TELOS ONE

The three Telos ONE models present superb digital telephone hybrid performance to broadcast, teleconferencing, and communications applications. Proven Telos processing technologies perform all hybrid functions. gain control, and filtering completely in the digital domain. This edge-of-the-art approach makes the Telos ONE very affordable while assuring consistently superior performance regardless of telephone line characteristics.

The fast, precise, and automatic digital nulling allows smooth, natural, simultaneous conversation without the usual speakerphone up-cutting effect, voice distortion, and level matching problems often experienced with other hybrid-type interface devices. Digital acoustic ducking and pitch shifting create a wide feedback margin when the Telos ONE is used with open monitor speakers.

The Telos ONE comes in three versions: A single hybrid, available in either standard rack mounting chassis or compact modem case, and as the ONE plus ONE, a dual hybrid with a built-in mix minus matrix.

- True digital, with all processing performed in the digital domain.
- Trans-hybrid loss greater than 40dB.
- Sophisticated automatic gain control on input and output audio.
- Advanced caller audio downward expansion and override function.
- Excellent in applications where open monitor speakers are used.
- Switchable mic/line input.
- Second output with either caller output or a mix of caller and input signals.
- Metering of input and output levels and gain reduction.
- Integrates with the Telos family of accessories as part of a complete talk show system.
- Auto-answer accessories available for installation flexibility.

DIGITAL TELEPHONE INTERFACES

FEATURES AND BENEFITS

The Telos ONE is an ideal solution for any telephone interface application. We kept the cost low by using intelligent software rather than complex hardware. All processing is performed in the digital domain, including:

■ An advanced digital auto-nulling hybrid with excellent send audio rejection. The Telos ONE automatically adapts to each new call. Very pure caller audio appears at the output.

■ An input gain processor with a smart, floating freeze-gain gate.

■ A sophisticated output gain processor which provides level control and smart downward expansion. This section is cross-coupled to the input section so that telephone line noise and residual hybrid leakage are carefully and cleanly attenuated without low level callers being gated off.

■ A selectable override function to reduce the caller level about 8dB when input audio is present. This allows the talent's voice to have more presence when speaking at the same time as the caller.

■ A pitch-shifter and an acoustic ducking function in the input audio path work together to allow significant gain-before-feedback when used with open monitor speakers.

■ High- and low-pass filtering to clean up phone line noise and hum.

■ Special software versions for use with particularly troublesome telephone lines; for connecting phone lines to intercom systems; for interconnecting two-wire and four-wire intercoms; and for teleconferencing.

Installation and set up of the Telos ONE is simple and easy:

■ The input is switchable for either microphone or line level.

■ Two outputs are provided, one of which may be used as a second independent output or maybe switched to a mix of the input and caller signals. This is very handy for tape feeds.

■ Input and output gain levels are set from front panel, multi-turn screwdriver adjustable pots.

■ Monitoring of input and output levels, as well as their respective gain processing, is provided by an LED meter.

■ With the exception of the power supply, the rack mounting and modem case versions of the Telos ONE are electronically identical.

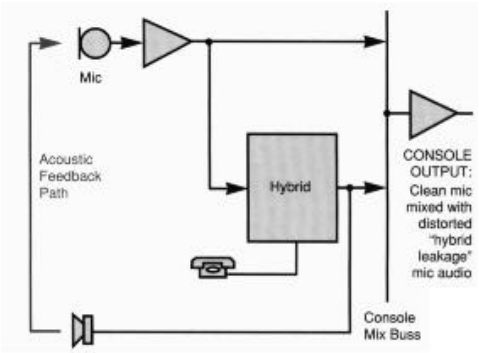
■ Optional rack mount kits hold one or two units in a single rack height.

■ For multiple hybrid installations, the Telos ONE plus ONE offers two hybrids and a mix-minus matrix in a single rack unit enclosure. The matrix cross couples the outputs of the two hybrids, so you need to send the ONE plus ONE only mix-minus to feed both hybrids.

■ Hybrids may be turned on and off remotely.

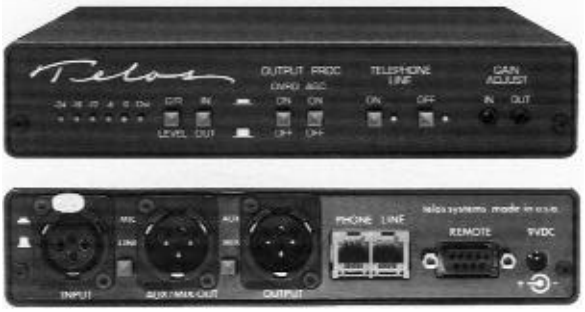
This diagram shows the potential problems caused by poor hybrid performance. Telos' all digital approach reduces announcer mic distortion and speaker feedback while enabling natural sounding, two-way conversation on-the-air.

SIMPLIFIED SIGNAL FLOW



The Telos ONE input may be switched to accommodate either mic or line level. Two outputs are provided, one of which may be switched to provide either an independent caller output or a mix of the input and caller signals. Modular jacks are used for connection of the phone line and, if desired, a phone instrument. A connector allows remoting the hybrid ON/OFF function and integrating the Telos ONE into a complete, talk show system. The rack mounting unit has a universal, auto-configuring power supply.

The ONE plus ONE eliminates the need to create complex mix-minus schemes when using two hybrids. Its hybrids may be used independently or conferenced together. Inputs, outputs and phone line connections duplicate the single-hybrid Telos ONE.



When space or budgets are tight, the modem case version of the Telos ONE is an excellent alternative. Electronically identical to the rack mounting version, it differs only in its enclosure and use of an external power supply.

SOME QUESTIONS ANSWERED

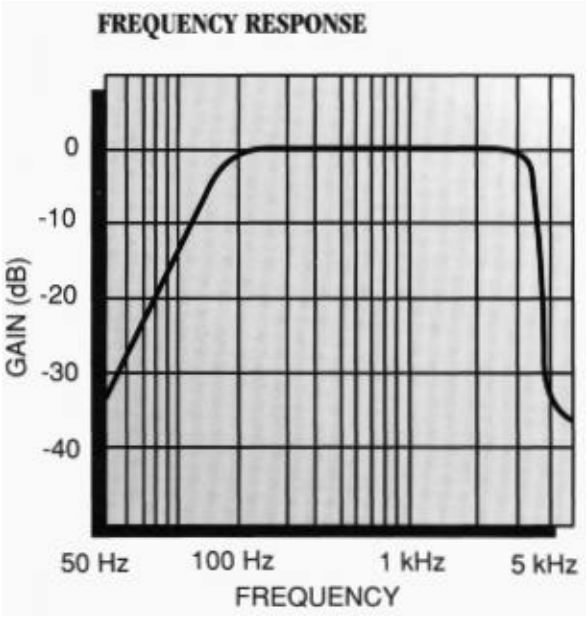
What is the advantage digital signal processing brings to telephone interface equipment?

The primary advantage is vastly improved "trans-hybrid loss." Trans-hybrid loss is the announcer's voice signal (or send audio) that leaks through the hybrid to the output. Ideally, the output should consist of the caller audio only.

In a broadcast studio, the announcer audio is mixed at the console with the hybrid (caller) output to create the "on-air" mix, when you use a poor hybrid, its output includes a distorted, phase shifted version of the announcer signal. When this "leakage" is combined with the clean announcer audio, a "hollow" or "tinny" sound is produced as some frequencies are more effected by phase cancellation than others.

Are there any other problems caused by poor trans-hybrid loss?

Yes. Poor trans-hybrid loss can cause feedback when the caller must be heard on an open speaker in the studio. Also, in systems using multiple hybrids to conference several callers, poor trans-hybrid loss will cause a serious "singing" feedback, especially on low-level callers.



These problems result from the nature of phone lines, right?

You've got it. Hybrids must deal with complex and erratic phone line impedance characteristics across the phone line's frequency range. Impedance variations are caused by nearly every piece of equipment and run of cable between your studio and the caller's telephone. To cancel the send audio, primitive analog hybrids use simple resistor-capacitor "balancing networks" to attempt to match the impedance of the phone line. It is a rare phone line that has a smooth, unvarying characteristic, so analog hybrids are often hopelessly ineffective.

How does Telos' digital processing hybrid work?

Telos digital hybrids use a very advanced convolutional adaptive filter concept to synthesize a transfer function for the balancing network. A feedback loop continuously adjusts the filter to conform to changing line impedances. In the Telo5 ONE, an error signal is used to adjust the amplitude and phase cancellation signal at a large number of frequency points. The result is a very close match to the phone line impedance curve for optimum rejection.

Must I manually adjust the hybrid so that each call begins with optimum trans-hybrid loss?

The Telos ONE performs all adjustments automatically and requires no "tweaking" once installed, when a call is initially established, a brief mute/adapt period (about 250ms) causes the system to adjust to the phone line before that call goes on the air. The caller hears a "noisy tone," but the tone is not heard on the air because the output is muted during this time. This has the incidental benefit of removing the line-switching "clunk." As the conversation proceeds, adaption continues, using the send audio as the driving signal.

Is there other processing that improves performance?

Our full digital approach also provides very smart gain control on both the announcer send signal and the caller signal. The input gain section uses an advanced adaptive gate scheme to compensate for widely varying levels without bringing up room noise. The output gain section is cross-coupled to the input section so that it will not compress up hybrid leakage. And the downward expander subtly reduces phone line noise while distinguishing and passing low level callers. Overall, the caller audio is clear and undistorted.

You mention an acoustic duck function. What is this?

Acoustic ducking, a function unique to Telos hybrids, significantly improves gain-before-feedback when the hybrid is used with an open speaker to amplify the caller's voice. It is a linear ducker in the send path which reduces gain dynamically when the caller talks. Because it is linear rather than on-off switching, it allows natural conversation without the negative effects of speakerphone-style hard switching. It is also much shallower in its gain reduction than the usual switching and very fast. A pitch-shifter also helps by preventing feedback from building up.

Can I use the Telos ONE for a talk show with multiple phone lines and callers?

Yes. The rear panel remote connector provides appropriate control capability for use with our full range of interface modules and consoles.

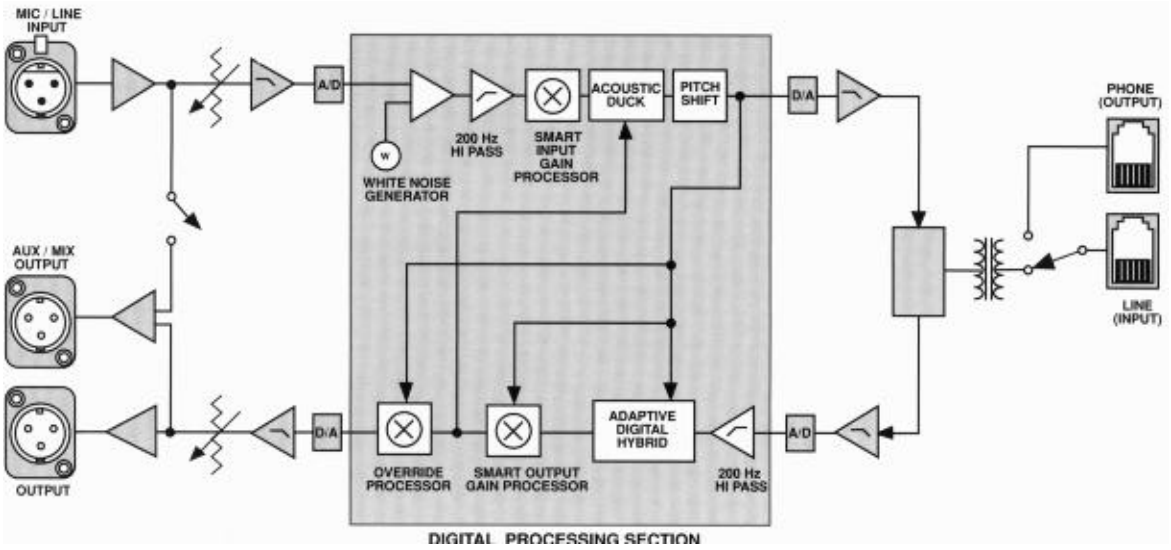
Why is Telos the preferred choice among the available digital telephone interface equipment?

The Telos ONE is the result of years of development effort, field experience, and extensive testing. Telos' unsurpassed experience, combined with a passionate and exclusive dedication to telephone interface technology, have paid off. We've found ways to "tweak" the adaptive process to achieve very fast fluffing, stability of adjustment, and, of course, maximum trans-hybrid loss. No other equipment comes close.

Our full range of accessories allows our hybrids to be used in virtually any telephone-to-audio interface application.

BLOCK DIAGRAM

The secret to the Telos ONE'S exceptional performance at low cost is the use of digital signal processing for all audio functions. The auto-nulling hybrid as well as intelligent gain control, a pitch-shifter, and other dynamic functions are accomplished digitally.



TECHNICAL SPECIFICATIONS

System
True digital. Second generation Texas Instruments TMS320C25 processor. 8kHz sampling rate. Internal digital input and output gain processing, filtering.

Trans-hybrid Loss
>40dB with pink noise or voice as test input. Test set-up as specified in our *Telephone **Q** &A.* All dynamic enhancement processing is switched off. With the override and output expander functions switched in, trans-hybrid loss is enhanced to >50dB.

Send Level to Phone Line
-10dBm average level. Maintained by internal digital AGC.

Frequency Response (caller to output)
200 – 3400Hz, ±1dB.

Noise and Distortion (caller to output)
Distortion: Typical 0.4% THD+N, measured @ 1kHz at any level from -48dBm to -8dBm. Signal-to-Noise: >72dB referenced to 0dBm phone level.

Send Audio Input
XLR female connector. Active balanced. Accommodates -24dBm to + 12dBm levels in LINE mode; -68dBm to -35dBm in MIC mode. Front panel screwdriver level adjustment.

Caller Audio Output
XLR male connector. Active differential. Output 1evels to +14dBm depending upon caller telephone line level and adjustment of front panel level adjust. Drives 600 ohms.

Aux/Mix Output

XLR male connector. Active differential. In AUX mode, this output is an isolated second output. In MIX mode, this is a combined send and caller output. Input to Mix output: Unity gain. <0.04 % THD; + 12dBm clip point.

Physical Dimensions
Telos ONE modem case version
7¼" **X** 1 ½"**X** 9 ½"
18.4cm x 3.8cm x 24cm
Telos ONE rack mount version
Standard rack mount, one rack unit high.
9 3/8" deep (23.8cm)
Telos ONE plus ONE
Standard rack mount, one rack unit high.
15¼" deep (38.7cm)

Weight
Telos ONE modem case version
3 pounds (8 pounds shipping weight)
1.3 kilograms (3.6 kilograms shipping weight)
Telos ONE rack mount version
5 pounds (10 pounds shipping weight)
2.3 kilograms (4.5 kilograms shipping weight)
Telos ONE plus ONE
8 pounds (13 pounds shipping weight)
3.6 kilograms (5.9 kilograms shipping weight)

Power Supply
Telos ONE modem case version
External plug transformer. 9V DC, 500ma. Available for 117V/60Hz or 230V/50Hz AC.
Telos ONE rack mount version
Universal, input switching operable from 85VAC to 250VAC, 50Hz or 60Hz. Power consumption 15 watts. Incorporates surge suppression and line voltage "dip" protection.
Telos ONE plus ONE
Universal, input switching operable from 85VAC to 250VAC, 50Hz or 60Hz. Power consumption 25 watts. Incorporates surge suppression and line voltage "dip" protection.

Software and Hardware

There are several Telos ONE software/hardware options for special applications. Unit price is not effected by software/hardware configuration. Options are subject to change without notice.

Version 1.X Normal Operation
This software serves the needs of the overwhelming majority of Telos ONE users and is ordinarily installed in units.

Version 4.X Four-Wire
Intercom/Teleconferencing
This version is widely used with RTS, McCurdy, Clear-Corn and other four-wire intercom systems. It has 6dB greater send level, ducking is modified to somewhat favor the receive audio, and input AGC is replaced with a limiter. This version can also be used to create a multi-line teleconferencing bridge.

Version 5.X "Dallas" Software
As far as we can tell, many of the worst phone line conditions in the US exist in the Dallas/Fort Worth and Miami/Fort Lauderdale areas. The "Dallas" software is optimized for very poor phone lines with widely varying levels. It can also be used by those who prefer more of a "speakerphone" switching effect; prefer a more aggressive AGC on the phone audio; or have feedback problems with open monitor speakers. We recommend that you try the Normal Operation software first, if its performance is not optimal, contact Telos to discuss whether the "Dallas" software will resolve your difficulties.

Version 6.X Intercom Interconnect
This software is used to interconnect two-wire intercom systems with four-wire intercom systems. The hybrid's telephone jack is used as the input for the two-wire intercom. The software keeps the telco line seized at all times in case of a power interruption. A minor hardware change blocks the DC on the intercom side, increases send-to-intercom level, and re-adjusts the analog hybrid to accommodate 200-ohm intercom impedance. The inter-connection is bandwidth limited to 300Hz to 3500Hz.

Optional Accessories

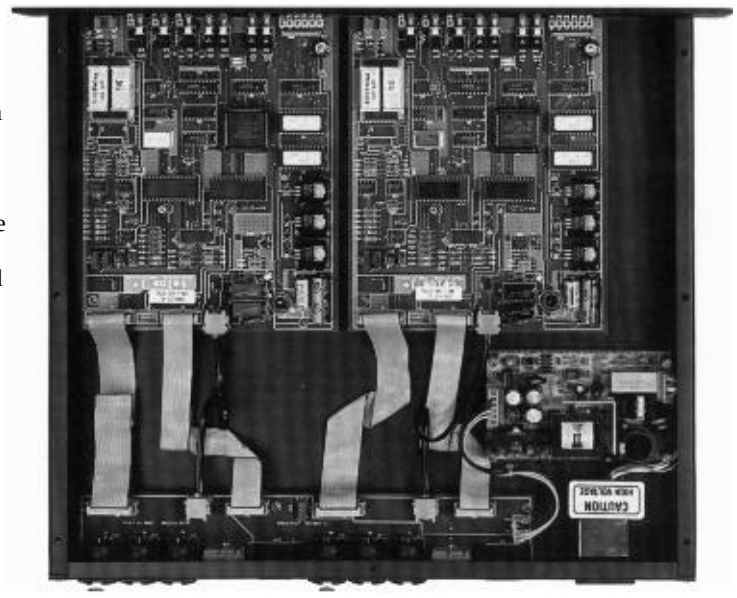
■ Rack mount kits that hold one or two modem case Telos ONEs in a single rack unit.

■ Basic Auto-Answer board.

■ Super Auto-Answer board with remote control of line SEIZE and DROP; selectable number of rings before answering; dial tone detector for failsafe line drop; DTMF decoder with open collector outputs; and other features.

■ Rack mounting dual redundant power supply to power up to ten Telos ONEs.

■ Software options for teleconferencing and intercom applications.



Inside the ONE plus ONE are two independent hybrids and a mix-minus matrix. Auto-Answer and Super Auto-Answer accessories may be individually installed in either or both hybrids.