Glensound
Keeps Working

telephone hybrid

Atomic

Copper 29

Copper 29

Telephone hybrid with -76dB separation

Glensound invented the world's first hybrid in 1966 for the BBC. Current technology, combined with the Glensound Engineers understanding of digital systems for audio, have presented the environment to develop the ultimate telephone balancing unit.

Glensound presents the Copper 29 as part of the Atomic range, as it is considered to excel in its application.

Features

- **Precision telephone balancing unit / hybrid with -76dB separation**
- **Dual DSP, with digital control of all key systems**
- **Dedicated Echo Cancellation**
- **Automatic gain control and compression**
- **Configurable auto answer**
- **Serial and loop remote control options**
- **LED PPMs for input and output**
- **Analogue and AES inputs and outputs**
- **Available in single or twin versions**
- **DIP switches for setup and configuration**
- **HEX switch for worldwide impedance matching**
- **Available in desk or rack mounting versions**

features

Atomic Copper 29

Atomic Range

- **Analogue and Digital I/O**
  The maximum flexibility is offered with analogue and digital audio connections

- **Twin DSP Processing and Control**
  Two digital signal processors are used in the Copper 29 to allow dedicated control of the very important echo cancellation routines in one, whilst employing a second that is dedicated to the input/output process.

- **Compressor and Limiter - DSP1**
  The incoming audio into the Copper 29 must be at the correct levels to start with. DSP1 manages the incoming analogue and digital audio with compression and limiting so as to not overload the telephone line.

- **Automatic Gain Control - DSP1**
  Our automatic gain control maintains a constant caller level on the Copper 29 output making it easier to manage for the studio.

- **Automatic Caller Ducking - DSP1**
  If there is an incoming audio signal into the Copper 29 from the studio, then the caller level will be ducked. This is to stop the caller talking over a presenter.

- **Band Pass Filters - DSP1**
  Incoming and outgoing audio is put through band pass filters to remove unwanted artefacts.

- **Intelligent Sample Rate Converter - DSP1**
  DSP1 manages sample rate conversion and removes any unnecessary
  delay.

TELEPHONE HYBRID POTS

ATOMIC Copper 29

Copper 29 Digital Hybrid

- **The World's Finest Echo Cancellation Algorithm - DSP2**
  Our impressive separation figures are a result of our dedicated echo cancellation system developed by the Glensound Digital Design Team.

- **Internal Mix Minus Generation - DSP2**
  A second algorithm in our echo canceller produces an internal mix minus.

- **Worldwide Line Impedance Matching**
  A DAA device optimized for voice applications is used to match worldwide Impedance variations on analogue telephone circuits.

- **PPM Meters**
  Both the input and output have an 8 bar LED PPM meter

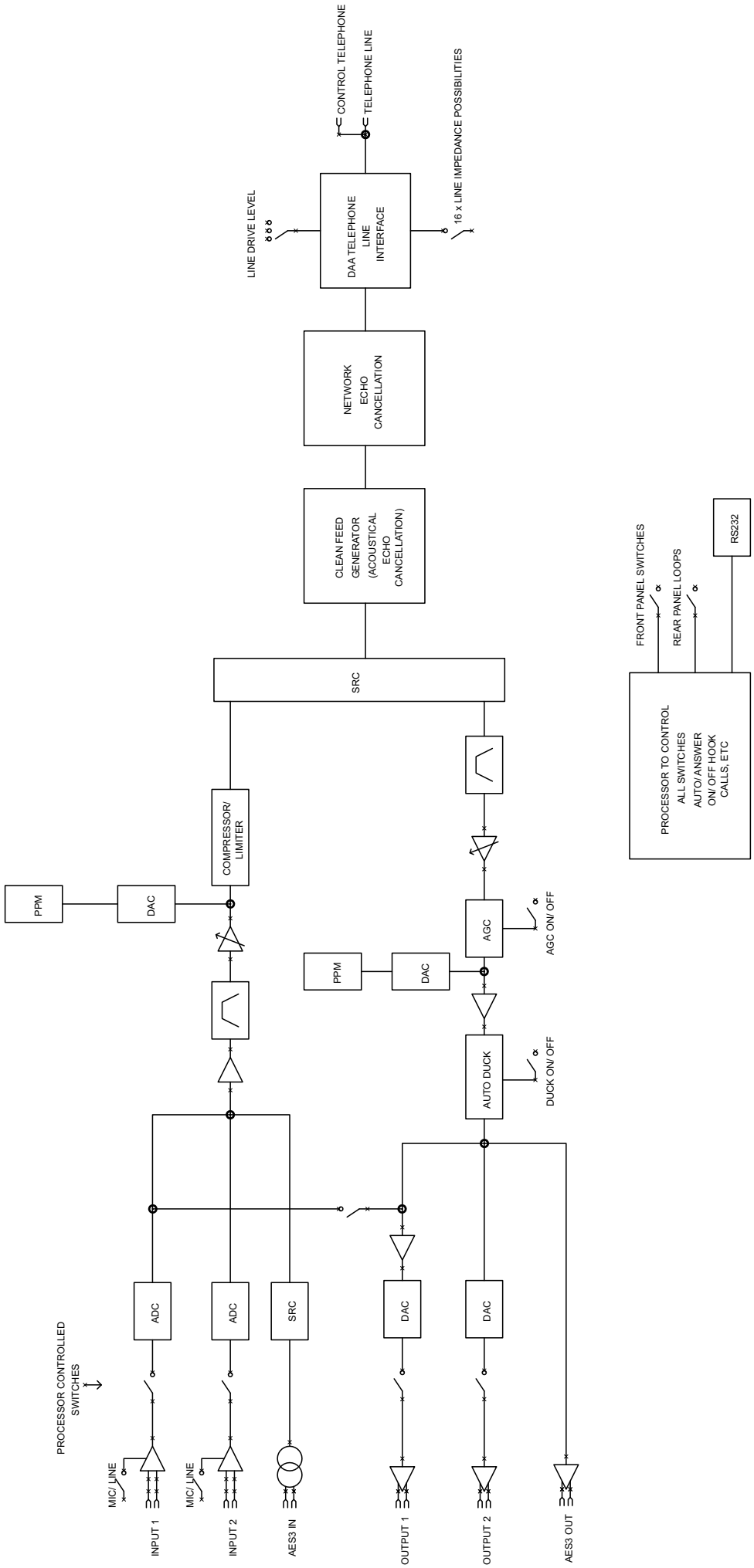
- **Adjustable Level Control**
  The input and outputs both have adjustable level control

- **Auto Answer**
  When selected, the auto answer function answers an incoming call after a preset number of rings.

- **Remote Control**
  System control is available via a rear panel dsub 15 connector. This contains RS232 and 8 loops. RS232 gives you full setup and system control, where the loops give you on/off hook, divert, and 4 audio switches.

- **Handset Interface**
  RJ11 connection to an external telephone for dialling.

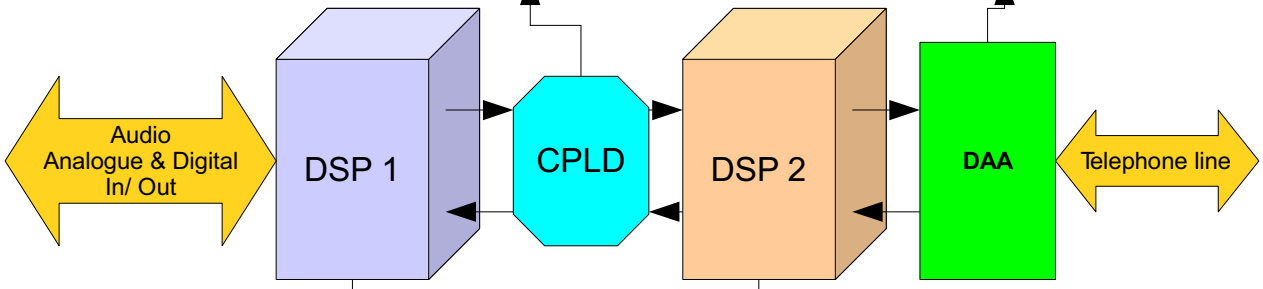
block diagram



Workflow Diagram

CPLD
The CPLD provides system clocks and manages switch data.

DAA
The DAA is an incredibly sophisticated device which has been optimized for demanding voice applications. It safely connects the hybrid to the telephone line and conforms to telephone standards around the world. It has an extremely advanced network of 'Rs' and 'Cs' that allow excellent line impedance matching. Without this correct line matching impedance, the world class results would not be achievable.



DSP no 1
This provides extensive digital Control of the I/O audio.

1) For clear audio on the outgoing telephone circuit it is important not to overload the telephone line. An advanced digital compressor/ limiter circuit makes sure this happens.
2) To keep a constant incoming audio level from the telephone line, an auto gain circuit is provided. This makes sure that consistent audio levels are presented from the telephone line to the studio. (Along with most other functions this can be turned off if not required).
3) An audio ducking option is provided to allow the presenters voice from the studio to be louder than that of the incoming callers.
4) To keep the overall performance of the hybrid at a premium and unwanted artefacts out of the audio chains making sure that all audio is crystal clear both incoming and outgoing band pass filters are included.
5) The 2 analogue outgoing audio circuits and the outgoing AES3 circuit are all digitally mixed within this DSP ready to be sent to the telephone line.
6) The incoming audio from the telephone line is digitally duplicated to provide the 3 outputs.
7) High quality 48kHz sample rate converter. Also removes any unwanted delay.

DSP no 2
This provides 2 exceptionally important functions.

1) It utilizes probably the worlds most advanced network line echo cancellation algorithm. This is the part that makes the Copper 29 perform so well. Using constantly varying parameters this algorithm successfully removes all the unwanted audio that '*echoes*' back from the telephone network. This algorithm is responsible for the amazing separation figures of this hybrid.
2) A second echo cancellation algorithm is included to remove the incoming audio from the telephone line, from the outgoing (to the telephone line) signal. This algorithm means that this hybrid, unlike most, can be used on mixing desks that don't provide a clean feed output (sometimes referred to as 'mix minus')

specifications

Atomic Copper 29

VERSIONS

COPPER 29-S	19 inch 1RU single TBU
COPPER 29-T	19 inch 1RU twin TBU (as pictured in this catalogue)
COPPER 29-SD	Single Desktop TBU

GENERAL SPECIFICATIONS

HEIGHT (ALL)	1RU
WIDTH (29-S and 29-T)	19 inch
WIDTH 29-SD	290mm
DEPTH (ALL Excluding Connectors)	220mm
POWER INPUT	90 to 240 VAC 50 – 60 Hz
AUDIO CONNECTORS	Neutrik XLRs

ANALOGUE AUDIO INPUT SPECIFICATIONS (per single TBU)

QUANTITY	2
CIRCUIT TYPE	Electronically balanced
INPUT CONNECTORS	3 Pin XLR sockets
INPUT IMPEDANCE	> 100K
INPUT LEVEL	Each input selectable between Mic & Line
MIC INPUT GAIN RANGE	± 10dB
MAXIMUM MIC INPUT LEVEL (UNITY GAIN)	-35dB
LINE INPUT GAIN RANGE	± 10dB
MAXIMUM LINE INPUT LEVEL (UNITY GAIN)	+20dB

DIGITAL AUDIO INPUT SPECIFICATIONS (per single TBU)

QUANTITY	1
TYPE	AES3
INPUT CONNECTOR	3 Pin XLR socket
SAMPLE RATES	32 – 192KHz (internal auto sample rate conversion to 48KHz)
RESOLUTION	24 Bit
FULL SCALE	= +18dBu

LEVEL METERS (PPM STYLE(per single TBU))

QUANTITY OF LEDS	8
RANGE PER LED	4dB
LED INDICATION RANGE	+12 to -20dB
INPUT METER POINT	PRE COMPRESSOR/LIMITER
OUTPUT METER POINT	AFTER GAIN CONTROL

ANALOGUE AUDIO OUTPUT SPECIFICATIONS (per single TBU)

QUANTITY 2	2
SOURCE	1st output always output from telephone line, 2nd output can additionally have input mixed in with it (selectable from front panel dip switch)
CIRCUIT TYPE	Electronically balanced
OUTPUT CONNECTORS	3 pin XLR plug
OUTPUT IMPEDANCE	50 Ohms
MAXIMUM OUTPUT LEVEL	+18dBu
OUTPUT GAIN RANGE	±10dB

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Specifications

Atomic Copper 28

DIGITAL AUDIO OUTPUT SPECIFICATIONS (per single TBU)

QUANTITY	1
SOURCE	Output from telephone line
TYPE	AES3
INPUT CONNECTOR	3 Pin XLR plug
SAMPLE RATES	32 – 192KHz (follows digital input sample rate) if no digital input the output sample rate is fixed at 48KHz)
RESOLUTION	24 Bit
FULL SCALE	= +18dBu

TELEPHONE LINE INTERFACE SPECIFICATIONS (per single TBU)

QUANTITY	1
CONNECTOR	RJ11 socket (6P4C)
IMPEDANCE	16 complex AC circuits suitable for use Worldwide selectable by front panel 'HEX' switch.
STANDARDS	Globally compliant design implemented (FCC, NET4, TBR-21 (replaces BABT), JATE & others)
LINE ISOLATION	5000 V
BANDWIDTH	125Hz to 3.6kHz (- 3dB) at 1kHz
SEPARATION (AUDIO IN to OUT)	>76dB with 0dB pink noise input
TELEPHONE LINE FULL SCALE	0dBm, +6dBm selectable via front panel DIP switch
LINE UP LEVEL	-6dBm, -12dBM selectable via front panel DIP switch
LINE DISCONNECT	Automatic on K break (selectable)

TELEPHONE CALL CONTROL (per single TBU)

AUTO ANSWER SELECTION	Select between Off, after 1 ring or after 8 rings
HANDSET INTERFACE (handset not included)	1
RS232 INTERFACE	1
LOOP CONTROLS	8
HANDSET CONNECTOR	RJ11 socket (6P6C)
RS232 CONNECTOR	15 pin 'D' socket
LOOP CONTROL CONNECTOR	(on 15 pin 'D' with RS232)
HANDSET FUNCTIONS	Full dial/ answer line functions
RS232 FUNCTIONS	Full line control plus full set up control
LOOP FUNCTIONS	On hook, Off hook/ Divert, 4 x audio switch controls,
ADDITIONAL OUTPUT	Open collector output indicating on/ off hook status

FRONT PANEL CONTROLS (per single TBU)

DIP SWITCHES	12 dip switches for full setup / configuration
HEX SWITCH	16 position switch for line impedance matching
INPUT GAIN	Recessed input gain control
OUTPUT GAIN	Recessed output gain control
ON HOOK/ OFF HOOK ILLUMINATED SWITCH	Can answer/ hang up call, flashes on incoming ring and indicates when line is open

Glensound Hybrids - A Brief History

Around 1966 Glensound founder, Len Davis, first designed a TBU for one of BBCs light programmes. This allowed the BBC to achieve live on air phone calls and was an exciting development.

Within a few years Glensound TBUs were found in a number of EMX (engineer managed exchanges). By 1972 a multiple (4 channel) TBU was in use in BBC studio 3E, London. In 1975 'auto gain control' was added to the standard TBU type PA8/351, enabling consistent caller level.

By 1980 the next generation of TBUs were designed and during the 80's several hundred of this generation were in use in different formats. Around 1989 one of the last designs utilizing the Glensound TBU was manufactured. This was called 'TRICE' (Tony Richies International Commentary Equipment).

By the start of the 90s Glensound moved away from the TBU market to concentrate on ISDN codecs and commentary equipment.

In 2010, the Glensound TBU was set for a comeback!

TELEPHONE HYBRID POTS

Glensound ATOMIC Range

The ATOMIC Range features the key elements demanded by the modern broadcaster. Sonic integrity, the finest audio components, ease of use, and Glensound broadcast grade reliability.

If you see the Atomic and Glensound logo on a product, you have the assurance of a product designed with the best available technology, with the design and development expertise of Glensound engineers who have been developing broadcast audio products since 1966.

Atomic

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Your local dealer:

Glensound
6 Brooks Place, Maidstone, Kent, ME14 1HE. UK
Tel: +44 (0) 1622 753662 Fax: +44 (0) 1622 762330
Email: sales@glensound.co.uk www.glensound.com