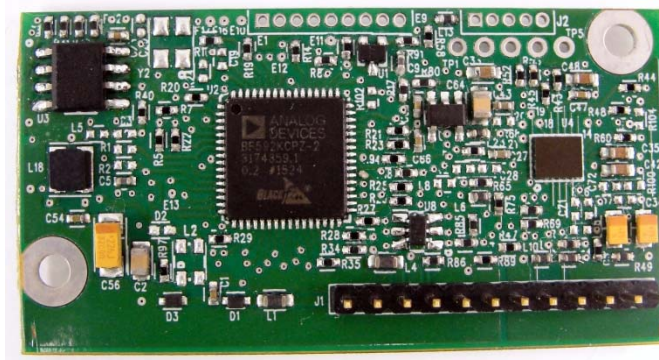




DA-250 Q

DSP STEREO ARRAY MICROPHONE MODULE SPECIFICATION REV -



*MICROPHONE ARRAY MODULE FOR HANDS FREE CLEAR COMMUNICATIONS
AND ENHANCED SPEECH RECOGNITION ACCURACY*

WWW.ANDREA-ELECTRONICS.COM

THIS PRODUCT IS COVERED BY ANDREA ELECTRONICS CORPORATION'S PATENT NO'S:
5,825,898; 6,049,607; 6,108,415; 6,178,248; 6,198,693; 6,332,028;
6,363,345; 6,377,637; 6,483,923; 6,594,367; 8,150,054; AND PATENTS
PENDING

- PROPRIETARY DOCUMENT -



ANDREA

620 JOHNSON AVE • BOHEMIA NY, 11746, USA • (TEL) 631-719-1800

KEY FEATURES

DIRECTIONAL DIGITAL NOISE CANCELLING NEAR & FAR-FIELD MICROPHONE

ACOUSTIC ECHO CANCELLATION (AEC)

AUDIO IC: BLACK FIN DSP PROCESSOR 100-200MHZ

16 BIT DAC AND 16 BIT ADC

INTERFACE AND CONTROL:

TWO ANALOG SIGNAL INPUT FROM STEREO MICROPHONES

TWO ANALOG SIGNAL INPUT FOR AEC REFERENCE

MONO ANALOG SIGNAL OUTPUT TO AUDIO DEVICE

12 PIN ON BOARD HEADER FOR MICROPHONE OUTPUT, POWER AND CONTROL

4 PIN ON BOARD HEADER FOR MICROPHONE INPUT

ONE SPI DIGITAL PORT TO HOST DEVICE (OPTIONAL)

ONE I2S DIGITAL AUDIO PORT

FUNCTION MODE CONTROL: FILTER SELECTION AND EQ BOOST BUTTONS

DSP PROCESSING FUNCTION

FAR-FIELD MICROPHONE, DISTANCE UP TO 15FT (4.5M)

STEREO BEAM FORMING (BF)

STEREO ACOUSTIC ECHO-CANCELLATION (AEC)

NOISE REDUCTION (NR)

MICROPHONE DRC (OPTIONAL)

MICROPHONE AGC (OPTIONAL)

DIGITAL EQUALIZER (OPTIONAL)

LED INDICATOR: POWER, FILTER, VOLUME (OPTIONAL)

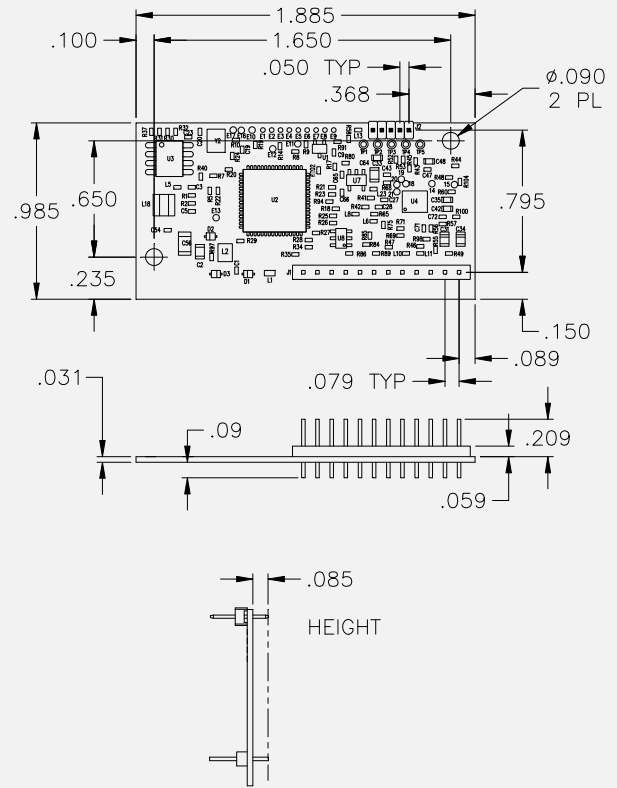
DIGITAL FILTER SELECTION BUTTONS

LOW POWER CONSUMPTION, LESS THAN 0.2 WATTS

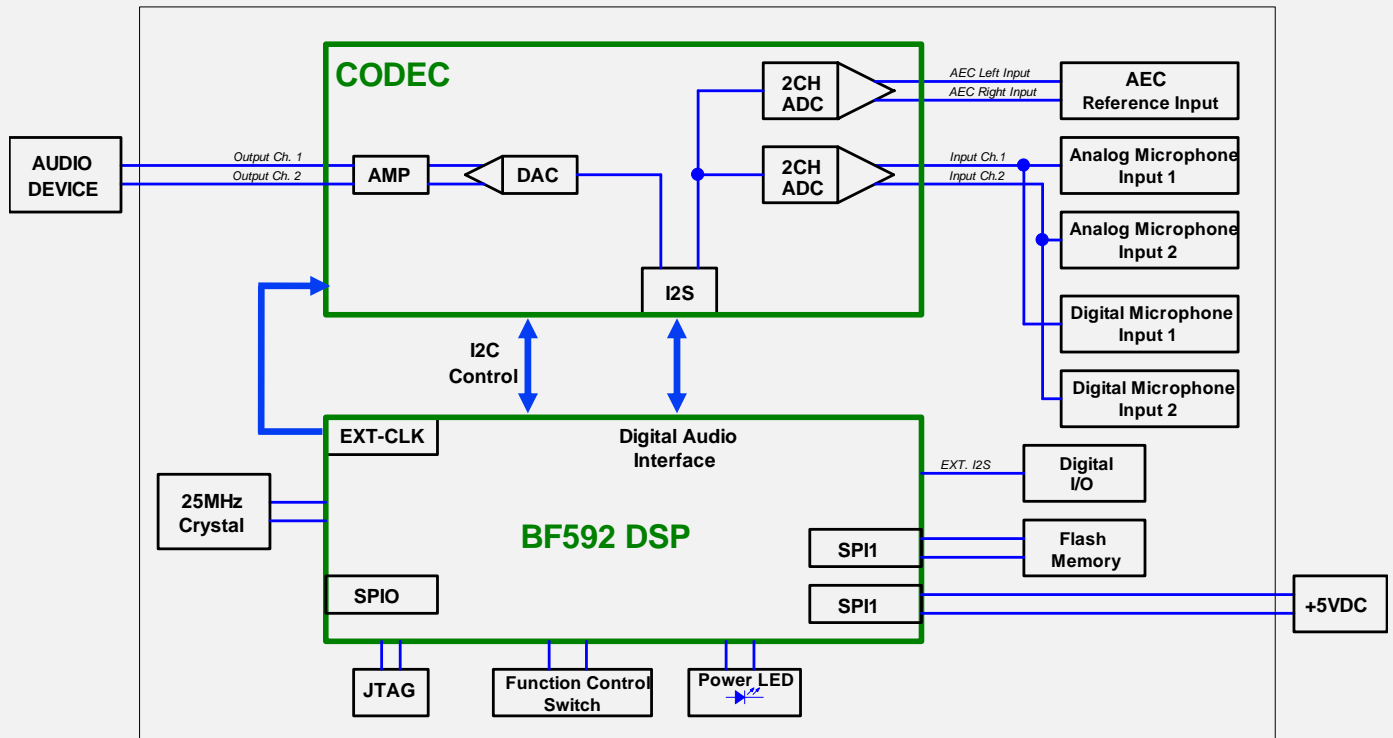
ROHS COMPLIANT

MODULE SIZE L X W = 1.85" X 0.985" (47MM X 24.5MM)

MODULE DIMENSION



BLOCK DIAGRAM



AUDIO CHARACTERISTICS

| Parameter | Limits | | | Unit | Condition |
|---|------------|--------------|-----|--------|----------------------|
| | Min | Typ | Max | | |
| Gain @ 1KHz | | 40 | 60 | dB | Adjustable |
| * Gain with EQ | | - | | dB | Adjustable |
| *Frequency Response | 100 | | 16K | Hz | Adjustable |
| *Sample Rate | 16K | 24K | 32K | Hz | Adjustable |
| THD | | | 0.5 | % | 100-10KHz |
| Microphone Input Level | | 0.01 | 0.1 | Vrms | |
| Output Line Level | | | 2.2 | Vpp | |
| *Acoustic Echo Cancellation Reference Input Level | | 10m | 30m | Vrms | |
| *Acoustic Echo Cancellation | -40 | | | dB | 100-10KHz |
| S/(N+D) | | 85 | | dB | Line Output |
| Dynamic Range | | 87 | | DBFs=S | |
| * Noise Reduction 1 | -10 | -12 | | dB | PureAudio |
| * Noise Reduction 2 | -20 | -24 | | dB | Aggressive PureAudio |
| Beam Forming | -10 at 90° | Refer to pg6 | | dB | DSDA2 |
| * Dynamic Range Compression | | Refer to pg6 | | dB | Adjustable |
| Output Impedance | 10 | 200 | | Ohm | |
| Temperature Range | -40 | | 85 | °C | |
| Input Power VDC | 3.7 | 5 | 5.5 | VDC | |
| Input Current | | 60 | | mA | |
| Time Delay | | 74 | | mSec | PureAudio+DSDA2 |
| | | 125 | | mSec | AEC |

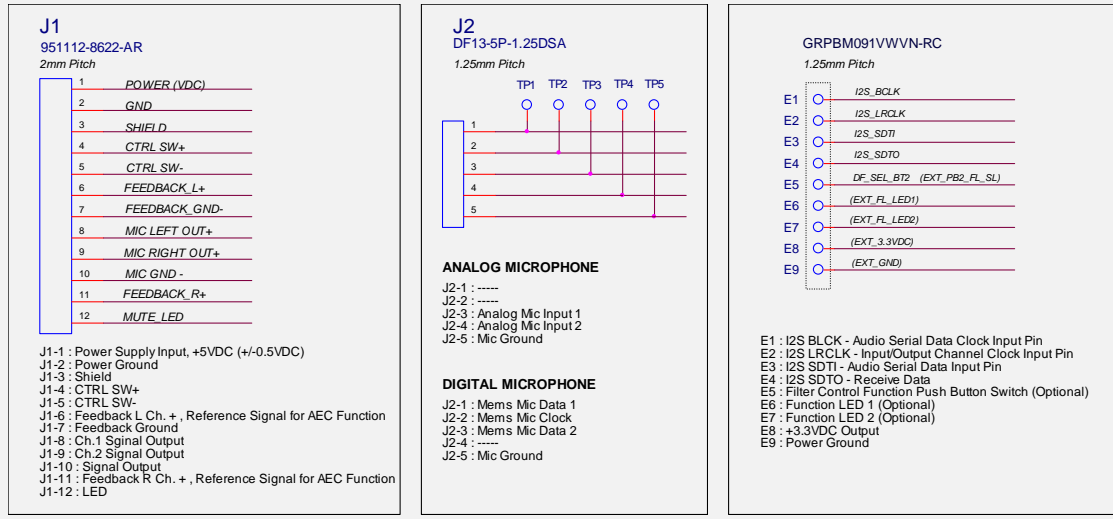
* *Optional Configuration*

MICROPHONE ELEMENT SPECIFICATION

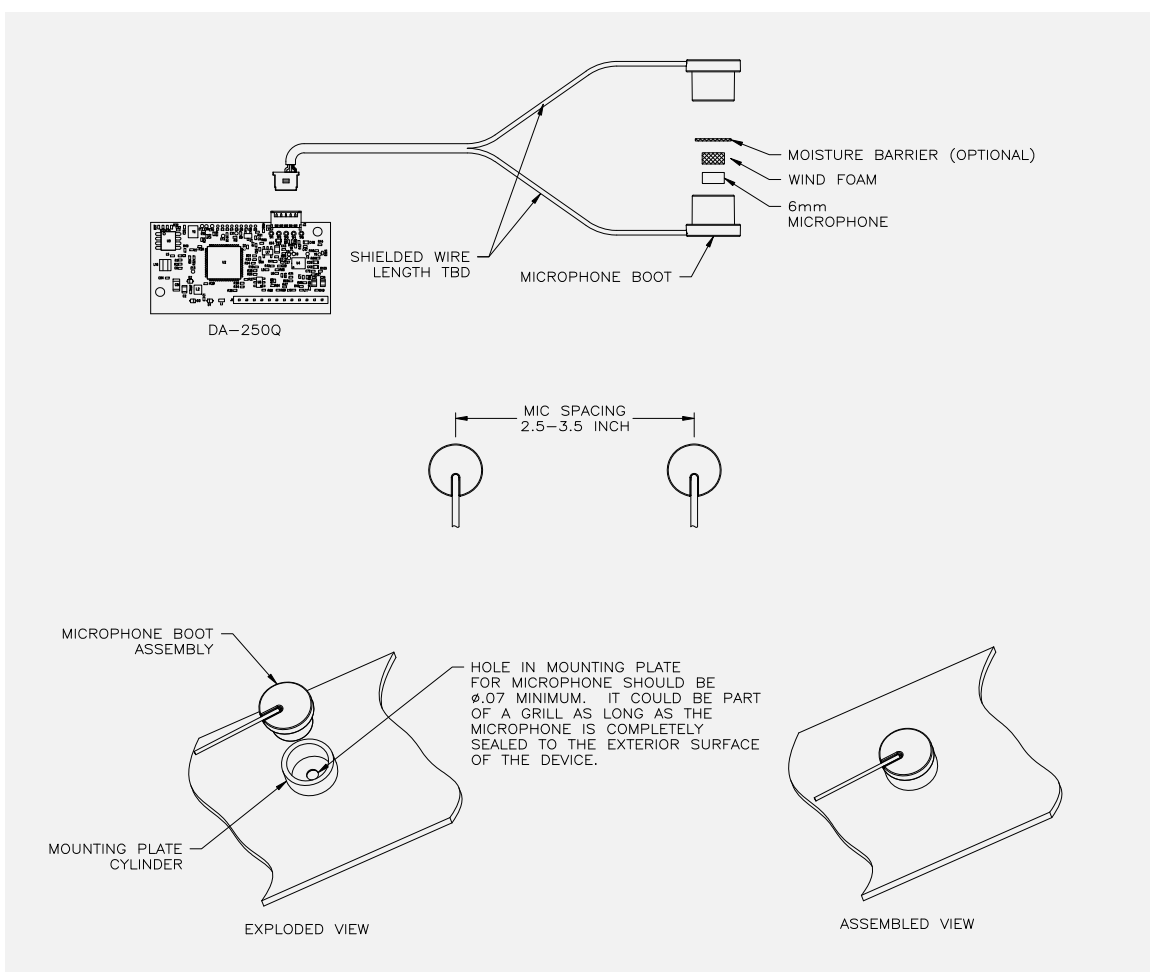
| Parameter | Limits | | | Unit | Condition |
|---------------------|-----------|-----------|-----------|--------|------------|
| | Min | Typ | Max | | |
| Type | | | | - | ECM / MEMS |
| Sensitivity @ 1KHz | -39 | -36 | -33 | dBV/Pa | Far-Field |
| Sensitivity @ 1KHz | -52 | -49 | -46 | dBV/Pa | Near-Field |
| Frequency Response | 100 | | 12K | Hz | |
| Impedance | | 2.2K | | Ohm | |
| *Directivity | | | | - | Omni |
| Operation Voltage | | 1.5 | 5 | V DC | |
| Current Consumption | | 0.5 | | mAmp | |
| Signal to Noise | | 58 | 87 | dB | |
| ECM Dimension | 4.0 x 1.5 | 5.8 x 3.0 | 9.7 x 5.0 | φ mm | |
| MEMS Dimension | | 2.7 x 3.5 | | φ mm | Analog |

*Note MEMS microphone only available as Omni-directional

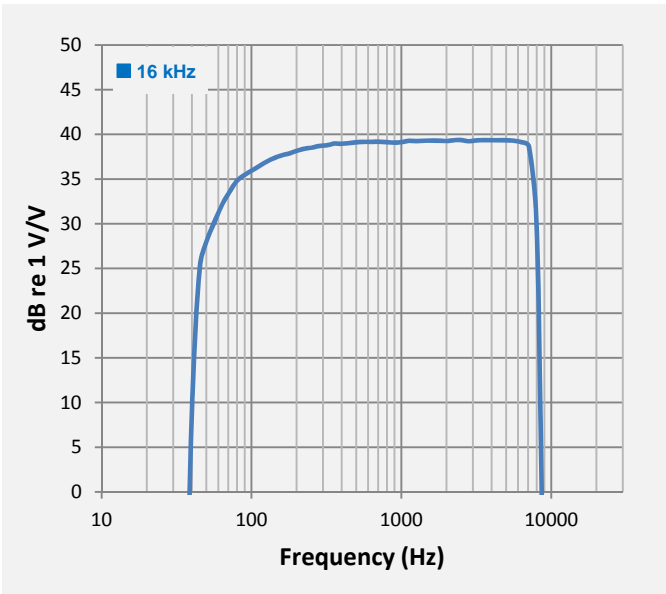
CONNECTOR LAYOUT



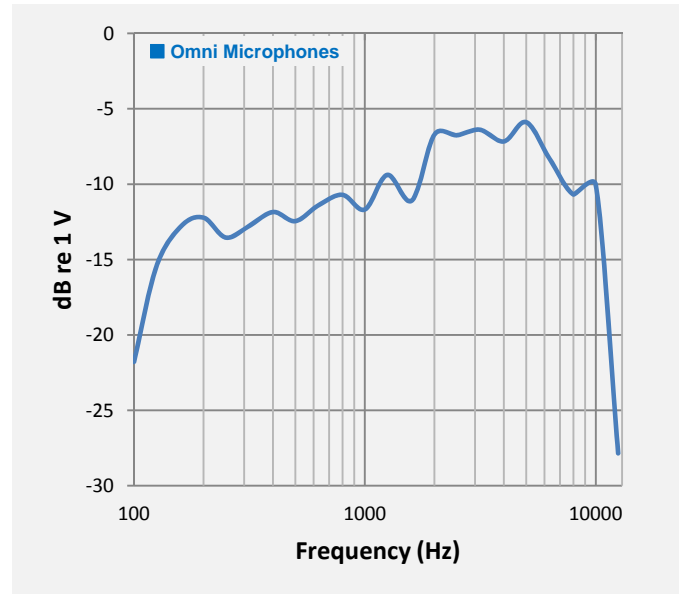
MICROPHONE SPACING AND MOUNTING



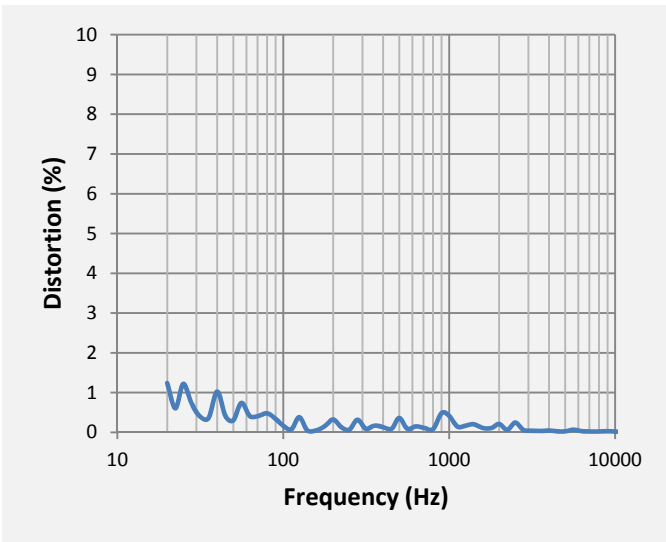
**FREQUENCY RESPONSE
DIRECT SIGNAL IN / OUT**



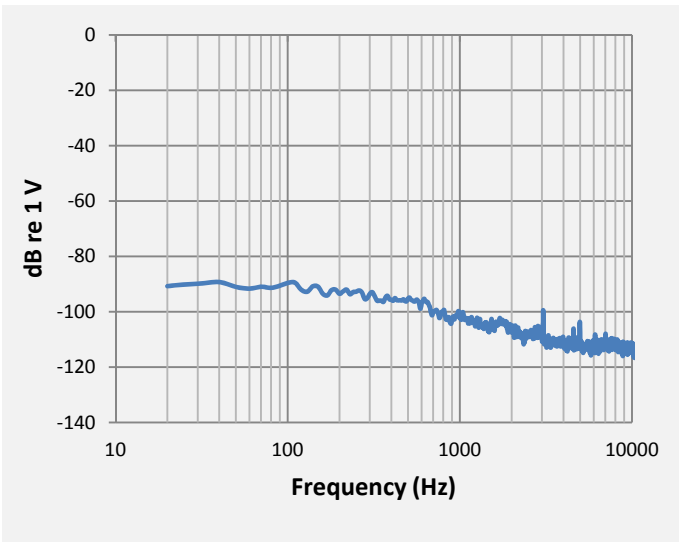
**FREQUENCY RESPONSE
ARRAY MICROPHONE**



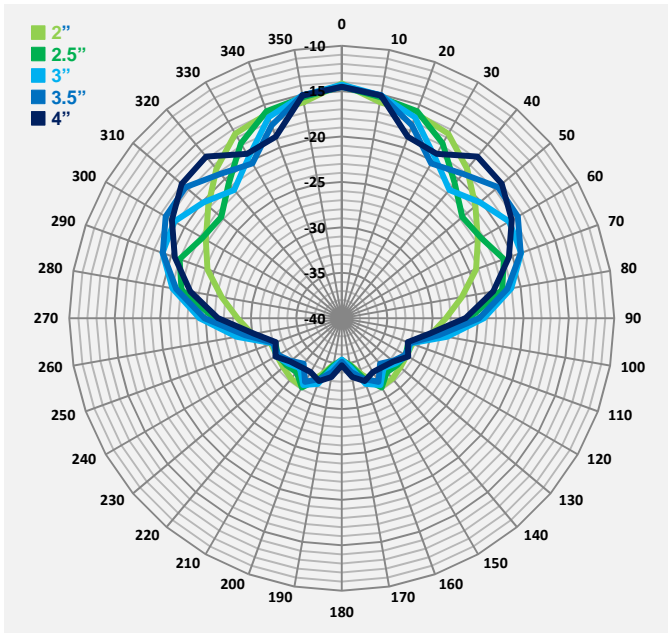
**DISTORTION
THD**



**INTERNAL
NOISE**

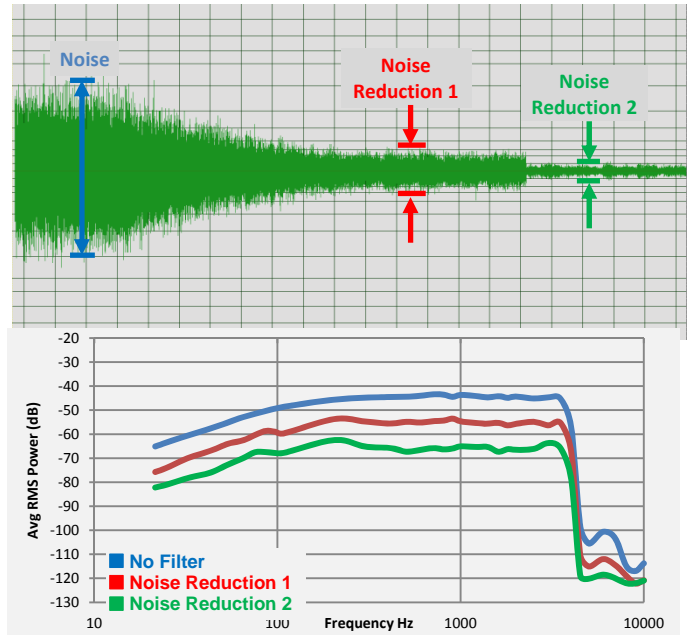


**SYSTEM POLAR PATTERN
BEAM FORMING DIRECTIONALITY**



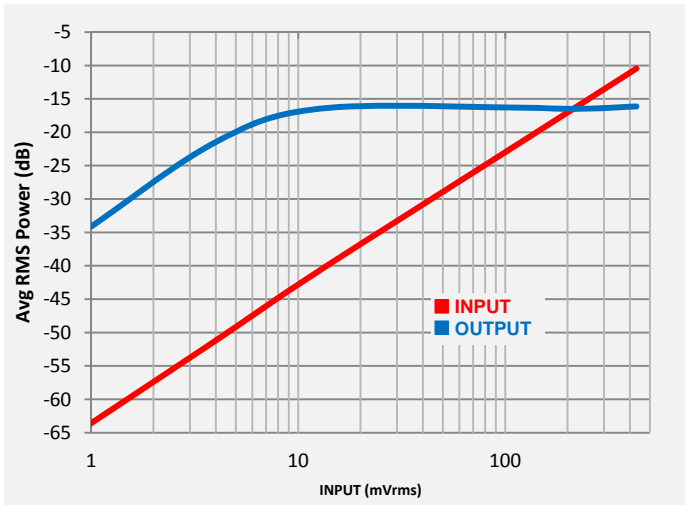
Two omni-directional Microphones spaced at 2" to 4" distance apart
Microphones placed at 18 inch distance from 1KHz signal source.
Signal source adjusted for 94dB SPL at 1 inch

**NOISE REDUCTION
PUREAUDIO**

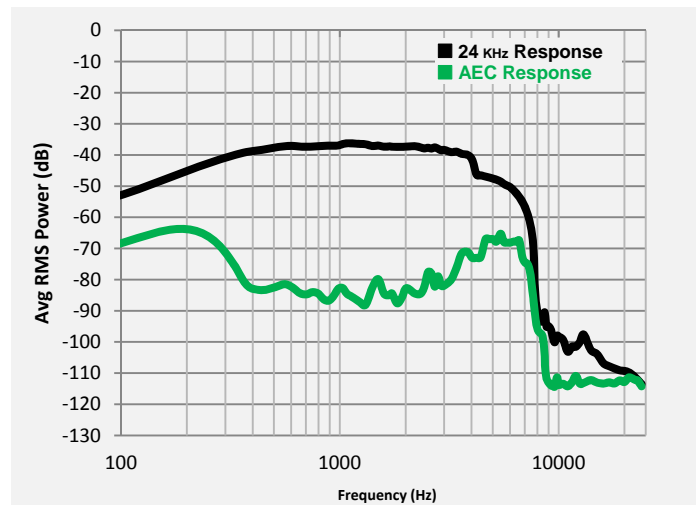


White Noise signal source. The White noise signal contains equal power within a fixed bandwidth at all frequencies (50-10KHz).

**AGC
INPUT VS OUTPUT**



**AEC
ACOUSTIC ECHO-CANCELLATION**



Sweep signal source contains equal power within a fixed bandwidth at all frequencies (20-20KHz).



SPEECH RECOGNITION ACCURACY

Setup

Testing was performed under the following controlled, but real life conditions:

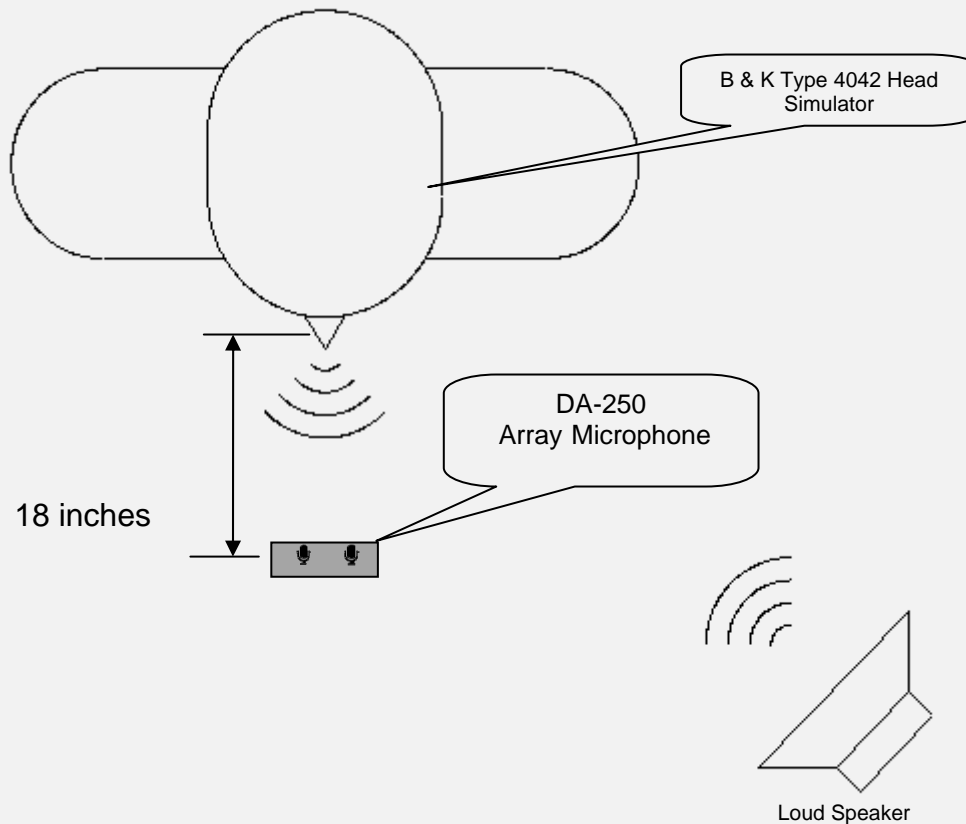
The setup used a computer as the source of the 1411kbps high quality speech file that is played from the PC through a Brüel & Kjær artificial head simulator, to ensure repeatable results.

All text readings transcribed by Dragon NaturallySpeaking Software were rated with a scoring utility application that checks for word recognition accuracy. The scores can be used to determine the amount of microphone distortion.

- The DA250 Microphone is placed in a fixed position at 18 inches distance from the B&K Head Simulator.
- A generated "Speech" wave file text reading is played through the B&K Head Simulator. The "Speech" output is calibrated and adjusted for 94 dB SPL max at 1" distance away from Mouth Simulator.
- The Microphone is subjected to calibration prior to testing. The microphone has a specific user setting with Dragon NaturallySpeaking to compensate for gain and noise variance.
- Crowd Noise is played from a speaker calibrated for 65-70 dB at the DA-250 array microphone.

The intention is not to determine absolute Speech Recognition accuracy. With this in mind, we are using only a single male voice for speech input. Minimum training is performed. Additional training will improve absolute accuracy.

Note: The accuracies herein are for comparison purposes only and may not reflect actual user experiences.



| Conditions | Accuracy (Uni-Directional) |
|---|----------------------------|
| No Noise | 96.89% |
| 65-70dB SPL Environmental Noise Without Filters | 92.55% |
| 65-70dB SPL Environmental Noise With Filters | 96.27% |