

## Audio Video Forensic Lab

3 Neptune Rd., Suite Q14B  
 Poughkeepsie NY 12601  
 (845) 463-3116 phone/fax  
 (845) 797-3850 cell  
[robert.w.sanderson@verizon.net](mailto:robert.w.sanderson@verizon.net)

12/29/06

Mr. Robert E. Hanlon  
 Alston & Bird LLP  
 90 Park Ave.  
 New York, NY 10016

Re: Report of Findings: Entral Group Int'l v. YHLC

Dear Mr. Hanlon:

As requested I have conducted examinations of nine musical recordings forwarded to me on 12/12/06. They are file AVSEQ01, AVSEQ02 and AVSEQ03 referred to herein as the known exemplar works, and suspected copies identified in the "Y" and "N" columns per the table below:

Song No.	"EGI" CD	"Y" CD	"N" CD
1.	AVSEQ01	00765	00765
2.	AVSEQ02	20975	20975
3.	AVSEQ03	20973	20973
4. Not Reviewed	AVSEQ04	N/A	N/A

### Basic Methodology:

The recordings were transferred to the computer and played/viewed in Digidesign Pro Tools and Adobe Audition. The "Y" and "N" versions of each suspect copy were compared to each other. Each of the three known exemplar works was then compared to its respective "Y" and "N" suspect copy. The examination is focused on signal analysis, the instrumental performances as well as the quality and delivery attributes of the vocal performances.

### Summary of Findings:

For each work, the "Y" and "N" recordings are musically, sonically and electrically identical to each other. Therefore a comparison of either recording to its respective known exemplar yields the same results. I find that each of the three known exemplars examined share a common source or master recording with the suspect "Y" and "N" recordings. This means that, though the "Y" and "N" recordings may have been copied, edited and received other electronic manipulations; the musical compositions, instrumentations, key signatures, time signatures and data obtained through forensic analysis leads me to conclude that they are the same work as the exemplar recordings.

**Basis of Opinions:**

I used three steps to analyze the recordings:

1. Critical Listening. In this step I determine exactly what the recordings sound like in great detail. The recordings under study are played numerous times. With each play I focus on a particular instrument or voice, its sonic qualities, localization phenomena, timing and delivery nuances. Overall the recordings are evaluated as to individual and comparative continuity.
2. Waveform/Spectrographic Analysis. Waveform views in the computer allow me to visually see the overall recording's wave envelope and individual excursions of particular sounds. For example, the overall envelope can reveal phase anomalies or timing similarities of two recordings. In an expanded view a repetitive drum sound can be evaluated as to wave shape, reverberation characteristics and tempo. Spectrograms are a visual tool used to identify similarities or differences in the frequency and power spectrum of the recording over time.
3. High Resolution Scanning. In this step I am looking for common stationary harmonic tones in the recordings utilizing STC EdiTracker software and a Stanford Research SR785 Dynamic Signal Analyzer. This can be a one or two step process.
  - a. Estimate the signal spectrum for quasi-stationary harmonics in a specified frequency range.
  - b. Scan the phase of the resultant selected stationary harmonic.

In this circumstance I am looking for harmonic tones common to individual recordings and a comparison of their phase plots.

**Data Used in Forming Opinions:**

**SONG 1:**

Known Exemplar supplied as AVSEQ01.dat

When copied and played as an mpeg file this is a stereo recording consisting of music, effects, backing vocals on the left channel and music, effects, backing vocals and lead vocals on the right channel. Quality is excellent. The song is 3:32.1 long. It was provided on CD (scan attachment 1). Scanning indicates a stationary harmonic at 61.79 Hz and this is also present in the "Y" & "N" recordings (see attachments 4, thru 9). Critical listening indicates no significant musical differences between this recording and the "Y" & "N" recordings.

**"Y" "N" 00765**

These are the same musical compositions as AVSEQ01. The "Y" & "N" recordings were provided on separate CDs. (scan attachment 1.1) They are the same length as each other and AVSEQ01. They each have the same temporal qualities (rhythm, tempo) and the same key signature.

The waveforms have similar characteristics as AVSEQ01 however "Y" & "N" have been over-processed and exhibit digital clipping as well as altered dynamics (see attachment 10). Electrically, the phase has been reversed so that the left and right channels are opposite phase of each other. (attachment 2) This is a technique often used to eliminate or significantly reduce a stereo lead vocal. There is a lead vocal prominent on the right channel (possibly added back in after vocal removal) and the left channel exhibits reverberation remnants of lead vocal not completely removed. The listener now has a choice of the left channel as mostly music, backing vocals and effects, or the right channel which also has a prominent lead vocal or both simultaneously. The quality of the left channel is reduced due to the phase cancellation of certain frequencies however there is enough waveform definition for analysis.

The spectrogram (exhibit 3) comparison shows the frequency and power spectrum over time similarities in the two "Y" and "N" recordings. They are indistinguishable to a conclusive degree. High resolution scanning indicates that "Y" & "N" share the 61.79 Hz harmonic and both have similar phase plots.

**Conclusion:**

The AVSEQ01 recording and the "Y" & "N" versions are sourced from the same master recording.

**SONG 2:**

Known Exemplar supplied as AVSEQ02.dat

When copied and played as an mpeg file this stereo recording consisting of music, effects, backing vocals on the right channel and music, effects, backing vocals and lead vocals on the left channel. Quality is excellent. The song is 3:08.54 long. It was provided on CD (scan attachment 1). Scanning indicates a stationary harmonic at 61.8 Hz and this is also present in the "Y" & "N" recordings (see attachments 11 thru 28). Critical listening indicates no significant musical differences between this version and the "Y" & "N" right channel recordings. (The "Y" & "N" left channel recordings are a looping fragment of AVSEQ02.)

**"Y" "N" 20975**

These are two track musical recordings. The left channel of each is a looping piano/bass/vocal fragment (attachment 29) derived from the introduction of AVSEQ02 and the right channel is a full duplicate version of the left channel of AVSEQ02. The "Y" & "N" recordings were provided on separate CDs. (scan attachment 1.1) They are the same length as each other and AVSEQ02. They each have the same temporal qualities (rhythm, tempo) and the same key signature.

The waveforms have similar characteristics as AVSEQ02 however "Y" & "N" have been poorly copied, compressed and visually exhibit altered dynamics (see attachment 30).

The spectrogram (exhibit 31) comparison shows the frequency and power spectrum over time similarities in the two "Y" and "N" recordings. They are indistinguishable to a conclusive degree. High resolution scanning indicates that "Y" & "N" share the 61.825 Hz harmonic and both have similar phase plots.

**Conclusion:**

The AVSEQ02 recording and the "Y" & "N" versions inclusive of the left channel variant are sourced from the same master recording.

**SONG 3:**

Known Exemplar supplied as AVSEQ03.dat

This is a live stereo recording consisting of music, effects, backing vocals and lead vocals. The lead vocal is mixed to the right channel and a reverberant lead vocal remnant is present on the left channel. Quality is excellent. The song is 4:19.5 long. It was provided on CD (attachment 1). Critical listening indicates no significant differences between this version and the "Y" & "N" recordings except that "Y" & "N" abruptly end earlier.

Scanning indicates a stationary harmonic at 61.9 and this is also present in the "Y" & "N" recordings (see attachments 32 thru 40). Critical listening indicates no significant differences between this version and the "Y" & "N" recordings.

**"Y" "N" 20973**

This is a live stereo recording consisting of music, effects, backing vocals and lead vocals. The lead vocal is mixed to the right channel and a reverberant lead vocal remnant is present on the left channel throughout. Quality is fair. The "Y" & "N" recordings were provided on separate CDs. (attachment 1.1) They are the same length as each other but end abruptly and earlier than AVSEQ03. Up to the abrupt ending they each have the same temporal qualities (rhythm, tempo) and the same key signature.

The waveforms have similar characteristics as AVSEQ03 (attachment 41).

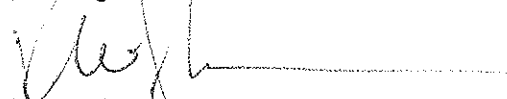
The spectrogram (attachment 42) comparison shows the frequency and power spectrum over time similarities in AVSEQ03 and the two "Y" and "N" recordings. They are indistinguishable to a conclusive degree except that AVSEQ03 is longer and so the spectrogram display is somewhat compressed.

High resolution scanning indicates that "Y" & "N" share the 61.95 Hz harmonic and both have similar phase plots.

**Conclusion:**

The AVSEQ03 recording and the "Y" & "N" versions are sourced from the same master recording.

Best regards,

A handwritten signature in black ink, appearing to read "Robert Sanderson", is written over a horizontal dotted line.

Robert Sanderson  
Forensic Analyst  
President, Audio Video Forensic Lab

Attachments 1 thru 42: Various Data Related Exhibits

43: CV of Robert Sanderson

44: Compensation

45: Cases of Witness Testimony





1.1