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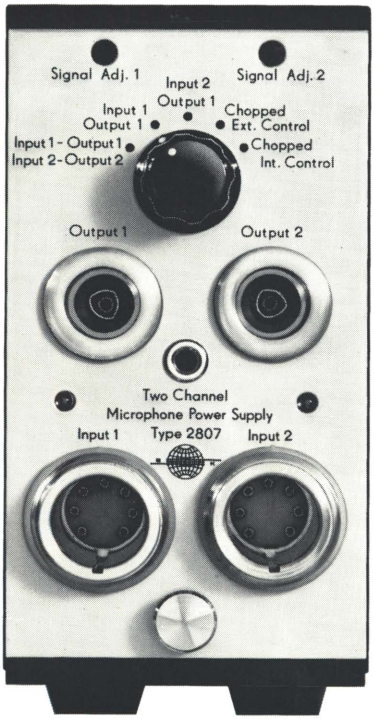
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2807

Instructions and Applications



Two Channel Microphone Power Supply Type 2807

The 2807 is a compact instrument of modular construction providing stabilized voltages for B & K Microphone Preamplifiers and Condenser Microphones. The low output impedance of its two amplifier channels enables long cables to be used for connection of indicating instruments. The two channels may be monitored simultaneously, or they may be automatically or remotely switched so they can be monitored alternately using a single indicating instrument.

BRÜEL & KJÆR

030-0331

TWO CHANNEL MICROPHONE POWER SUPPLY
TYPE 2807

October 1971

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1. INTRODUCTION

The Two Channel Microphone Power Supply Type 2807 is a compact instrument of modular construction designed for use with the B & K Microphone Preamplifiers Type 2615, 2618, 2619 and 2627. It supplies stabilized voltages to power the preamplifiers and accompanying condenser microphones and has two amplifier channels to convert the output impedance of the preamplifiers to a low impedance so that long cables may be used to connect recording or measuring instrumentation. The amplifiers have a linear frequency response which is flat to within ± 0.2 dB from 2 Hz to 200 kHz and have a gain of approximately unity. A separate multi-turn potentiometer at the input of each amplifier enables input signals to be attenuated by more than 40 dB. The cross-talk between the two amplifiers is better than −60 dB.

The two channels of the 2807 may either be used independently of one another, or they may be automatically or remotely switched enabling the output of both channels to be monitored using one set of recording or measuring instrumentation. Automatic switching is accomplished using a relay operated by an internal multivibrator. The switching frequency is approximately 2 Hz. For remote switching the relay can be operated by grounding an EXT. CONTROL using either an external switch, or the two-channel selector of the 2305 Level Recorder. The advantage of using the Level Recorder for this purpose is that the output from both channels can be recorded simultaneously on frequency calibrated paper.

The 2807 may also be employed as an impedance converter for vibration measurements. For this purpose the 2807 can be used together with the Vibration Preamplifier Type 2623 and the Power Supply ZR 0024 or with the high input impedance Microphone Preamplifiers Type 2615, 2619, and 2627.

2. CONTROLS

2.1. FRONT PANEL

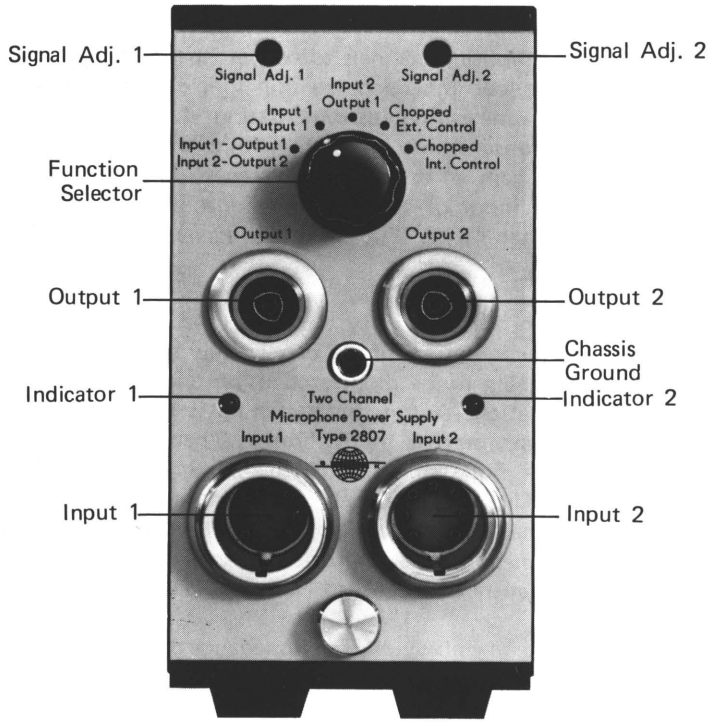


Fig.2.1. Front Panel of 2807

INPUTS 1 and 2: Two 7 pin sockets for connection of B & K Condenser Microphones or Accelerometers, via their associated preamplifiers to the inputs of channel 1 and 2 amplifiers respectively. The sockets also carry the necessary supply

and polarization voltages for powering the preamplifiers and microphones which are connected. The internal connections to the sockets are shown in Fig.2.2.

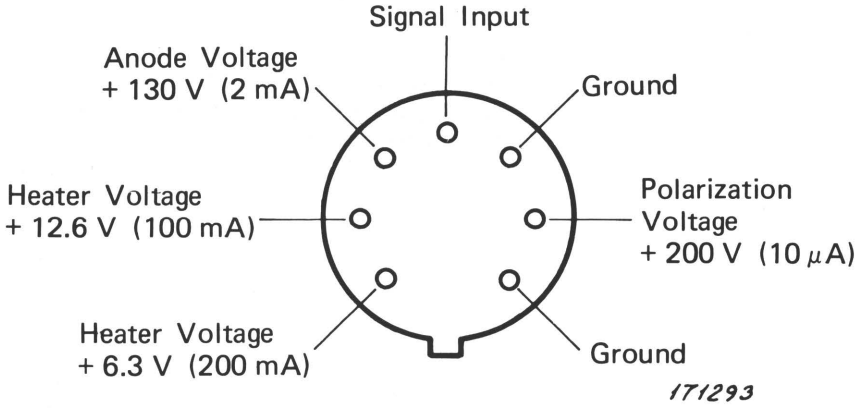


Fig.2.2. External view of the sockets INPUT 1 and 2

SIGNAL ADJ. 1 and 2: Multi-turn potentiometers for adjustment of the input signals applied at sockets INPUT 1 and 2 respectively. The range of attenuation is from 0 to 40 dB.

FUNCTION SELECTOR: Five position switch with the following functions:

"Input 1 – Output 1. Input 2 – Output 2". The input and output of channel 1 amplifier are connected to the respective sockets INPUT 1 and OUTPUT 1. Similarly the input and output of channel 2 amplifier are connected to the respective sockets INPUT 2 and OUTPUT 2.

"Input 1 – Output 1". The input and output of channel 1 amplifier are connected to the respective sockets INPUT 1 and OUTPUT 1. The sockets OUTPUT 2 are grounded.

"Input 2 – Output 1". The input and output of channel 2 amplifier are connected to the respective sockets INPUT 2 and OUTPUT 1. The sockets OUTPUT 2 are grounded.

"Chopped Ext. Control". The outputs of channel 1 and 2 amplifiers may either be chopped using the 2305 Level Recorder connected to the EXT. CONTROL socket, or they may be selected by grounding the socket. The chopped or selected outputs are available at the sockets OUTPUT 1. The sockets OUTPUT 2 are grounded.

"Chopped Int. Control". The outputs of channel 1 and 2 amplifiers are chopped at a frequency of approximately 2 Hz by a relay operated from an internal multivibrator. The chopped signal is available at the socket OUTPUT 1. The sockets OUTPUT 2 are grounded.

INDICATORS 1 and 2: Two neon indicator tubes which when lit signify that either or both of channel 1 and 2 amplifiers are functioning.

OUTPUTS 1 and 2: Two standard B & K coaxial sockets which depending on the setting of the FUNCTION SELECTOR, are connected to the outputs of channel 1 and 2 amplifiers. The sockets accept the B & K Plugs Type JP 0101 and are connected in parallel to the sockets of the same name on the rear panel of the 2807. The output impedance is 13 Ω in series with 4.7 μF.

CHASSIS GROUND: Socket for connection the chassis of the 2807 to ground. The socket accepts the B & K Banana Plugs Type JB 0002/3.

2.2. REAR PANEL

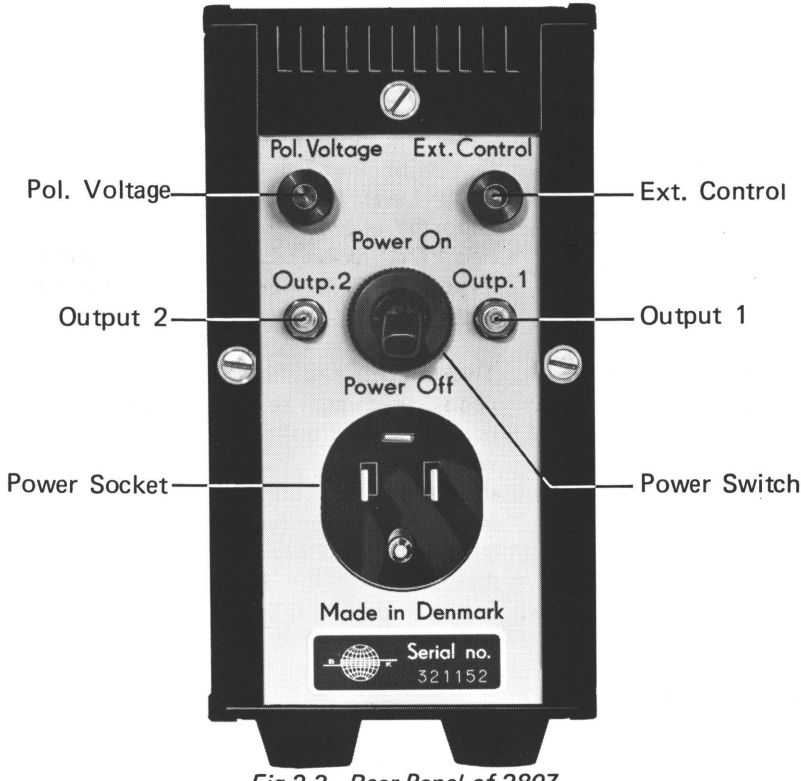


Fig.2.3. Rear Panel of 2807

POL. VOLTAGE: Socket for measurement of the polarization voltage using an external DC digital voltmeter having a rating of at least 20 kΩ/volt. A CHASSIS GROUND socket which may be used as a DC return when measuring the polarization voltage is situated immediately to the right of the POL. VOLTAGE socket. To adjust the polarization voltage see section 3.1.

EXT. CONTROL:

Socket which when grounded operates an internal relay to connect the sockets OUTPUT 1 from the output of channel 1 to the output of channel 2 amplifier when the FUNCTION SELECTOR is set to "Chopped Ext. Control". The socket may also be used in conjunction with the Two-Channel Selector of the 2305 Level Recorder which will remotely chop the outputs of the two amplifier channels. The socket accepts the Banana Plugs Type JB 0002/3. For further information see section 3.3.

OUTPUTS 1 and 2:

Two miniature coaxial sockets which are connected in parallel to the sockets of the same name on the front panel. Depending on the setting of the FUNCTION SELECTOR, the sockets are connected to the outputs of channel 1 and 2 amplifiers which have an output impedance of 13 Ω in series with 4.7 μF. The sockets accept the B & K Miniature Coaxial Cables type AO 0037, AO 0038, AO 0051, AO 0052, or AO 0500.

POWER:

On/Off switch for power.

MAINS INPUT:

For connection of AC mains supply with provision for connecting one of the mains transformer shields to the earth of the mains supply. For connections see Fig.2.4.

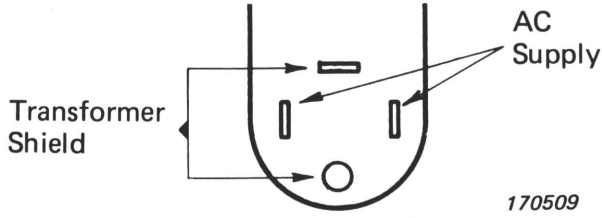


Fig.2.4. MAINS INPUT socket of 2807

2.3. BOTTOM PANEL

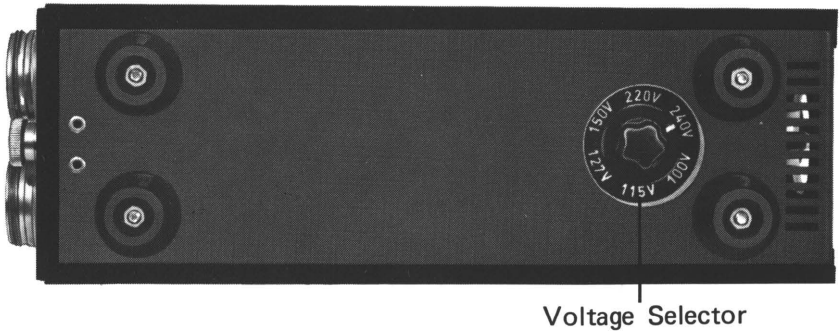


Fig.2.5. Bottom Panel of 2807

VOLTAGE SELECTOR: For selection of the correct mains voltage. The selector may be turned to the correct voltage using a small coin, or wide blade screwdriver, when the knob in the centre of the selector is unscrewed. The knob contains a 250 mA mains fuse.

3. OPERATION

3.1. ADJUSTMENTS

3.1.1. Voltage Selector

Before the instrument is used check that the VOLTAGE SELECTOR (see Fig.2.5) on the bottom panel of the 2807 is set to the correct mains voltage. If not, unscrew the knob at the centre of the selector and turn the selector to the correct voltage indication using a small coin, or wide blade screwdriver.

3.1.2. Polarization Voltage

The 200 Volt polarization voltage provided by the 2807 for condenser microphones is preset at the factory to within ± 1 Volt and therefore further adjustment is not normally necessary. If it is required to check, or adjust it however, then it should be measured using a digital voltmeter (meter rating 20 kΩ/Volt) connected between the POL. VOLTAGE and

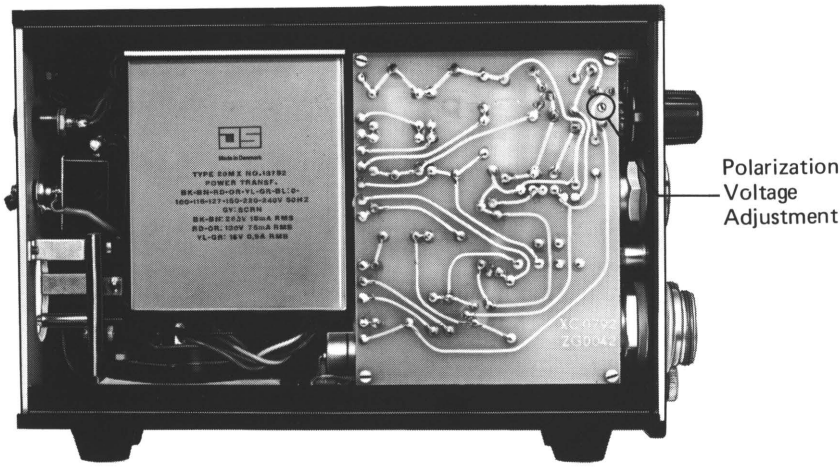


Fig.3.1. Polarization voltage adjustment

CHASSIS GROUND sockets of the instrument. The polarization voltage adjustment potentiometer is situated on the main printed board (see Fig.3.1) on the right hand side (as viewed from rear) of the instrument. It is accessible by unscrewing the right-hand panel fastening screw on the rear panel and sliding the panel towards the rear of the instrument.

3.2. CONNECTION OF MEASURING INSTRUMENTATION

1. Carry out the preliminary adjustments necessary. See section 3.1.

2. Connect the POWER INPUT socket to the mains supply using the mains cable supplied.

3. To one or both of the sockets INPUT 1 and INPUT 2 fit the appropriate preamplifiers and measurement transducers. For sound measurements the Microphone Preamplifiers Type 2615, 2618, 2619 and 2627 are recommended. For vibration measurements see section 5.2.

4. Set the FUNCTION SELECTOR switch to the appropriate operating mode.

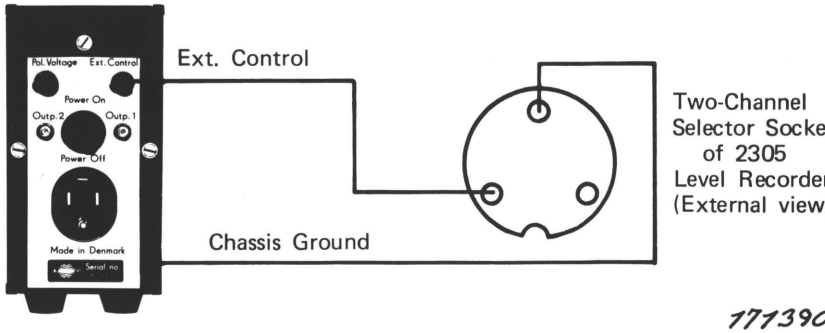
5. Depending on the operating mode selected, connect one or both of the sockets OUTPUT 1 and OUTPUT 2 to the recording and measuring instrumentation. The effect of capacitive loading on these sockets is shown in Fig.4.2.

6. Switch the power on. Because the 2807 is transistorized no warm up time is necessary and it is therefore ready for use immediately.

3.3. USE OF EXTERNAL CONTROL SOCKET

In the "Chopped Ext. Control" mode of the FUNCTION SELECTOR switch the channel selector relay of the 2807 may be operated remotely by grounding the EXT. CONTROL socket. The phasing of the relay is such that when the socket is grounded the relay will switch from the output of channel 1 to the output of channel 2. The selected channel output is applied to the sockets OUTPUT 1, whilst the sockets OUTPUT 2 are grounded.

The channel selector relay may also be operated using the Two-Channel Selector of the 2305 Level Recorder to ground the EXT. CONTROL socket. The selector is a cam operated micro-switch which is mechanically coupled



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Fig.3.2. External connections from the EXT. CONTROL and CHASSIS GROUND sockets of the 2807 to the Two-Channel Selector of the 2305 Level Recorder

to the drive shaft mechanism of the level recorder. Thus by selecting a suitable drive shaft speed using the recorders DRIVE SHAFT SPEED control, the output of the 2807 may be chopped at a frequency which permits the output of both channels to be recorded alternately using one chart length of the recording paper (see Fig.5.2). The connections from the EXT. CONTROL socket to the Two-Channel Selector of the 2305 Level Recorder are shown in Fig.3.2.

3.4. INSTALLATION IN MODULE SYSTEM

The 2807 is part of the B & K KK Module System. The system is designed for easy rack mounting of instrument combinations so that entire measurement systems may be assembled in the same rack.

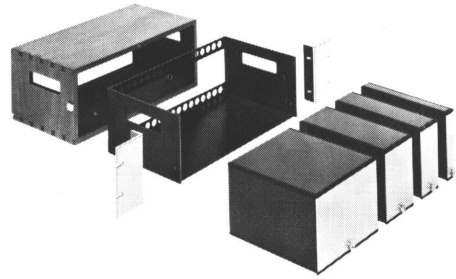


Fig.3.3. The B & K Module System

The system consists of a metal case KK 0014 into which the modules are mounted. For mounting the case into a 19 inch rack, it can be fitted with the slotted flanges GV 1037, or if a more rugged instrument is required the metal case can be fitted with the wooden case KA 0027 for protection.

For further information on the module system consult the KA, KK, KQ, KS Assembly Instructions.

4. DESCRIPTION

The principle of operation of the 2807 Two Channel Power Supply will be described with reference to the schematic diagram given in Fig.4.1.

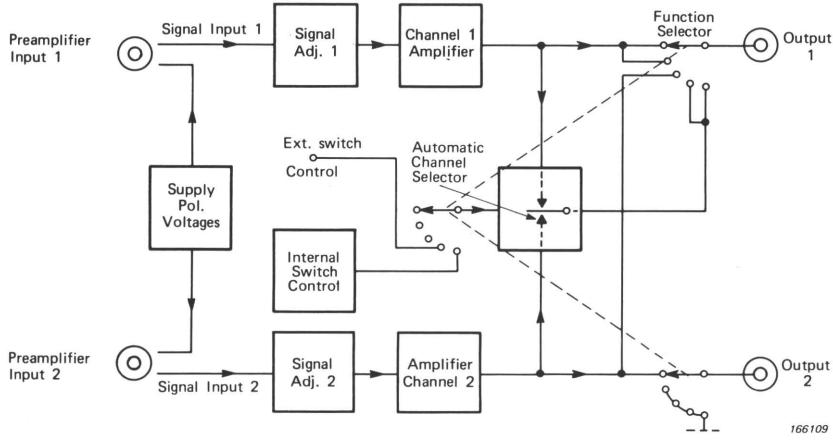


Fig.4.1. Schematic diagram of the 2807

4.1. AMPLIFIER CHANNELS 1 AND 2

The sockets INPUT 1 and INPUT 2 accept the 7 pin plugs of the B & K Microphone Preamplifiers Type 2615, 2618, 2619 and 2627. Pin 4 (see Fig.2.2) of the sockets is the respective input to the two amplifier channels of the 2807, whilst the remaining pins supply stabilized voltages from the 2807 to operate the preamplifiers and condenser microphones.

The two amplifier channels are 3 stage class A – B, push-pull transistor amplifiers with a voltage gain of approximately unity (i.e. <0.15 dB attenuation). Each has a multi-turn potentiometer at its input for separate attenuation of signal level applied to each amplifier. The potentiometers are termed SIGNAL ADJ. 1 and 2 and have an attenuation range from 0 to approximately –40 dB. The input impedance of the amplifiers at pin 4 of their respective input sockets is 50 kΩ.

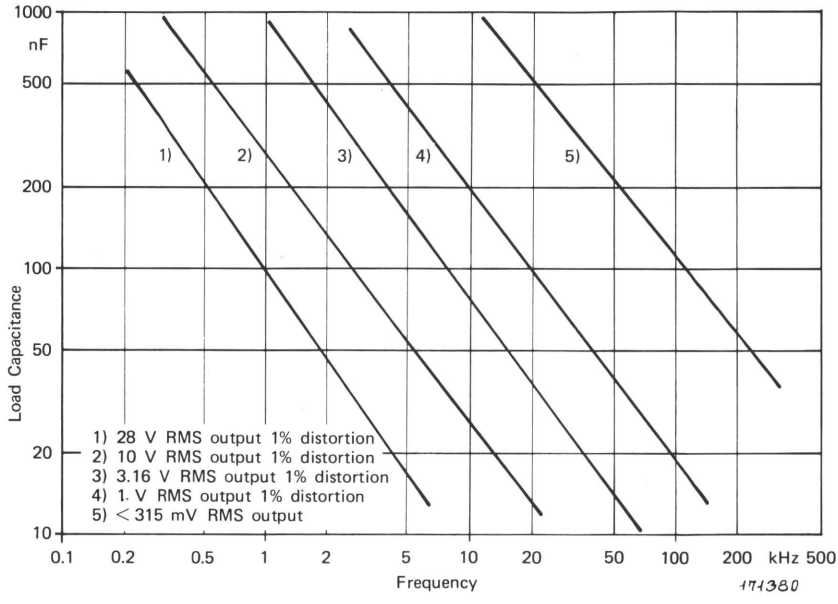


Fig.4.2. High frequency cut off (−3 dB point) of 2807 as a function of output voltage and of different capacitive loads shunting the socket OUTPUT 1 and 2

The outputs of the amplifiers are connected via the FUNCTION SELECTOR switch to one or both of the pairs of sockets termed OUTPUT 1 and OUTPUT 2. Each pair of output sockets consists of a standard B & K coaxial socket in parallel with a B & K miniature coaxial socket. The output impedance of the amplifiers seen from these sockets is low (approximately 13 Ω in series with 4.7 μF) and therefore the effect of cable shunt capacitance is small (see Fig.4.2). For measurements this permits the output sockets to be connected to the input of an indicating instrument using reasonably long connecting cables.

The maximum output voltage available from the amplifiers for 1% harmonic distortion is shown in Fig.4.3. Diodes in the output stages of the amplifiers limit the maximum output current to approximately 20 mA and therefore protect the amplifiers from damage resulting from accidental short circuit of the output sockets. For normal operation, however, the maximum output current should not be allowed to exceed 8 mA.

The frequency response of the two amplifier channels of the 2807 is flat

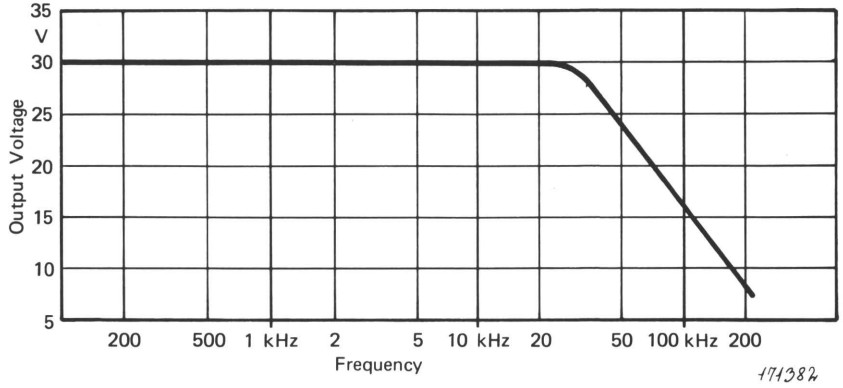


Fig.4.3. Maximum output voltage available from each amplifier channel of the 2807 for 1% harmonic distortion

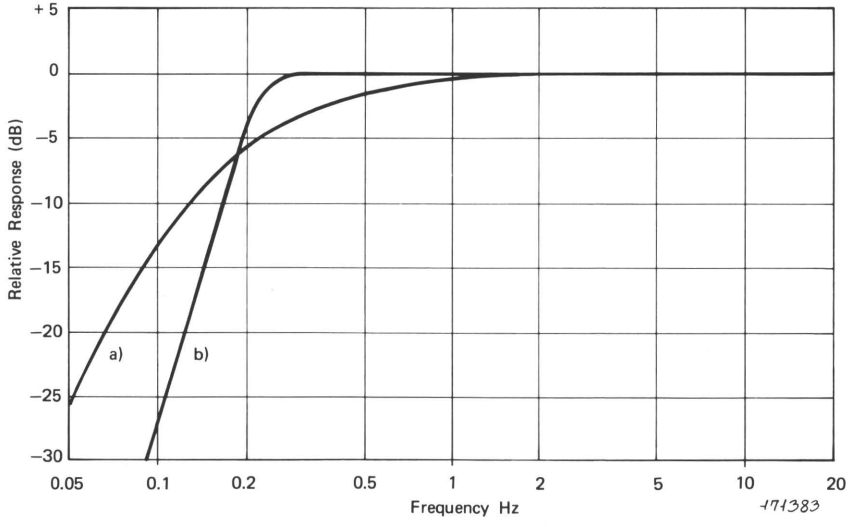


Fig.4.4. Low frequency characteristics
a) 2807 alone
b) 2807 plus 2627 Microphone Preamplifier with 50 pF capacitance in series with the preamplifier's input to simulate cartridge capacitance of a 1 inch condenser microphone

to within ±0.2 dB from 2 Hz to 200 kHz and therefore the frequency range for measurements will normally be determined by the upper and lower limiting frequency characteristics of the microphone and microphone preamplifier used with the 2807. For instance Fig.4.4 shows that when a 1 inch Microphone Preamplifier Type 2627 is used with the 2807 the overall low frequency response of the combination (curve b) is much lower than that of the 2807 alone (curve a). This is because of a slight rise in the preamplifier's low frequency characteristics below 2 Hz.

As with most amplifiers, the two amplifier channels of the 2807 suffer from phase distortion. This also applies to the microphone preamplifiers which may be used with the 2807, and therefore the phase characteristics of the 2807 with and without the use of the 2627 Microphone Preamplifier are shown in Fig.4.5. The difference in phase response between the two amplifier channels is less than $\pm 2^{o}$ in the 2 Hz to 200 kHz range.

The cross-talk between the two amplifier channels measured with a 47 Ω resistor shunting one of the amplifier inputs is better than −80 dB from 2 Hz to 20 kHz and −60 dB at 200 kHz.

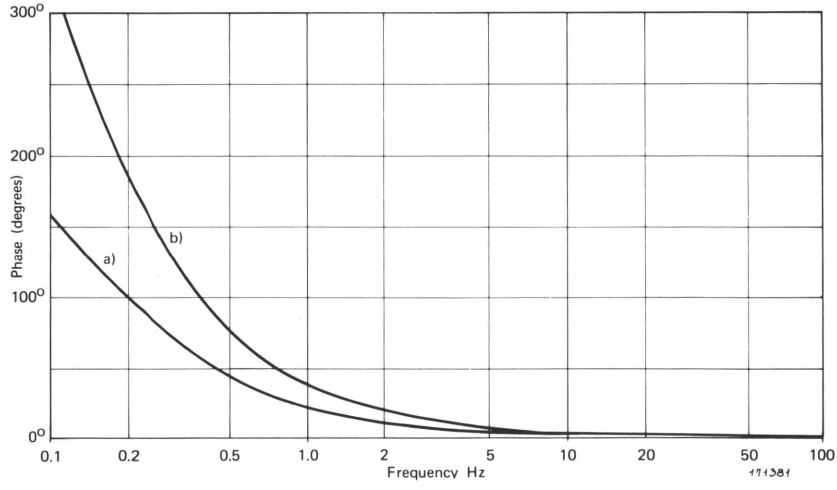


Fig.4.5. Phase characteristics
a) from input to output of 2807
b) from input of 2627 in series with 50 pF capacitor (corresponding to capacitance of a 1 inch condenser microphone) to the output of the 2807

4.2. AUTOMATIC CHANNEL SELECTOR

In the "Chopped Int. Control" and "Chopped Ext. Control" modes of the FUNCTION SELECTOR switch, the sockets OUTPUT 2 are grounded, whilst the outputs from the two amplifier channels are chopped and applied to the OUTPUT 1 sockets. Chopping is accomplished using a relay, which in the "Chopped Int. Control" mode is activated by an internal astable multivibrator. The multivibrator has an operating frequency of 2 Hz and therefore the relay switches between each of the channel outputs every 0.5 sec.

In the "Chopped Ext. Control" mode chopping may be accomplished remotely using the 2305 Level Recorder. The frequency at which the channel outputs are chopped is determined by a cam operated switch in the recorder's Two-Channel Selector. The selector activates the relay in the 2807 by grounding the EXT. CONTROL socket.

The EXT. CONTROL socket may also be grounded using a normal single pole switch as a remote channel selector. The phasing of the relay is such that when the socket is grounded the relay will switch from the output of channel 1 to the output of channel 2.

To denote which amplifier channel is functioning when various operating modes are selected a second relay is used to switch an internal supply to two neon indicator tubes. These are termed INDICATOR 1 and 2 (see Fig.2.1) and when lit signify which amplifier channel is in circuit.

4.3. POWER SUPPLY

The power supply of the 2807 may be operated from any 100, 115, 127, 150, 220 or 240 Volt, 50 to 400 Hz AC mains supply. It is split into three main circuits which provide the necessary stabilized voltages to power the internal circuitry of the 2807 as well as the preamplifier and microphones which may be connected to the sockets INPUT 1 and INPUT 2 (see Fig.2.2).

The polarization voltage circuit provides 200 Volts DC for condenser microphones which may be connected to INPUT 1 and 2 via a microphone preamplifier. In order to make it insensitive to variations in the mains supply voltage it is stabilized using three voltage stabilizer tubes which ensure a good long term stability. A potentiometer in the circuit permits the polarization voltage to be adjusted by $\pm$ 10 Volts (see section 3.1).

An anode and collector voltage circuit delivers power to the two amplifier channels and neon indicators of the 2807. It also provides a 130 V (2 mA) to power the microphone preamplifiers which may be connected. It is controlled via a transistorized voltage regulator circuit to ensure good stability and low voltage ripple.

The filament and relay voltage supply delivers + 12.6 and + 6.3 Volts DC to power the internal astable multivibrator of the 2607 as well as the heater voltage for the 2615 preamplifier and the microphone heaters of the 2618, 2619 preamplifiers. This supply is also controlled by a transistorized voltage regulator to ensure good stability and low voltage ripple.

5. APPLICATIONS

5.1. SOUND INSULATION MEASUREMENTS

An application which illustrates the use of the 2807 both as an impedance converter and as a two-channel selector is the measurement of the sound insulation properties of a wall for which a measurement arrangement is given in Fig.5.1.

In this arrangement the wall to be tested is built as a partition between two reverberant rooms, one of which is termed the transmitter room and the other the receiver room. By means of a loudspeaker coupled to the output of a 1024 Sine Random Generator, the transmitter room is acoustic-

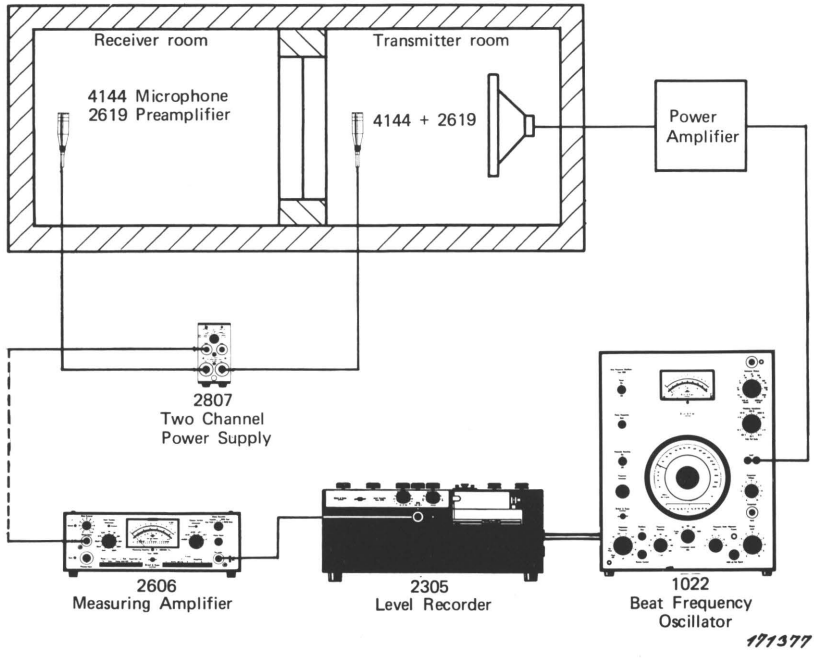


Fig.5.1. Measurement of sound insulation properties of a wall

ally excited using narrow band noise. The noise is centered around a variable center frequency and creates a diffused sound field in the room which is monitored using a microphone. The microphone is connected via a microphone preamplifier to one of the two channels of the 2807. The other channel is connected to a microphone and preamplifier in the receiver room and is used to monitor the noise transmitted via the partition. The output from the two channels is then chopped using the EXT. CONTROL socket of the 2807 together with the Two-Channel Selector of the 2305 Level Recorder (see section 3.3) which is also used to record the signal after it has been amplified by a 2606 Measuring Amplifier. This has the advantage that the output from both channels can be recorded alternately using only one recorder and the same chart length of the recording paper (see Fig.5.2).

From the recording (see Fig.5.2) the sound insulation of the partition can readily be calculated from:

$$D_{eff} = L_1 - L_2 + x$$

where $L_1 - L_2$ is the difference in sound pressure between the rooms and x is a correction based on the sound absorption of the receiver room, as recommended by ISO Recommendation 140.

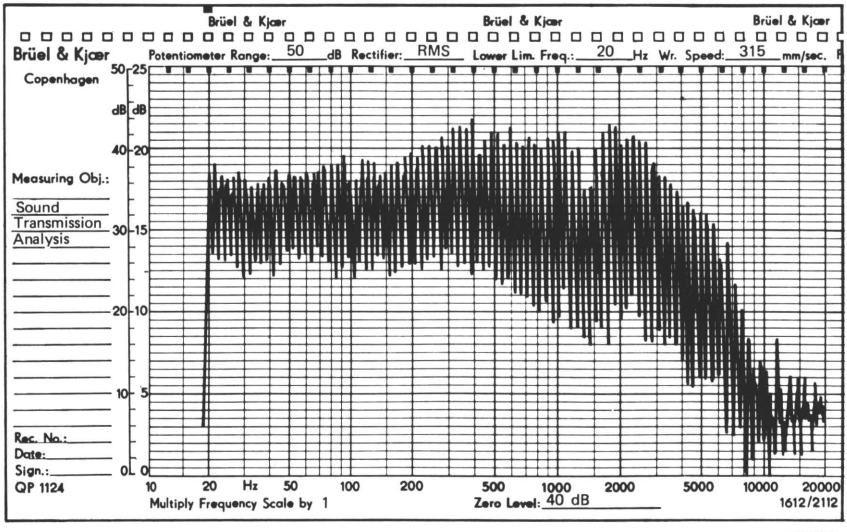


Fig.5.2. Recording obtained for sound insulation measurements using the arrangement in Fig.5.1

5.2. VIBRATION MEASUREMENTS

The 2807 will also be found extremely useful as an impedance converter and two-channel selector for vibration measurements. For this purpose accelerometers may be connected to the 2807 using a separate Vibration Preamplifier Type 2623 and Power Supply ZR 0024 for each of its channels.

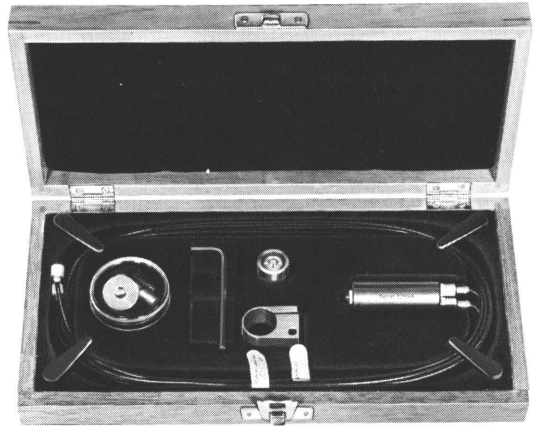


Fig.5.3. Vibration Preamplifier Type 2623

The 2623 is a small, low noise, unity gain preamplifier which has a field effect input stage to give it an extremely high input impedance of 2 GΩ. For measurements the preamplifier may either be screwed directly onto the output of an accelerometer, or the accelerometer may be connected using one of the types of B & K miniature coaxial cable which are available.

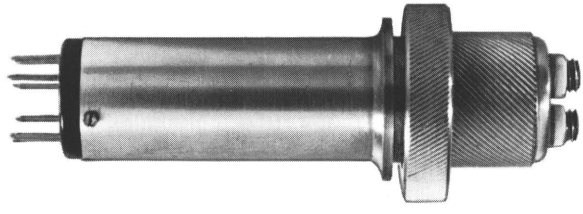


Fig.5.4. Power Supply Type ZR 0024

The Power Supply ZR 0024 is a transistorized voltage regulator which provides 28 Volts to operate the 2623. The supply is contained in a standard 7 pin B & K microphone plug and therefore directly fits the input sockets of the 2807.

Vibration measurements may also be made using the Microphone Preamplifiers Type 2615, 2619 and 2627 with the 2807. To fit accelerometers to these preamplifiers consult the relevant preamplifier instruction manual.

5.3. SIMULTANEOUS TAPE RECORDING OF SOUND AND VIBRATION DATA

An interesting application of the 2807 presents itself when it is required to record sound and vibration data simultaneously. Fig.5.5 shows a set-up where an accelerometer is mounted on a vibrating surface under investigation and a condenser microphone placed close to the sound generating area of interest. The sound and vibration signals are fed separately via microphone preamplifiers to the respective channel inputs of the 2807 in its operating mode "Input 1 – Output 1. Input 2 – Output 2". The low impedance outputs of the two channels may then be connected using reasonably long cables to a two channel tape recorder. Once recorded the sound and vibration data can be subjected to detailed processing such as frequency analysis, cross spectrum measurements, auto-correlation or cross-correlation measurements.

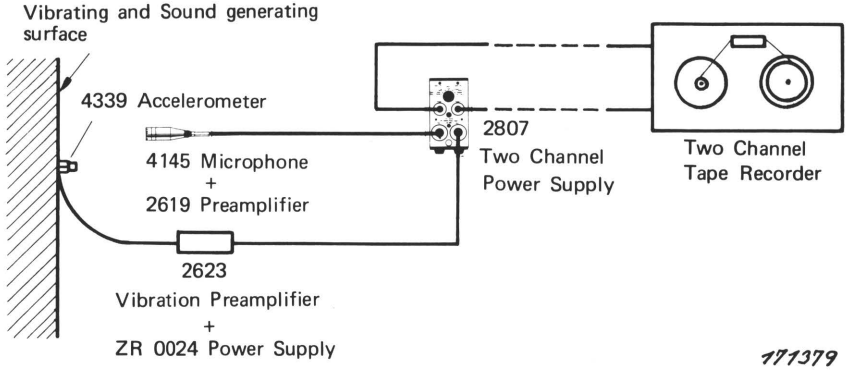


Fig.5.5. Arrangement for simultaneous tape recording of sound and vibration data

6. SPECIFICATIONS

AMPLIFIER CHANNELS

Number of Channels:	2.
Frequency Response:	2 Hz to 200 kHz ± 0.2 dB.
Phase Deviation:	$< \pm 2^{o}$ between the two channels in the 2 Hz to 200 kHz range.
Sensitivity:	Adjustable from 0 dB to approx. −40 dB.
Cross talk:	Better than −80 dB from 2 Hz to 20 kHz and −60 dB at 200 kHz.
Noise:	$< 15\ \mu V$ over the 20 Hz to 200 kHz range with input to the amplifiers shunted to ground with a 750 Ω resistor.
Input Impedance:	In accordance with B & K Microphone Preamplifiers.
Max. Input Voltage:	28 V from 2 Hz to 200 kHz.
Output Impedance:	13 Ω in series with 4.7 μF.
Max. Output:	28 V, 8 mA with distortion less than 1%.

CHANNEL SELECTOR

Manual:	Using the FUNCTION SELECTOR switch either or both of the two amplifier channels may be selected for operation.
Automatic:	In the "Chopped Int. Control" mode of the 2807 the output from the two amplifier channels is chopped at a frequency of 2 Hz using an internal multivibrator.

Remote:

In the "Chopped Ext. Control" mode of the FUNCTION SELECTOR the output of the 2807 may be switched remotely from the output of channel 1 to the output of channel 2 by grounding the EXT. CONTROL socket. The EXT. CONTROL socket may also be used with the Two-Channel Selector of the 2305 Level Recorder. This permits both channel outputs to be recorded alternately using only one recorder.

POWER SUPPLY

POWER INPUT

Voltage:	100 – 115 – 127 – 150 – 220 – 240 Volts AC ± 10% 50 to 400 Hz
Consumption:	10 Watts approx.

POWER OUTPUTS

Polarization voltage:	+ 200 V, 10 μA/channel for condenser microphones.
Preamplifier voltage:	+ 130 V, 2 mA/channel
Heater voltages:	+ 12.6 V, 100 mA/channel and + 6.3 V, 200 mA/channel.

DIMENSIONS

Height: 132.6 mm (5.30 in)
Width: 69.5 mm (2.6 in)
Depth: 200 mm (8.00 in)
Weight: 2.2 kg (4.9 lbs).

ACCESSORIES SUPPLIED

Power Cable (European)	AN 0005
or Power Cable (American)	AN 0006
Fuses	VF 0012.



B & K INSTRUMENTS:

ACOUSTICAL....
Condenser Microphones
Piezo-Electric Microphones
Microphone Preamplifiers
Microphone Calibration Equip.
Sound Level Meters
(general purpose-precision-
and impulse)
Standing Wave Apparatus
Tapping Machines
Noise Limit Indicators

ELECTROACOUSTICAL....
Artificial Ears
Artificial Mouths
Artificial Mastoids
Hearing Aid Test Boxes
Telephone Measuring Equipment
Audiometer Calibrators
Audio Reproduction Test Equip.

STRAIN....
Strain Gauge Apparatus
Multipoint Panels
Automatic Selectors
Balancing Units

VIBRATION....
Accelerometers
Accelerometer Preamplifiers
Accelerometer Calibrators
Vibration Meters
Magnetic Transducers
Capacitive Transducers
Vibration Exciter Controls
Vibration Programmers
Vibration Signal Selectors
Mini-Shakers
Complex Modulus Apparatus
Stroboscopes

GENERATING....
Beat Frequency Oscillators
Random Noise Generators
Sine-Random Generators

MEASURING....
Measuring Amplifiers
Voltmeters
Deviation Bridges
Megohmmeters

ANALYZING....
Band-Pass Filter Sets
Frequency Spectrometers
Frequency Analyzers
Real-Time Analyzers
Slave Filters
Psophometer Filters
Statistical Analyzers

RECORDING....
Level Recorders
(strip-chart and polar)
Frequency Response Tracers
Tape Recorders

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