

User Guide - Using Thinklabs One with Cisco SX-10, SX-20 DX-80

The Thinklabs One can achieve very high quality sound transmission when combined with Cisco hardware codecs. This document discusses the connections and settings required to achieve high quality. Optimal performance will not be achieved without attention to every detail, so this documentation should be read carefully and connections and settings verified to achieve the best sound quality.

Preamble – Person holding stethoscope should always listen while holding stethoscope on patient

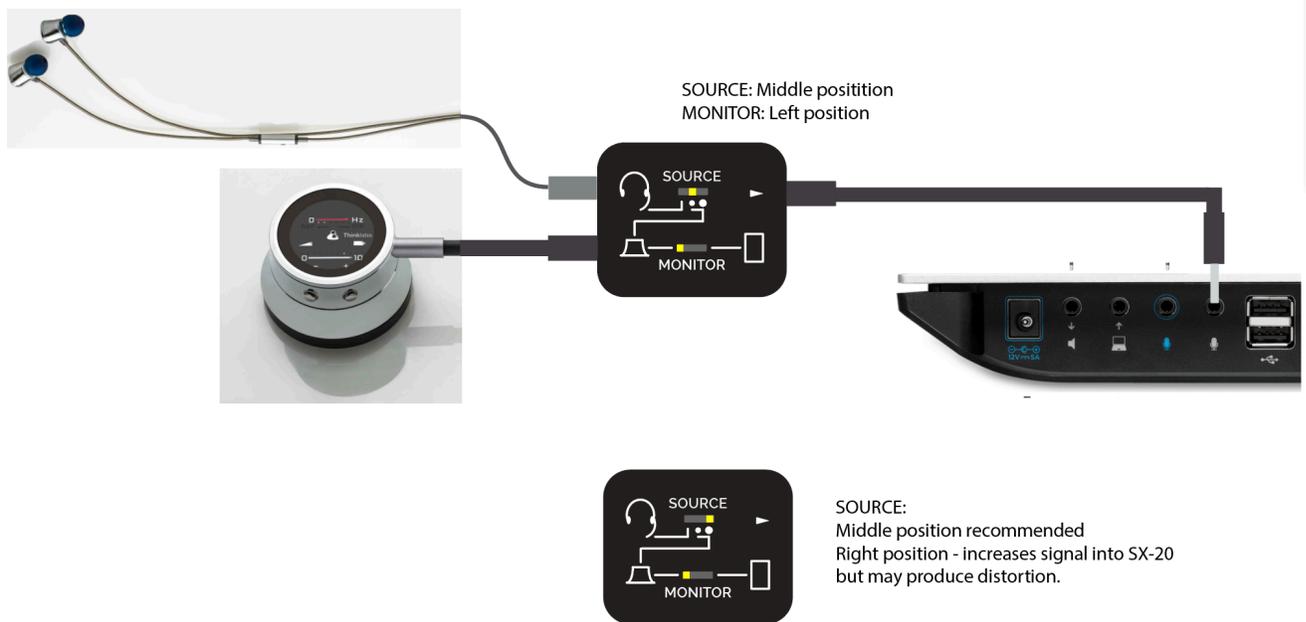
We ALWAYS recommend that clinicians or medical assistants holding the stethoscope against the patient should be listening at the same time as the remote doctor. The reason is that if one holds the stethoscope while listening, it is natural to avoid rubbing or inadvertent noise due to movement. The active listener will tend to make sure that the stethoscope is being held steady to reduce noise. Without listening, it is more difficult to realize that one is creating noise with inadvertent movement of the stethoscope on the patient.

The following pages explain use of the Thinklabs One with various Cisco devices. Thinklabs offers a custom Thinklink intended for connection to the Cisco SX-10 or SX-20. Contact Thinklabs for further information.

SX-20 Connections using Custom Thinklink for Cisco (Special Order from Thinklabs)

Thinklabs offers a custom Cisco Thinklink. Do not make the connections shown using a standard Thinklabs. (The custom Thinklabs has yellow switch caps. The standard Thinklink has red switch caps.)

The recommended connections for SX-20 are shown below.
For SX-10, use the equivalent external MIC INPUT jack.



Notes:

1. The SOURCE switch allows you to reduce the stethoscope signal into the sensitive SX-20 input. Set it to the middle position, and set the stethoscope volume to a range of 2-5 on the volume scale.
2. Increasing the volume on the stethoscope too high will produce distortion for the remote listener provider. The provider should increase volume on the listening end computer.

See next pages for further settings and instructions.

Settings when using Thinklabs One and SX-10/20 Microphone Inputs

The settings are critical to successful use of the Thinklabs One with Cisco codecs. Follow the table below:

Thinklabs One Settings	Setting	Notes
Volume	0 - 2	Excessive volume will cause clipping to occur on the Mic input, causing a scratching sound on heart sound peaks. If you detect static sounds on audio peaks, decrease volume.
Filters	Low "Bell" settings for heart, mid frequency settings for lungs.	This is up to the discretion of the user, but these are recommended settings. Others may be used.
Cisco Audio Codec Settings	Setting	Notes
Codec	AAC-LD	PREFERRED - This may not be available on all connections. Use if possible.
Codec	Opus-Mono	Use if AAC-LD not offered on some connections.
Bit Rate	Fixed if available	Not always available, but if offered, use fixed bit rate 64 kbit/sec or greater, such as 128kbits/sec.
Bit Rate	Variable	Less desirable but can achieve good results. Values above 38kbits/sec and ideally closer to 64kbits/sec. This is not controllable, however lower values indicate potential connection issues wherein lower bit rate will compromise sound.
AGC	Off	If this is offered, better to disable AGC so that it does not adjust to heartbeat peaks.
Noise reduction or other signal processing	Off	If settings are shown, preferable to disable all "enhancements" which tend to work well with voice but not with stethoscope sounds.
Input Sensitivity	Very Low	Adjust experimentally. However, increased sensitivity can cause signal clipping to occur.

Headphones - Listening to remote stethoscope on SX-10/20

It is always best to use headphones with good bass when listening to a remote patient/stethoscope. Typical Logitech or Plantronics headsets do not have sufficient bass. We recommend Thinklabs Earbuds, Beats, Bose or other high quality headphones.

Listening on DX-80

Transmission from an SX-10/20 to DX-80 produces outstanding results.

See above for headphone recommendations. However, the DX-80 does not have a headphone jack, but does have a USB audio connection. Since USB headsets generally do not have sufficient bass, use an external USB audio device, with separate lapel mic and high quality headphones. For example, use the following, connecting headphones and mic to USB Audio device:

USB Audio: Audio Technica ATR2USB

Headphones: Thinklabs earbuds, or other headphones with excellent bass (see above).

Microphone: Lapel microphone, Sony ECMCS3 <https://goo.gl/HwLSP5>, Audio Technica, etc.

Listening on Macbook/PC using Jabber Client

Using a Jabber client produces less optimal results than using DX-80 or listening codec to codec. Always use good headphones. However, until further optimization, there is currently some artifact – a slight burst of white noise – during each peak of the heartbeat. Clinicians are unlikely to confuse this with actual pathology, however clinicians should be informed of the potential for this artifact, and we generally do not recommend using Jabber at this time.

Connecting Thinklabs One to PC/Macbook

When connecting Thinklabs One to a Macbook/PC, use an external USB audio device. We recommend The Audio Technica ART2USB device. Connect Thinklabs One to the Mic In (Pink jack) and earbuds/headphones to the Headphone Out (Green jack).

The Audio Technica, once activated by the operating system, usually provides a pass-through signal so that stethoscope sounds is looped back out to the headphones to facilitate listening to the patient by the clinician/medical assistant who is with the patient. (See Preamble at the head of this document.)

Transmitting from DX-80

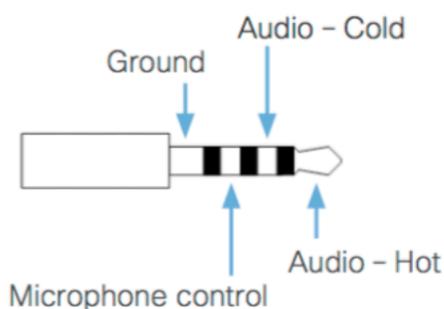
Connect the USB audio device as you would do for listening on a DX-80, explained above, and connect the Thinklabs One to the Mic Input on the DX-80, while listening on the headphone jack. Use appropriate settings (low volume on stethoscope, and adjust Cisco audio settings.)

APPENDIX – TECHNICAL DETAILS and USE OF LINE INPUT

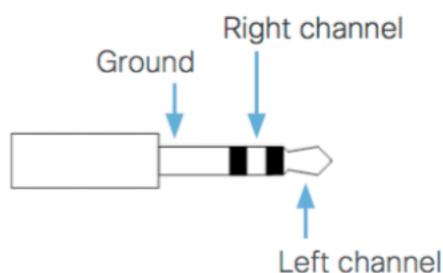
SX-10 and SX-20 Connections

The SX-10 has only microphone inputs. The SX-20 has both microphone and line (content) inputs. The connections are shown below:

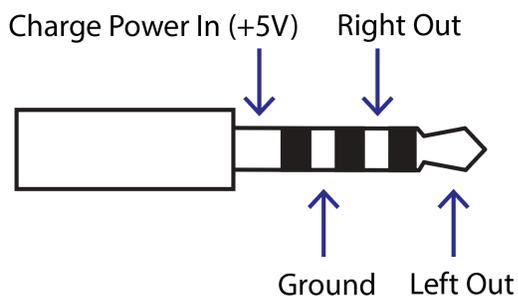
3.5 mm mini-jack, 4-conductor (microphone)



3.5 mm mini-jack, 3-conductor (line-in/line-out)



The Thinklabs One has the following Pinout:



SX-20 Line In Connections

To connect Thinklabs One to SX-20 Line In, simply use a 3.5mm direct audio cable i.e. the connections match without any modifications.

Monitoring Stethoscope Sound - In order to listen to the stethoscope while holding the stethoscope against the patient, a splitter or Thinklink can be used. We recommend a standard audio splitter when using the Line Input, since no special cables are required. Simply connect a

headphone splitter (3.5mm jacks and plugs), and connect a set of earbuds or headphones to one of the Y positions on the splitter.

If using the Thinklink to connect to SX-20 Line Input, connect as follows.

Thinklink Jack	Connect To	Notes
Lower Left Stethoscope In	Thinklabs One	Use longer male-male cable
Upper Left Headset	Earbuds / headset	
Upper Right Out (>)	SX-20 Line In	Use a standard male-male 3.5mm preferably 3-conductor, but 4-conductor can work.
Lower Right	Not used for Cisco devices	
Thinklink Switches	Position	Notes
SOURCE	Right or Center	Right for increased output, Center for lowering output level from stethoscope to SX
MONITOR	Left position	To monitor stethoscope in earbuds/headphones.

SX-10 or SX-20 Microphone-In Connections

Based on the above pinouts, the following cable connections are required. This requires a custom cable. Thinklabs has a specialized Thinklink (yellow switches) to facilitate this connection.

Thinklabs One Pin	Thinklabs One Signal	SX-10/20 Pin	SX-10/20 Signal In
Tip	Left Signal Out	Tip	Audio Hot
Ring1	Right Signal Out	-	-
Ring2	Ground	Ring1	Audio Cold
Shield	Charge In (+5V)	-	-
Ring2	Ground	Shield	Ground
-	-	Ring 2	Mic Control

If a corresponding column is blank (“-“) the signal is unconnected and not used.

Monitoring Stethoscope Sound – We recommend using an audio splitter to listen to patients while transmitting sound. This would have standard connections (off the shelf splitter) as long as it is connected on the Thinklabs One side of a custom cable with the above pinouts.