

ISDN

Telephone Hybrid



## TELOS TWO ISDN HYBRID

TWO means twice  
the hybrid

**T**he new Telos TWO ISDN Hybrid offers amazing new ISDN capabilities for audio professionals. With the Telos TWO, the world's first telephone

hybrid that works with digital phone lines (BRI/U or S), users can exploit the ability of the ISDN network to cross-connect with POTS lines, eliminating the studio side of Telco A/D and D/A. You have clean, pure digital caller audio, right from the Central Office—along with truly independent send and receive paths, lower noise and distortion, faster call setup and caller ID functionality.

Besides ISDN connectivity, Telos TWO gives other important advantages: the slim Telos TWO case contains two

digital hybrids, so you can conference two callers internally. No extra hybrid needed—because it's already there. Of course, all mixing and conferencing is done completely in the digital domain. AES/EBU as well as analog outputs give you maximum output flexibility. And built-in Ethernet connectivity makes easy work of remote control and software upgrades.



*Telos TWO: superior Telos technology  
brings the power and clarity of  
ISDN to you.*

## FEATURES & BENEFITS

Small package,  
Big capabilities.

**T**elos products have earned a reputation for ease of use and outstanding performance—for good reason. Our advanced ISDN hybrid technology

consists of an integrated suite of audio processing functions that help you achieve unsurpassed audio quality.

- 2-RU package includes two high performance digital telephone hybrids. Conference linking ability lets you set up high-quality conferencing between callers with no external equipment—only a single mix-minus is required.
- Studio-grade 20-bit A-to-D conversion, combined with noise gating and shaping, guarantees superb send-to-caller audio.
- Simultaneous baseband analog and AES/EBU outputs.
- Automatic high-precision sample rate conversion on incoming ISDN calls.
- Unmatched Send/Receive separation using Telos' time-tested Adaptive Cancellation technology. Each hybrid automatically adjusts to phone line conditions, virtually eliminating the hollowness, feedback and distortion that occurs when send audio "leaks" into the caller output signal.
- Sophisticated AGC/limiting functions and three-band Digital Dynamic Equalization ensure consistent caller audio levels and spectral consistency. Easy to use front-panel menus, meters and keypad make setup and operation simple.
- Caller ID support and fully adjustable Caller Ducking helps hosts stay in control.
- Built-in Ethernet and RS-232 ports for remote control and easy software upgrades.



## FEATURES & BENEFITS

Intelligent form and function

**W**ith so much functionality packed into one compact unit, the Telos TWO lends itself to an almost infinite variety of uses.

- Radio station production facilities can use the Telos TWO in the assembly of pre-produced talk programs, interviews, infomercials and other commercial productions.
- The Telos TWO can be used to provide IFB for radio station remote broadcasts or promotional appearances where the codec abilities of a Telos Zephyr® or ZephyrExpress® are not necessary.

- Audio production companies can use the Telos TWO to record voiceovers from talent located outside the studio, or for previewing material recorded at another location.

- Corporations can utilize the Telos TWO for boardroom teleconferencing applications, conference room settings or remote employee training sessions.

- Telos TWO fits perfectly with schools, colleges or other educational or institutional enterprises utilizing distance learning programs.



*Clear, easy-to-use front panel controls make setup fast and simple.*



## TALK DIGITAL TO ME

It's the only way to go

### **I**ntegrated Services Digital Network (ISDN)

is a set of international standards for digital transmission over ordinary telephone copper wire (as well as over

other media). Presently, the dial-up telephone network is nearly entirely digital, except for the "last mile" copper connections from the Central Office to the customer's site. Telos' new ISDN hybrids take advantage of this technology to deliver crystal clear caller audio to the radio studio.

Even though it takes two separate circuits—one send and one receive circuit—to transmit telephone audio, traditional analog lines multiplex both circuits in order to use a single pair of wires. This causes what's referred to as "leakage"—when the announcer's audio is present on the hybrid output, creating

an annoying "hollow" sound. A "four-wire" circuit has two wire pairs, and therefore two independent audio paths. Digital circuits are designed to always offer independent and separated signal paths. (Though a digital circuit may today not use wires at all, but rather fiber, or microwave radio, or satellite, telephone engineers, bowing to tradition, continue to refer to all separated speech paths as being "four-wire.")

While the application of digital signal processing to the problem of separating host and caller audio—pioneered by Telos and used in all of our ISDN hybrid interfaces—has made a dramatic improvement over pure analog systems, using digital phone lines for incoming calls further improves performance for several reasons:





#### ■ Lower Noise.

Analog lines are exposed to a variety of noise and impulse trouble-causers as they move across town on poles and through your building. Hum is the main one,

owing to line proximity to pole transformers and power lines, but there are also sources of impulse noise from motors, switches, and other electrical activity. By contrast, digital circuits aren't susceptible to induced noise; digital lines convey the bits precisely and accurately from the phone network to your studio equipment without any inductive disturbance, so the audio remains clean. Even when the caller is using an analog phone line to call in, the noticeably quieter digital connection between the hybrid and the telephone network helps the hybrid achieve better rejection of outgoing audio leakage.

#### ■ Elimination of D-to-A conversion.

The analog-digital conversion equipment used in telephone central offices is of poor quality compared to the con-

verters used in professional audio equipment. Using a digital phone line enables you to maintain a digital path all the way from the caller's CO to your studio equipment—requiring only the initial conversion to digital, and doing away with the need to reconvert from digital to analog audio. (AES/EBU outputs are provided in the Telos Two ISDN hybrid, TWO-x-Twelve Talk Show System, and Series 2101 Talk Show System to help accomplish this direct connection to digital studio gear.)

#### ■ Higher Gain and Reduced Feedback During Multi-line Conferencing.

When conferencing is required on 2-wire circuits, very good hybrids are needed to separate the two audio paths in order to add gain in each direction. When the gain around the loop exceeds unity, the unpleasant result is feedback. Since the conference path usually includes four AGC functions, the hybrid must be able to cover the additional gain that may be dynamically inserted. Because of the 4-wire nature of digital telephone lines, the hybrid function is more effective—and more reliably so across a variety of calls. That means more gain can be

inserted between calls before feedback becomes a problem.

■ **Better Line Monitoring, Call Setup and Supervision.** On an analog line, one discovers a problem only from a failed attempt to use the line. Digital phone lines maintain a full-time connection between the Central Office and your studio on the "D" channel, so you can quickly detect when a line is a not working.

■ **Furthermore,** the sophisticated transactions on the "D" channel keep both ends of a call accurately informed about line status. For starters, digital lines feature call set-up times of only a few milliseconds, enhancing production of a fast-paced show. More importantly, when a caller disconnects while waiting on hold, this status change is communicated instantly (contrasted with the usual 11-second delay on most analog lines). One of the most common complaints of talk hosts is that they go to a line where they expect a caller, only to find a blaring, annoying dial tone. The chance of this happening with a digital line is close to zero.

# TECHNICAL INFORMATION

## System Description

Two-line stand-alone digital hybrid. Connects directly to BRI/U/S telephone lines; features conferencing, adaptive dynamic caller EQ, AGC, ducking; supports caller ID

### Audio Performance

**Trans-hybrid Loss:** -76 dBr RMS with white noise

**Frequency Response (Caller to Output):** 200Hz - 3500Hz,  $\pm 1$ dB

**Receive Output:** THD+N (@ 1 kHz, OdBu output) 0.06%;  
Dynamic Range - 93dBFS

**Signal-to-Noise:** >88dB

**Send Input:** -0 to +8dBu nominal level with 13dB head room before clipping

**AES/EBU Digital Input/Output:** Sample rates supported: 32, 44.1, 48kHz  
Output clock: ISDN network clock or AES input source

**Coding Modes:** A-law or  $\mu$ -law (selectable)

**Converter Word Length:** Analog to digital 20 bits, digital to analog 16 bits

**ISDN BRI:** (28+D) Interfaces: USA/Canada - 2 wire U interface (built in NT1)  
Worldwide: 4 wires S interface

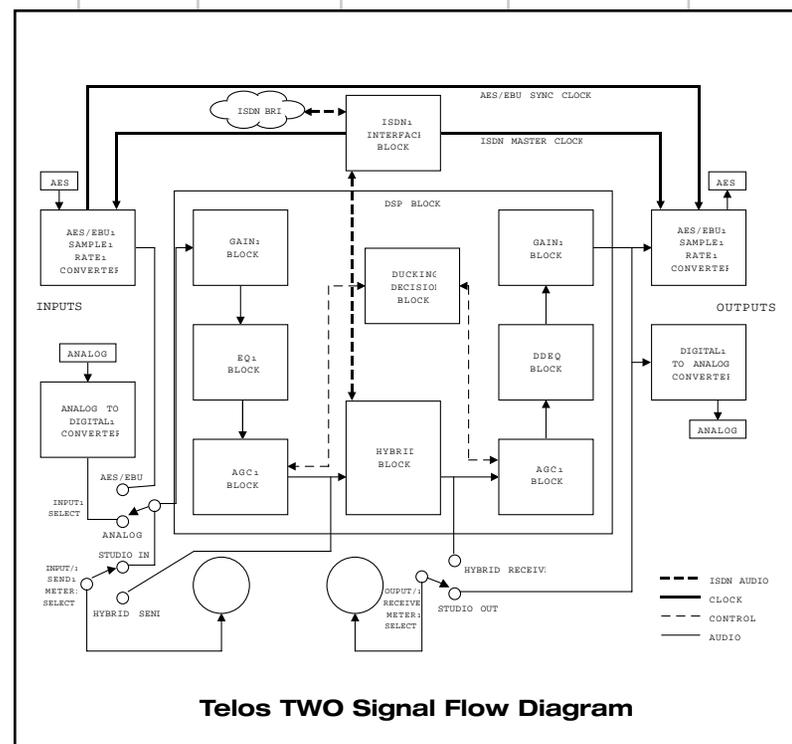
**Power Supply:** Internal 110/240 VAC

### Dimensions & Weight:

All rack mounts are 19" wide. Depth does not include connectors

#0180-1000/2000 Telos TWO:

H: 2RU D: 13in/33cm Wt: 10lbs/4.5kg



Telos TWO Signal Flow Diagram

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TELOS SYSTEMS 2101 SUPERIOR AVENUE CLEVELAND, OHIO 44114 USA  
TEL: +1 (216) 241-7225 FAX: +1 (216) 241-4103 E-MAIL: info@telos-systems.com www.telos-systems.com

TELOS EUROPE JOHANNISTR.6 D85354 FREISING GERMANY  
TEL: +49.8161.42467 FAX: +49.8161.42402 E-MAIL: europe@zephyr.com www.zephyr.com

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