Outdoor Microphone Unit

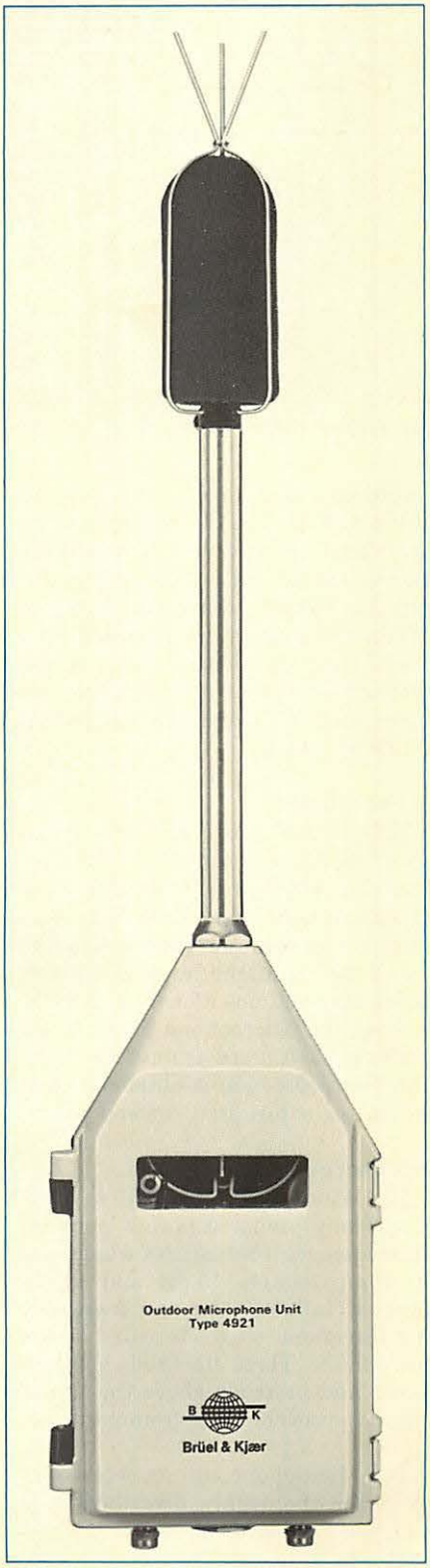
type 4921

FEATURES:

- All weather operation
- Excellent long term stability
- Remote calibration facilities
- Superior resistance to humidity and corrosion
- Frequency Range 20 Hz to 20 kHz

USES:

- In permanent outdoor noise monitoring systems
- Noise measurement in most humid or corrosive atmospheres



The Outdoor Microphone Unit Type 4921 brings new standards of accuracy and reliability to outdoor noise measurement and to permanent noise monitoring systems by using the quartz-coated ½″ Condenser Microphone Type 4149 and comprehensive weather and moisture-proofing arrangements. It can be used in most areas where sound measurements are required in extreme environments, but the Unit's unique moisture resistant construction is especially valuable in systems for outdoor monitoring and long term noise surveillance.

As can be seen from the photograph, the Outdoor Microphone Unit consists of two distinct components separated by a stainless steel tube. The upper component consists of microphone, preamplifier, rain cover and windscreen, while the lower component contains a dehumidifier and most of the electronics for the Unit enclosed in a weatherproof case.

The electronic section is delivered as illustrated in Fig.1 with all electronic components installed. This configuration can be powered either from an internal battery pack or from an external supply. Alternatively (by special order) the Control Box ZZ 0035 can be removed from the case and the system used with just the preamplifier and dehumidifier, all power being supplied and control functions exercised by an external unit. Several different output possibilities are available to suit any particular measuring requirements.

THE UPPER COMPONENT

Quartz-Coated Microphone

This system uses the Type 4149 Microphone which is a development of the familiar and widely accepted B & K ½″ Condenser Microphone Type 4133. The Type 4149 has a very thin (0,7 μm, 0,000 03 in) layer of quartz on the diaphragm and backplate to give protection against moisture penetration and corrosion. Additional protection against moisture is obtained by leading the internal air equalization passage through the rear of the microphone cartridge, through the preamplifier and down into a dehumidifier in the lower component.

Rain Cover

A specially developed Rain Cover (UA 0393) with a built-in electrostatic actuator is screwed on to the top of the microphone to give protection and

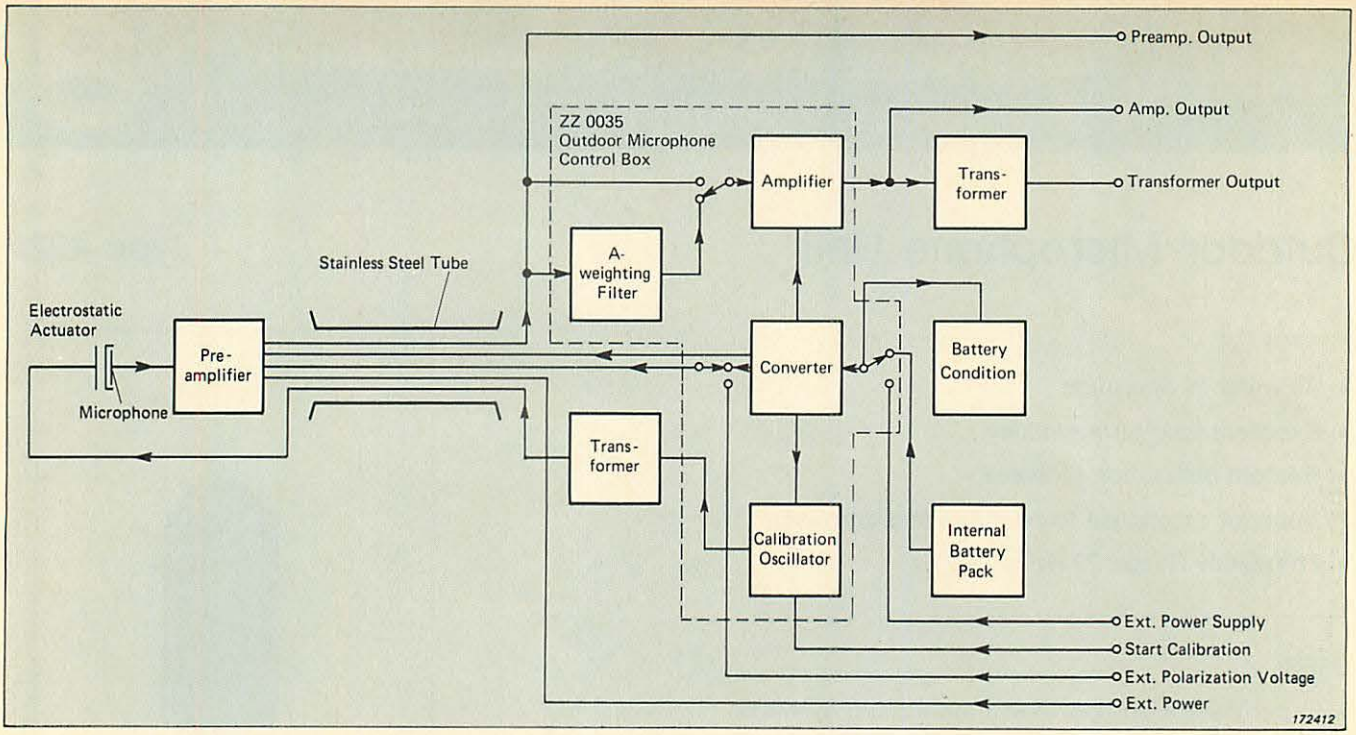


Fig. 1. Block diagram showing the electronic components of the 4921

improved omnidirectional response below 12 kHz. The electrostatic actuator allows reliable remote controlled calibration of the system from diaphragm motion to electrical output. When the actuator is activated by a signal from the Control Box, the microphone diaphragm experiences the equivalent of a sound pressure level of 90 dB at 1 kHz.

Preamplifier

Microphone Cartridge and Rain Cover are screwed directly to the Preamplifier which is a solid state FET impedance converter. Some of its electrical components are located in the top of the Dehumidifier. The Preamplifier also contains a heating element to keep the Microphone warm as an additional safeguard against moisture. The best protection is obtained when the heater is operated continuously.

Windscreen

The Windscreen (UA 0570) is made of specially prepared porous polyurethane sponge. It attenuates wind noise by approximately 15 dB and has a minimal influence on the frequency and directional characteristics of the microphone. Three steel rods hold the screen and protrude above the top as spikes to prevent birds from perching.

The Microphone and its accessories are more thoroughly described in a separate Product Data sheet.

THE LOWER COMPONENT

Dehumidifier

From the base of the Preamplifier, a stainless steel tube joins the Microphone and accessories to the weatherproof case. This tube encloses all the electrical leads from the Preamplifier and electrostatic actuator and carries them into the case and simultaneously forms the air passage for microphone pressure equalization. This air passage terminates in a closed jar of silica gel, which vents into the case through a fine bore tube one meter in length. This arrangement acts as a Dehumidifier and ensures that the long term pressure variations caused by changes in ambient pressure and temperature are equalized with dry air. The jar is visible from outside through a window in the case so that the colour of the contents gives an indication of moisture present. The 75 grams (2,5 oz) of gel contained should be sufficient to give protection for at least three years. A schematic diagram of the Dehumidifier arrangement is shown in Fig.2.

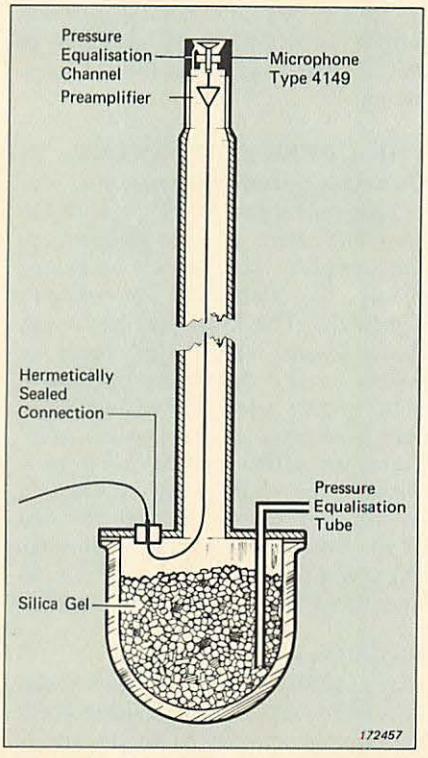


Fig. 2. The dehumidification system

Weatherproof Case

The cast aluminium case containing the electronic components has been profiled to minimise reflections that disturb the sound field around the microphone. The case is sealed to protect its contents from the weather and all air venting and cable ingress take place through the bottom as an added safeguard.

Outdoor Microphone Control Box

The output signal from the Microphone is led via the Preamplifier to the terminal strip (Preamp. Output), and to an A-weighting Filter in the Outdoor Microphone Control Box. Alternatively the signal, weighted or un-

weighted, can pass through an Amplifier stage. The Amplifier has a rotary switch giving 10 dB steps in gain and a potentiometer that is continuously variable over 10 dB so that any amplification between 0 and 60 dB may be selected. From the Amplifier, two output possibilities are available; one leads directly to the terminal strip (amp. Output), while the other gives the option of a balanced output from a transformer.

Calibration Oscillator

The Oscillator generates the 500 Hz signal that is stepped-up by a Transformer to the 215 volts required to drive the electrostatic actuator. The electrostatic attraction causes frequency doubling at the microphone diaphragm giving an output signal at 1 kHz. Calibration can be initiated either locally by the REF button, or by remote control from the central processing unit.

Converter

The Converter supplies the different voltages required by the various electronic components. It is able to supply alternative polarization voltages of 200 V or 28 V to the Microphone and normally 200 V will be used, but in high intensity noise fields (above approx. 140 dB) it is an advantage to exploit the reduced microphone sensitivity obtained with 28 V polarization voltage. By this means sound pressure levels up to 160 dB can be measured.

To aid servicing in the field, the Outdoor Microphone Control Box ZZ 0035 has been constructed as a plug-in unit which contains most of the electronic components.

Power Supplies

The configuration illustrated in Fig.1 needs a power supply of 12 volts DC which can be obtained from the following alternative sources.

An Internal Battery Pack (delivered with the 4921) can supply 12 volts from a set of eight IEC LR 20 alkaline batteries (D cells) that are housed in a moulded plastic holder in the door of the Lower Component. When the Unit is used with internal batteries, the heater coil for the Microphone and Preamplifier should not be connected, to conserve battery power. Alkaline batteries give sufficient power for approximately 120 hours of continuous operation.

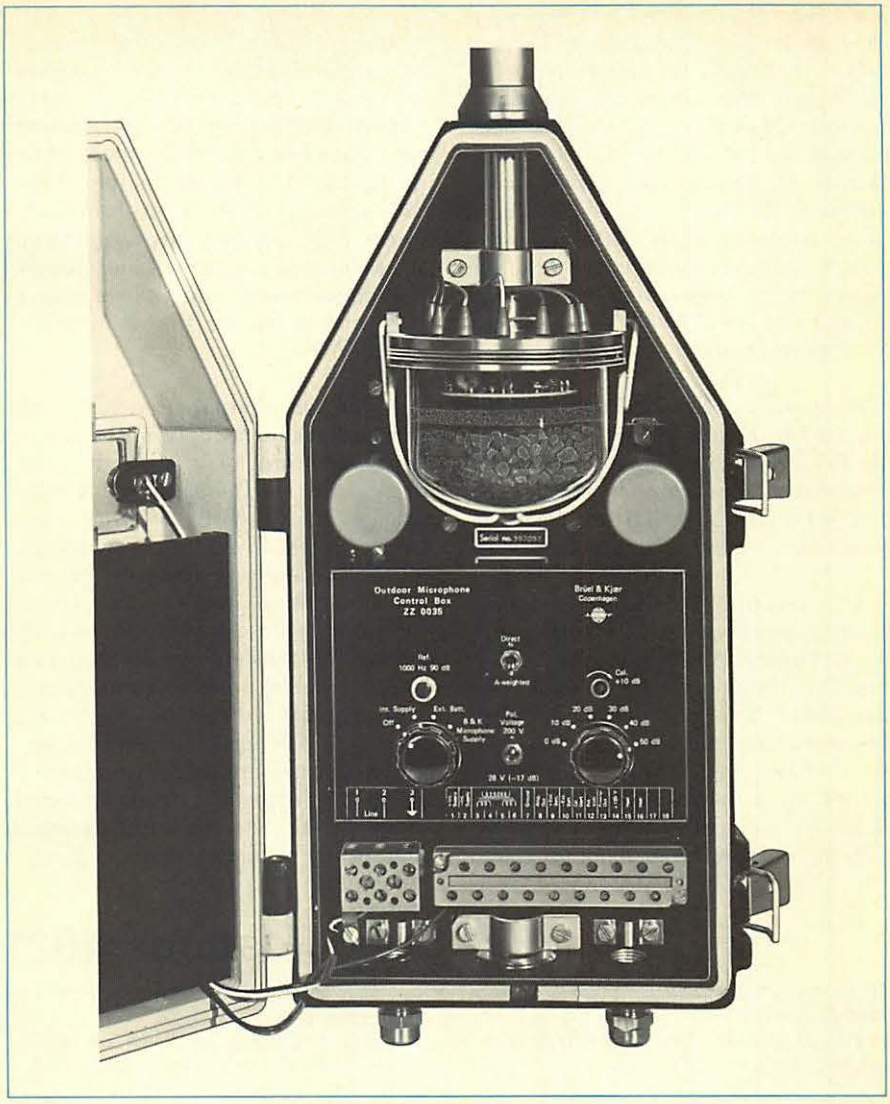


Fig. 3. The interior of the lower component showing the Control Box ZZ 0035

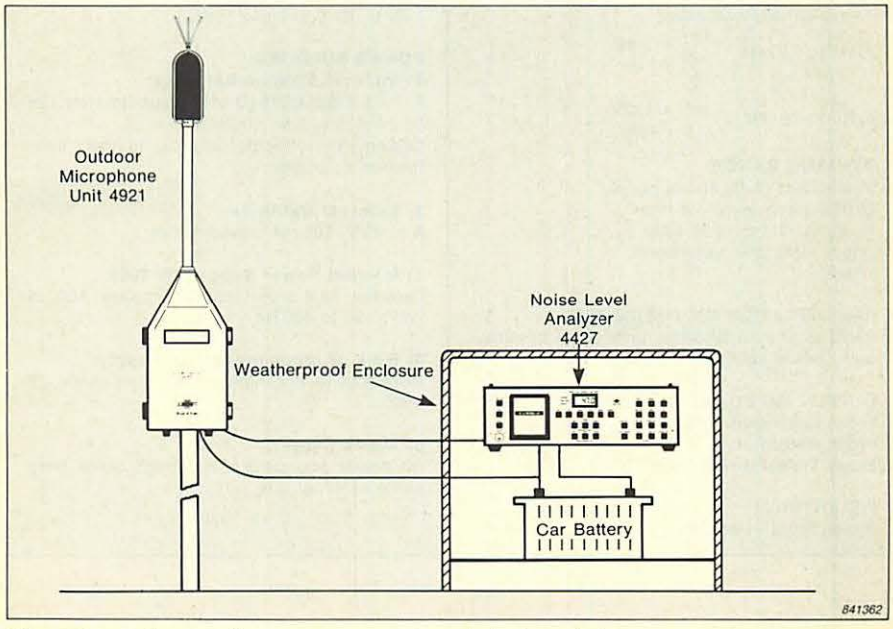


Fig. 4. Set-up for sound measurement and statistical analysis

An external battery (not supplied), for example a car battery, can be employed, and with its greater capacity will give a longer period of operation between battery changes. This also permits use of the heater coil, and such an externally powered system is shown in Fig.4. It includes a Noise Level Analyzer Type 4427 and this system can automatically give detailed reports on the noise climate, including L_{eq} and statistical levels L_N, at selected time intervals.

Mains power can give the 12 volts required by means of the Power Supply ZG 0085 which must be ordered separately. This Power Supply replaces the Internal Battery Pack in both function and location.

A standard B & K Microphone Power Supply such as the Type 2807, or Measuring Amplifiers Type 2610 and Type 2636 can be used to supply the power for the Microphone and Preamplifier, (including heater power). These instruments must be housed in a separate weather-proof enclosure, or perhaps in a nearby building as there is not room for them within the 4921 case. The Preamplifier connections are lead via the terminal strip directly to the standard B & K seven pin socket on the Power Supply or Amplifier thus eliminating the Control Box ZZ 0035. It should be noted that the Power Supply Type 2807 does not contain weighting networks, although these are available in the Measuring Amplifiers, and that an alternative power and control source will be required for the electrostatic actuator.

A further alternative removes all electrical components from the Lower Component which is then used merely as a case for the Dehumidifier. A separate weather-proof case with controlled internal environment houses all control and power supply circuits, and in addition, it can contain either recording facilities or transmission elements for transferring measured data to some central processing unit. These arrangements (shown in Fig.5) are used in B & K airport noise monitoring systems where data is transferred either as a frequency modulated signal or in digital code via a duplex radio link, or via ordinary telephone lines.

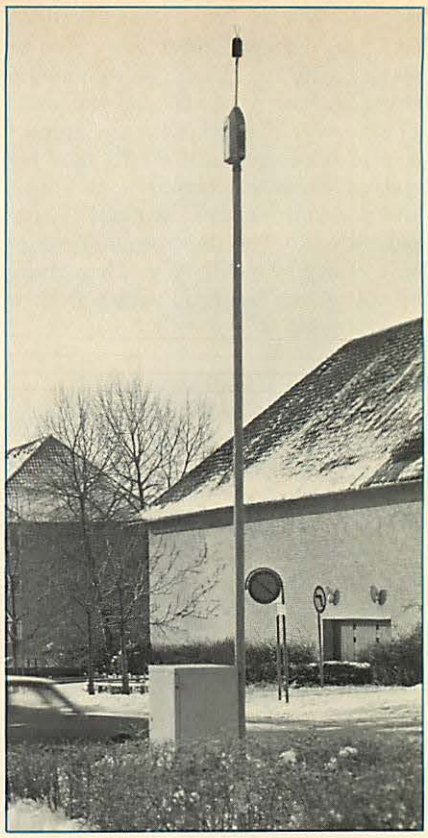


Fig. 5. Typical Noise Monitoring Terminal

Specifications 4921

MICROPHONE:
B & K Type 4149 Quartz-coated 1/2″ Condenser Microphone

FREQUENCY RESPONSE:
Amplifier:
20 Hz to 20 kHz ± 1 dB
Acoustical System:
In accordance with IEC 651 Type 1
(Free field 0° incidence)

20 Hz to 10 kHz	+ 1 dB – 2 dB
20 Hz to 20 kHz	+ 1 dB – 4 dB

DYNAMIC RANGE:
Lower limit (5 dB above noise):
40 dB(A) with external filter
46 dB(A) with built-in filter
Upper limit (3% distortion):
160 dB

AMPLIFICATION BY THE ZZ 0035:
60 dB in five 10 dB steps plus 10 dB continuously adjustable

OUTPUT IMPEDANCE:
From Preamplifier: < 50 Ω
From Amplifier: < 1 Ω
From Transformer: 50 or 200 Ω

WEIGHTING:
A-weighting in accordance with IEC 651

DEHUMIDIFIER:
Contains 75 g (2,5 oz) of Silica gel which should give protection for approximately 3 years

HUMIDITY RANGE:
0 to 100% relative humidity

TEMPERATURE RANGE:
–25 to 70°C (–13 to 158°F)

POWER SUPPLIES:
1) Internal Alkaline Batteries:
8 × 1,5 V IEC LR20 (D cell) approximately 120 hours continuous operation
Ordinary dry cells give approx. 30 hours continuous operation

2) External Batteries:
8 to 12 V, 100 mA consumption

3) Internal Power Supply ZG 0085:
Delivers 12 V from mains supplies 100 to 240 V, 50 to 400 Hz

4) B & K Microphone Power Supply:
Connects to Preamplifier and by-passes ZZ 0035

5) Mains Supply:
All power and control functions come from some external unit

CALIBRATION:
Built-in electrostatic actuator gives 90 dB at 1 kHz (initiated by push button on the ZZ 0035 or from some remote station)

FIXING FOOT SCREW THREAD:
1″ Pipe thread in the case
3/4″ Pipe and 3/8″ Whitworth threads available in bush inserts supplied

OVERALL DIMENSIONS:
Height: 870 mm (34,3 in)
Width: 200 mm (7,9 in)
Depth: 110 mm (4,3 in)

Weight (as delivered including internal batteries):
7,4 kg (16,3 lb)

COMPONENTS INCLUDED:

Microphone	Type 4149
Rain Cover	UA 0393
Windscreen	UA 0570
Outdoor Microphone Control Box	ZZ 0035
Preamplifier	
Internal Battery Pack 8 × IEC LR20 Alkaline batteries (D cells)	QB 0004

ACCESSORIES AVAILABLE:

Power Supply	ZG 0065
Microphone Power Supply	2807
Measuring Amplifiers	2610/2636