

Model DSP2B & Model DSP2BP
User's Manual
OPTion STICisâ - Intelligibility & Privacy Meter
U.S. Patent 6,792,404

- **Now Intelligibility and Privacy Can Be Measured**
- **Meet or Exceed International Standards**
- **Test CD Developed by TNO Human Factors Research Laboratory in Holland - Developer of STI in Europe**

Speech intelligibility is not a physical quantity like Amperes, Volts or BTU's. It is the degree to which we understand spoken language. Speech is not necessarily intelligible simply because it is audible. Everyone has experienced speech signals that are loud enough but overly reverberant, suffer from echoes or distortion and therefore are not understandable. Announcements in airports, train stations and places of worship often suffer from this problem.

Intelligibility

Intelligibility is measured by looking at how well the room responds to changes in sound level in the octave bands. Two factors affect this response which is known as the Modulation Transfer Function.

1. The presence of noise may prevent the level from changing enough, as it will not fall below the noise.
2. Reverberation and echoes will cause the level to change at a slower rate.

The STI-PA test signal contains known modulation rates and by measuring the difference in the sound heard from the known sound played, we can derive the STI number.

The Speech Transmission Index (STI) is a quantitative method of measurement covered in the International Electrotechnical Commission (IEC) standard 60268-16.

These Gold Line meters include the STI-PA signal developed by TNO Human Factors Research Laboratories in the Netherlands where the STI method was researched and developed. The STI-PA signal, contained on an audio CD, is input to the system under test.

STI measurements can be made without significant training. Once the STI-PA signal has been input to the system under test, a single button push on the DSP2B will produce the STI, converted to the Common Intelligibility Scale as specified in IEC standard 60849, in about 15 seconds. The STI-PA signal can be left continuously playing, making it possible to simply move the DSP2B to a new position and a new measurement initiated.

“VALIDATION: The DSP2B is designed for making STI-PA (IEC 60268-16) and CIS measurements and has been validated for that purpose by the TNO Human Factors Group. Model DSP2BP is capable of making PRIVACY measurements in addition to intelligibility. The TNO Human Factors Group recommends STI-PA as the preferred objective methodology for measuring reproduced speech intelligibility.”

TECHNICAL PAPERS & DATA FOR FIRE AND HEALTHCARE

Fire Issues

See http://www.gold-line.com/pdf/articles/p_sti01e14.pdf

Ken Jacob, presentation to the National Fire Protection Association Congress, Understanding Speech Intelligibility and the Fire Alarm Code.

Healthcare Issues:

Increasingly Codes and liability laws are compelling modern consultants, to find a way to verify the Privacy of a system. The new HIPAA standards for Patient Information privacy is driving the trend towards Privacy Index measurements as the best method for assuring that masking systems are in fact providing adequate levels of privacy. **White papers** from Government Studies have recommended **PI** as the preferred method for assuring that speech remains confidential. Two recent studies by Dr. Kenneth Roy, PhD have documented the superiority of Privacy Index measurements, and the legal issues related to failure to provide speech privacy under the new HIPAA medical regulations see:

http://www.wedi.org/cmsUploads/pdfUpload/WhitePaper/pub/P-Final-Oral_Com.pdf

<http://www.wedi.org/cmsUploads/pdfUpload/eventsPresentationInformation/pub/MillerandSykes.pdf>

AVAILABLE PRODUCTS TO MEASURE INTELLIGIBILITY AND PRIVACY

Gold Line offers a portable sound source, the Gold Line TalkBox™ to provide a source for the STI-PA tones. The system includes a portable CD player that has been modified for measurement quality performance, an internal amplifier and a small positionable loudspeaker. The system is contained in a lightweight carry case and can be run on AC Power or internal batteries.

Privacy Index is essentially the inverse of the intelligibility Index. One can think of it as an *Un-Intelligibility* Index. Whereas Gold Line's intelligibility firmware tells you when people are able to understand speech from a sound system, OPT PI (Privacy Index) does the opposite. It tells you when speech is sufficiently blocked or masked so that people cannot understand the content. By doing so it predicts when various degrees of privacy have been achieved.

Model DSP2B is a dedicated meter to measure Speech Intelligibility. **Model DSP2BP** includes **both OPT STICis and OPT PI** which is the firmware option to measure Privacy. In order to accept the OPT PI firmware, a meter must have the intelligibility software, OPT STICis, since the two packages share code.

Analyzers that accept OPT PI and OPT STICis are the DSP2, DSP30 & DSPCIW.

Instructions For Stand Alone Models DSP2B and DSP2BP

Before beginning the test: Play the STI-PA test tone. It is suggested that you play the test tone on a Gold Line Talkbox.

INTELLIGIBILITY TESTING FOR VOICE EVACUATION SYSTEMS

REQUIRED EQUIPMENT:

- TALKBOX (requires 110vac or 8 AA Alkaline or Nicad batteries)
- DSP2B (requires 110vac or 8 AA Alkaline or Nicad batteries)
- STI-PA CD test tones (included with DSP2B & DSP30B)

INSTRUCTIONS TO MEASURE INTELLIGIBILITY (OPT STIcis):

1. Insert PA system microphone into Talkbox holder
2. Position the Talkbox loudspeaker at the normal mouth to microphone distance.
3. Play the STI-PA CD with the Talkbox
4. Insert analyzer microphone into the meter and turn on (will display the SPL dBA). Place the DSP2BP microphone 1 meter from the Talkbox loudspeaker and adjust the Talkbox level to 65dBA.SPL
5. Place meter microphone in the area to be measured.
6. Adjust the fire alarm system level until the reading matches the recommended level for fire systems, which is 85dBA. For additional information about levels see the white paper by *Ken Jacob, presentation to the National Fire Protection Association Congress, Understanding Speech Intelligibility and the Fire Alarm Code.* Copy attached.
7. To make an intelligibility test, set the Analyzer to the intelligibility mode by pressing the (MODE SELECTOR) on the bottom of the analyzer, until the CIS LED is lit. If your specification provides for STI, rather than CIS, depress the Mode Selector until the STI LED is lit.
8. To start the test Press the [TEST] Button. Test results will display in 15 seconds
9. If “Err” is displayed, press the [dBA] Button and repeat from step 8 as reliable data could not be collected.
10. If the “BAT” symbol is shown, replace batteries.

Computer Interface Overview INTELLIGIBILITY (Add Noise and Save Files)

1.To utilize the computer interface install the Wincvo software into your computer To connect your analyzer to your computer make use of the enclosed serial port cable or you may use an aftermarket serial to USB converter.

2.Launch the program and Octave band frequency data will be displayed along with the ambient sound dBA level

3.This utility allows you to correct an STI score measured in an empty room, to that which would be obtained with the room occupied. The noise correction calculation requires three pieces of information:

1. An intelligibility measurement for the room when empty,
2. The spectrum of the ambient noise at the time of the intelligibility test,
3. The spectrum of the noise that the measurement is to be corrected to.

Noise Correction Procedure

In order to predict the effects of noise on intelligibility, if you are measuring a room without its characteristic noise, it will be necessary to measure the room with and without noise.

MEASUREMENT 1 (QUIET ROOM)

1. Connect the DSP2B to the computer via the RS232 serial port.
2. Launch the Wincvo software the STI-CIS is automatically activated.
3. Measure the ambient noise by clicking the [**EMPTY**] button. This will open a window Gathering the ambient noise and click on (**MEASURE**) to record the ambient noise level, in the first column of numbers, plus capturing the octave band spectrum of the ambient noise.
4. Start the STI-PA test tone CD and place the microphone 1 meter from the talkbox loudspeaker. Adjust the level until the talkbox produces a level of 65dBa SPL. Click on (**MEASURE**) to measure the intelligibility. This will fill in the second column of numbers with intelligibility scores.
5. Save the data you have gathered so far by clicking **File Save** on the menu.

MEASUREMENT 2 (WITH NOISE)

1. Connect the DSP2B to the computer via the RS232 serial port.
2. Launch the WINCVO software. STI-CIS mode will be activated.
3. Measure the noise by clicking the [**OCCUPIED**] button when room is occupied and click on (**MEASURE**). This will fill in the second (noise)column
4. Save the data by clicking **File Save** on the menu
5. To calculate the corrected STI score, all you need to do is open both of these making use of the file open procedure, and the corrected STI scores will be displayed.

You can estimate the correct STI or CIS by manually filling in the expected octave band information for the room.

If you are measuring in a room that is at its normal ambient noise level, no correction is required to the STI test result.

Evaluating the results - INTELLIGIBILITY

The front label of the DSP2B has the basic instructions and the following tables
To evaluate the results of the test

According to NFPA 72 (appendix), a passing score is .70 CIS / .50 STI or higher.

STI	1.00	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
	EXCELLENT					GOOD			FAIR		
CIS	1.00	0.98	0.95	0.93	0.90	0.87	0.84	0.81	0.78	0.74	0.70

STI	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05	0.00
	POOR			BAD						
CIS	0.65	0.60	0.54	0.47	0.39	0.29	0.16	0.00	0.00	0.00

PRIVACY INDEX TESTING

REQUIRED EQUIPMENT:

- TALKBOX (requires 110vac or 8 AA Alkaline or Nicad batteries)
- DSP2BP (requires 110vac or 8 AA Alkaline or Nicad batteries)
- STI-PA CD test tones (included with DSP2BP & DSP30BP)

INSTRUCTIONS TO MEASURE PRIVACY (OPT PI)

PI measurements are made in occupied areas, typically with the sound masking system turned on, and set to its normal levels.

1. Insert the STI-PA CD into the TalkBox and turn on.
2. Insert analyzer microphone into the Analyzer and turn on (will display dBa SPL)
3. Place the talk box loudspeaker in the general location where the person will be speaking during normal use of the space and set the level on the TalkBox to 65dBa, as measured with microphone approximately 1 meter (39”) from the TalkBox loudspeaker.
4. Place DSP2BP microphone in the area to be measured for privacy (adjoining cubicle, adjoining room, etc).
5. To make a PI test, set the DSP2BP to the PI mode by pressing the (MODE SELECTOR) on the bottom of the analyzer, until the PI LED is lit.
6. To start the test Press the [TEST] Button. Test results will display in 48 seconds.
7. If “Err” is displayed, press the [dBa] Button and repeat the test as reliable data could not be collected. The PI Mode has an auto reject mode, if corrupted date is detected during the test (slamming doors, other impulsive type noises). If this occurs, you will see the numeric

box stop its count down, and go back to the start of the sequence. If this auto-detect/correct mode is successful, it will take slightly longer to test, but will display a score. If too many errors are detected, it will instead display Err, and you need to re-run the test. Remember that PI tests measure very low levels, so it is best to do this type of work when it is relatively quiet in the room.

8. If the “BAT” symbol is shown, replace batteries.

Evaluating the results - PRIVACY

	EXCELLENT		GOOD		FAIR	
PI	1.00	←→	.95	.94	↔	.90
				.89	←→	.80
	POOR		NO PRIVACY			
PI	.79	←→	.70	.69	←→	0.00

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.