Model 2221

Microphone Preamplifier Power Supply Manual

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Larson Davis

Model 2221 Microphone Preamplifier Power Supply

Manual

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Model 2221 Serial Number: _____ Purchase Date: _____

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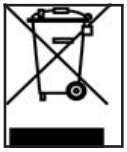

Warranty

For warranty information, refer to our *Terms and Conditions of Sale* on our website, www.larsondavis.com/TermsConditions.aspx.

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CHAPTER

1 Introduction

This chapter describes the features of the Larson Davis Model 2221 Microphone Preamplifier Power Supply.

Features

The Larson Davis Model 2221 Microphone Preamplifier Power Supply provides power for a microphone preamplifier, a microphone bias voltage of 200 V for use with traditional air condenser microphones (which can be switched off for use with prepolarized microphones) and up to 50 dB of gain to optimize the level of the output signal. It can be powered by internal or external batteries or an external DC voltage. It is characterized by low noise level and distortion and the ability to drive very long cables, input and output.

The Larson Davis Model 2221 Microphone Power Supply has the following features:

- Single Channel power and amplification for precision microphone preamplifiers
- Internal batteries for portable operation
- 0 and 200 microphone bias voltages
- Selectable Flat (Z), A- and C-Weighting frequency responses
- 0 to 50 dB gain range

- Last settings are saved even when not powered
- Both instantaneous and latched overload indications
- Output signal level indicating LED
- Internal battery voltage LEDs
- External power LED
- Ability to drive long input and output cables.
- Uses no power from internal or external batteries when switched off.
- When powered by an external battery or DC voltage, power will switch without interruption to the internal batteries in the event of a power failure or when the external DC voltage drops below the internal battery voltage.

Unpacking and Inspection

Your Model 2221 has been shipped in protective packaging. Please verify the package contains the items listed below and retain the shipping container for safe shipment at a future date. Report any damage or shortage immediately to Larson Davis, Inc. at 801 375-0177.

If you have not already done so, please record your instrument's serial number (located on the bottom of the instrument) and the purchase date. You may be asked to give this information in future communications with Larson Davis.

Accessories and Optional Equipment

The Model 2221 delivered with the following *standard* accessories:

- Six 1.5V AA Alkaline cells
- PSA027 115 Vac to 9Vdc 500 mA Power Adaptor
- Adjustment tool for use with vernier gain control
- Product manual on CD
- Calibration Certificate

The following *optional* equipment is also available:

- PRM902 and PRM903 1/2" Microphone Preamplifiers
- ADP008 1" microphone to 1/2" microphone preamplifier adaptor
- ADP043 1/4" microphone to 1/2" microphone preamplifier adaptor
- EXAXXX Microphone Extension Cable, 7-pin LEMO® (the XXX indicates length in feet)
- CBL097 cable with 7-pin LEMO to BNC plug, 6' long
- PRA951-2 and PRM951-4 Current Sources permitting ICP® accelerometers to be used with the Model 2221.
- CAL200 and CAL250 Acoustic Calibrators
- PSA021 230Vac to 9Vdc 500 mA Power Adaptor

CHAPTER

2 Description

This chapter presents the Model 2221 physical description, including front panel keys, connectors, instrument controls, and LED indicators.

General Description

The Model 2221 has a flat shape factor with top panel controls for optimal use on a table or desktop.

FIGURE 2-1 Model 2221

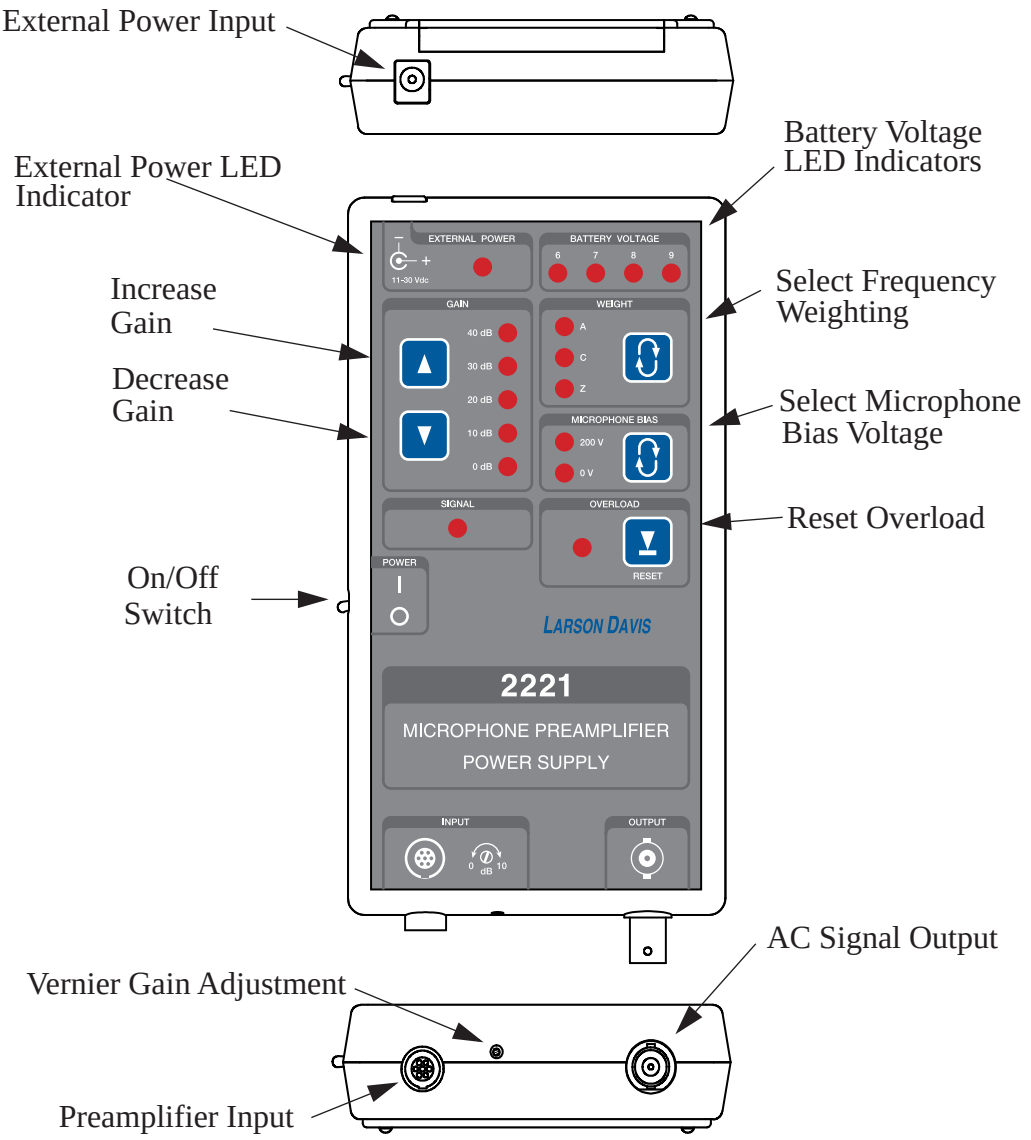


FIGURE 2-2 2221 Controls

Connectors

Preamplifier Input

LEMO® EPG.1B.307 7-pin Female connector

Pin Connections

Pin	Signal
1	No Connection
2	Signal Ground
3	Microphone Polarization Voltage 0 or 200 Volts
4	Signal Input
5	No Connection
6	Power Supply Positive Voltage + 18 Volts
7	Power Supply Negative Voltage - 18 Volts
Shell	Connected to Case ground

AC Output

BNC Female

External DC Power Input

2.5 x 5.5 mm Coaxial Connector, center positive (External DC voltage range: 10.5 to 30 V)

Controls

Power

Side mounted toggle switch

Back/On (|)

Forward/Off (O)

Microphone Bias Voltage

200 or 0 Volt, selection indicated by illuminated LED

Gain

0 to 40 dB in 10 dB steps, selection indicated by illuminated LED

Note that there is also a 0 to 10 dB vernier gain (12 turn potentiometer) adjustment at the front of the case.

Frequency Weighting

Choice of A, C or Z (Flat) Weighting, selection indicated by illuminated LED

Overload Reset

Press button to reset latching overload

LED Indicators

Overload

Flashing of the OVERLOAD LED indicates a steady input overload. When the input voltage drops below the overload level, the OVERLOAD LED will remain illuminated (latched on) until reset.

Signal Present

The SIGNAL LED is illuminated when the output signal exceeds 45 mV. The brightness will increase with the signal level in a manner approximately proportional to the log of the voltage.

External Power

The presence of an external voltage (10.5 - 30 Vdc) is indicated by the illuminated EXTERNAL POWER LED

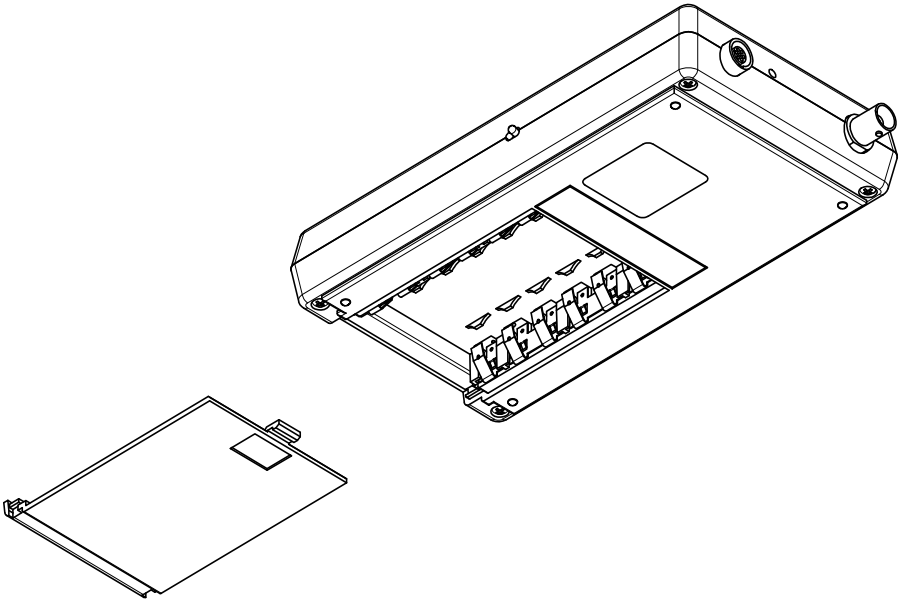
Battery Voltage

The internal battery voltage is indicated by the illumination of one of the BATTERY VOLTAGE LEDs as indicated in the following table.

LED	Battery Voltage (Volts)
6	5.5 to 6.5
7	6.5 to 7.5
8	7.5 to 8.5
9	8.5 to 11.3

Battery Compartment

The Model 2221 is powered by six AA batteries. The battery compartment is accessed from the bottom by removing the door as shown below. The battery polarity is indicated in the bottom of the compartment.



CHAPTER

3 Operation

This chapter presents a detailed description of the operation of the Model 2221.

Powering the Model 2221

The Model 2221 can be powered by internal batteries or from an external DC power source such as the Larson Davis PSA027, which is supplied as a standard accessory. No internal or external power is used when the instrument is switched off.

Internal Battery Power

The Model 2221 is designed to use six AA batteries. This will provide 40 hours of continuous operation with the PRM902 Microphone Preamplifier. To insert the batteries, remove the battery compartment access door as shown in FIGURE 3-1. The polarity is indicated in the bottom of the battery compartment.

Battery Replacement

When replacing batteries, the manufacturer strongly recommends that all cells be replaced with new ones of the same capacity and type (e.g. all cells Alkaline, NiMH or NiCd). Failure to do so could lead to cell leakage and possible damage to the instrument.

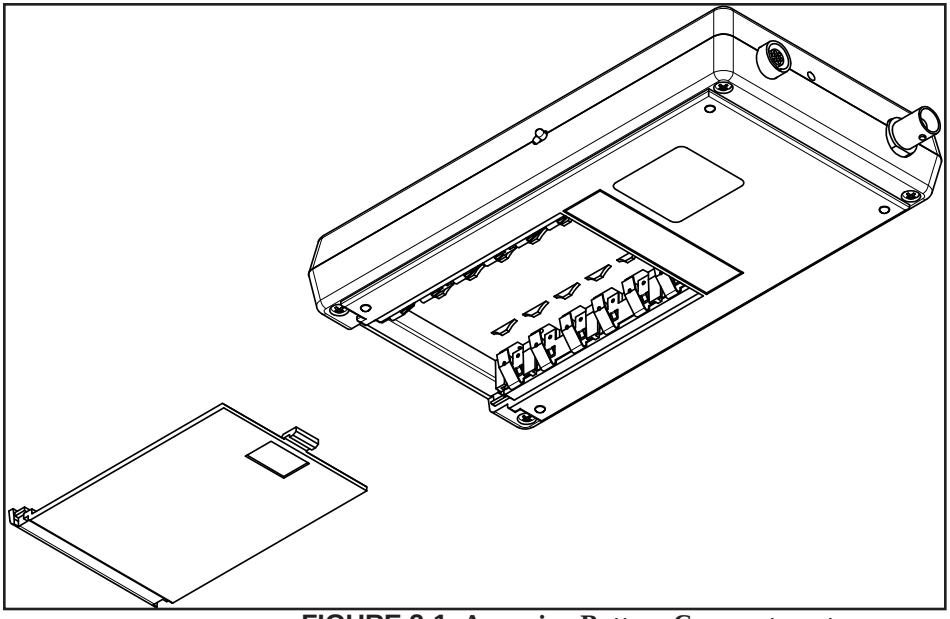


FIGURE 3-1 Accessing Battery Compartment

The internal battery voltage is indicated by one of four LEDs as described in the section “External DC Power Input” on page 2-3. If no LED is illuminated, the battery voltage is less than 5.5 Volts.

External Battery or DC Power

Note: The internal batteries need not be present to operate the Model 2221 under external DC power.

Note: The PSA027 115 Vac to 9Vdc 500 mA power adaptor provided with the Model 2221 provides approximately 12 Volts when lightly loaded by the 65 mA drawn by the 2221.

The Model 2221 can be powered by an external 12 Volt battery or an AC/DC adaptor providing a voltage within the range 10.5 to 30 Vdc.

Power will switch without interruption to the internal batteries when there is an external power failure or if the external voltage drops below the internal battery voltage.

Cable Connections

Signal Input Cable

Caution:Be sure that all connections in the signal path are made prior to turning on the system power.

Connect the microphone preamplifier cable to the 7-pin LEMO® connector on the front of the case. The length of the cable will affect the frequency response of the system as indicated in the section "Cable Driving Capability".

To remove the cable, hold the connector collar between the thumb and forefinger and pull.

AC Signal Output Cable

Connect the signal output cable to the BNC connector on the front of the case.

Operation

Switch On

The power switch is on the left side of the case. Toggle it backward to switch on the Model 2221 and forward to switch it off. The Microphone Bias Voltage LED flashes for 40 seconds while the bias voltage stabilizes.

Parameter Selection

The measurement parameter settings of the Model 2221 are saved two seconds after the last change, even when not powered. Therefore, when switched on all measurement parameters will be the same as when it was switched off.

Microphone Bias Voltage

The bias voltage should be set to zero when using a prepolarized (electret) microphone and 200 V when using a traditional air condenser microphone.

The microphone bias voltage is either On, providing a highly stable level of 200 Vdc, or Off. Pressing the MICROPHONE BIAS key

will toggle the state between these two, When the bias voltage selection is changed, the MICROPHONE BIAS LED will flash for 40 seconds while the bias voltage stabilizes.

Frequency Weighting

The input signal frequency weighting is selected by pressing the WEIGHT key

Repeated presses will move the selection in the sequence Z (Flat), C and A as indicated by the illuminated LED to the left of the key. The characteristics of these weightings are described in the section “Frequency Response” on page A-2

Gain

The input gain is set using the up and down arrow keys in the front panel section entitled GAIN. The selected value is indicated by the illuminated LED to the right of the arrow keys.

Vernier Adjustment

Very fine gain adjustments can be made using the 12 turn potentiometer located on the front end of the case to the right of the signal input connector. This can increase the gain by up to 10 dB by turning it clockwise using the adjustment tool provided.

Gain Adjustment for Best Measurement

The SIGNAL LED will be illuminated when the input signal level is above 45 mV. The higher the level, the brighter the LED will be. When measuring fairly stable signals, it is recommended to increase the gain until an overload is indicated, reduce the gain by 10 dB and reset the latching overload. If no further overloading is indicated, this should be a good setting.

If using the Model 2221 for repeatable non-steady signals, such as recording the output during a machine cycle, it is recommended to make several test runs in order to find the highest gain setting which does not produce an overload during the complete measurement period.

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.

Electrical Specifications

All values are given at 20 °C, 50% R.H., 12 V external supply, < 3 m (10') cable and a direct input from a 50 Ohm generator unless otherwise specified.

Input Impedance:

Frequency	A-Weight	C- and Z-Weight
100 Hz	169 kOhm	39 kOhm
1 kHz	34 kOhm	28 kOhm
10 kHz	28 kOhm	28 kOhm

Output Impedance

50 Ohm

Preamplifier Supply

± 18 Volts

Maximum Input Level

18 Volt, Peak

Maximum Output Current

25 mA

Overload Level (Input or Output)

Positive and negative overload detection: ± 16.5 Volt Peak

Output Slew Rate

10 Volt/µS

Microphone Bias Voltage

0 and 200 Volt (± 0.25 V)

Note: LED flashes for 40 seconds while microphone bias voltage is stabilizing

Gain Settings

0 to 40 dB in 10 dB steps

0 to 11 dB vernier gain (12 turn potentiometer)

Error with vernier fully counter-clockwise

< 0.1 dB to 20 dB

< 0.2 dB to 40 dB

Frequency Response

.

Weighting	Specification
A- and C-Weight	IEC 60651 (2001) and ANSI S1.4 (R 2001) “Sound Level Meters” Type 0
A-, C- and Z-Weight	IEC 61672-1 (2002) “Sound Level Meters” Class 1

A-Weight	63 Hz to 20 kHz (± 0.3 dB) 10 Hz to 50 Hz (± 0.7 dB)
C-Weight	25 Hz to 20 kHz (± 0.3 dB) 10 Hz to 20 Hz (± 0.6 dB)
Flat (Z-Weight)	10 Hz to 100 kHz (± 0.2 dB) 1 Hz to 150 kHz (-3 dB)

Output Noise

The output noise is measured over the frequency range 20 Hz to 20 kHz, with the input shorted.

Gain	Flat (Z-Weighting)	A-Weighting	C-Weighting
0	1.9μV	5.9μV	4.4μV
10	3.7μV	8.6μV	5.0μV
20	7.8μV	20μV	6.6μV
30	25μV	64μV	21μV
40	77μV	200μV	64μV

Cable Driving Capability

The values presented below correspond to a cable having a capacitance of 30 pF/ft.

Length, feet	14 Vpeak	4.2 Vpeak	1.4 Vpeak
250	38 kHz	120 kHz	300 kHz
500	19 kHz	62 kHz	180 kHz

Length, feet	14 Vpeak	4.2 Vpeak	1.4 Vpeak
1,000	9.5 kHz	31 kHz	92 kHz
2,000	4.7 kHz	15.6 kHz	47 kHz

Indicators

Overload

Instantaneous (Blinking LED)

Latched (Steady LED) - Reset on Keypad

Output Signal

LED illuminated for output signals > 45 mV

Battery Level

LED	Battery Voltage (Volts)
6	5.5 to 6.5
7	6.5 to 7.5
8	7.5 to 8.5
9	8.5 to 11.3

Power Supply

Battery Power

Six AA batteries

40 hours of continuous operation with the PRM902 Microphone Preamplifier

Battery level indicator (4 LEDs)

Standby Performance

Uses no power from internal or external batteries when switched off.

External 12 V battery or AC Adaptor

External DC Voltage Range: 10.5 to 30 V

Note: The Model 2221 will run on external DC voltage down to 6 Volts, but will draw power from whichever supply (external or internal battery) has the highest voltage.

Current: 65 mA @ 12 V with PRM902 Microphone Preamplifier

2.5 x 5.5 mm coaxial connector, center positive

Power switches (without interruption) to the internal batteries when there is an external power failure or low external voltage.

Mechanical

Dimensions

Height

32.8 mm (1.29 in)

Width

104 mm (4.10 in)

Length

204 mm (8.02 in)

Weight

425 grams (15 oz.) with six AA cells

Connectors

Input

LEMO® EPG.1B.307 7-pin Female

Pin Connections

Pin	Signal
1	No Connection
2	Signal Ground
3	Microphone Polarization Voltage 0 or 200 Volts
4	Signal Input
5	No Connection
6	Power Supply Positive Voltage + 18 Volts
7	Power Supply Negative Voltage - 18 Volts
Shell	Connected to Case ground

Output

BNC Female

Environmental

Operating Temperature Range

- 40 to + 60 °C (- 40 to +140 °F)

Operating Humidity Range

0 to 90% RH non-condensing

Temperature Sensitivity

<± 0.03 dB @ 1 kHz from - 40 to + 60 °C (- 40 to +140 °F)

Humidity Sensitivity

<± 0.03 dB @ 1 kHz from 0 to 90% RH non-condensing at 40 °C (104 °F)

Electromagnetic Compatibility

Europe

CE

The Model 2221 complies with the European Community EMC Directive (2004/108/EC) and also the Low Voltage Safety Directive (2006/95/EC) by meeting the following standards:

- IEC61326-1:2005: Electrical equipment for measurement, control and laboratory use - EMC requirements.

  •IEC61000-4-2:2008 Electrostatic discharge (ESD) immunity. ± 4kV contact discharges and ± 8 kV air discharges.

  •IEC61000-4-3:2006 Radiated, radio frequency, electromagnetic field immunity. 26 MHz to 1 GHz at 10 V/m, 1.4 GHz to 2 GHzat 3 V/m, 2.0 GHz to 2.7 GHz at 1 V/m with 1 kHz 80% AM.

  •IEC61000-4-4:2004 Electrical fast transient (EFT)/burst immunity. ±2 kV (5/50 ns, 5 kHz).

•IEC61000-4-6:2008 Immunity to RF conducted line disturbances. 10 V, 1 kHz 80% AM from 150 kHz to 80 MHz.

•IEC61000-4-8:2001 Power frequency magnetic field immunity. 80 A/m. 50/60 Hz.

•CISPR 11:2009: Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measuremen.t Class B

- IEC61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General Requirements.

United States

In the United States of America, the Model 2221 complies with he FCC Part 15 regulations as follows:

- Conducted and Radiated Emissions meet Class B limits.

EMC Test Configurations

The Model 2221 was tested with 40 dB Gain, Z weight and with the microphone bias set to 200V.

The reference orientation is with the microphone facing the emissions/immunity antenna.

The following accessories are connected during testing: 2559 microphone, PRM902 preamplifier, EXA010, and External power from a PSA027 AC to DC power adapter.

The setting and configuration for greatest radio-frequency emissions and mode of operation that produce minimum immunity to power-and radio-frequency fields is Z weight, 40 dB Gain with all of the accessories listed above connected.

No degradation in performance or loss of functionality was found following the application of electrostatic discharges.

The method of mounting the instrument for acoustic testing is with the microphone on a tripod.