Array Microphone
Digital Noise Reduction and Echo Cancellation Technology
for
OEM Digital Signal Processors
About Andrea Electronics

- Andrea Electronics founded in 1934
- Public corporation since 1961
- Pioneered microphone/headset technology for IBM speech recognition and shipped 10’s of millions of units (1995)
- First company to create an Array Microphone for the PC and Automotive industry (2001)
- Shipped over 1,000,000 SuperBeam microphones (2007)
- Currently licensing millions of our patented audio input technologies to top OEM notebook manufacturers
Andrea Array Solutions in the PC Industry

**OEM Hardware**
Creative Labs Web Cameras
IBM ThinkPad Accessory
Samsung Tablet PC

**Embedded Software**
Asus, Intel, Dell, and HP - Over ½ Billion units shipped

- ASUS Deluxe Motherboard Bundles
- HP Pavilion
- HP TouchSmart
- Dell Inspiron
Andrea’s PureAudio™ patented and award winning noise reduction speech enhancement algorithm significantly improves intelligibility of voice audio and accuracy in speech driven applications, particularly in high noise environments.

- Patented noise reduction speech enhancement algorithm
- Designed for hi-fidelity sound quality and compatible with speech recognition software
- Reduces repetitive background noise on both acoustic and electronic system noise up to 12 dB
- Can be utilized on microphone input and received speaker output
- Award winning EDN Magazine top 100 technologies of the year
Andrea’s patented DSDA™ (Digital Super Directional Array) adaptive beam forming system powers Andrea’s stereo microphone system which enables more intelligible audio by forming a beam toward the speaker and eliminating background noises that are outside of the beam.

- SuperBeam 2- 4 Microphone Phased Array Technology
- Enables more intelligible audio by eliminating background noise outside of reception cone
- Perfect for enhancing SoHo VoIP communications and providing a more professional sound
- High quality sound with minimal voice distortion
- Cancels non-repetitive directional noises up to 9 dB
- Reduces room reverberation for a more natural sounding voice
- Beam can be manually steered in 5 increments
Andrea’s patented EchoStop™ provides a full duplex acoustic echo cancellation algorithm enabling both speaker to broadcast and microphone to transmit simultaneously turning your audio system into a high quality speakerphone.

- Filters have been tightly integrated for Blackfin providing more efficient processing
- Can be enabled after the audio streams have been opened
- Adaptive processing reacts to any changes in the user environment maintaining consistent performance

The results of combining the filters are shown on the next pages and as follows:

- The amount of echo cancellation is significantly better when combined with the noise reduction filters. In these tests, the filters increased overall system intelligibility.
- These results can vary in different environments. In a noisy environment adding beam forming will remove additional room/cabin noise, making it possible to have the clearest communication in a noisy environment.
EchoStop Acoustic Echo Cancellation Performance

**No Filters:**
This test is with all filters turned off. It is used as a baseline for determining the amount of noise cancellation.

**EchoStop with PureAudio:**
This test has both EchoStop and PureAudio turned on. The amount of echo cancellation is 30 dB.
EchoStop with DSDA and PureAudio:

This test has EchoStop, DSDA and PureAudio turned on showing clean signal intelligibility.

<table>
<thead>
<tr>
<th>Filters</th>
<th>MIPS</th>
<th>Memory</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Code</td>
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<td>PureAudio</td>
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<td>EchoStop/PA</td>
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<td>14500</td>
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<tr>
<td>EchoStop/DSDA2/PA</td>
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<td>20500</td>
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</tbody>
</table>

These numbers are for sample rates of 8000 & 16000
Examples of OEM Embodiments
GM Cadillac XLR (OnStar)

Embedded Digital Array Microphone
Voice Activation and Telephone Communication
Visteon TACNET

DA-350 Digital Array Microphone
Voice Activation and
Radio / Telephone Communication
Clever Devices

SpeakEasy 2 Array Microphone Technology
Internal and External Digital PA System
Marconi ViPr System

Digital Array Microphone and Stereo Echo Cancellation System
Advanced Audio / Video Conferencing
Integrated PC Audio, Stereo Array Microphone
Voice Recognition and Internet Telephony

(Shipped Approximately 1,000,000 Units To Date)
Gentex Smart-Sync Mirror

Hands-Free Phone
Bluetooth-Enabled Cell Phone Interface in an Automatic-Dimming Rearview Mirror

Microphone
- Electronically controlled dual microphone array enables superior in-car performance
- Includes noise and echo cancellation
- Compatible with phone voice recognition system
- Air flow and moisture resistant

Speaker
- Voice and ring volume control
- Custom designed speaker for superior sound quality
- 5-watt amplifier
- Audio originates from front of driver, mimicking natural conversation

Mirror
- Mirror detects glare and automatically dims to protect driver vision and make nighttime driving safer
- Safe location to integrate hands-free control, as mirror is in driver’s line of sight/voice
- Full duplex operation allows callers on both ends to talk simultaneously

Bluetooth
- Fully integrated Bluetooth module
- Pairing with up to three phones with indicator
- Supports operation when Bluetooth-enabled phone is anywhere within the vehicle cabin
- Indicators for Bluetooth and cell tower connection

Installation
- Easy, universal install to rearview mirror windshield button
- Integrated speaker and microphone means no messy wire routing or splicing into sound system

Options
- Mirror could also include compass, outside temperature display, LED light, and other features

Embedded Stereo Digital Microphone and Echo Cancellation for Bluetooth Phone Connectivity
HP TouchSmart PC

Embedded Stereo Array Microphone
Command and Control Speech Recognition
Voice Over Internet Telephony
Embedded Stereo Array Microphone
Command and Control Speech Recognition
Voice Over Internet Telephony

Tested & recommended by ATT/ Watson Speech Group
Thank you!

FOR PRODUCT INFORMATION AND MORE

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