Speech Studio is Laryngograph’s voice analysis system. The integrated software and hardware are specifically designed for the exacting requirements of voice measurement. The Laryngograph microProcessor provides a Laryngograph and acoustic waveform. These input to the host PC via a highly specified USB interface to give precise analyses of sustained vowels and, uniquely, connected speech.

**Features**

Laryngograph microProcessor provides a Laryngograph (EGG) and Speech input.

- 4 channel high quality recording and playback.
- Realtime narrowband or broadband spectrogram and formant display.
- Continuous display of closed quotient (Qx) and fundamental frequency (Fx).
- Jitter, shimmer and HNR measurements for continuous vowels.
- Extensive library of quantitative analyses for connected speech. These work on different kinds of speech pattern including fundamental frequency, speech amplitude, vocal fold contact quotient, nasality and friction.
- Optional Nasality Processor for temporal nasalance measures.
- USB 2.0 interface allows use with desktop or laptop PC.
- Advanced methods of voice analysis are linked to diagnosis and stroboscopy.

**Speech Studio**

![Speech Studio software interface](image)

**Diagram 1:**

- **Normal**
- **Vocal fold scarring**

![Graph 1](image)

- **Graph 1:**
  - **Fx (Hz)**
  - **Probability (%)**
  - **Start at:** 1140 ms
  - **End at:** 1254 ms
  - **No. Periods:** 78
  - **Duration:** 714 ms
  - **Minimum Fx:** 103.7 Hz
  - **Maximum Fx:** 114.5 Hz
  - **Average Fx:** 108.9 Hz
  - **S.D. Fx:** 1.92%
  - **Minimum Qx:** 50.37%
  - **Maximum Qx:** 65.78%
  - **Average Qx:** 62.22%
  - **S.D. Qx:** 1.65%
  - **Jitter Ratio:** 0.98%
  - **Jitter Subj.:** 0.52%
  - **Shimmer Ratio:** 16.81%
  - **Shimmer Subj.:** -17.34%
  - **JitterFactor:** 0.95%
  - **R&P:** 0.71%
  - **Shimmer dB:** 1.49 dB
  - **NNE:** -3.40 dB
  - **CPP:** 2.61
  - **HNR:** 8.37 dB
Specifications

Laryngograph Processor

Microphone    Omnidirectional (pressure sensitive) electret, +/- 2dB 100Hz to 10kHz noise level 26dB (SPLA), dynamic range 88dB
Laryngograph  Gold plated electrodes in small, medium and large sizes
Bandwidth     +/- 1dB, 1Hz to 10kHz
Gain          0-22.5dB, software adjustable

USB Interface
Analog inputs 4 channel, +/- 5V, 16-bit A to D, 90dB dynamic range
Sampling rate  24, 16, 12kHz
Analog outputs Speech and Lx waveforms, 16 bit D to A, speaker or headphone compatible
PC Interface   USB 2.0

Speech Studio Software

- record speech and laryngograph and optionally up to two more waveforms to hard disk at 12000 or 16000Hz
- real time display of waveforms, fundamental frequency (Fx), amplitude (Ax), frication, contact quotient (Qx), spectrogram and LPC spectrum.
- high quality playback
- display of fundamental frequency (Fx) and/or closed quotient (Qx)
- pattern display combining Fx, amplitude (Ax), frication and optionally nasality
- realtime acoustic spectrogram with narrowband (40Hz) or broadband (200Hz) resolution
- realtime display of formants via LPC spectrum
- Sustained vowel analysis
  - Minimum, maximum, average and SD for Fx and Qx
  - Jitter (%)
  - Shimmer (% and dB)
  - HNR (harmonic to noise ratio)
  - NNE (normalised noise equivalent)
  - RAP (relative amplitude perturbation)
- Connected speech analysis (QA)
  - First and second order frequency distribution (DFx1 and 2)
  - Pitch crossplot (CFx) with irregularity score (%)
  - First and second order closed quotient distribution (DQx1 and 2)
  - Closed quotient crossplot (CQx) with irregularity score (%)
  - First and second order amplitude quotient distribution (DAx1 and 2)
  - Amplitude crossplot (CAx) with irregularity score (%)
  - Speech pattern elements – time spent in voice, non voice, friction and nasalance (with optional Nasality Processor) (%)
  - Dynamic phonetogram – Ax vs Fx, first and second order
  - Qx vs Fx, first and second order
  - Statistics

Minimum PC specification
P4 or Pentium-M (Centrino) processor, 512 MB RAM, 80GB IDE HDD, CD-RW, USB 2.0 interface, Windows XP Professional.