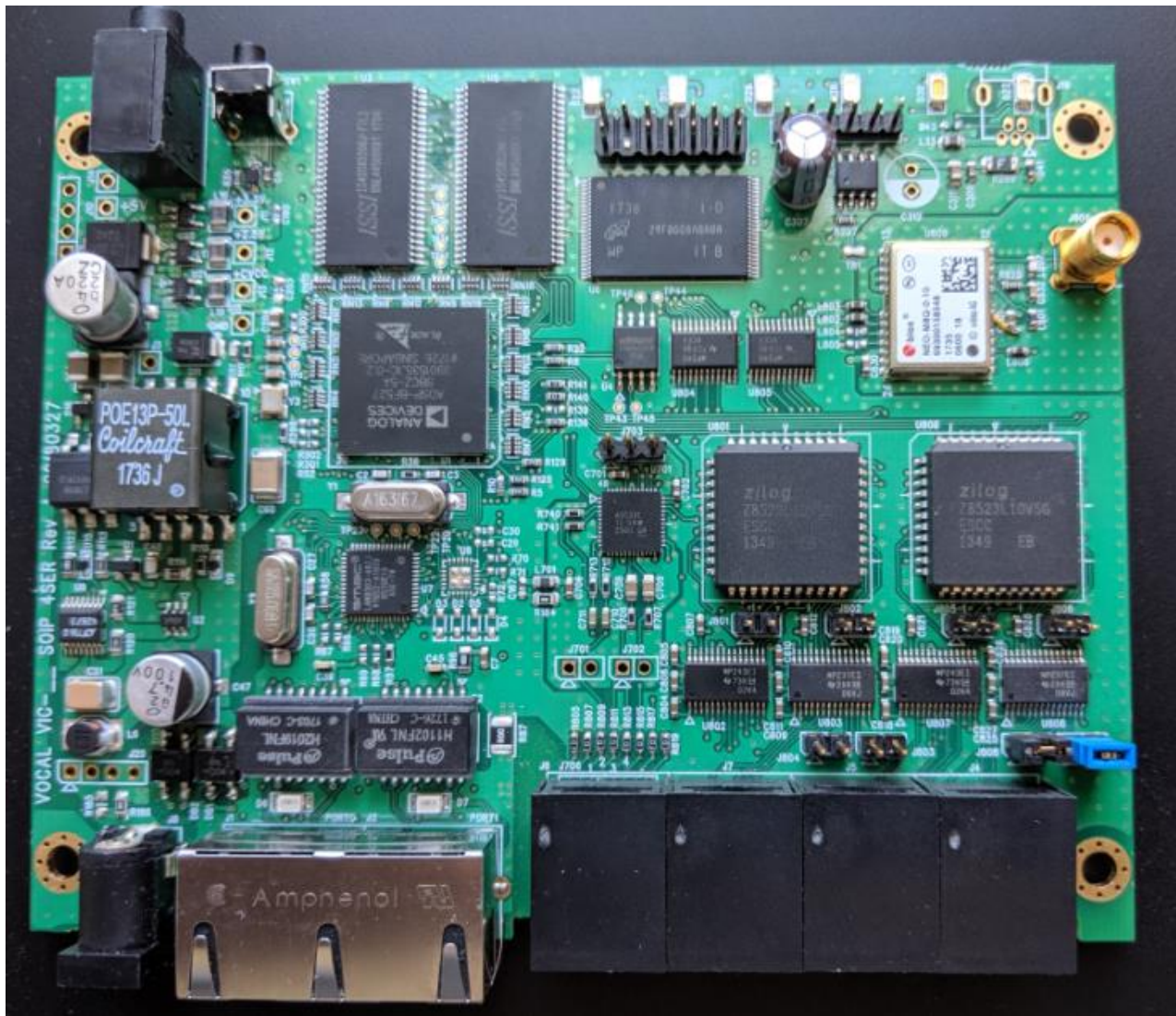


VOCAL

Serial Over IP Integrated Communicator

The VOCAL Integrated Communicator enable licensees to deploy a variety of standards-based next generation SoIP product configurations with extensive features. VoCAL's highly optimized On-One™ DSP technology is used to reduce system cost by controlling all SoIP operations for one or two audio (E&M/handset) ports and two to four sync/async serial ports 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. VOCAL's VIC-M product line implements special configurations of this hardware with customized application-specific operating software. Details of VIC-M models may be available upon request.

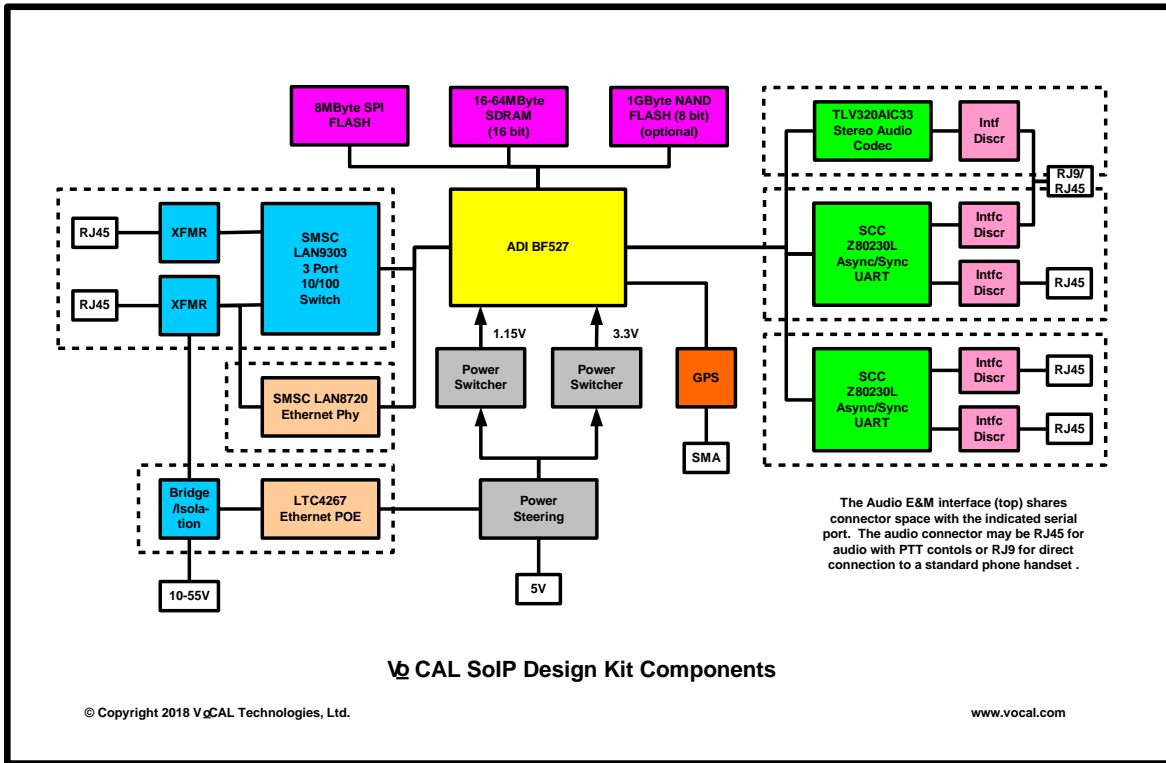


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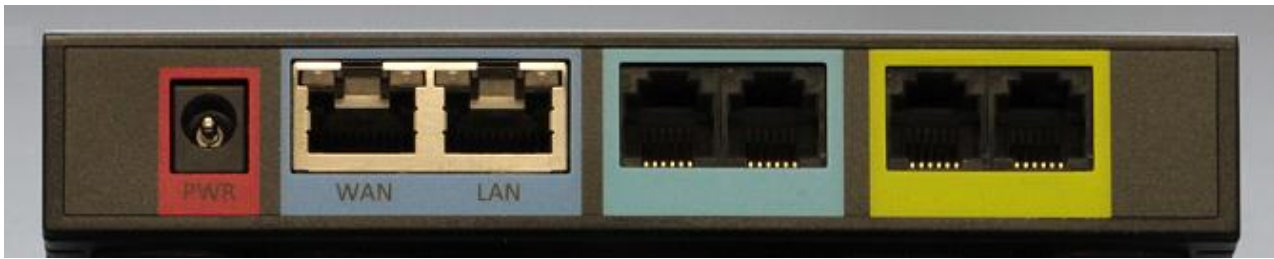
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Tel: (716) 688-4675
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Product configurations (please see diagram below):

- 2 Sync/Async Serial Ports with handshake controls and two Analog E&M Handset Ports
- 3 Sync/Async Serial Ports with handshake controls and one Analog E&M Handset Port
- 4 Sync/Async Serial Ports with handshake controls (no Analog Port)
- 2 Analog E&M Handset Port supports GPIO controls for PTT input/output
- 1 Optional GPS receiver for stream time synchronization
- 1 or 2 Ethernet with optional POE
- 5 volt wall adapter standard
- 10-55 volt isolated power option



GPIO signals are protected and configured for driving PTT (push to talk) and receiving COS/COR (carrier on squelch/receive) signals. Analog signals are single-ended and may be converted to isolated 600 ohms externally. Digital MEMS microphones may be supported as an alternate use of GPIO signals with synchronous sampling as two independent audio channels.



Connectors (left to right):

- 5.5/2.1mm barrel connector for 5VDC or optional 10-50V isolated power⁺
- RJ45 Ethernet with optional POE
- RJ45 Ethernet (optional)
- RJ45 Serial Port 4 or Analog E&M Handset Port 2 (RJ9 Handset connector optional)
- RJ45 Serial Port 3 or Analog E&M Handset Port 1 (RJ9 Handset connector optional)
- RJ45 Serial Port 2
- RJ45 Serial Port 1

+ - Optional isolated power supply also supports locking barrel connector. Requires resistor straps and eliminates Ethernet POE.

For all Serial Ports (RJ45 - 8 position, 8 contact) – EIA/TIA-561 and RS-232C/MIL-STD-188-114A

- Pin 1 – TCLK/DSR/RI in/out (direction jumper configurable, function software dependent)
- Pin 2 – DCD out
- Pin 3 – RCLK/DTR in (function software dependent)
- Pin 4 – Ground
- Pin 5 – TXD out
- Pin 6 – RXD in
- Pin 7 – RTS out
- Pin 8 – CTS in

In case of multiple signals, the factory default signal is shown first. Alternative signals usually require reconfiguration of strapping resistors.

For Audio E&M Ports (RJ45 – 8 position, 8 contact) – supports PTT controls

- Pin 1 – +3.3V
- Pin 2 – M Lead (PTT input with optional +3.3v pull-up or pull-down)
- Pin 3 – Mic + (with optional microphone bias)
- Pin 4 – Ear + (or Ground)
- Pin 5 – Ear -
- Pin 6 – Mic - (with optional microphone bias or Ground)
- Pin 7 – E Lead (PTT output – open drain with optional +3.3v pull-up)
- Pin 8 – Ground

For Audio Handset Ports (RJ9 – 4 position, 4 contact) – overlaps pins 3 to 6 of above connector

- Pin 1 – Mic + (with optional microphone bias)
- Pin 2 – Ear + (or Ground)

- Pin 3 – Ear -
- Pin 4 – Mic - (with optional microphone bias or Ground)

GPS Antenna Connector (Right Angle SMA) – located on side of unit if equipped

Audio inputs may be biased for powering Electret or MEMS analog microphones using resistor straps and software configuration (none, 2, 2.5 or 3.1V bias). Audio inputs/outputs $2V_{p-p}$ or $0.707V_{rms}$ max (0dB). Audio input voltage divider is configurable with resistors.

Serial Modem Emulator (SME)

Today's world uses a mixture of communications technologies for modern and many not-so-modern devices. The PSTN is being replaced with VoIP technologies and many analog phone lines are being obsoleted. But there is a considerable amount of legacy equipment that still uses dial-up data modems for communications to/from application servers. If the legacy equipment uses modems which are built-in, then VOCAL's Analog Modem Adapter (AMA) is one of the best replacement technologies. However if the dial-up data modem is external, then VOCAL Serial Modem Emulator (SME) provides greater benefits. The VOCAL SME replaces a dial-up modem and implements commonly used AT commands for modem control, dialing and session management.

Many applications use a pure dial-up connection for a device to be in contact with a server. Either end-point may initiate the communications depending on the application. Server applications commonly use RFC 2217 for access of remote COM ports on terminal servers or deprecated Cisco modem server banks. VOCAL's SME eliminates the modem at the remote location and utilizes VOCAL's SAMS (SIP Analog Modem Server) for managing connections between remote devices and the applications servers. This works well for many PSTN replacement scenarios including for remote utility meter access and management of remotely controlled equipment (MV90, PrimeRead and Autosol).

Another class of applications requires access of either a public or private internet. These formerly relied upon now deprecated Cisco (and other vendor) RAS modem server banks. VOCAL SME devices can be used in several modes to service these applications. The emulated "modem" in the SME provides support for the fastest data connections. The packetized application data may be transported back to a central site for access to a local PPP/RADIUS server (using a SAMS). Alternatively, the SME may use its internal PPP stack and either deliver packets directly to a locally connected IP network or tunneled to remote IP network. Communications for all modes can be secured using TLS or DTLS as per configuration.

Simultaneous Audio and Data (SAD)

There still quite a few remote site applications which require both audio and data communications. Many of these have used legacy Digital or Analog Simultaneous Voice and Data (DSVD/ASVD) modems which are no longer in production and failing from exposure to harsh environments. VOCAL's SoIP implements one or two channels of independent audio processing as well as two or three serial ports with modem command set emulation. VOCAL's customizable software supports several standard ways to deliver bidirectional audio data. One of the simplest is as VoIP/SIP RTP audio to a standard public, government or private SIP network. Alternatively, the audio may be delivered as encoded voice in a modem's voice command set (AT+FCLASS=8). Simultaneous Audio and Data (SAD) applications may also be customized to support dedicated configurations working with specialized equipment such as crypto units.

Specifications and Features

The SoIP Adapter product family from VoCAL offers the following capabilities:

Technical Specifications

Voice-over-IP (VoIP) protocols

- SIPv2 - Session Initiation Protocol (RFC 3261, 3262, 3263, 3264)
- SDP - Session Description Protocol (RFC 4566)
- RTP - Real-Time Protocol (RFC 3550, 3551)
- RTCP - Real-Time Control Protocol (RFC 3550)
- RFC 4733 X-NSE Tone Events for SIP/RTP
- RFC 4733 AVT Tone Events for SIP/RTP
- STUN - Simple Traversal of UDP over NATs (RFC 3789)

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)
- HTTP - HyperText Transfer Protocol
- TFTP - Trivial File Transfer Protocol (RFC 1350)
- PPPoE - Point to Point Protocol over Ethernet (RFC 2516)

Voice Codecs

- G.711 - Pulse Code Modulation
- G.722 - Wideband ADPCM
- G.723.1 - 6.4 and 5.3 kbps ACELP/MP-MLQ
- G.726 - 16, 24, 32 and 40 kbps ADPCM
- G.728 - 16 kbps LD-CELP
- G.729A - 8 kbps CS-ACELP
- G.729B - Silence Detection/Comfort Noise Generation
- iLBC - Internet Low Bitrate Codec
- MELPe - 2400/1200/600 bps Codec
- TSVCIS - Tactical Secure Voice (Wideband MELPe)
- LPC10 and CVSD - Legacy Voice Codecs

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 Detection
- Caller ID Type II Detection

Line-echo cancellation

- G.168 Line Echo Cancellation
- 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/100base RJ-45
- Ethernet WAN Port RJ-45
- Ethernet LAN Port RJ-45
- Configurable MAC Address (IEEE 802.3)

Analog Port

- Narrow (8KHz), wide (16KHz), or full (48KHz) band operation

Serial Ports

- Asynchronous 75 to 115,200 bps, 5-8 data bits, optional parity
- HDLC with internal or external clocks
- Binary synchronous with internal or external clocks

Indicators

- POWER LED (Power, Registration, Use)
- LAN LED (Activity and Link Fail)
- LINE LEDS (Line Status)

Reset Button

- System Reset
- Reset Configuration to Factory Defaults when Held

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