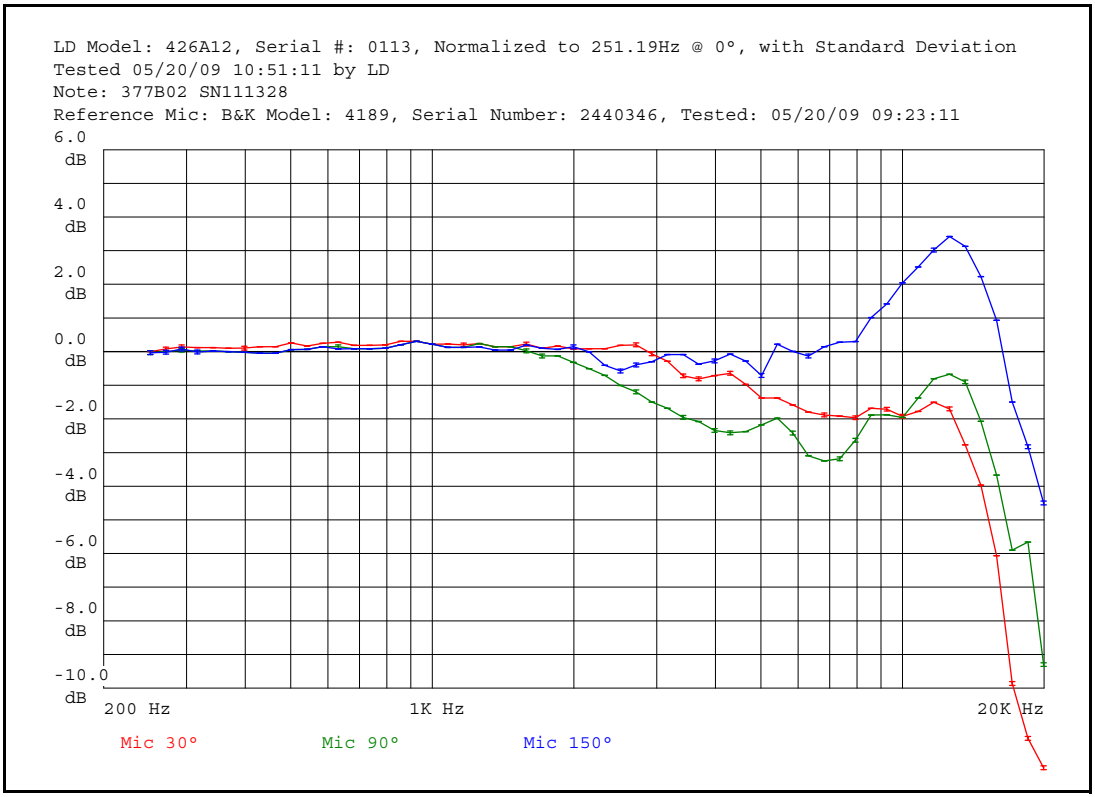


FIGURE A-3 426A12 with 377B02 Microphone: 30, 90 and 150 degrees

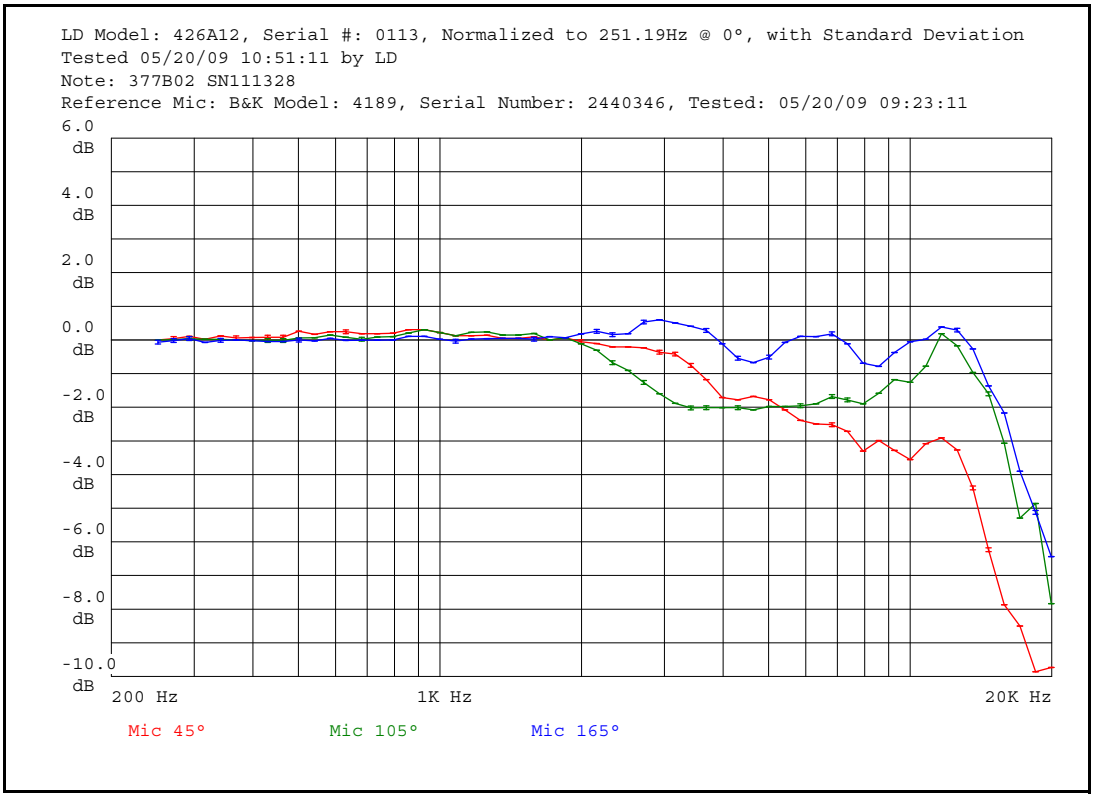


FIGURE A-4 426A12 with 377B02 Microphone: 45, 105 and 165 degrees

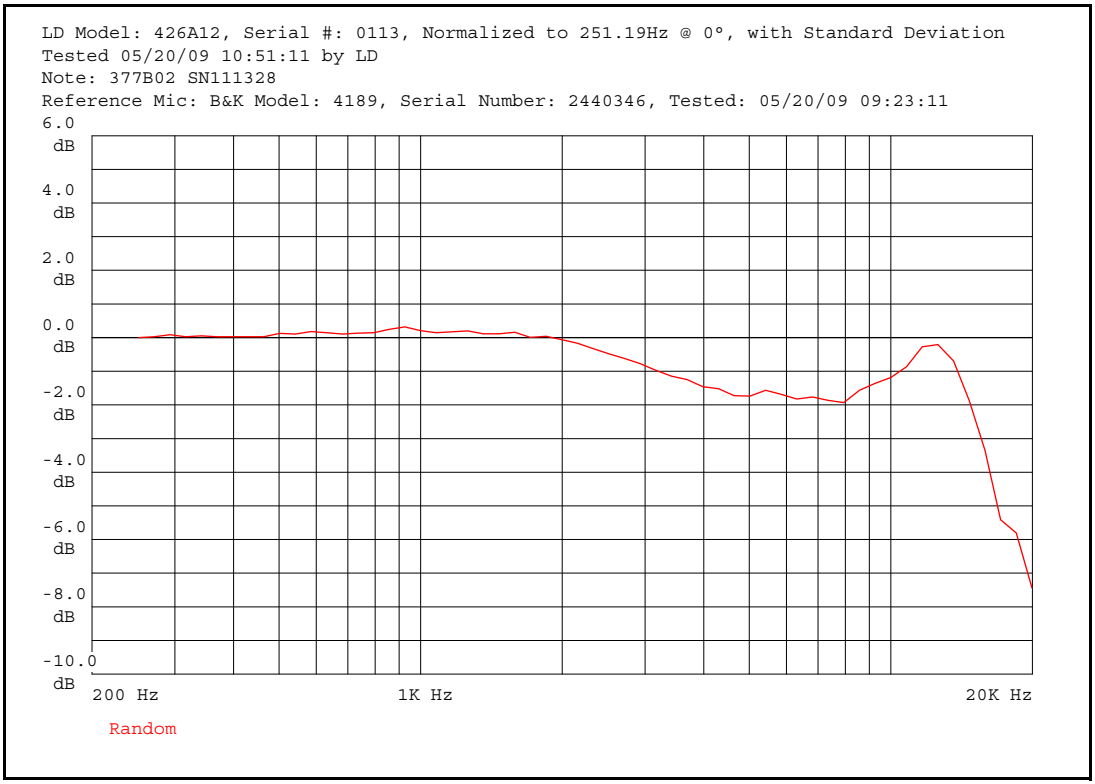


FIGURE A-5 426A12 with 377B02 Microphone: Random Response

Directional Response

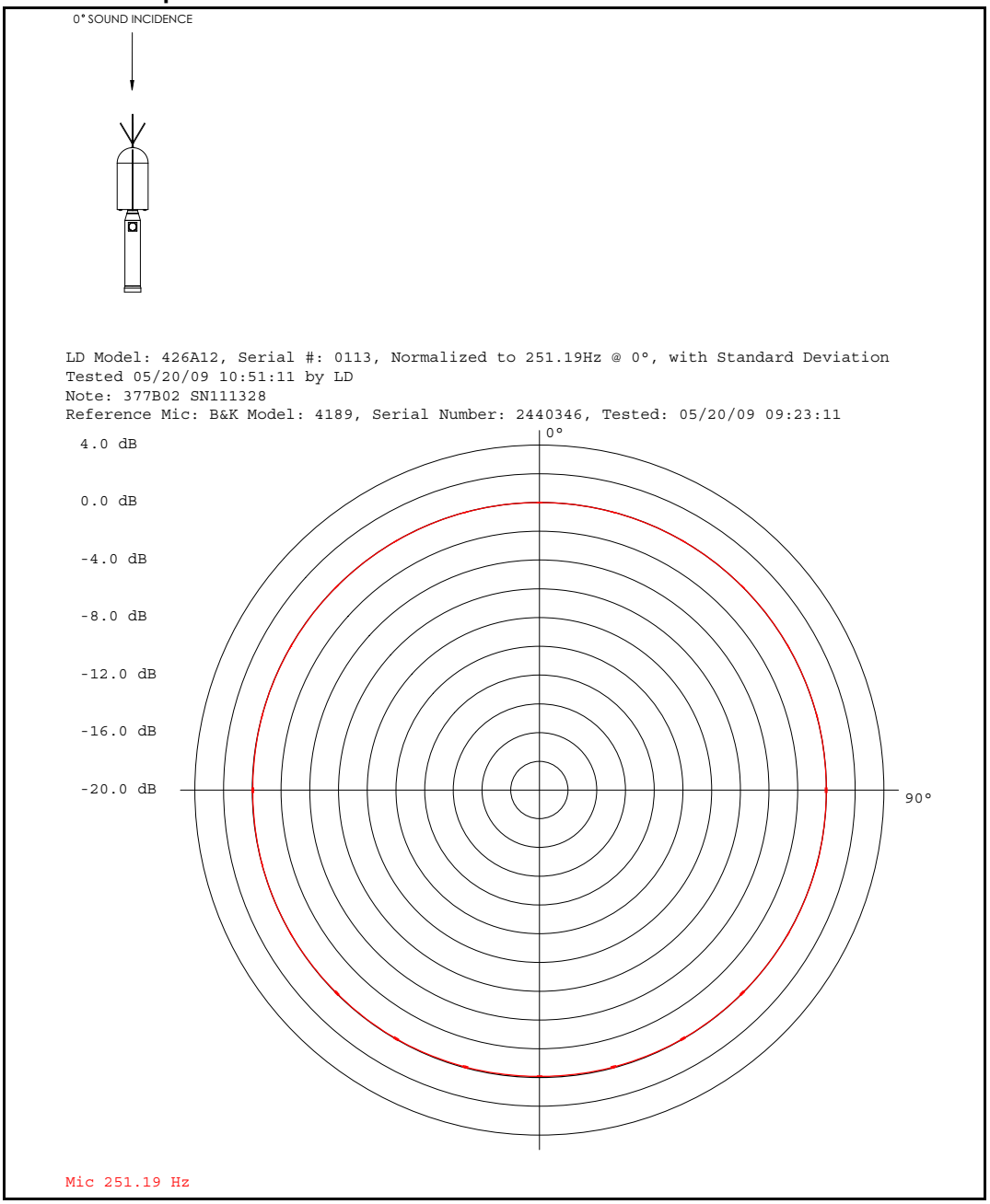


FIGURE A-6 426A12 with 377B02 Microphone: 251.19 Hz

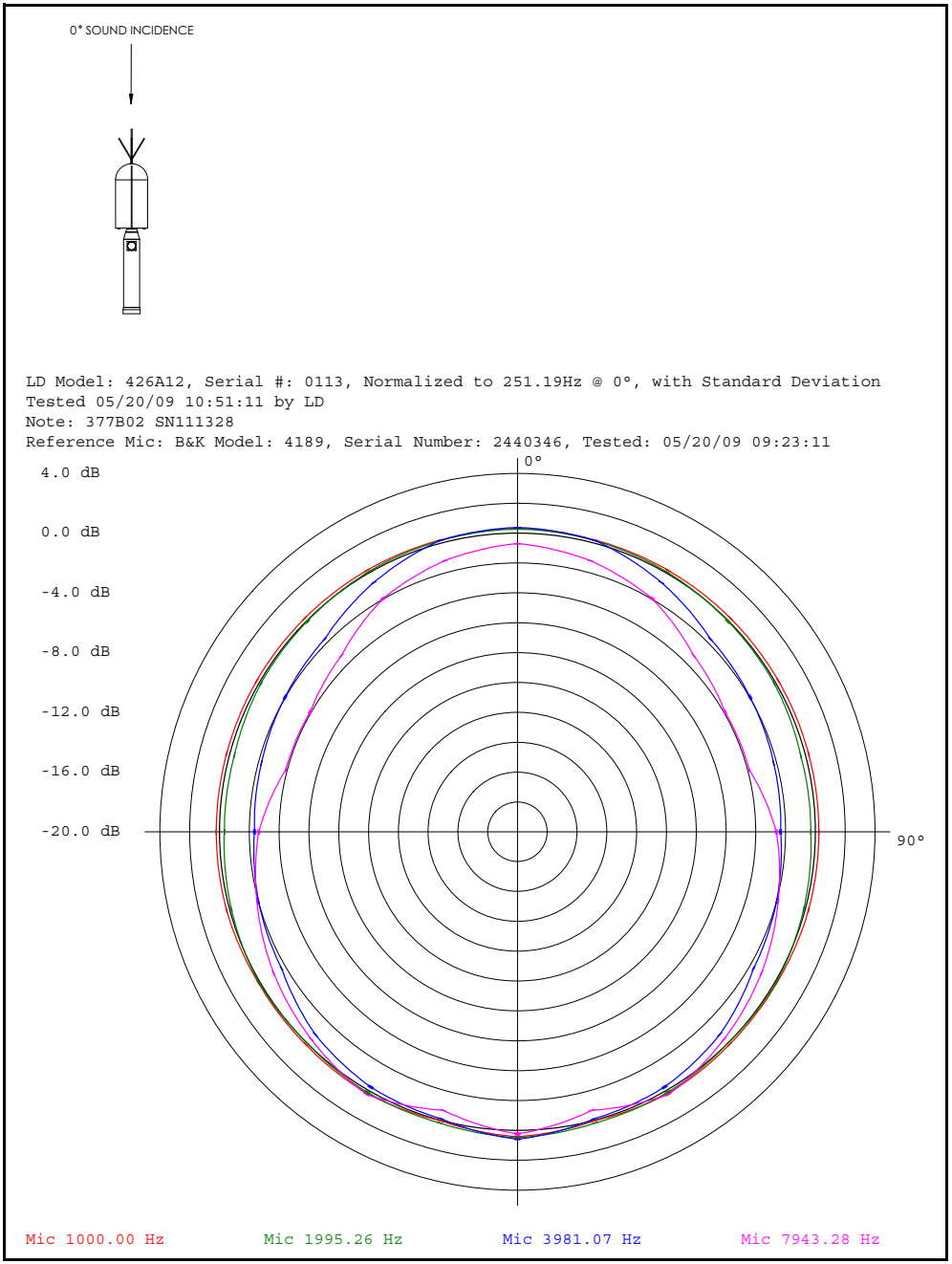


FIGURE A-7 426A12 with 377B02 Microphone: 1000.00 Hz, 1995.26 Hz, 3981.07 Hz and 7943.28 Hz

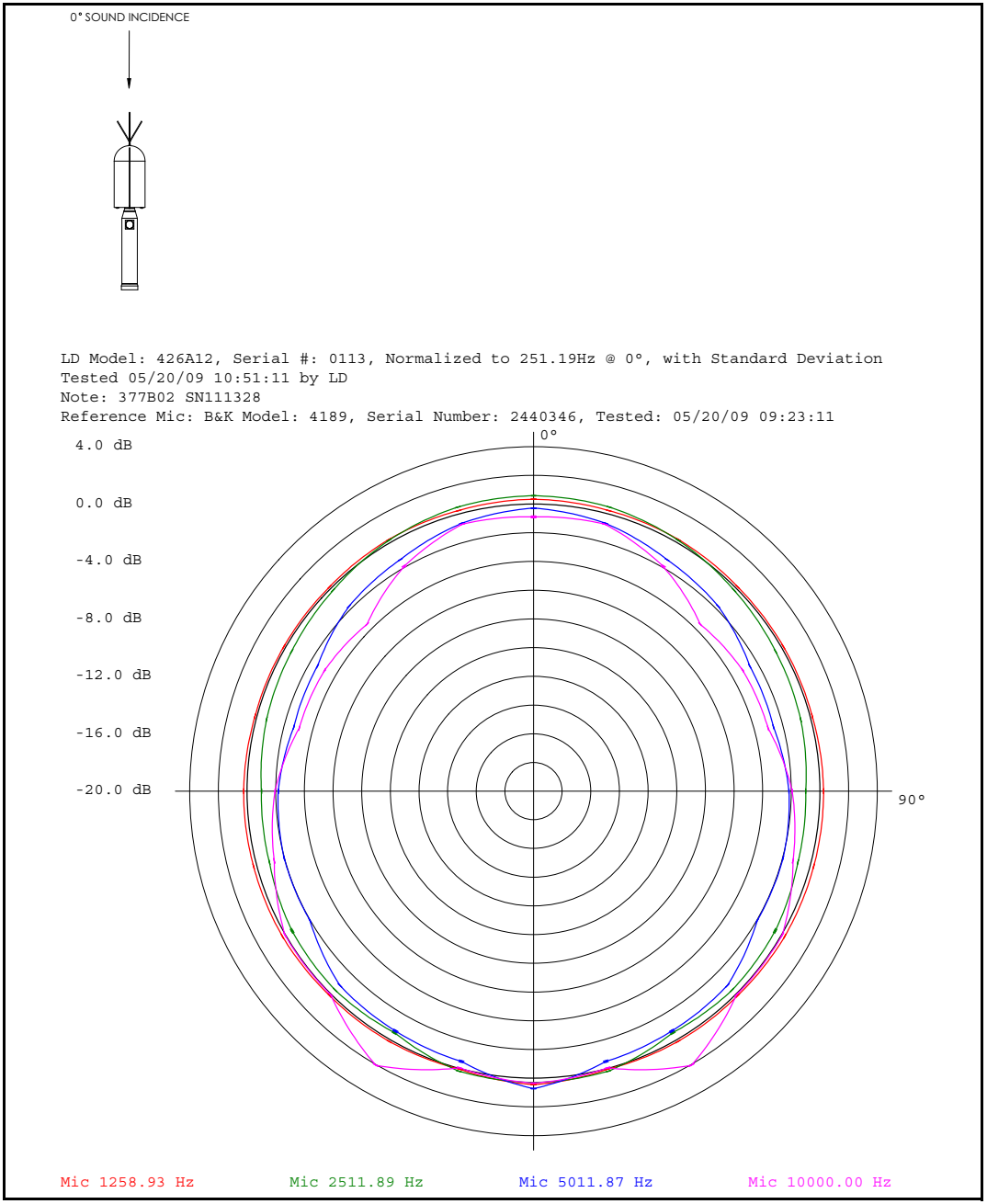


FIGURE A-8 426A12 with 377B02 Microphone: 1258.93 Hz, 2511.89 Hz, 5011.87 Hz and 10000.00 Hz

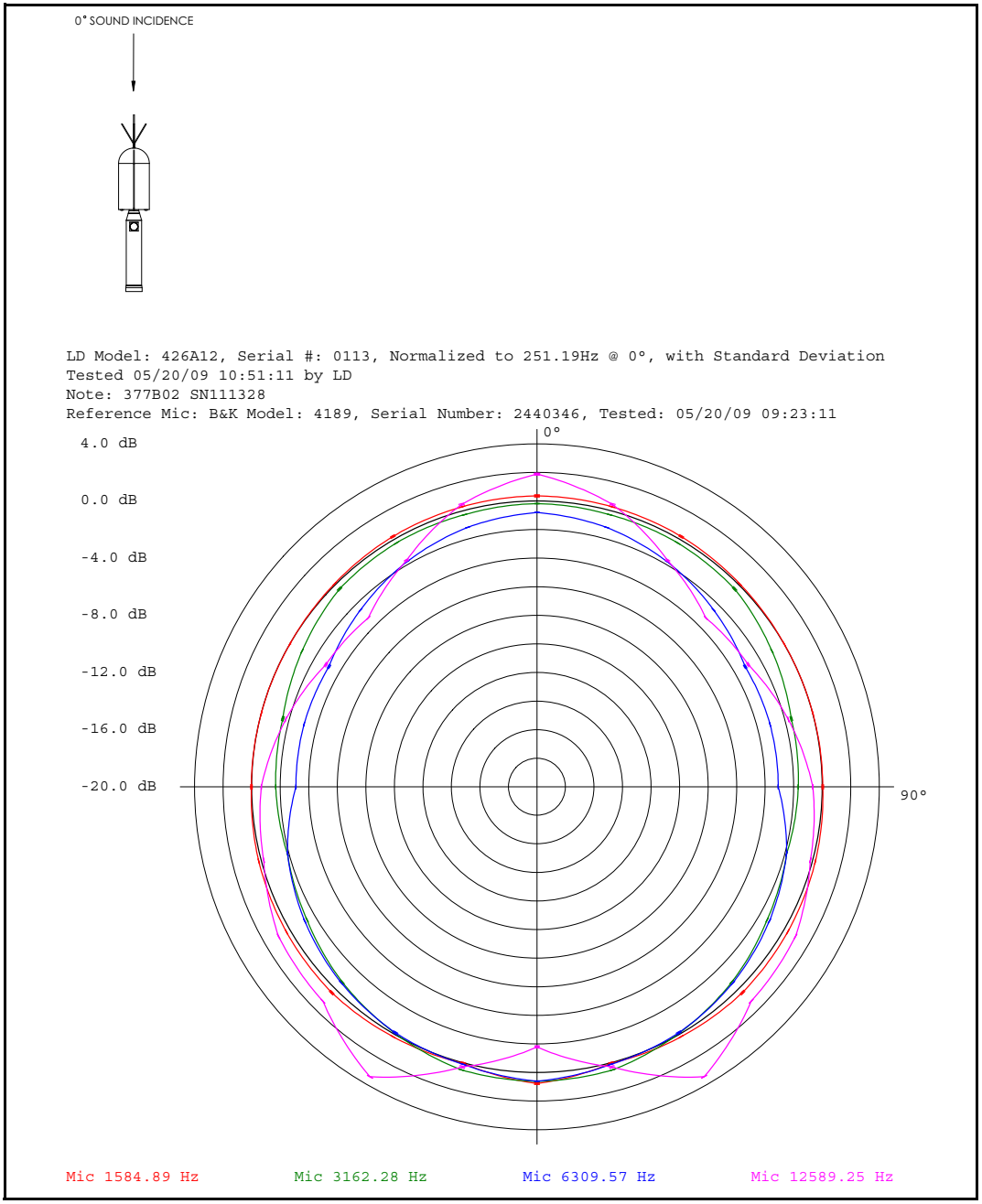


FIGURE A-9 426A12 with 377B02 Microphone: 1584.89 Hz, 3162.28 Hz, 6309.57 Hz and 12589.25 Hz

With 2565 1/2” Random Incidence Microphone

Frequency Sweep

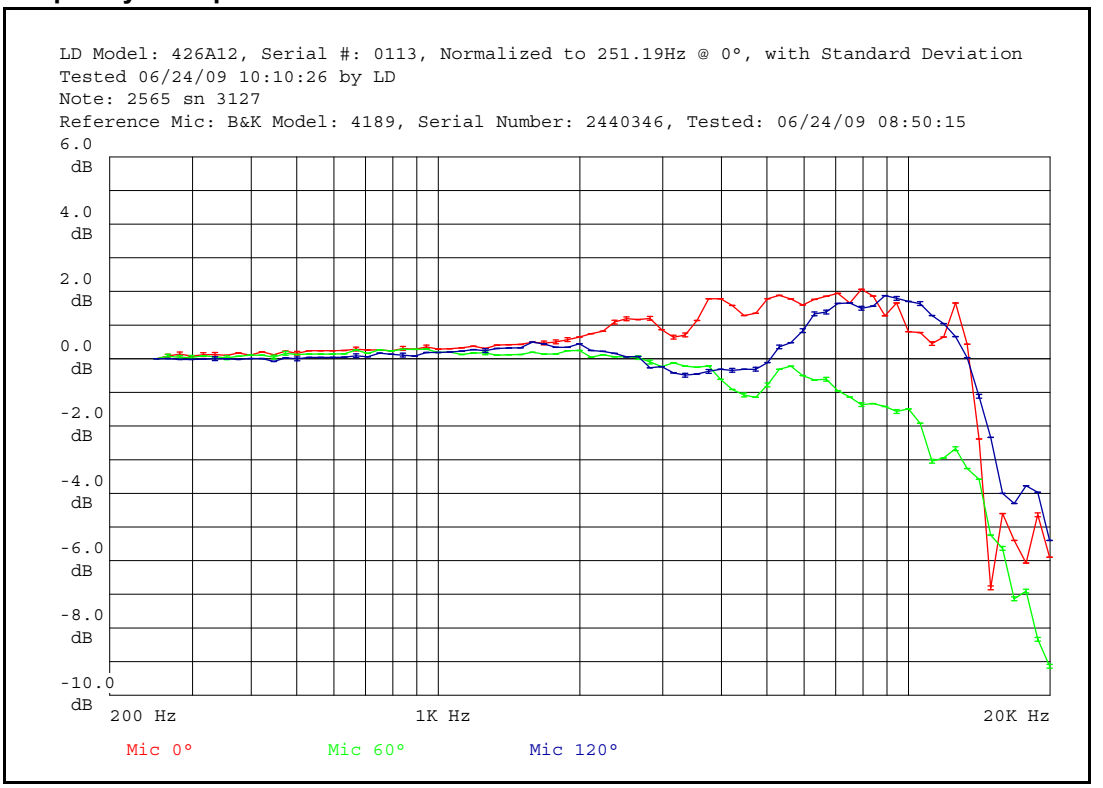


FIGURE A-10 426A12 with 2565 Microphone: 0, 60 and 120 degrees

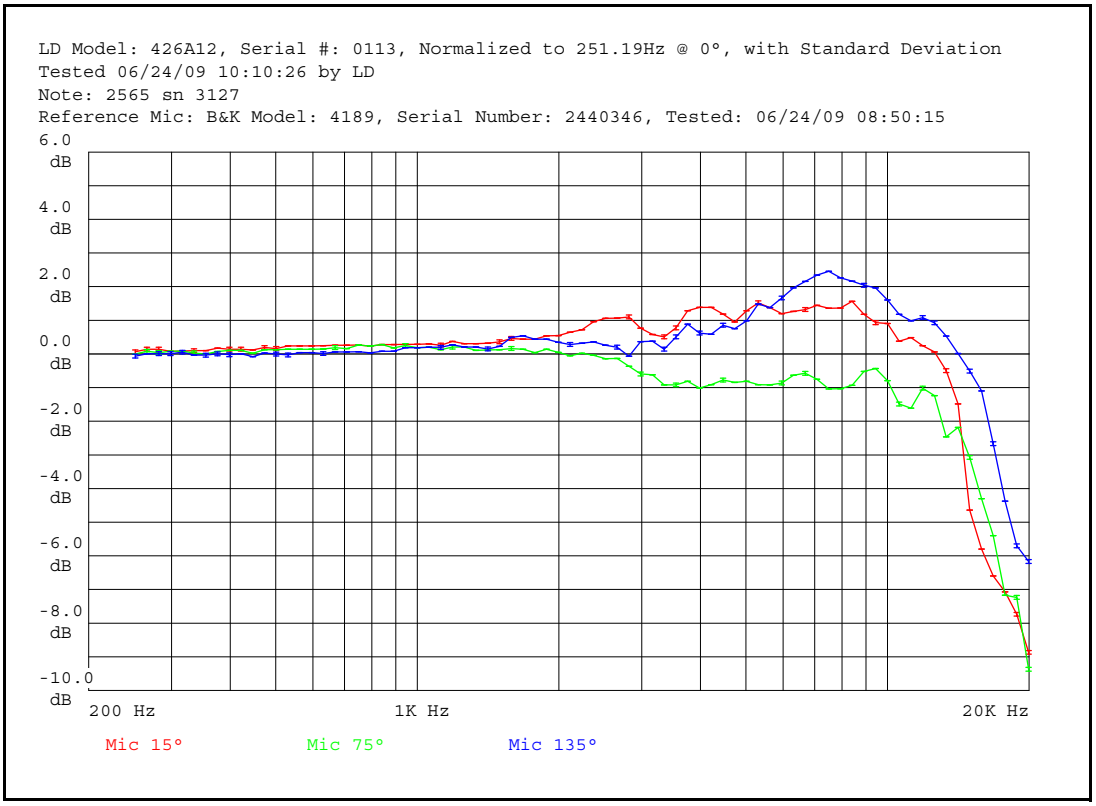


FIGURE A-11 426A12 with 2565 Microphone: 15, 75 and 135 degrees

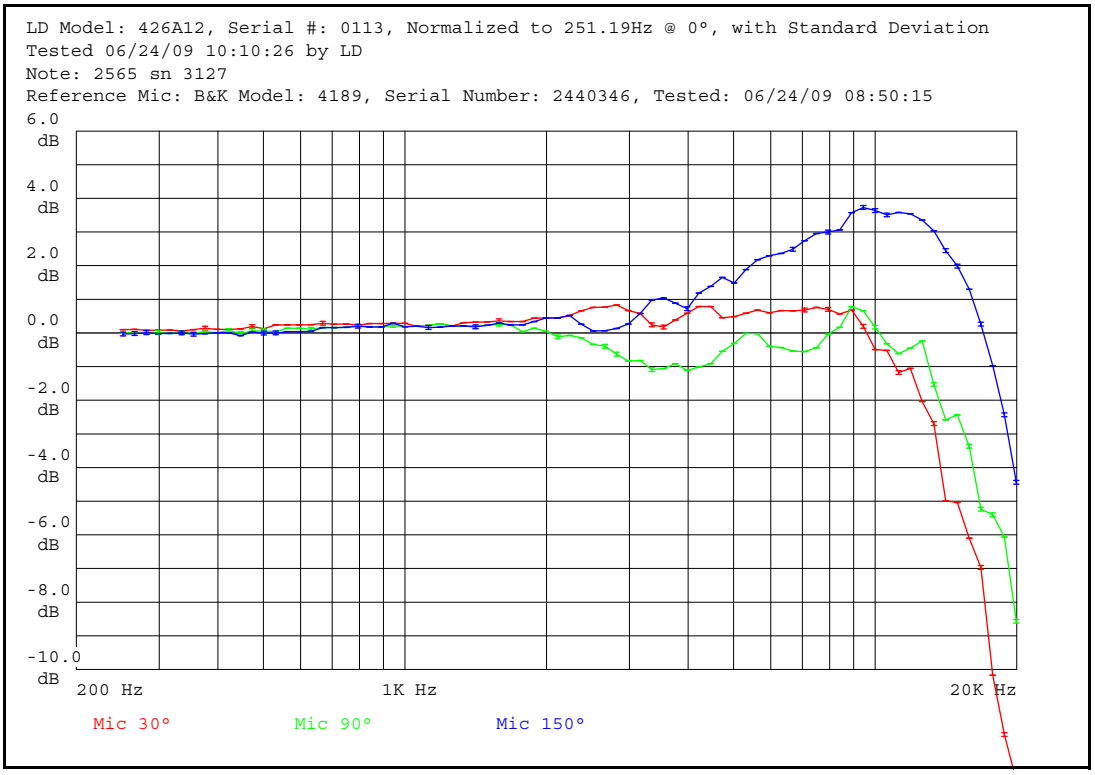


FIGURE A-12 426A12 with 2565 Microphone: 30, 90 and 150 degrees

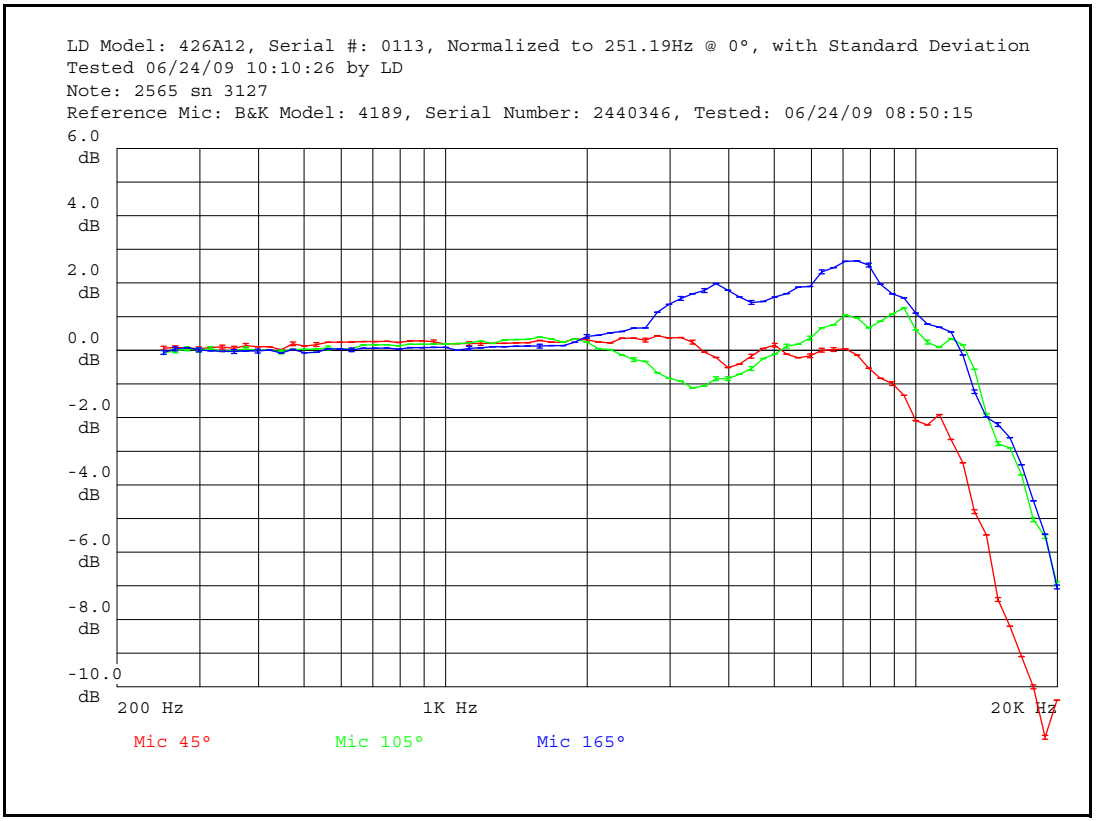


FIGURE A-13 426A12 with 2565 Microphone: 45, 105 and 165 degrees

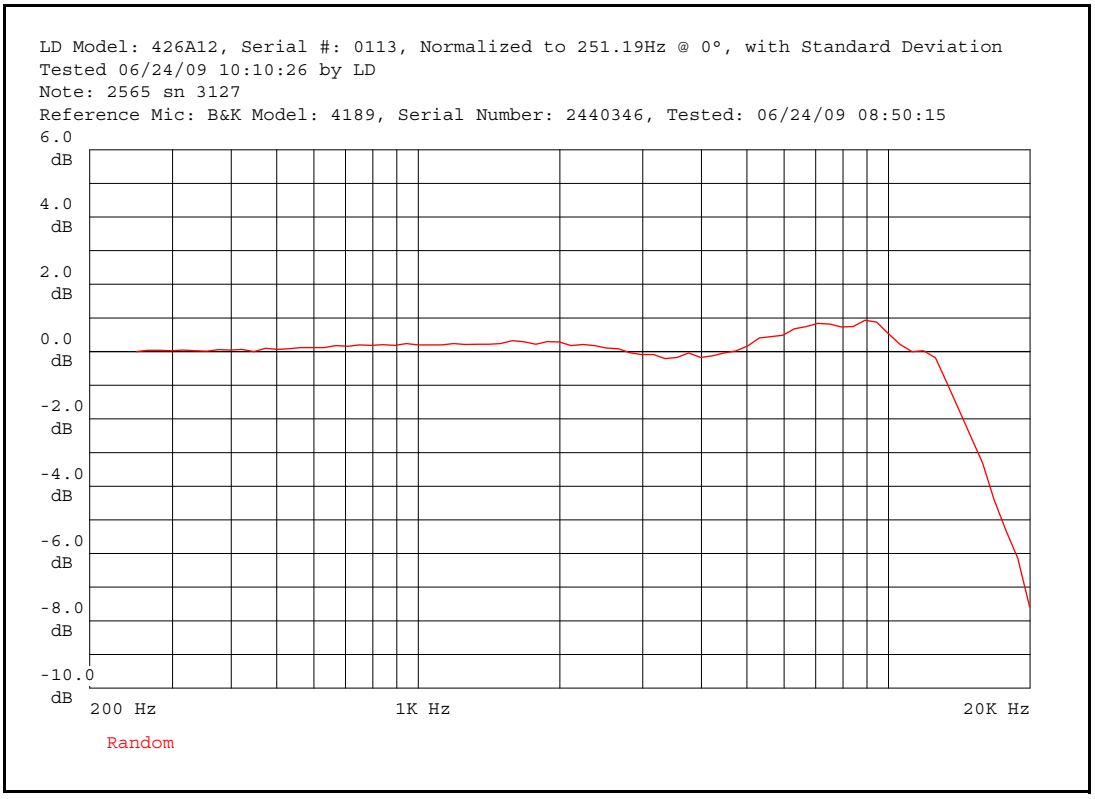


FIGURE A-14 426A12 with 2565 Microphone: Random Incidence

Directional Response

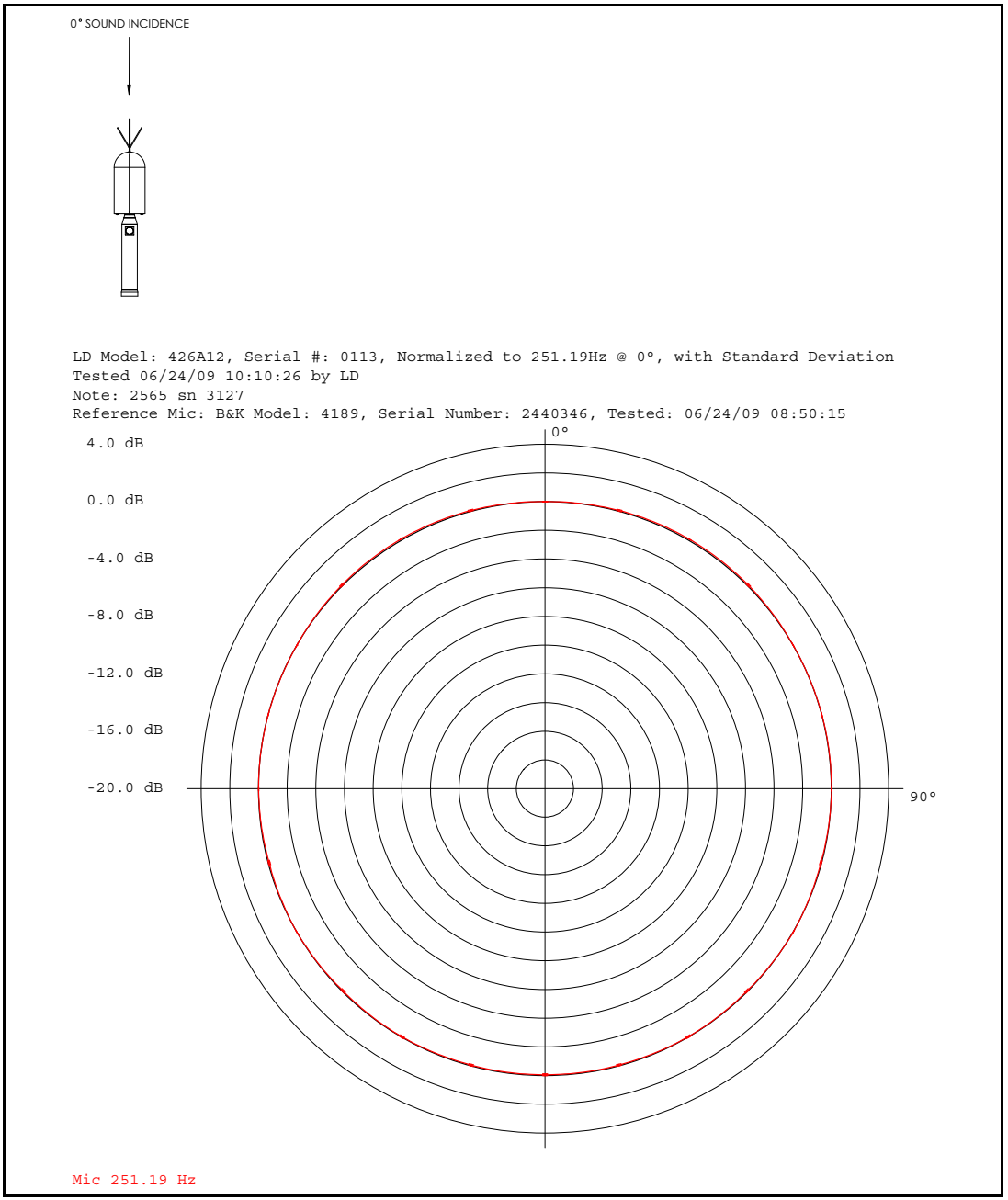


FIGURE A-15 426A12 with 2565 Microphone: 251.19 Hz

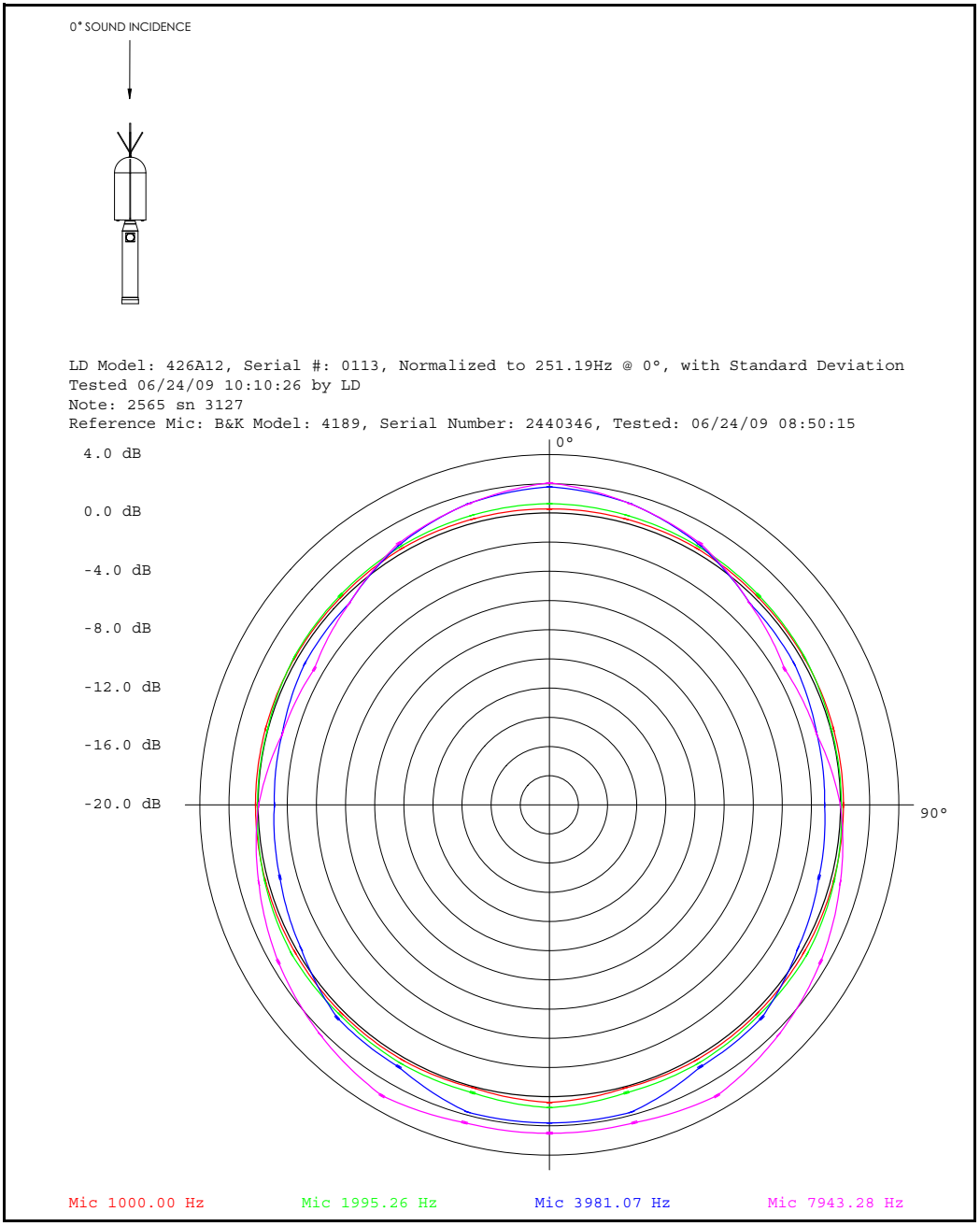


FIGURE A-16 **426A12 with 2565 Microphone: 1000.00 Hz, 1995.26 Hz, 3981.07 Hz and 7943.28 Hz**

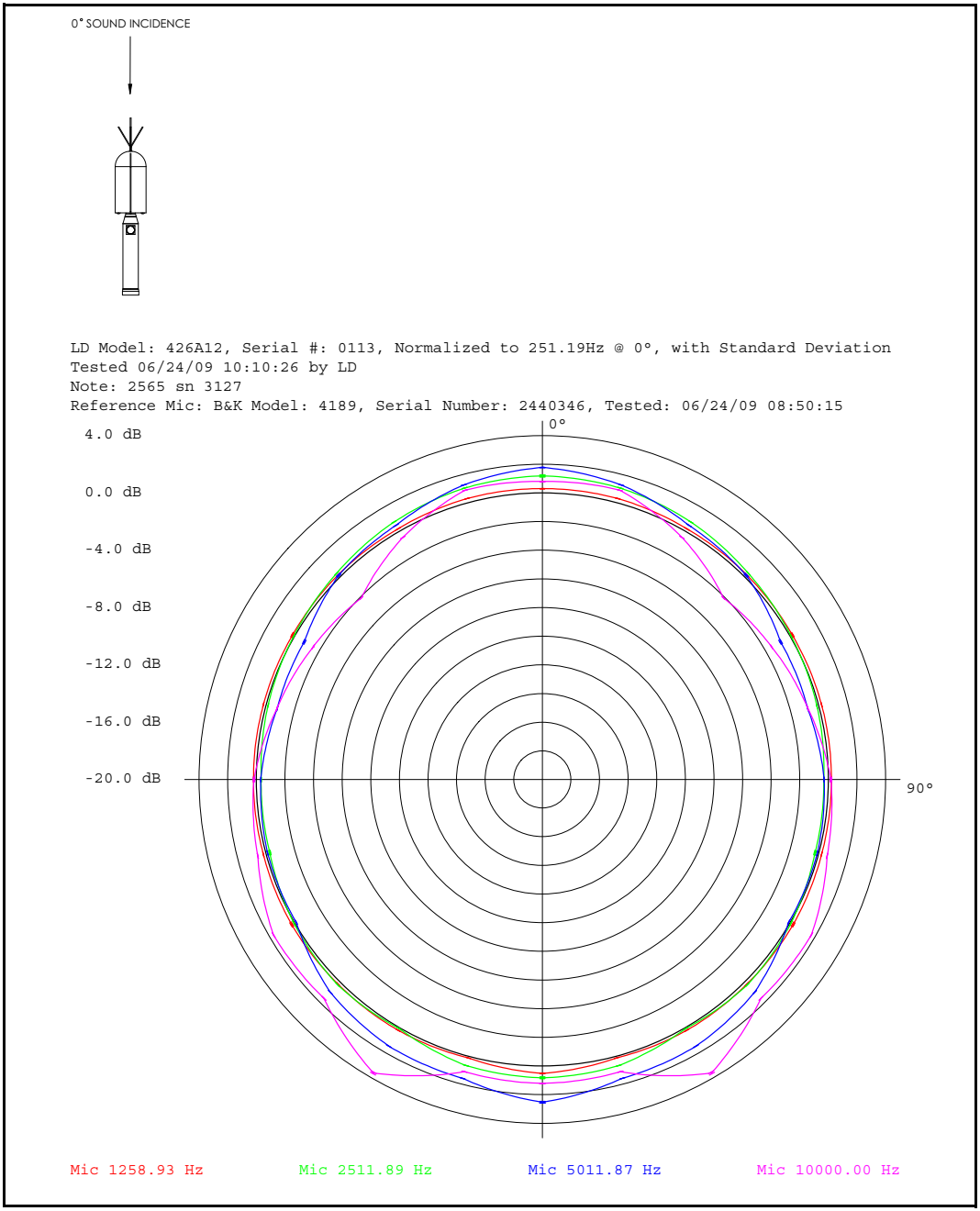


FIGURE A-17 426A12 with 2565 Microphone: 1258.93 Hz, 2511.89 Hz, 5011.87 Hz and 10000 Hz

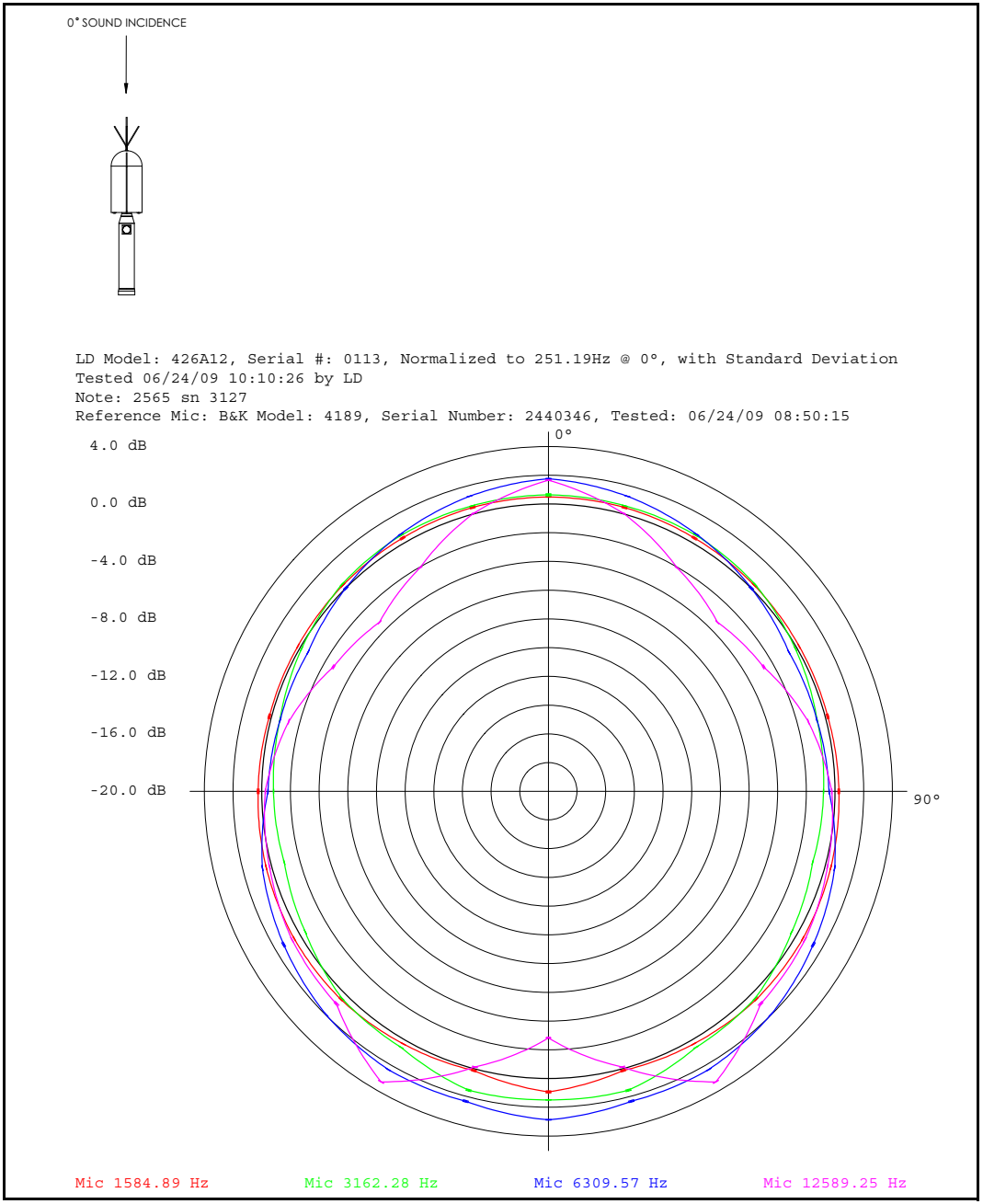


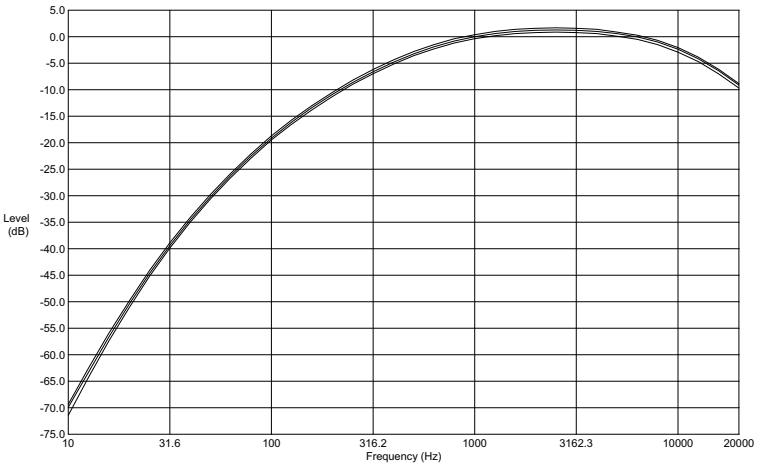
FIGURE A-18 **426A12 with 2565 Microphone: 1584.89 Hz, 3162.28 Hz, 6309.57 Hz and 12589.25 Hz**

Electrical Frequency Response

A-Weight Frequency Response

Model: 426A12; Serial Number: 0110
Certificate of A-Weight Electrical Conformance

This instrument was set to 20 dB gain in A-weight with preamplifier and tested using a 0.75 Vrms input sinewave at exact frequencies as specified in ISO 266:1997 with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 7.4818 Vrms (19.979 dB ref to input), uncertainty 0.033 dB.



Response in dB re output response at 1kHz

Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance	Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance
10.00	-70.4	-69.91	0.35	0.49	+1.05, -1.05	501.19	-3.2	-3.26	0.10	-0.06	+0.40, -0.40
12.59	-63.4	-63.32	0.22	0.08	+0.86, -0.86	630.96	-1.9	-1.92	0.10	-0.02	+0.40, -0.40
15.85	-56.7	-56.70	0.15	0.00	+0.73, -0.73	794.33	-0.8	-0.83	0.10	-0.03	+0.40, -0.40
19.95	-50.5	-50.47	0.10	0.03	+0.62, -0.62	1000.00	0.0	0.00	0.10	0.00	+0.40, -0.40
25.12	-44.7	-44.71	0.10	-0.01	+0.54, -0.54	1258.90	0.6	0.60	0.10	0.00	+0.40, -0.40
31.62	-39.4	-39.44	0.10	-0.04	+0.50, -0.50	1584.90	1.0	0.99	0.10	0.00	+0.40, -0.40
39.81	-34.6	-34.63	0.10	-0.03	+0.44, -0.44	1995.30	1.2	1.22	0.10	0.02	+0.40, -0.40
50.12	-30.2	-30.22	0.10	-0.02	+0.42, -0.42	2511.90	1.3	1.30	0.10	0.00	+0.40, -0.40
63.10	-26.2	-26.19	0.10	0.00	+0.40, -0.40	3162.30	1.2	1.23	0.10	0.03	+0.40, -0.40
79.43	-22.5	-22.51	0.10	0.00	+0.40, -0.40	3981.10	1.0	1.01	0.10	0.01	+0.40, -0.40
100.00	-19.1	-19.15	0.10	-0.05	+0.40, -0.40	5011.90	0.5	0.60	0.10	0.10	+0.40, -0.40
125.89	-16.1	-16.11	0.10	-0.01	+0.40, -0.40	6309.60	-0.1	-0.05	0.10	0.05	+0.40, -0.40
158.49	-13.4	-13.37	0.10	0.03	+0.40, -0.40	7943.30	-1.1	-1.02	0.10	0.08	+0.40, -0.40
199.53	-10.9	-10.89	0.10	0.00	+0.40, -0.40	10000.00	-2.5	-2.38	0.12	0.12	+0.42, -0.42
251.19	-8.6	-8.66	0.10	-0.06	+0.40, -0.40	12589.00	-4.3	-4.19	0.12	0.11	+0.42, -0.42
316.23	-6.6	-6.64	0.10	-0.04	+0.40, -0.40	15849.00	-6.6	-6.45	0.12	0.15	+0.42, -0.42
398.11	-4.8	-4.84	0.10	-0.04	+0.40, -0.40	19953.00	-9.3	-9.15	0.12	0.15	+0.42, -0.42

Noise floor data: 1kHz (1/3 Octave) = 3.43 uV, 10.7 dBuV; 20Hz-20kHz = 15.7 uV, 23.9 dBuV; uncertainty = 0.47 dB.

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

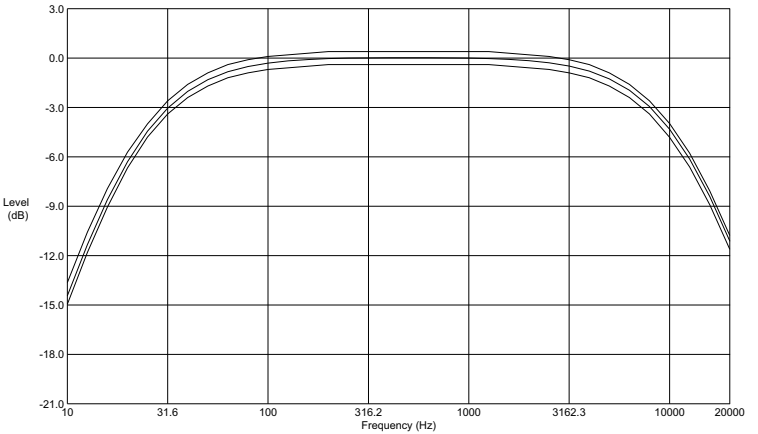
This instrument is in compliance with Larson Davis limits.

Technician: LD Test Date: 24APR2007

FIGURE A-19 Electrical Frequency Response: A-Weight

Model: 426A12; Serial Number: 0110
Certificate of C-Weight Electrical Conformance

This instrument was set to 20 dB gain in C-weight with preamplifier and tested using a 0.1 Vrms input sinewave at exact frequencies as specified in ISO 266:1997 with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.9956 Vrms (19.962 dB ref to input), uncertainty 0.033 dB.



Response in dB re output response at 1kHz

Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance	Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance
10.00	-14.3	-14.45	0.10	-0.15	+0.66, -0.66	501.19	0.0	0.03	0.10	0.03	+0.40, -0.40
12.59	-11.2	-11.34	0.10	-0.14	+0.62, -0.62	630.96	0.0	0.03	0.10	0.03	+0.40, -0.40
15.85	-8.5	-8.61	0.10	-0.11	+0.56, -0.56	794.33	0.0	0.02	0.10	0.02	+0.40, -0.40
19.95	-6.2	-6.30	0.10	-0.10	+0.48, -0.48	1000.00	0.0	0.00	0.10	0.00	+0.40, -0.40
25.12	-4.4	-4.45	0.10	-0.05	+0.40, -0.40	1258.90	0.0	-0.03	0.10	-0.03	+0.40, -0.40
31.62	-3.0	-3.04	0.10	-0.04	+0.40, -0.40	1584.90	-0.1	-0.08	0.10	0.02	+0.40, -0.40
39.81	-2.0	-2.02	0.10	-0.02	+0.40, -0.40	1995.30	-0.2	-0.16	0.10	0.04	+0.40, -0.40
50.12	-1.3	-1.31	0.10	-0.01	+0.40, -0.40	2511.90	-0.3	-0.29	0.10	0.00	+0.40, -0.40
63.10	-0.8	-0.83	0.10	-0.03	+0.40, -0.40	3162.30	-0.5	-0.49	0.10	0.01	+0.40, -0.40
79.43	-0.5	-0.52	0.10	-0.02	+0.40, -0.40	3981.10	-0.8	-0.80	0.10	0.00	+0.40, -0.40
100.00	-0.3	-0.31	0.10	-0.01	+0.40, -0.40	5011.90	-1.3	-1.26	0.10	0.04	+0.40, -0.40
125.89	-0.2	-0.18	0.10	0.02	+0.40, -0.40	6309.60	-2.0	-1.96	0.10	0.04	+0.40, -0.40
158.49	-0.1	-0.09	0.10	0.00	+0.40, -0.40	7943.30	-3.0	-2.95	0.10	0.05	+0.40, -0.40
199.53	0.0	-0.04	0.10	-0.04	+0.40, -0.40	10000.00	-4.4	-4.32	0.12	0.08	+0.42, -0.42
251.19	0.0	-0.01	0.10	0.00	+0.40, -0.40	12589.00	-6.2	-6.13	0.12	0.07	+0.42, -0.42
316.23	0.0	0.01	0.10	0.01	+0.40, -0.40	15849.00	-8.5	-8.41	0.12	0.09	+0.42, -0.42
398.11	0.0	0.03	0.10	0.03	+0.40, -0.40	19953.00	-11.2	-11.11	0.12	0.09	+0.42, -0.42

Noise floor data: 1kHz (1/3 Octave) = 3.39 uV, 10.6 dBuV, 20Hz-20kHz = 28.8 uV, 29.2 dBuV; uncertainty = 0.47 dB.

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

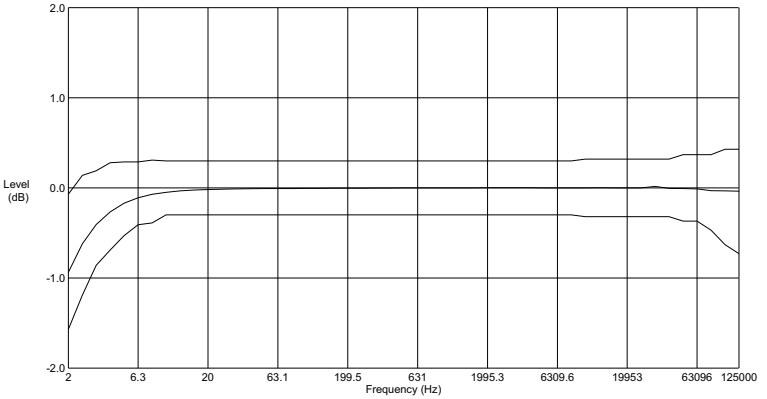
This instrument is in compliance with Larson Davis limits.

Technician: LD Test Date: 24APR2007

FIGURE A-20 Electrical Frequency Response: C-Weight

Model: 426A12; Serial Number: 0110
Certificate of Flat-Weight Electrical Conformance

This instrument was set to 20 dB gain in Flat-weight with preamplifier and tested using a 0.1 Vrms input sinewave at exact frequencies as specified in ISO 266:1997 with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.9951 Vrms (19.958 dB ref to input), uncertainty 0.033 dB.



Response in dB re output response at 1kHz

Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance	Freq (Hz)	Theor	Measured	Uncertainty	Error	Tolerance
2.00	0.0	-0.94	0.32	-0.94	-0.07, -1.57	630.96	0.0	-0.00	0.10	0.00	+0.30, -0.30
2.51	0.0	-0.62	0.32	-0.62	+0.14, -1.19	794.33	0.0	-0.00	0.10	0.00	+0.30, -0.30
3.16	0.0	-0.41	0.23	-0.41	+0.19, -0.86	1000.00	0.0	0.00	0.10	0.00	+0.30, -0.30
3.98	0.0	-0.27	0.23	-0.27	+0.28, -0.69	1258.90	0.0	0.00	0.10	0.00	+0.30, -0.30
5.01	0.0	-0.17	0.17	-0.17	+0.29, -0.53	1584.90	0.0	0.00	0.10	0.00	+0.30, -0.30
6.31	0.0	-0.11	0.13	-0.11	+0.29, -0.41	1995.30	0.0	0.00	0.10	0.00	+0.30, -0.30
7.94	0.0	-0.07	0.13	-0.07	+0.31, -0.39	2511.90	0.0	0.00	0.10	0.00	+0.30, -0.30
10.00	0.0	-0.05	0.10	-0.05	+0.30, -0.30	3162.30	0.0	0.00	0.10	0.00	+0.30, -0.30
12.59	0.0	-0.03	0.10	-0.03	+0.30, -0.30	3981.10	0.0	0.00	0.10	0.00	+0.30, -0.30
15.85	0.0	-0.03	0.10	-0.03	+0.30, -0.30	5011.90	0.0	0.00	0.10	0.00	+0.30, -0.30
19.95	0.0	-0.02	0.10	-0.02	+0.30, -0.30	6309.60	0.0	0.00	0.10	0.00	+0.30, -0.30
25.12	0.0	-0.01	0.10	-0.01	+0.30, -0.30	7943.30	0.0	0.00	0.10	0.00	+0.30, -0.30
31.62	0.0	-0.01	0.10	-0.01	+0.30, -0.30	10000.00	0.0	0.00	0.12	0.00	+0.32, -0.32
39.81	0.0	-0.01	0.10	-0.01	+0.30, -0.30	12589.00	0.0	0.00	0.12	0.00	+0.32, -0.32
50.12	0.0	-0.01	0.10	0.00	+0.30, -0.30	15849.00	0.0	0.00	0.12	0.00	+0.32, -0.32
63.10	0.0	-0.01	0.10	0.00	+0.30, -0.30	19953.00	0.0	0.00	0.12	0.00	+0.32, -0.32
79.43	0.0	-0.01	0.10	0.00	+0.30, -0.30	25119.00	0.0	-0.00	0.12	0.00	+0.32, -0.32
100.00	0.0	-0.01	0.10	0.00	+0.30, -0.30	31623.00	0.0	0.02	0.12	0.02	+0.32, -0.32
125.89	0.0	-0.01	0.10	0.00	+0.30, -0.30	39811.00	0.0	-0.01	0.12	0.00	+0.32, -0.32
158.49	0.0	-0.01	0.10	0.00	+0.30, -0.30	50119.00	0.0	-0.01	0.17	0.00	+0.37, -0.37
199.53	0.0	-0.00	0.10	0.00	+0.30, -0.30	63096.00	0.0	-0.01	0.17	-0.01	+0.37, -0.37
251.19	0.0	-0.00	0.10	0.00	+0.30, -0.30	79433.00	0.0	-0.03	0.17	-0.03	+0.37, -0.47
316.23	0.0	-0.00	0.10	0.00	+0.30, -0.30	100000.00	0.0	-0.03	0.23	-0.03	+0.43, -0.63
398.11	0.0	-0.00	0.10	0.00	+0.30, -0.30	125890.00	0.0	-0.04	0.23	-0.04	+0.43, -0.73
501.19	0.0	-0.00	0.10	0.00	+0.30, -0.30						

Noise floor data: 1kHz (1/3 Octave) = 3.24 uV, 10.2 dBuV, 20Hz-20kHz = 35.1 uV, 30.9 dBuV; uncertainty = 0.47 dB.

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

This instrument is in compliance with Larson Davis limits.

Technician: LD Test Date: 24APR2007

FIGURE A-21 Electrical Frequency Response: Flat-Weight

Gain Stage

Model: 426A12 Serial Number: 0110
Certificate of Gain Stage Electrical Conformance

A 1Vrms 1000Hz signal is cabled direct-in to the preamp. The signal input is decreased by an amount equal to the gain setting on the 426A12. The output level should remain at the 1V level for each gain level tested. Error shown is the difference between the output level read and the input for 0 dB and output level read compared to the 0 dB level for 20 dB.

Gain (dB)	Output (V)	Error (dB)	UC (dB)	Limits (dB)
0.0	0.9933	-0.059	0.03	-0.18/+0.03
20.0	0.9952	0.017	0.04	+/- 0.14

This instrument is in compliance with limits established for Larson Davis 426A12.

Technician: LD Test Date: 24APR2007

FIGURE A-22 Gain Stage Electrical Conformation

Effect of Temperature Variation

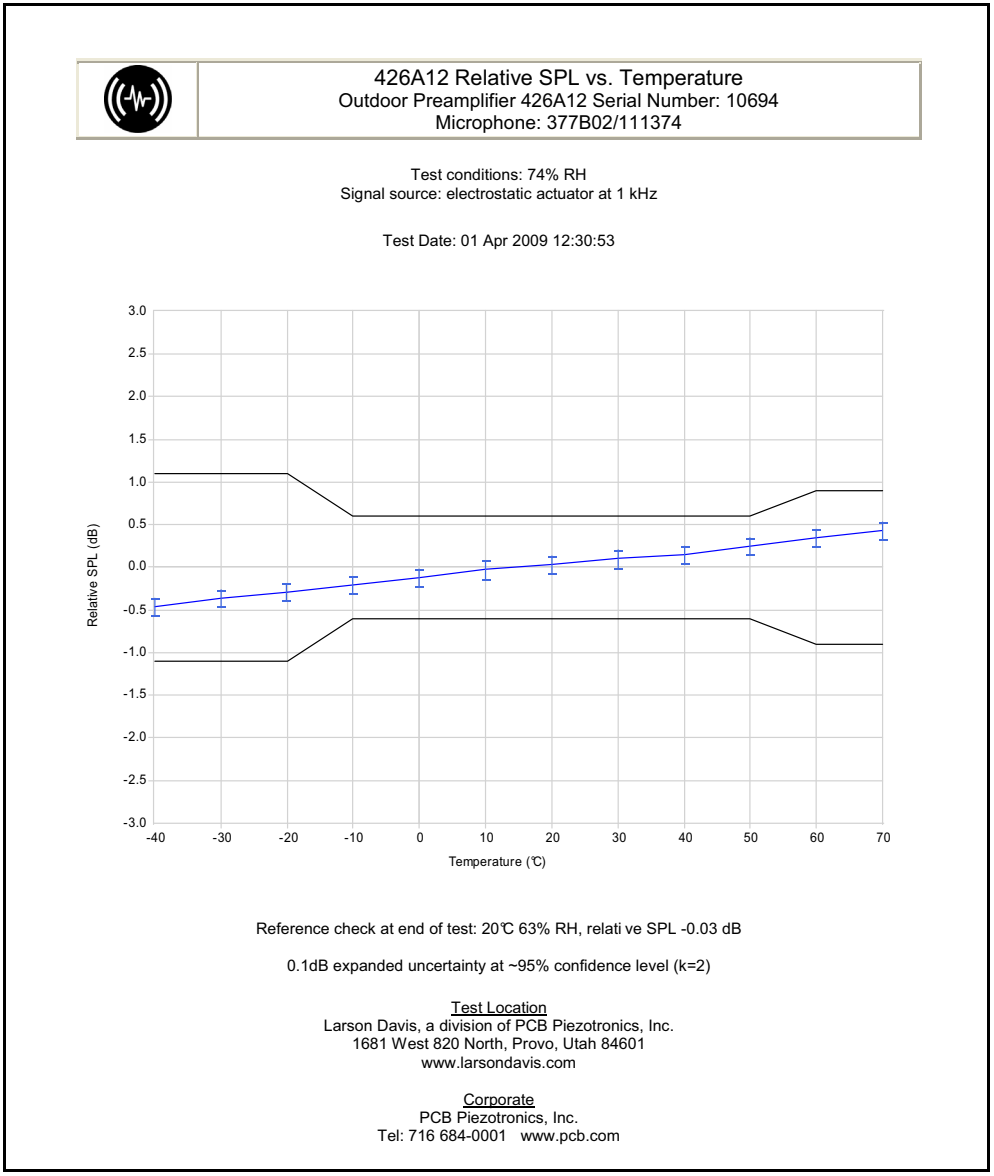


FIGURE A-23 Relative SPL versus Temperature

Effect of Humidity

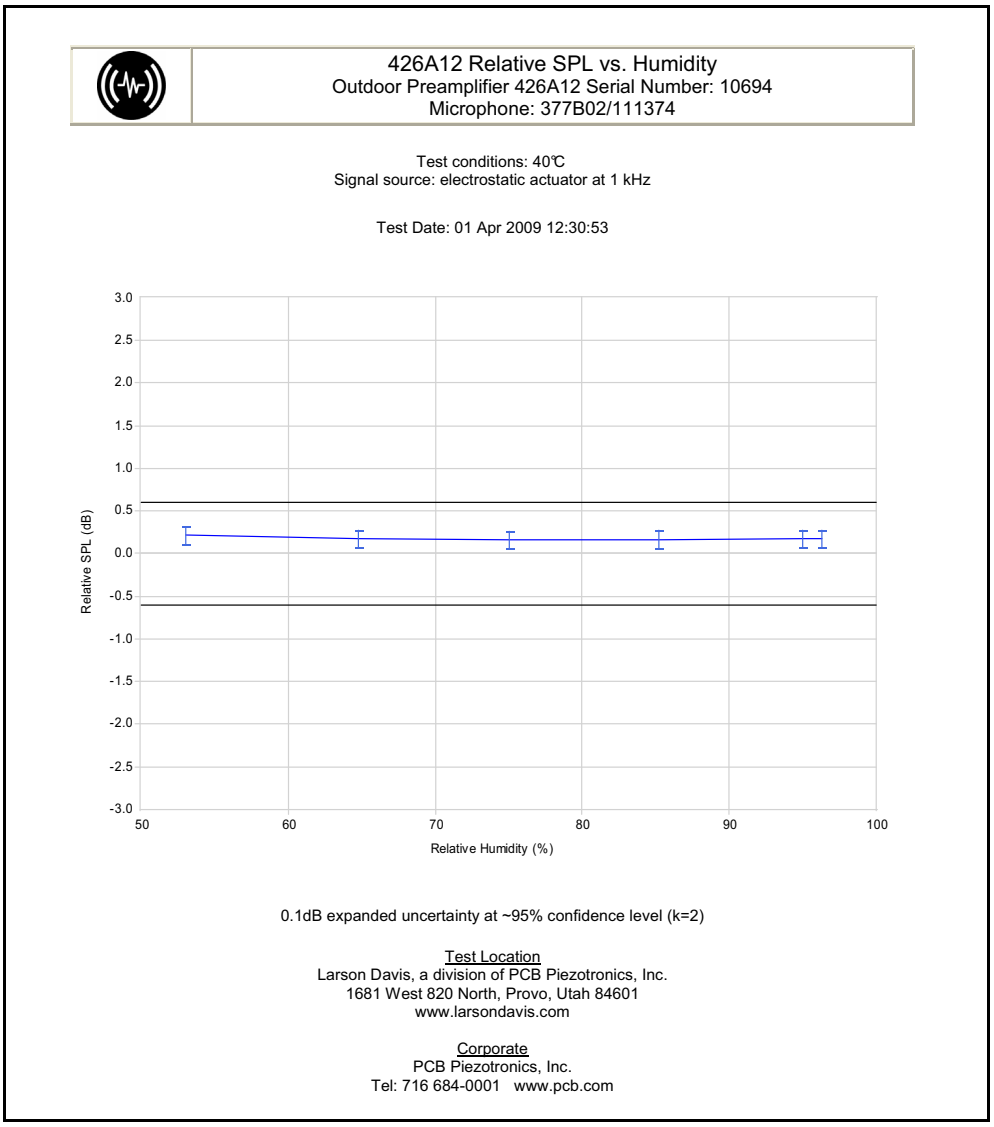


FIGURE A-24 Relative SPL versus Humidity

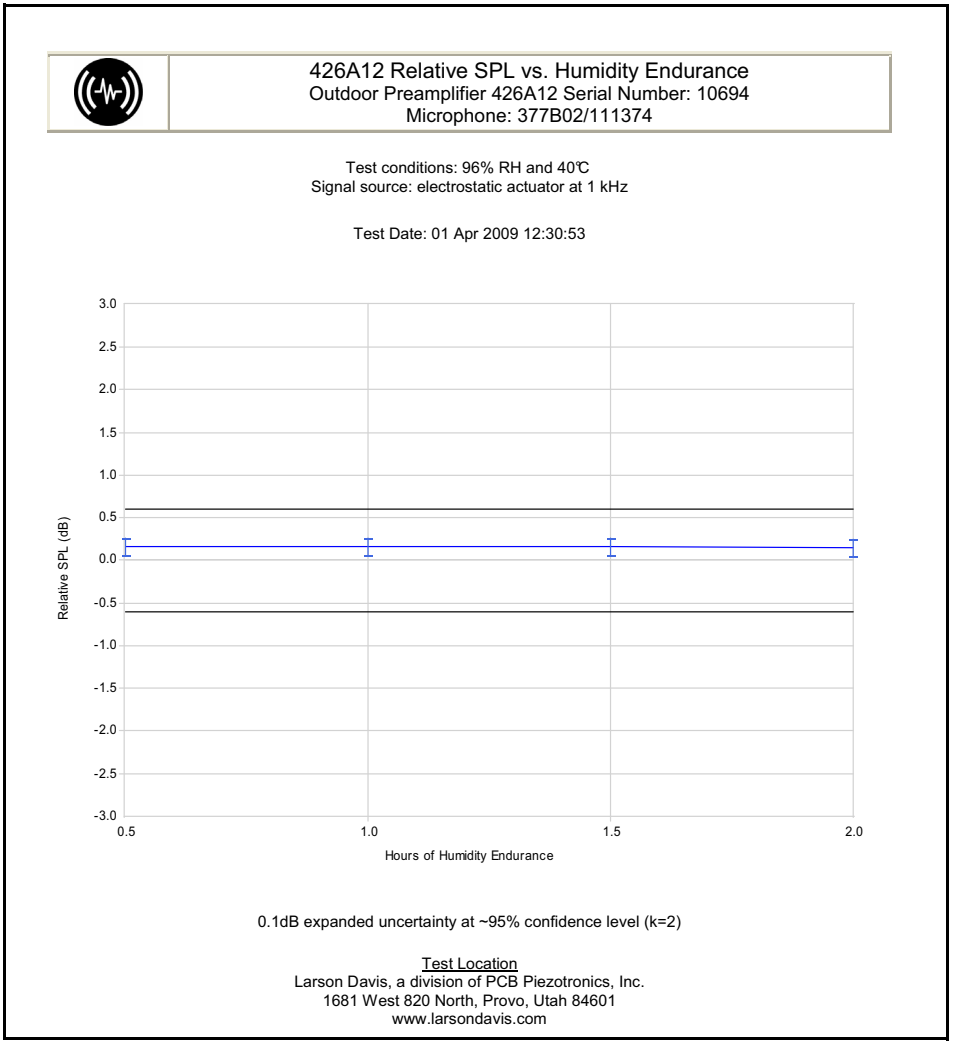


FIGURE A-25 Relative SPL versus Humidity Endurance

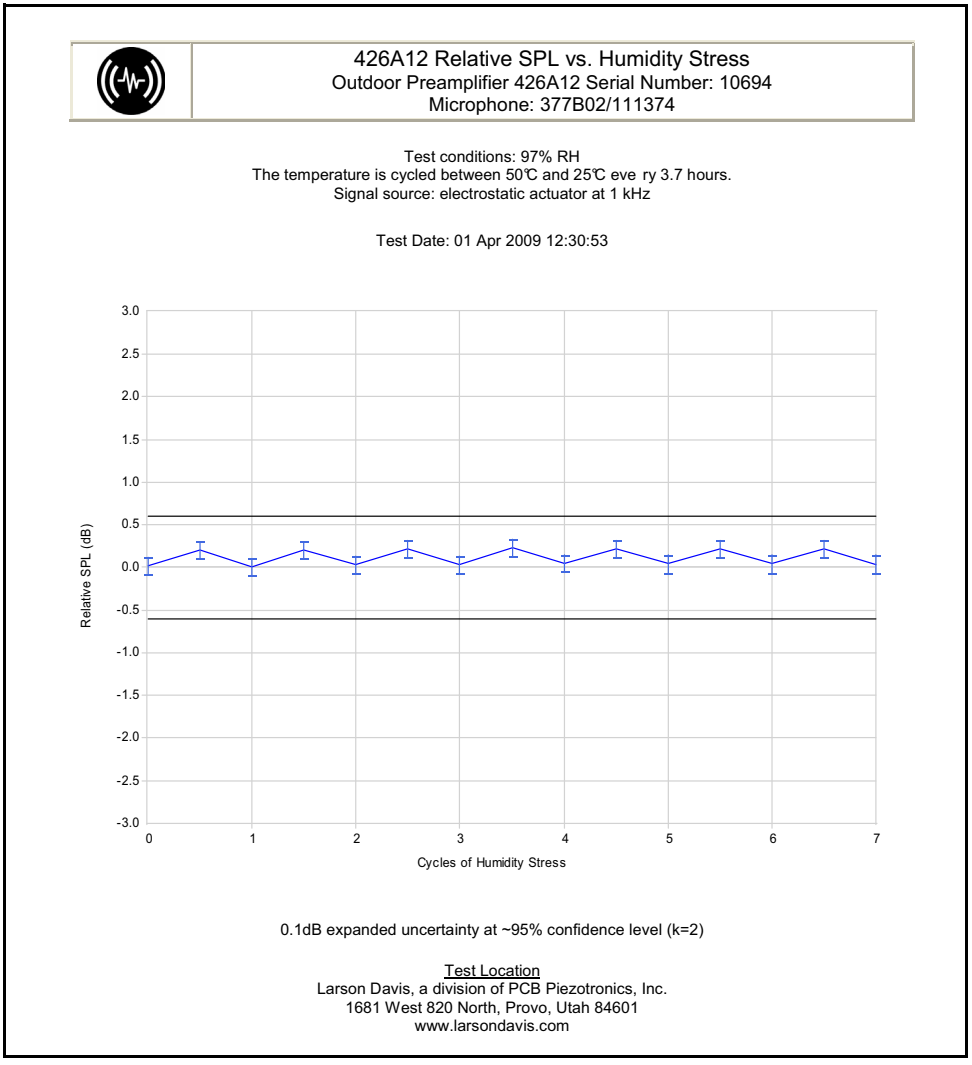


FIGURE A-26 Relative SPL versus Humidity Stress Test

Electronic

Microphone Bias

0 and 200 V (± 2 V), selected using an internal jumper

Gain Setting

0 and 20 dB, selected using an internal jumper

Input Impedance

10 GΩ // 0.16 pF

Output Impedance

50 Ω

Maximum Input Level

18 Vpeak

Overload Level at Input or Output

16 Vpeak typical

Dynamic Range

Typical dynamic range with input electrically tested through an ADP005 adaptor (18 pF)

0 dB Gain, A-Weight

130 dB; 10 dB noise floor to 140 dB re.20μPa with an equivalent 50 mV/Pa microphone.

20 dB Gain, A-Weight

114 dB; 6 dB noise floor to 120 dB re.20μPa with an equivalent 50 mV/Pa microphone.

Note that a typical 50 mV/Pa microphone has a 15 dB A-weighted noise in addition to the electrical noise of the preamplifier.

Maximum Output Current

25 mA

Output Slew Rate

4 V/μS

Output Noise

Note that a typical 50 mV/Pa microphone has a 15 dB A-weighted noise in addition to the electrical noise of the preamplifier.

20 Hz to 20 kHz, with input through an ADP005 (18 pF)

Gain, dB	Z-Weight	A-Weight	C-Weight
0	3.6 µV	3.0 µV	3.6 µV
20	33 µV	16 µV	27 µV

Table A-2: Output Noise, Input Through ADP005 to Ground

Distortion (THD)

- 67 dB typical at 9 Volts rms out, 1 kHz, 0 dB gain

-75 dB typical at 10 Volts rms out, 1 kHz, 20 dB gain

Preamplifier Output Signal Cable Driving Capacity

Length, ft	14 Vpeak	4.2 Vpeak	1.4 Vpeak
250	38 kHz	120 kHz	300 kHz
500	19 kHz	62 kHz	180 kHz
1,000	9.5 kHz	31 kHz	92 kHz
2,000	4.7 kHz	15.6 kHz	47 kHz

Table A-3: Signal Cable Driving Capacity

Control Cable

The control cable length is limited to 120 feet total of CBL154 and EXAXXX extension cable.

For longer lengths up to 500 feet, use CBL171 (CABLE LEMO TO MODEL 831 CONTROL, 2FT) and EXHXXX cable (CONTROL CABLE with XXX the cable length up to 500 feet) with a 15 V power supply PSA030.

Internal Sensor Accuracy

Relative Humidity Sensor

±5% RH

Temperature Sensor

±2 °C

Power Supply

Voltage

External 12 Vdc

Voltage Range: 10.5 to 18 Vdc

Isolated from preamp circuitry for ground loop protection

Power Consumption

0 V Microphone Bias

85 mA at 12 Volt (110 mA with electrostatic actuator on)

200 V Microphone Bias

120 mA at 12 Volt (160 mA with electrostatic actuator on)

Desiccant [dehumidifier] (DSC004)

One 1.5 gram blue indicating silica gel capsule and one 1.5" x 6" bag with expected life of 6-12 months (replacement required when indicating gel turns pink). The internal RH sensor will indicate > 70% RH when the silica gel need to be changed.

The blue indicating silica gel capsule contains 0.5% to 1% by weight cobalt chloride, which is listed as a potential carcinogen by inhalation and as a hazardous substance for disposal. The blue indicating silica gel capsule gives virtually no exposure to cobalt chloride dust since the silica gel is held within the capsule. The spent indicating capsule should be disposed of according to national and local regulations.

Rainhat/Electrostatic Actuator (EPS2112)

94 dB (re. 20μPa) @ 1 kHz typical. The 94 dB level can vary from system to system. Levels for 377B02 microphones will be 94 dB ± 3 dB. Other microphones can have a different level that depends upon the physical structure of the microphone.

The internal electrostatic actuator verifies the complete system accuracy (including microphone) at 1 kHz.

Windscreen/Birdspikes (WS009)

Rugged construction for repelling birds; includes foam windscreen

Windscreen Insert (WS009-F)

Black foam windscreen for use with WS009

Environmental with 377B02 or 2565 Microphone

Operating Temperature Range

- 40 °C to 70 °C (- 40 °F to 158 °F)

Operating Humidity Range

0 to 100% relative humidity, excluding internal condensing

Temperature Sensitivity

< ± 1.1 dB @ 1 kHz from - 40 °C to -10 °C (- 40 °F to 14 °F)

< ± 0.6 dB @ 1 kHz from - 10 °C to 50 °C (14 °F to 122 °F)

< ± 0.9 dB @ 1 kHz from 50 °C to 70 °C (122 °F to 158 °F)

Electrostatic Actuator Temperature Sensitivity

- 0.0015 dB/°C typical

Humidity Sensitivity

< ± 0.6 dB @ 1 kHz from 0 to 100% relative humidity, at 40 °C (104 °F)

Physical

Threads

Microphone Thread

11.7 mm - 60 UNS (.4606 - 60 UNS)

Mounting Screw Threads

G 1½" (ISO 228-1)

Dimensions

Maximum Housing Diameter

54 mm (2.125 in)

Windscreen Diameter

101.6 mm (4 in)

Height

587 mm (23.1 in)

Weight:

1.361 kg (3 lb.)

Venting

At bottom of preamplifier through a membrane for protection of the microphone pressure equalization vent

Connectors

Output

BNC female: center is the output signal and the BNC female shell is connected to the internal ground.

Control Connector

LEMO EXG.1B.307 7-pin Female

Pin	Signal
1	External Power Supply, Negative
2	Control Ground
3	Electrostatic Actuator Control Input (< 0.5 V Off, > 2.5 V On)
4	Overload Output (< 0.5 V No Overload, > 4 V Overload)
5	External Serial Clock Input Signal for Reading Temperature and Humidity (< 1 MHz)
6	Data I/O Signal for Temperature and Humidity When EA Control is Low, and for TEDS When EA Control is High
7	External Power Supply, Positive
Shell	Connected to Internal Ground

Table A-4: Control Connector Pins

The outer tube of the 426A12 is connected to the bird spikes and is intended to have an earth ground for electrostatic protection.

Declaration of Conformity

PCB PIEZOTRONICS Inc.

Declaration of Conformity

Application of Council Directives: 2004/108/EC EMC Directive and 2006/95/EC Low Voltage Directive

Standards to which Conformity is Declared:

CE	CE - Mark indicates compliance with EMC directive 2004/108/EC and Low Voltage directive 2006/95/EC.	
Harmonised EMC Standards	IEC 61672-1:2002 - Sound level meters – Part 1: Specifications. IEC 61326-1:2005 Electrical equipment for measurement, control, and laboratory use - EMC requirements. IEC 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.	
Emissions Test Standards	CISPR 11: edit 4.1 2004: Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement. Class B.	Passed
	IEC 61000-3-2 and IEC 61000-3-3. Limits for harmonic current emissions and voltage changes, fluctuations, and flicker. (equipment input current ≤ 16 A per phase).	Passed
Immunity Test Standards		**Performance Criteria**
	IEC 61000-4-2:2008 Electrostatic discharge (ESD) immunity. ±4 kV contact discharges and ±8 kV air discharges.	B
	IEC 61000-4-3:2006 Radiated, radio-frequency, electromagnetic field immunity. 26 MHz to 1 GHz at 10 V/m, 1.4 GHz to 2 GHz at 3V/m, 2.0 GHz to 2.7 GHz at 1V/m with 1 kHz 80% AM.	A
	IEC 61000-4-4:2004 Electrical fast transient (EFT)/burst immunity. ±2 kV (5/50 ns, 5 kHz).	A
	IEC 61000-4-5:2005 Surge immunity. ± 1 kV.	B
	IEC 61000-4-6:2008 Immunity to RF conducted line disturbances. 10 V, 1 kHz 80% AM from 150 kHz to 80 MHz.	A
	IEC 61000-4-8:2001 Power frequency magnetic field immunity. 80 A/m. 50/60 Hz.	A
Notes: The above are guaranteed when using with 831, 831-INT, and 377B02 or 2565 microphone.		

Manufacturer's Name: PCB Piezotronics, Inc.
Manufacturer's Address: 3425 Walden Ave.
Depew, NY, 14043, USA

Type of Equipment: **Model 426A12 – Outdoor Microphone Preamplifier**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature: Kenneth J. Gonyea Jr.

Name:	Kenneth J. Gonyea Jr.
Title:	V.P. Manufacturing

- ISO 9001 Certified -
PCB Piezotronics, Inc.
Phone: 716-684-0001 FAX: 716-684-0987

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