The ATA Reference Design Kits enable licensees to develop a variety of standards-based next generation product configurations with extensive features and world-wide configurability. VoCAL’s highly optimized On-One™ DSP technology is used to reduce system cost by controlling all ATA operations and performing advanced signal processing on a single state-of-the-art DSP. These designs far surpass the competition in terms of cost advantage and time-to-market potential, and VoCAL’s extensive customization support allows quick and easy implementation of value added features.

Configurations

Product configurations (please see diagrams on next page):

- 1 Analog Port (FXS), 1 Ethernet
- 2 Analog Ports (FXS), 1 Ethernet
- 2 Analog Ports (FXS), 2 Ethernet

The designs include PSTN lifeline support via a failover relay. A full FXO is supported with the addition of a codec and DAA hardware.

Features

Included are all the standard features expected of an ATA, plus innovative customer demanded premium features. With the patent-pending VoCAL VoATA control software, an end user can manage up to four VoIP service providers with a single ATA. User access may be automatic on a per-number basis, or can be as simple as using a standard long distance prefix such as “1010825...”.

Compatibility and Interoperability

All VoCAL Software benefits from over 15 years of service history. Compatibility has been assured by many current licensees and extensive testing with popular industrial products such as Cisco, Quintum and Asterisk. Configurations for service providers such as Vonage, Free World Dialup (FWD) and many others are available. Individual user configuration can be completely managed from the web interface built into the VoATA software, or restricted as desired by the licensee.

Provisioning

The VoCAL VoATA software is designed to support many common provisioning requirements. All tone and ring cadences and frequencies are configurable to meet world-wide expectations. Individual advanced features may be configured based on the customer’s service plan, and administrators may prepare configuration change files and firmware updates for automatic distribution to deployed ATA’s.
**Analog Telephone Adapter**

2x2+1 Development board

Unlike traditional architectures, the 2x2+1 ATA hardware and software designs fully utilize leading DSP resources and advanced patent-pending algorithms to eliminate the need for an additional RISC processor, reducing the cost of typical bill of material by as much as $8 per design. The solution is ideal for VoIP equipment suppliers desiring to add a low-cost, compact ATA solution to their portfolios.

The 2x2+1 ATA solution supports up to two telephone lines, two Ethernet ports and a PSTN life-line port for automated voice service switching in case of a power outage or network disconnection and is stackable to larger port configurations. End users can connect their homes and businesses to VoIP services using conventional wired and cordless phones without incurring additional monthly service fees or adding extra hardware. The 2x2+1 ATA solution initiates calls using the rapidly emerging IP telephony standard Session Initiation Protocol (SIPv2) and supports multiple advanced codecs to optimize performance. For VoIP service providers looking for a design that is
easily configurable with their networks, the solution provides secure and sophisticated Web-based provisioning and firmware update technology.

The 2x2+1 ATA solution is reconfigurable in the field and designed to give OEMs and service providers the ability to bring their products to market quickly and deploy them with immediate interoperability in most broadband VoIP service provider networks. OEM customers can also take advantage of VOCAL’s high-end customization capabilities, including reference design assistance and integration of value-added features.

## Reference Design Kit

The ATA Reference Design Kits from VoCAL offer the following capabilities:

### Technical Specifications

#### Voice-over-IP (VoIP) protocols
- SIPv2 - Session Initiation Protocol (RFC 3261, 3262, 3263, 3264)
- SDP - Session Description Protocol (RFC 2327)
- RTP - Real-Time Protocol (RFC 1889, 1890)
- RTCP - Real-Time Control Protocol (RFC 1889)
- RFC 2833 X-NSE Tone Events for SIP/RTP
- RFC 2833 AVT Tone Events for SIP/RTP

#### Fax Support
- G.711 Fax Pass-Through
- T.38 - Real-Time Fax Over IP
- T.38 using UDP
- T.38 using RTP

#### Network Protocols
- IPv4 - Internet Protocol Version 4 (RFC 791)
- TCP - Transmission Control Protocol (RFC 793)
- UDP - User Datagram Protocol (RFC 768)
- ICMP - Internet Control Message Protocol (RFC 792)
- RARP - Reverse Address Resolution Protocol (RFC 903)
- ARP - Address Resolution Protocol (RFC 826)
- DNS - Domain Name Server
- DHCP Client - Dynamic Host Control Protocol (RFC 2131)
- NTP - Network Time Protocol (RFC 1305)
- SNTP - Simple Network Time Protocol (RFC 2030)
- STUN - Simple Traversal of UDP over NATs (RFC 3709)
- HTTP - HyperText Transfer Protocol
- TFTP - Trivial File Transfer Protocol

#### NAT/Firewall Support (2x2 product configuration)
- Router
- NAT Firewall
- Gateway and DMZ Port Forwarding
- DHCP Server
- PPPoE - Point to Point Protocol over Ethernet (RFC 2516)

#### Telephony
- Q.24 DTMF Generation with Zero Crossing Cutoff
- Q.24 DTMF Detection exceeding Bellcore Specifications
- Configurable Tone Generation for 4 Sets of Frequencies and 4 Sets of On/Off Cadence
- Caller ID Type I (On-hook) Generation
- Caller ID Type I (Off-hook) Generation
- Caller ID Type I Detection
- Caller ID Type II Detection

#### Line-echo cancellation
- G.168 Line Echo Cancellation
- Echo Canceller for Each Port
- 16 ms Echo Length
- Nonlinear Echo Suppression (ERL greater than 28 dB for f = 300 to 3400 Hz)
- Double-Talk Detection

#### Quality of Service
- Layer 2 Class-of-Service (CoS) Tagging (802.1P)
- Layer 2 (802.1Q VLAN)
- Layer 3 Type-of-Service (ToS) Tagging (RFC 791/1349)
- Layer 3 DIFFServ (RFC 2475)

#### Hardware Features

#### Data Network
- Ethernet - 10baseT RJ-45
- Ethernet - 10baseT/100baseT RJ-45 (Optional)
- Ethernet WAN Port RJ-45
- Ethernet LAN Port RJ-45
- Configurable MAC Address (IEEE 802.3)

#### Analog Telephone Ports
- FXS Analog RJ-11 Ports (#)
- Up to 5 REN
- Configurable Terminating Impedance - 8 Settings
- -48V Nominal Battery
- 85V Ringing
- Sinusoidal or Trapezoidal Ringing

#### PSTN Port
- FXO Analog RJ-11 Ports (#)
- Lifeline Port (Processor Controlled Relay)
- Dial Plan Accessible
- Relay Deactivated on Power Fail

#### Indicators

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VOCAL Technologies, Ltd., 2008
### Tri-Color LEDs (Red, Orange, Green)
- POWER LED (Power, Registration, Use)
- LAN LED (Activity and Link Fail)
- MESSAGE LED (Message Waiting, Update Failure)
- LINE LEDS (Line Status)

### Feature List

#### Phone User Services
- Place/Cancel Outgoing Calls
- Answer Incoming Calls
- Full Duplex Audio
- Flexible Dial Plan Support
- Fax Tone Detection (Pass Through)
- ITU T.30 Fax Support
- PSTN Line Support (Dial and Backup)
- PSTN Emergency 911/999

#### Call-in Profiles
- IPBX (Internet Private Branch Exchange)
- IHT (Internet Home Termination)
- SIHT (Simple Internet Home Termination)
- SIOT (Small Internet Office Termination)

#### Voice features
- Voice Activity Detection (VAD)
- Silence Suppression (DTX)
- Comfort Noise Generation (CNG)
- Packet Loss Concealment (PLC)
- Dynamic Jitter Buffer (Adaptive)
- Audio Codec Preferences
- Dynamic Payload Negotiation
- Codec Name Assignment
- Adjustable Audio Frames per Packet

#### Telephony
- CLASS Features
- Call Waiting Enable/Disable
- Caller ID Display Enable/Disable
- Call Waiting Caller ID Enable/Disable
- Blocked Call List for a Specified Number
- Distinctive Ring for a Specified Number
- Block/Unblock Caller ID
- Block/Unblock Caller ID for One Call
- Accept Priority Call of a Specified Number
- Busy Number Redial
- Call Return (Call the Last Caller)
- Deactivate/Activate Call Waiting for Current Call
- Call Forwarding
  - Forward Priority Call of a Specified Number
  - Forward on Busy
  - Forward on No Answer
  - Forward all Calls
- Speed Dial (8 + 20 Numbers)
- Block Anonymous Calls
- Do Not Disturb
- Call Transfer
- 3-way Conference Calling with Local Mixing
- Redial
- Call Hold

#### Call Progress Tones
- Programmable Tone Generation Patterns
- Four Tones, Four On/Off Time Pairs
  - Initial Dial Tone
  - Secondary Dial Tone
  - Stuttered Dial Tone
  - Message Wait Dial Tone
  - Call Forward Dial Tone
  - Pre-Ringback Dial Tone
  - Ring Back Tone
  - Call Waiting Tone
  - Call Holding Tone
  - Call Disconnect Tone
  - Call Conference Tone
  - Busy Tone
  - Reorder Tone (Network/Fast Busy)
  - Off Hook Warning Tone (Howler Tone)
  - SIT Tones 1 to 4
  - Prompt Tone
  - Confirm Tone
  - Input Error Tone
  - Number Error Tone

#### Ringing Patterns
- Programmable Ring Patterns
- Four On/Off Time Pairs
  - Default Ring
  - Hold Ringer
  - Call Back Ring
  - Call Back Ring Splash
  - Call Forward Ring Splash
  - Message Waiting Ring Splash
  - 8 Distinctive Ring Patterns

#### Distinctive Call Waiting
- Programmable Tone Generation
- Four Tones, Four On/Off Time Pairs
- 8 Distinctive Call Waiting Patterns

#### LED Display Patterns
- Tri-Color LEDs (Red, Orange, Green)
- Programmable LED Patterns
- Four On/Off Time Pairs
- Configurable Display Priority
  - Use and Waiting
  - Ringing or Waiting
  - PSTN in Use
  - Use and Hold
  - Line in Use
  - Call Holding
  - Do Not Disturb
  - Call Forward
  - Message Waiting
Voice-over-IP (VoIP) protocols
- Power-on Auto Registration
- Re-registration with SIP Proxy Server
- SIP over UDP
- SIP Authentication (HHP Digest with MD5)

Quality of Service
- Port Priority for VoIP Packets from Application
- High and Low Priority Transmit Queues for Interface

NAT/Firewall Support
- Built-in Router
- Automated NAT Traversal Without Manual Manipulation of Firewall/NAT
- NAT Traversal for Private Networks with STUN (RFC3489)
- NAT Firewall
- Gateway and DMZ Port Forwarding
- LAN Pass Through
- Voice Priority

PPPoE – Point-to-Point Protocol over Ethernet (RFC2516)

Security
- Provisioning/Configuration/Authentications
- Password Protected Web based Administration
- RC4 Encryption for TFTP Configuration Profiles
- Authentication (DIGEST using MD5)

Remote Configuration/Maintenance
- Web Configuration via Built-in Web Server
- Configuration Update via TFTP or HTTP
- Firmware Upgrade via TFTP or HTTP
- SYSLOG Update/Upgrade Processing Notifications

Documentation
- Administration Guide
- Installation Guide
- Configuration Guide