

AWN-4 Instruction Manual



Applied Dynamic Measurements

ABN: 76 367 043 296

P.O. Box 294
NORTH BEACH WA 6920
AUSTRALIA

Telephone: 0414 472 901
Outside Australia: + 61 414 472 901
Email: sales@admnetworks.com
Web site: www.admnetworks.com

AWN-4 4-CHANNEL ACOUSTIC WEIGHTING NETWORK

Designed and manufactured by Applied Dynamic
Measurements.

Serial number:

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1. SPECIFICATION AWN-4

Tolerance

All networks to Type '0' precision

Input

Max input ± 2.5 V for A, B, C networks (clipping)

Max input ± 650 mV for D network (clipping)

Output Impedance

$\sim 100\Omega$ unity gain stable into 1000 pF load

Noise

Noise Spectral density typically $80 \text{ nV/Hz}^{(1/2)}$

for A weighted network with 50Ω i/p termination

Indicators

Overload detector and low battery detector

Environmental

Temperature -10 to +55 C

Power Requirements

Single 1.5 V AA alkaline cell

Life approximately 36 hours

Dimensions

22 x 65 x 120 mm (H x W x D)

Weight 154 grams (with battery fitted).

2. WARRANTY

The AWN-4 Acoustic Weighting Network is supplied with a conditional 24-month warranty from the date of purchase.

Applied Dynamic Measurements (ADM) undertakes to repair and recalibrate the instrument free of charge if the failure is the result of faulty workmanship or premature component failure.

This warranty does not extend to failure resulting from misuse of the instrument either of a physical or operational nature. Operational misuse refers to operations outside of the guidelines of the equipment handbook, in particular misconnection of signal sources and signal levels outside the recommended range.

The customer will cover the cost of returning the damaged instrument to ADM, in turn ADM will cover the cost of repair and any reasonable return cost for transportation to the customer.

Warranty Instructions

- 1) Please advise ADM of the pending warranty claim and the circumstances of the failure, prior to dispatching the instrument for repair.
- 2) Ensure that the instrument is packed adequately to prevent damage in transit.
- 3) **Remove** the battery from the instrument before it is dispatched.
- 4) The return address may be found by viewing the **Contact details** section of the ADM web site at *<http://www.admnetworks.com>*

All warranty claims will receive a high priority in order to minimise the delay and associated inconvenience to the customer.

3. FEATURES

The AWN-4 is a high precision set of acoustic weighting networks offering A, B, C and D functions designed to comply with ANSI S1, 42-1986 (R1998) and IEC 537 (D Weighting).

The instrument is primarily intended for laboratory use; however, its compact size and portable nature make it useful for applications in the field. The instrument operates from a single AA cell and features low battery detection and signal overload indications.

The AWN-4 has application in areas such as research, teaching and noise monitoring and assessment, in fact any measurement situation where access to the respective weighting transfer function is required.

The A and C weighting networks are commonly found in sound level meters but offer only one integrated measurement for the entire frequency range of the selected network. Conversely, the AWN-4 provides the corresponding weighted magnitude of each frequency point. In other words it can be used with other instrumentation to precisely identify the offending frequency components that contribute to an excessive noise measurement.

4. OPERATION

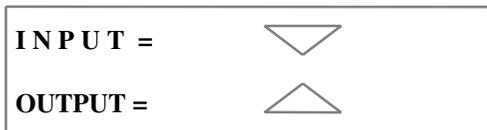
The AWN-4 is supplied in a fully operational condition but without a battery fitted. Remove the rear battery compartment cover and fit a 1.5V AA alkaline cell.

The instrument is switched on by depressing the **Power** push button. This is a toggle action switch which alternatively switches the instrument On and Off.

The required weighting network is selected by simply depressing the **A**, **B**, **C** or **D** push buttons. The instrument will always default to the **A** network when it is first switched on.

Each weighting network has an associated LED which when illuminated, indicates the selected function and that the instrument is switched on.

Signal connections are via the two BNC connectors mounted at the top end of the instrument. The direction of the arrow indicates input and output.



CAUTION: Observe the maximum input rating of 5V peak to peak. Inputs larger than 5V are automatically clipped to protect the instrument from damage. Clipped signals always introduce signal distortion!

The front panel **Status** indicator will light to indicate the onset of clipping in any of the networks. Since the A, B and C networks have unity gain, the **Status** indicator conveys an input overload condition. However, the D network has a gain of approximately 11 dB at a frequency of 3.5 kHz; an illuminated **Status** indicator in this case indicates that the overload is in the filter chain. In each case the input signal level must be reduced.

Note: Since the D network has a maximum frequency dependent gain of 11.6 dB ($G = 3.8$), clipping will occur with an input signal of greater than 650 mV.

The **Status** indicator also doubles as a **Low Battery** indicator. The indicator will light when the battery potential falls below approximately 1V. A low battery condition will illuminate the **Status** indicator irrespective of input signal level. If there is any difficulty in distinguishing between these conditions, the input signal cable can be momentarily removed. If the Status indicator remains lit then the battery needs to be replaced.

5. WEIGHTING NETWORKS

The subjective response of the human ear to the perceived loudness of sound not only varies with sound pressure but also with frequency.

The process of sound measurement must include an electronic weighting network for the measured result to bear any relationship to the perception of loudness and for the measurement to simulate the response of the human ear.

In order to compensate for variations in loudness due to sound pressure sensitivity, sound pressure measurements are divided into 3 regions. The A weighting network is designed to approximate the response of the human ear at low sound pressure levels i.e. below 55 dB. The B weighting network is designed for sound pressure levels in the range greater than 55 dB through to 85 dB, while the C weighting networks is designed for sound pressure levels greater than 85dB.

It immediately becomes obvious that given the extent of each of these ranges, an inherent error will exist in most weighted sound pressure measurements, since only one sound pressure level within each range will accurately match the response of the human ear.

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This error may be further compounded by the selection of an incorrect weighting network for the measurement of higher sound pressure levels.

The D weighting network is specifically designed for aircraft noise measurements, but is not commonly available on most instrumentation. Similarly, the B weighting network is not available on many instruments.

6. APPLICATIONS

The AWN-4 provides a reference transfer function of the A, B, C and D weighting functions. Any time signal applied to the input will be filtered by the selected weighting function. Sound signals picked up by a microphone may be weighted prior to recording or acquisition. Similarly, unweighted recorded time signals may be played back through the AWN-4 for review and analysis.

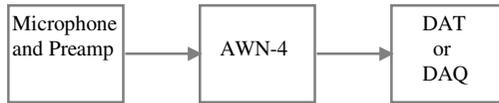
When used in conjunction with a Dynamic Signal Analyser, time signals connected to the AWN-4 will show the contribution of individual frequency components to the noise measurement process.

It should be remembered that filter settings in external instrumentation i.e., high pass or low pass filters where the cutoff frequency is within a decade of the weighting network cutoff, will influence the final response and should be taken into account. A convolution of the two transfer functions will occur since they are now in series i.e., $H(s)=H(f) * H(g)$.

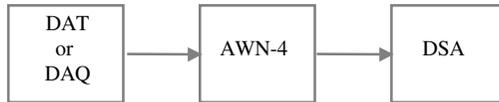
The AWN-4 may be used in teaching applications to visually demonstrate to students the operation and shape of acoustic weighting functions.

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Typical instrumentation setups are shown below:



Field Data Collection



Laboratory Analysis

7. CALIBRATION

The AWN-4 is calibrated prior to dispatch. All units are tested for Type '0' compliance. In addition, some instruments will be supplied with a certified NATA calibrated Type '0' compliance, according to the customer order requirements.

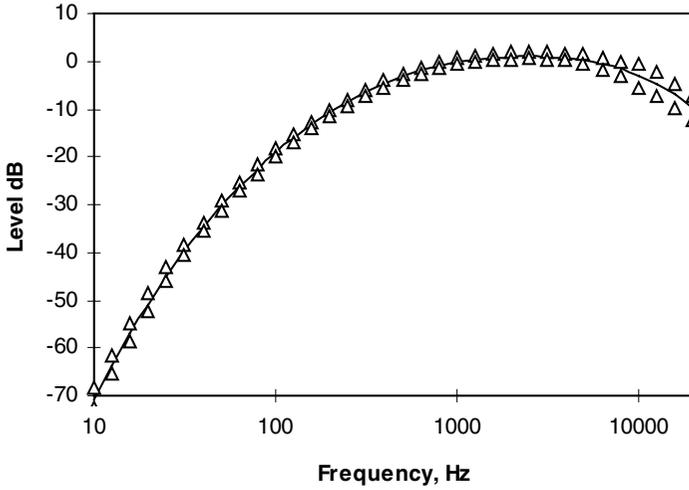
The following A, B, C and D weighting curves are generated from the recorded test results of a typical unit. The calibration results for the supplied instrument may be viewed in an Excel spreadsheet on the accompanying CD.

The serial number of the instrument is recorded on the front page of this instruction manual, which matches the serial number recorded inside the battery compartment of the associated unit.

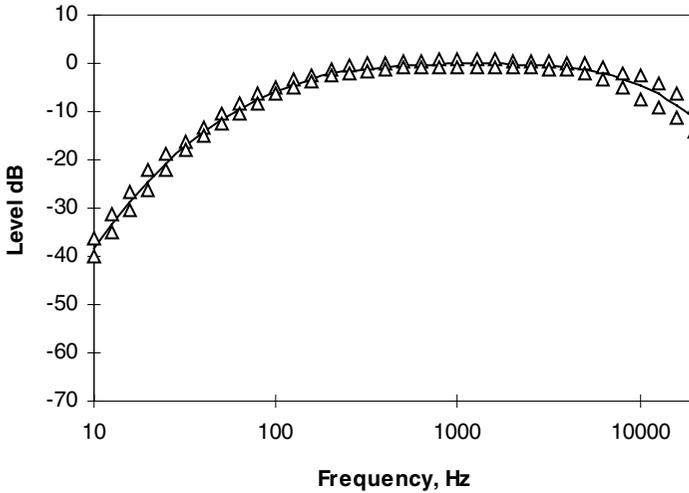
In the graphs below, the Type '0' tolerance band is shown on the respective graph by the triangular markers.

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Weighting Curve A

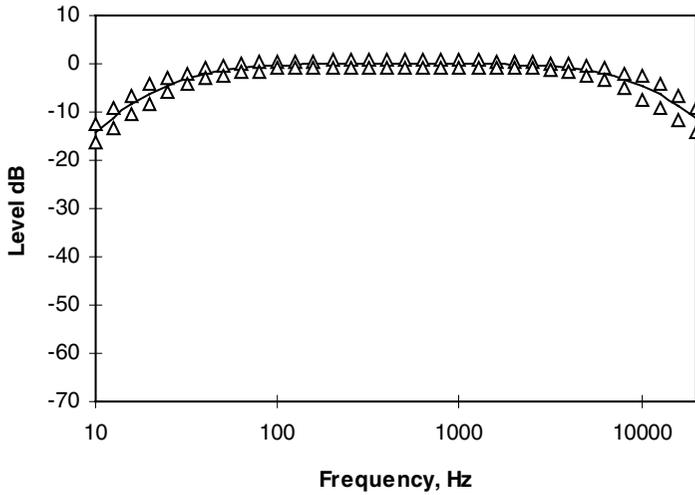


Weighting Curve B



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Weighting Curve C



Weighting Curve D

