

**OWNERS MANUAL**  
**MODEL 201**  
**MICROPHONE PREAMPLIFIER**



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Thank you for purchasing the Grace design model 201 microphone preamplifier. It is built to be completely reliable and easy to use. However, there are some important instructions included in this manual. Please take the time to familiarize yourself with the installation and operation of the unit and most problems will be avoided. Regardless of what sources you plan to record, the model 201 will be the invisible link between the microphone and recorder. Grace Design has been building professional audio products for the recording industry for over ten years. During this time the model 201 has evolved through a process of extensive listening, testing and refinement. We hope it helps you achieve a new level of excellence.

## I. OPERATION

### A. FRONT PANEL CONTROLS

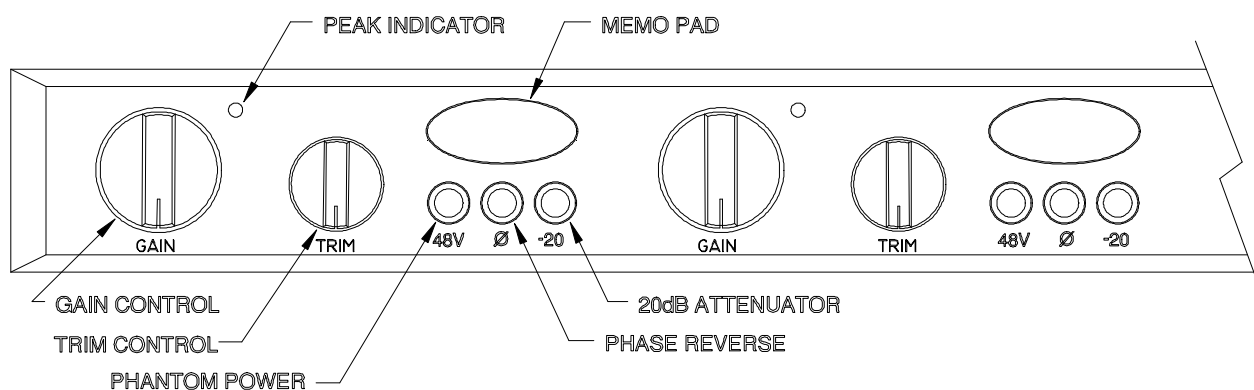


Figure 5. FRONT PANEL CONTROLS

1. **GAIN CONTROL** Each gain control has 24 positions and adjusts the voltage gain from 18dB to 64dB in 2dB steps. For reference, the 9 o'clock position is 30dB, the 12 o'clock position is 42dB, and the 3 o'clock position is 56dB.
2. **TRIM CONTROL** The trim control provides 10dB of continuously variable output attenuation. In the fully clockwise position the trim is at unity (no attenuation). In the fully counter-clockwise position the trim is at -10dB. For reference, the 3 o'clock position is -4dB and the 12 o'clock position is -8dB. The trim control should be left in the fully clockwise position during normal recording.
3. **PHANTOM POWER** The phantom power switch (labeled 48V) connects the +48V power supply to pins 2 and 3 on the XLR input connector. This switch illuminates red. It should be noted that the LED in this switch actually monitors the voltage at the input. With no microphone connected, the LED will continue to illuminate for approximately 10 seconds after the phantom power is turned off as the filter capacitors discharge. As well, even if the phantom power is switched

off, the LED will illuminate if voltage is being fed from an external source. (i.e. when using a direct split in a remote recording application.)

4. **PHASE REVERSE** The phase reverse switch (labeled  $\emptyset$ ) reverses the absolute polarity of the music signal at the input of the preamplifier. The switch illuminates green and provides power for a sealed gold contact relay located on the preamplifier circuit board. This eliminates signal wiring to the front panel and switch contact performance problems.
5. **20dB ATTENUATOR** The 20dB attenuator switch (labeled **-20**) attenuates the input signal 20dB. The switch illuminates amber when engaged. Like the phase reverse switch, this switch controls a sealed Gold contact relay on the preamplifier circuit board. With the -20 switch engaged, the effective gain range becomes -2dB to 44dB.
6. **PEAK INDICATOR** The LED peak indicator, which monitors the output signal, turns green at -14dB and switches to red at +16dB (12dB before clipping in balanced mode and 6dB before clipping in unbalanced mode). The threshold level for peak indication is adjustable on each channel. See section V. Maintenance.
7. **MEMO PAD** The Memo pad can be used with dry-erase or wet-erase type markers. If using dry-erase markers, black is recommended. Grease pencils are not recommended.

## B. SETTING THE GAIN

1. Turn the gain control fully counter-clockwise, turn the trim control fully clockwise and check that the +48V phantom power is off. Connect the microphone and then turn on the phantom power if required. When sending a signal to a tape recorder that has fixed input levels, simply increase the gain until the optimum recording level is reached. If the peak indicator flashes red excessively with the gain control in the fully counterclockwise position, engage the -20dB attenuator.
2. When sending a signal to a tape recorder with an input attenuator use the following procedure: With the sound source present, turn the preamplifier gain control clockwise until the peak LED begins flashing red, then reduce the gain until the red stops flashing. Since red indicates a peak level which is 12dB before clipping (6dB in unbalanced mode) it is OK for it to come on periodically during recording. If peak indicator flashes red excessively with the gain control in the fully counterclockwise position, engage the -20dB attenuator. Adjust the recorder input control for the optimum recording level.
3. The trim control can be used for ultra fine output level adjustment as well as for level riding during recording. It should be noted that the maximum output level of the preamplifier is reduced by the amount of output attenuation being used. For instance, if the trim is set to -6dB the maximum output level of the preamplifier will drop from +28dBu to +22dBu. Since the LED peak indicator monitors signal

level before the trim control, preamplifier overload can be avoided. It is best to leave the trim control fully clockwise for normal recording operations.

## II. INSTALLATION

### A. AUDIO TERMINATIONS

1. Input connections are made via female XLR connectors with pin 2 positive, pin 3 negative and pin 1 ground. 48V phantom power is supplied on pins 2 and 3.
2. Output connections are made via male XLR connectors with pin 2 positive, pin 3 negative and pin 1 ground. If the output is to be used unbalanced, pin 1 should be connected to signal ground and pin 2 to signal hot. Due to the nature of the balanced output stage, pin 3 should be left open for unbalanced operation. See figure below. Note: This will provide a signal of positive absolute polarity when the preamplifier is being used with microphone which produces a positive voltage on pin 2 with positive air pressure on the front of the diaphragm. While a vast majority of microphones conform to this standard a few do not. Use the phase reverse switch to compensate if necessary.

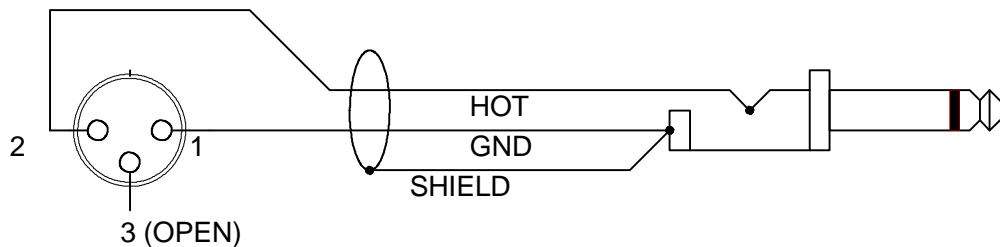


Figure 1. UNBALANCED OUTPUT CABLE TERMINATION

3. The balanced output driver is capable of driving a matched  $600\Omega$  line. This type of termination can be very advantageous for driving very long lines because it provides maximum power transfer through the cable. With a higher power music signal, aberrations caused by distributed capacitance and inductance in the cable are minimized which improves transient performance and harmonic integrity. To create a  $600\Omega$  balanced line, simply connect a  $301\Omega$  1% metal film resistor between pins 2 and 3 at the destination end of the cable. This termination combines with the preamplifier's  $300\Omega$  output impedance to provide a matched  $600\omega$  line.

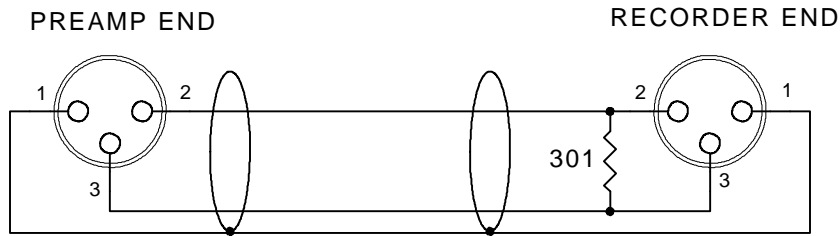


Figure 2. 600Ω BALANCED CABLE TERMINATION

## B. POWER TERMINATION

1. A standard AC power cable is included. For safety, it is recommended that the cord be connected to a grounded outlet. In the event of noise from a ground loop, the audio ground can be isolated from the chassis ground by throwing the AUDIO GND switch on the rear panel of the preamplifier. (See paragraph 3)
2. AC input voltage settings can be adjusted for 100V, 120V, 220V and 240V operation at 50-60Hz. From the outside of the preamplifier, open the trap door next to the IEC power inlet with a small screwdriver. Carefully pull the voltage set cam straight out and then insert with the desired voltage showing. Do not try to rotate the cam while it is in the power input module. Replace the fuses with the proper value selected from the table below. Be sure to use a time delay or Slow-Blow fuse with a 250V rating

Voltage	100V	120V	220V	240V
Fuse rating	0.25A	0.25A	0.125A	0.125A

Figure 3. FUSE VALUE TABLE

3. In certain installations it may be desirable separate the preamplifier signal ground from the chassis and earth grounds. Noise inducing ground loops can be broken while retaining the safety feature of the grounded AC power cord. The 201 should not be operated with a ground lift or "cheater" plug on the AC power cord. To isolate the audio ground from the chassis ground simply set the AUDIO GND switch on the rear panel from EARTH to ISO.

## C. MECHANICAL

1. The model 201 can be rack mounted in a standard 19" equipment rack. If desired the rack mount ears can be removed by removing the 3 #6-32 flat head

screws that hold each rack ear in place. After removing the rack ears replace the two lower screws on each side of the preamplifier.

### III. MAINTENANCE

A. The model 201 was designed to be maintenance free for many years. It is highly unlikely that your unit will require service. However, there are two adjustments that may need to be made from time to time. These procedures should be made only by a qualified service technician or the Grace Design factory.

B. PEAK LED ADJUSTMENT PROCEDURE The peak LED threshold levels may be adjusted to a user defined operating level. This circuit is set at the factory with the green threshold at -14dBu and the red threshold at +16dBu. The relationship between the two thresholds is fixed. The procedure for adjusting the red threshold follows.

#### 1. EQUIPMENT NEEDED

- i. Sine wave audio signal generator or oscillator output from a mixing console.
- ii. Audio level meter or VTVM
- iii. Plastic alignment tool or small screwdriver
- iv. Appropriate interconnect cables
- v. #2 Phillips screwdriver

#### 2. PROCEDURE

- i. With the power off, remove the top cover from the 801. Set all of the gain controls to the 9 O'clock position. (30dB gain)
- ii. Connect the audio generator to the input of channel 1. Set the output level to approximately -20dBu @1KHz. If the generator has an unbalanced output refer to Figure 6 below for termination information.

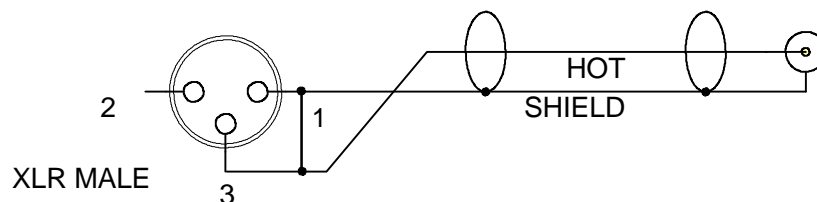


Figure 6. UNBALANCED INPUT CABLE

- iii. Connect the level meter to the output of channel 1. Set the input attenuator to +20dbu range. If the generator has an unbalanced input refer to Figure 1 for termination information.

- iv. Apply power to the generator, preamplifier, then the level meter.
- v. Adjust the generator output level so that the preamplifier output level is at the desired red threshold. If the proper level can't be reached, adjust the preamplifier gain control.
- vi. Locate VR1 on the channel 1 audio circuit board. (See figure 7) Adjust VR1 until the peak LED is between green and red. The color should appear amber when the setting is correct.
- vii. Repeat this procedure for channel 2.
- viii. If it is desired to calibrate the peak indicator to a specific tape recorder input level, simply replace the level meter with the recorder. Adjust the signal generator so that the desired peak level is indicated on the recorder and then adjust VR1 until the peak LED is between green and red.

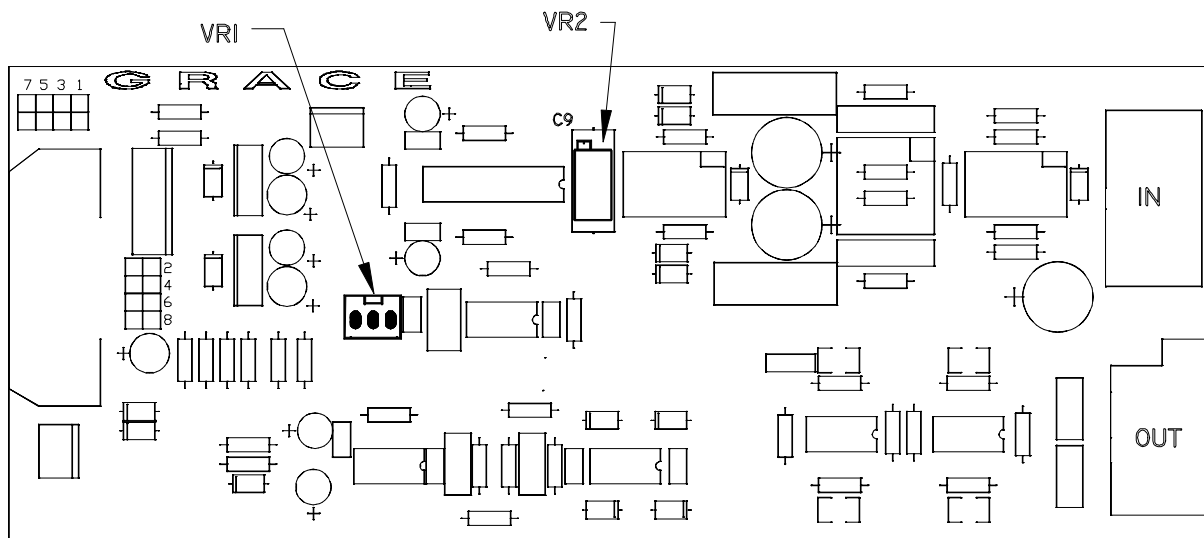


Figure 7. PEAK LED ADJ. VR1 AND OFFSET ADJ. VR2 LOCATIONS

C. **INPUT OFFSET ADJUSTMENT:** The input amplifiers in the 201 are ultra precision laser trimmed devices that have a very low input offset. However, even the smallest differential offset at the input can result in an audible "click" when the gain control is turned. It should be noted that this type of click will be audible when no signal is present. With no signal present there is no signal amplitude to be changed unless *input* offset is present. The DC servo circuit in the 201 corrects any DC errors that appear at the output of the instrumentation amplifier stage. It can not correct the very small offset at the inputs. This procedure nulls the input offset and minimizes the clicking sound with no signal present. In contrast, there will almost always be an audible click if turning the gain control while a signal is present. This is because the gain control, being a stepped control, will make an instantaneous change in amplitude when turned, which creates a transient signal.



## 1. EQUIPMENT NEEDED

- i. Oscilloscope with a DC coupled 10mV input range.
- ii. Unbalanced output cable. (see Figure 1.)
- iii. Plastic alignment tool or a small screwdriver.
- iv. #2 Phillips screwdriver

## 2. PROCEDURE

- i. Remove the 12 #6-32 flat head screws from the top lid but leave the lid in place.
- ii. Set all of the preamplifier gain controls to minimum. Set the trim controls to maximum. Turn on the 201 preamplifier and the oscilloscope and allow to warm up for at least 45 minutes.
- iii. Connect the output cable from channel 1 of the preamplifier to the oscilloscope input.
- iv. Set the oscilloscope vertical sensitivity to 10mV/division and input coupling to DC.
- v. Set the oscilloscope horizontal sweep rate to 0.5mS/division.
- vi. Adjust the trigger for a stable sweep and the vertical position so that the trace is on the zero line.
- vii. Remove the top lid and locate potentiometer VR2. (See Figure 7.)
- viii. While watching the scope, turn the gain control to the 12 o'clock position and watch for the offset to change. If the trace moves in the positive direction rotate VR2 in the clockwise direction. If the trace moves in the negative direction rotate VR2 in the counter-clockwise direction. Adjust VR2 until the trace is again on the zero line.
- ix. Return the gain control to minimum gain. At this point the DC servo may have developed a correction voltage in an attempt to zero the offset generated while at the higher gain. Therefore the trace might not return exactly to the zero line. What is important here is the *relative* offset between low and high gain settings. Turn the gain control quickly between minimum and 12 o'clock then back to minimum and watch the change in offset. Adjust VR2 so that the trace stays still while turning the gain up and down. This step provides a coarse adjustment. To make a fine adjustment repeat this step but turn the gain control all the way to maximum and check that the offset is constant to within plus or minus 10mV
- x. Repeat steps vii and viii for channel 2.
- xi. The input offset does drift with temperature and having the lid off will allow the circuitry to cool. It is advisable to replace the lid and let the preamplifier warm up again (about 20 minutes) and then recheck your adjustments.

## IV. SPECIFICATIONS

### FREQUENCY RESPONSE

@ 40dB gain /± 0.2dB	20Hz-300kHz
@ 40dB gain /± 3dB	4.5Hz-1.0MHz

### THD+N

@ 40dB gain +20dbu out	<.0015%
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### INTERMODULATION DISTORTION

@40dB gain +25dBu out	<.0025%
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### NOISE - REFERRED TO INPUT

@60dB gain 50 Ω source	-130dB
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### PHASE DEVIATION

50-20kHz	<2°
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### CROSSTALK

@40dB gain	-109dB
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### CMRR

@60dB gain, 3.5Vcm, 1kHz	80dB
@60dB gain, 3.5Vcm, 10kHz	97dB
Output CMRR	60dB

### MAXIMUM OUTPUT LEVEL

Balanced	+28dBu
Unbalanced	+22dBu

### IMPEDANCE

Input	1600Ω
Output	150Ω
Minimum Load Impedance	50Ω

### GAIN RANGE

2dB steps	18-64dB
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### POWER CONSUMPTION

@120VAC 60Hz	15 Watts max.
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### WEIGHT

6.4 lbs.

### DIMENSIONS

1U rack mount x 10" deep