

# Andrea

## Electronics Corporation Technology

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# White Paper

## DSDA

### ***SUMMARY***

*DSDA* technology makes all real-world voice applications work better than that possible with any conventional array microphone technology. Natural language interfaces, automatic speech recognition, voice verification, and all speech communication from point A to point B can be improved with this revolutionary new voice input technology.

In the real world, noise always corrupts to some degree the speech signal whether in the home, office, factory, transportation vehicle, or elsewhere. Under virtually all conditions, *DSDA* technology provides superior noise cancellation through the proprietary processing of acoustic information to separate the noise elements from the desired source elements in a very robust way, thus leaving the desired source uncorrupted.

*DSDA* technology adapts in real-time to changing conditions of reverberation, and noise sources whether they be narrow-band or wide-band, stationary or non-stationary. Therefore, non-predictive noises such as other people speaking and background music are effectively reduced before they enter the audio application, as is predictable noise sources such as air conditioning, computer fans, and automobile road noise.

Andrea Electronics Corporation believes virtually every voice application should benefit from *DSDA* technology. Simply stated: *DSDA* technology *makes all voice applications work better!*

### ***TWO VERSIONS COMING TO MARKET***

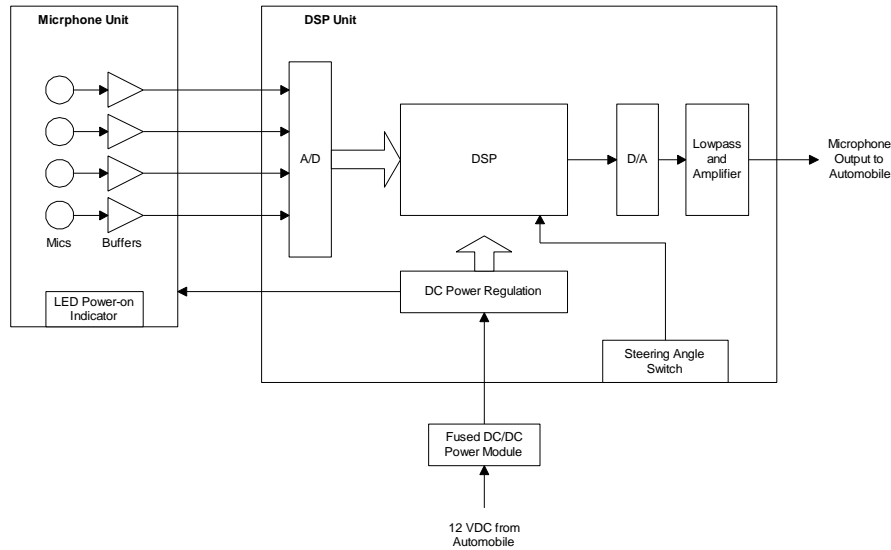
#### **AutoArray**

The *AutoArray* is a highly-directional adaptive noise-canceling voice input device designed for automobile voice recognition systems such as the AutoPC, Mobile Multimedia, Telematics, and improving intelligibility in point-to point cellular communication through hands-free carphone kits. The *AutoArray* consists of two units (microphone and DSP) and comes with a DC/DC Power Module, interconnecting cables, and mounting brackets facilitating mounting of the Microphone Unit in a variety of locations, including the sun visor.

Preliminary specifications for the *AutoPC DSDA* appear below:

| Description                                       | Value     | Units  |
|---|-----------|--------|
| Electrical  |           |        |
| Microphone/DSP Units                              |           |        |
| Output  |           |        |
| Sensitivity (1 kHz, 94dB SPL)                     | 425       | mV RMS |
| Impedance (1 kHz)                                 | 32        | ohm    |
| DC/DC Power Module                                |           |        |
| Input Voltage                                     | 11.0-13.7 | VDC    |
| Output Current                                    | 300       | ma     |
| Performance                                       |           |        |
| Operating Distance                                | 8-24      | in     |
| Noise Cancellation                                | 20 - 25   | dB     |
| Frequency Response                                | 200-6000  | Hz     |
| THD+N   | <0.5      | %      |
| Beam Width (1/3 octave multitone, centered 1 kHz) | 40        | degree |

A block diagram of the Microphone Unit, DSP Unit, DC/DC Power Module, and interconnecting cables is presented below:



The Microphone Unit consists of four pressure gradient microphone elements spaced in-line on two inch centers. The Microphone Unit receives its power from the DSP Unit. A Green LED indicates when power is on. The DC/DC Power Module receives +12 VDC power from the automobile and supplies low voltage DC power to the DSP Unit.

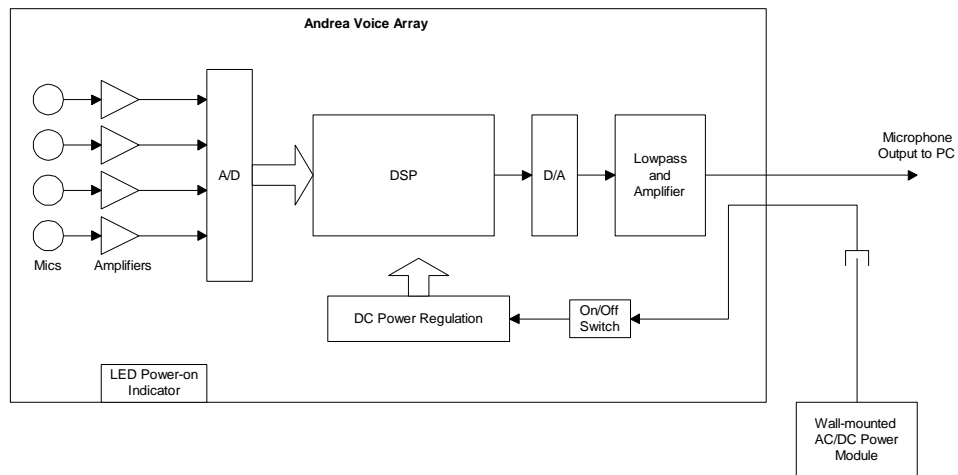
### Desktop DSDA

The *Desktop DSDA* is a highly-directional adaptive noise-canceling voice input device designed for PC voice recognition and Internet/telephony communication and is compatible with all PC sound cards. The *Desktop DSDA* consists of a single assembly and can be positioned in a variety of convenient locations on the desktop—including: on top of the monitor, or in front of (or behind or beside) the keyboard. The *Desktop DSDA* is powered by a UL listed Class 2 Wall-mounted AC/DC Power Module and therefore does not draw power from the PC.

Preliminary specifications for the *Desktop DSDA* appear below:

| Description                                       | Value    | Units  |
|---|----------|--------|
| Electrical  |          |        |
| Voice Array                                       |          |        |
| Output  |          |        |
| Sensitivity (1 kHz, 94dB SPL)                     | TBD      | mV RMS |
| Impedance (1 kHz)                                 | 32       | ohm    |
| Wall-mounted AC/DC Power Module                   |          |        |
| Power   |          |        |
| Current   | 300      | ma     |
| Ripple max (at 300 mA, 7.5 VDC)                   | 100      | mV     |
| Performance                                       |          |        |
| Operating Distance                                | 8-30     | in     |
| Noise Cancellation                                | 20 - 25  | dB     |
| Frequency Response                                | 100-8000 | Hz     |
| THD+N   | <0.5     | %      |
| Beam Width (1/3 octave multitone, centered 1 kHz) | 40       | degree |

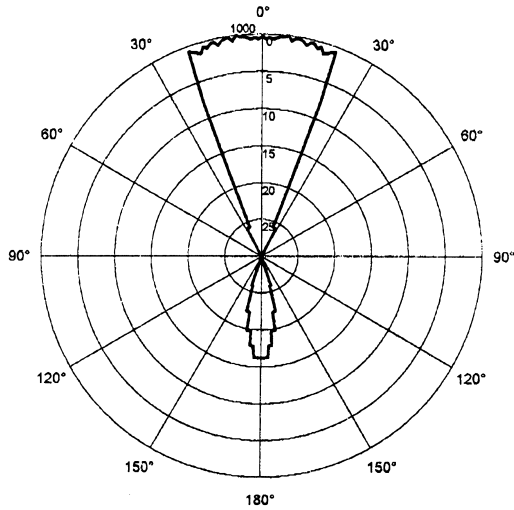
A block diagram of the *Desktop DSDA* and Wall-mounted AC/DC Power Module is presented below:



The *Desktop DSDA* consists of four pressure gradient microphone elements spaced in-line on two inch centers. The *Desktop DSDA* receives its power from the Wall-mounted AC/DC Power Converter and contains an On/Off switch. A Green LED indicates when power is on.

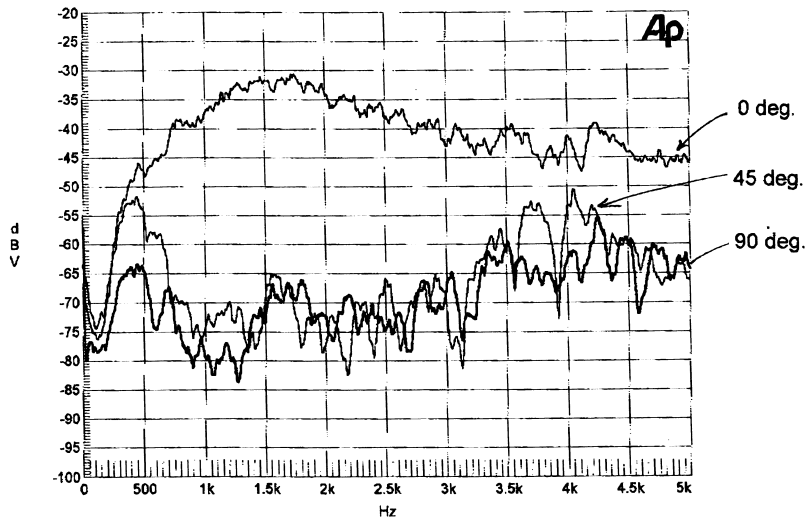
## ***DSDA NOISE CANCELLATION***

The following plot shows the sharp attenuation of noise outside the angle of acceptance.



Anechoic Response to 1/3 Octave Noise Centered at 1 kHz

The following plot shows the broadband rejection of noise from 300 Hz to beyond 5 kHz—performance hitherto unachievable from either far-field or close talking microphones:



Frequency Responses at Different Angles