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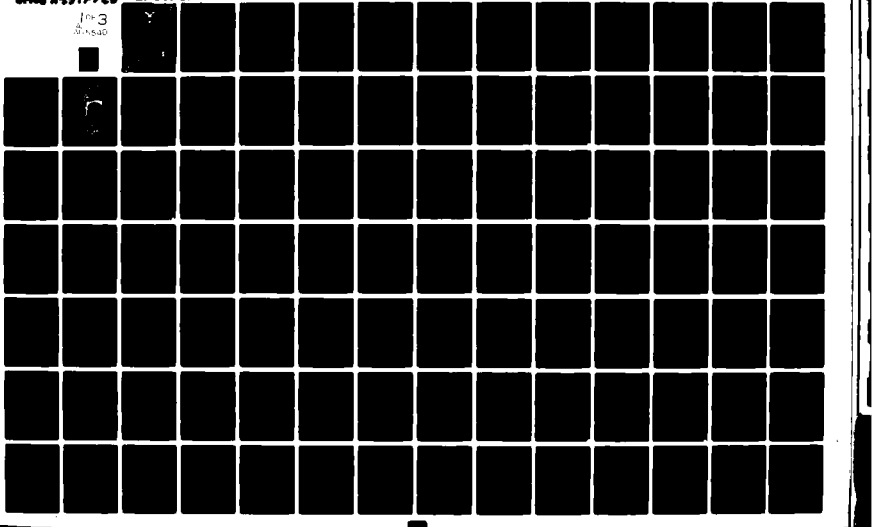

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TIME AXIS ANALYSIS OF GRAVITY DISTORTED SPEECH

THESIS

AFIT/GE/EE/81D-27

J. Calvin Hunter
Captain USAF

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Thesis

TIME AXIS ANALYSIS OF GRAVITY DISTORTED SPEECH

by

J. Calvin Hunter, BSEE
Captain USAF

Prepared for
the Faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science

December 1981

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Graduate Electrical Engineering

Preface

The technology base of the AFIT Signal Processing Lab has grown at an incredible rate. In this author's opinion, future graduate students could well spend their entire thesis quarter becoming familiar with the work that has preceded their own. In hope to ease this familiarization time, the programs used in this thesis, have been documented with a follow-on user in mind, and it is hoped sufficient background development for the reader to be able to appreciate and understand the problems associated with speech processing.

With basic understanding of the Signal Processing Lab Computers, the CLI (Command Line Interpretor) instructions, and the Superedit instructions; this thesis should guide follow-on efforts to further analysis, by similar methods.

The 1981 graduate students were fortunate to be the first generation users of a computer-interface to a Cromemco A/D and D/A Converter. (Earlier projects had to have A/D processing done at other support labs.) This convenience brings with it a responsibility to develop well documented procedures for use of this equipment; such an attempt has been made in this thesis report.

This research resulted from a suggestion by Dr. Matthew Kabrisky, Professor of Electrical Engineering at the Air Force Institute of Technology. The research is a processing technique to extract features (or characteristics) that are important in analyzing gravity distorted speech.

I owe thanks to Dr. Kabrisky for his suggestions and help during this work.

A special thanks is also due Captain Larry Kizer, who is primarily responsible for the AFIT Signal Processing Lab. Only small parts of this work could have been completed without this extremely well-planned facility.

Finally and most importantly, I wish to thank my wife/friend/partner/lover: Marsha. Without her support, encouragement, confidence, and understanding, this study could have been started but never finished.

J. Calvin Hunter
Capt USAF

Contents

List of Figures

List of Tables

Abstract

An algorithm to determine energy shift along the time axis was applied to digitized speech data, which had been recorded at six different gravity levels. The analog speech was recorded during centrifuge tests at the Air Force Medical Research Lab, Wright-Patterson AFB, Ohio. The data was then digitized, Fourier transformed, high frequency preemphasized, channel compressed, and energy-normaiized. The processed files were checked for time-duration of each word in both the time and frequency domain. Large time-duration differences--up to 200 msecs--were recorded; but there was no statistical mapping pattern of distortion versus gravity level. Time distortion of the speech energy within a given gravity level was as significant as the distortion between gravity levels. The results indicate that no additional time-warping considerations will need to be made, within the speech recognition algorithms, to compensate for gravity fluctuations.

TIME AXIS

ANALYSIS OF GRAVITY

DISTORTED SPEECH

I Introduction

Background

Man took to the air by brute force. He used his eyes for orientation and his muscles to maneuver the aircraft by altering the flight surfaces. Even in today's accelerated technology, not much has changed: hydraulic devices ease the flight surface altering procedures; and instruments give accurate position information; but touch and sight are still the only human functions which are used extensively in powered flight.

Current-generation, single-pilot aircraft stress the human motor responses to the point that the aircraft "cannot be flown during full combat maneuvers" (Ref 8). The button pushing, switch moving, and dial turning must be replaced with alternate functions.

Present efforts are attempting to exploit one other human function--speech. If voice commands can be recognized by machines, these commands could more effectively activate many modern aircraft cockpit procedures which are now performed by sight and touch.

The major problem with processing speech is that speech must be processed; not some smooth, predictable waveform. The energy produced by the human voice poses an enigma in the world of signal processing. The energy which forms the fundamental sounds (or phonemes) of speech are the component parts of all words in all languages. Phonemes can

be combined in different ways to produce any vocal sound. The number of phonemes varies, not only from one language to another, but within any given language. For instance: the word 'bottle', as pronounced in some parts of the Northeast, contains a glottlestop (a glottlestop is a sound within the larynx which results from a rapid closure of the glottis); or in the South, the vowel 'i' has a distinctively flatter sound than in other areas. Disregarding these occasional anomalies, English contains approximately 42 phonemes.

The different phonemes are produced by variations in the speech apparatus. The parts of this 'instrument' are the lungs, the larynx, the pharnx, the nose, and the mouth (see Figure 1). The lungs produce an airstream which passes through the glottis (the cleft or opening between the vocal folds, or vocal cords, at the upper orifice of the larynx). The vocal folds vibrate at a frequency determined by their mechanical properties (taughtness, length, and mass and by the air pressure in the lungs. The acoustical pressure then passes through the pharynx, into the mouth and out. The velum (or soft palate) opens during certain sounds, such as nasalized vowels, and allows the air to also pass out through the nose.

The speech apparatus can be configured in three different ways, giving rise to three different phoneme types. First, the <u>vowel sounds</u> result from the periodic opening and closing of the vocal folds by the lung air pressure and the laryngeal muscles. As the vocal folds open, the velocity of the air from the lungs reduces the air pressure between them. They then close, causing another build-up of air pressure in the lungs. The rate of this cycle is the fundamental frequency, or

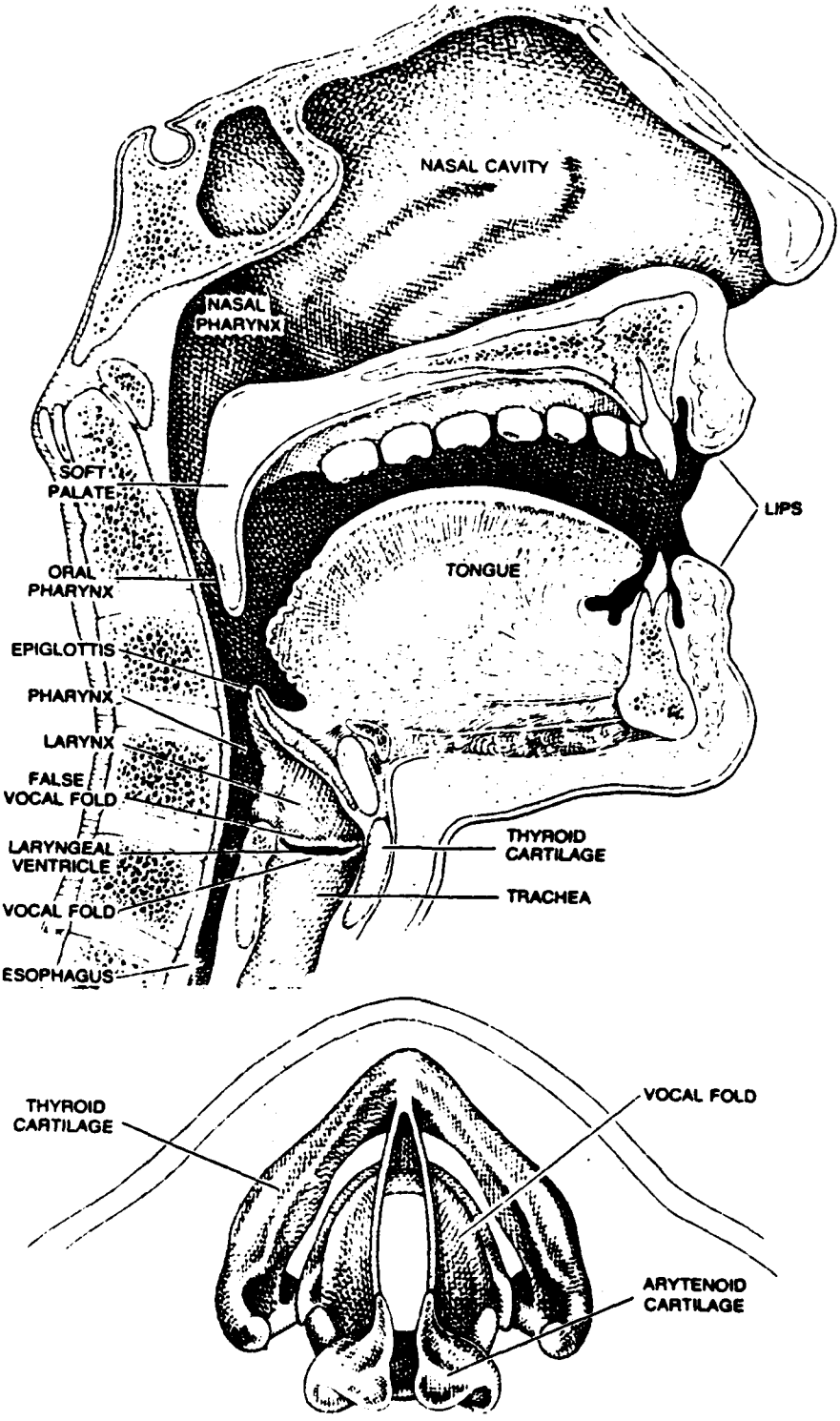


Figure 1. The Human Vocal Tract (Ref 9)

pitch of the voice. Secondly, the fricative sounds, such as 'f', 'sh', 'th', 's', 'z' are aperiodic or noise-like sounds. They result from turbulent air flow between the upper teeth and the lower lip, tongue, or lower teeth. The combination of the first two phoneme types, that is, a periodic sound and a noise-like sound, produce sounds such as 'v'. Thirdly, the plosive sounds, such as 'p', 't', 'k' are bursts of acoustic pressure. The forward parts of the mouth (tongue, lips, and/or teeth) release this energy by suddenly opening and freeing the built-up air pressure.

The vocal tract can then be considered to be a variable acoustic resonator, which is about 17 cm long. As with all acoustic resonators, the sounds which will transmit through it are highly dependent on frequency (the sounds that correspond to the resonant frequencies are transmitted at a much higher amplitude than those that are far from resonance). The important frequencies are those which have integer multiples of 1/4 wavelengths which will fit exactly within the length of the vocal tract (17 cm). These resonances or formants are at: 500 Hz (1/4 wavelength), 1500 Hz (1/2 wavelength), 2500 Hz (3/4 wavelength), and 3500 Hz (1 wavelength). (NOTE: Some frequency transmission continues up to approximately 10 kHz.)

To digitize human speech, a sampling rate must be used which is high enough to capture all of these resonant frequencies. For a minimum of two samples per cycle (Nyquist sampling criteria), a sampling rate in excess of 7 kHz is required.

The above information provides a basis for data capture and

data analysis of human speech phonemes; leaving two important questions: 1) Do phonemes contain the essence of speech intelligibility? 2) Can normal signal processing and measurement processes such as Fourier Transforms extract the characteristics (or features) of phonemes? The answer to both questions seems to be: 'yes' (Refs 1; 6). Based upon that assumption, the AFIT Signal Processing Lab is concentrating on phoneme characterization, phoneme processing, and phoneme based recognition processes. The assumption seems well founded since these speech sounds are the energy which the human ear processes in its speech recognition function.

Phoneme-based methods are among those found in the ten or more speech recognition units, which are presently available on the market. These units are single-word recognizers with recognition rates of 95-99%.

Unfortunately, these impressive recognition rates decrease rapidly outside of an ideal lab environment; such as an aircraft cockpit, where speech is corrupted by two major factors: noise and gravity fluctuations. Much work has and is being done on the effects of noise and how to best counter it. Communication fields, unrelated to speech processing, have contributed many of the breakthroughs in noise cancelling. Much more research is needed, however, in the specific problems that the human voice produces. Unlike noise, the second problem is unique to the aircraft cockpit: the distortion of speech which comes from increased gravity during flight. These increased G's can approach six or seven times that of normal gravity. This applies excessive stress to the entire body. Two possible

sources of distortion exist: 1) The vocal system or the oxygen mask/face combination could physically distort, which would cause frequency shifts; these would occur if the mechanical properties of the vocal tract, face, or oxygen mask were to change. 2) The stress on the body could make it more difficult to speak. If this is the case, the frequency would be relatively constant; but the time which it takes to make certain sounds would change.

Summary of Current Knowledge

Only one other study has attempted computer decoding and analysis of G-stressed speech signals (Levine, Ref 4). The data was insufficient and uncontrolled, which led to inconclusive results. However, the excellent research methods produced evidence of a tendency toward a time shift (or slowing of the speech) as the predominant distortion.

Objective

The objective of this study was to provide a systematic and documented method for extracting the features, or characteristics, of G-stressed speech. Thereby providing the tools for further study; and providing verification of the results reported by Levine, which really must be considered anecdotal because of the small data set. The reason for this objective is that an extensive amount of data will need to be processed to totally verify the source and extent of the distortion. Without a systematic method, the same processes could be repeatedly performed. Positive results would produce a mathematical expectation and representation of this distortion. With that

information, a speech processing/recognition algorithm could reasonably be expected to counter the distortion. Negative results would be: 1) Speech does not distort under gravity loads in any predictive way; or 2) The distortion is not speaker independent, nor can it be made to be so. If either of these conditions are found, and the distortion is extensive, current technology offers no certain immediate solution.

Scope

The data was limited to a 15-word vocabulary from one subject. This was principally done to rule out effects of speaker independence, for the initial study. Utterances of each word at six different gravity levels was then processed for feature extraction.

Approach

This research was divided into four main areas:

1. Data Acquisition
    a. Original Recording
    b. Editing
    c. Analog-to-Digital Conversion
2. Data Reduction
    a. Discrete Fourier Transform
    b. Channel Compression
    c. Spectrogram Production
3. Feature Extraction
    a. Word Length
    b. Frequency Length
4. Final Analysis

Assumptions

The only perceived hope for a solution to the speech distortion and classification problem is digital-computer-processing techniques. The extent to which speech must be processed, to make it a manageable sized data set, raises questions of maintaining the signal integrity; especially since many of the procedures are not truly reversible (for instance: a Fourier Transform process which saves only the magnitude cannot be inverted because the phase information has been discarded.) Care must then be used to insure that the techniques involved do not impose information onto the signal that might later be recognized as distortion during signal evaluation.

II Data Acquisition

Original Recording

The data tapes were produced by the Aerospace Medical Research Laboratory (AMRL), Wright-Patterson AFB, Ohio. Three subjects repeated a 15-word vocabulary at 2G, 3G, 4G, 5G, and 6G. Regrettably, only one subject established a "baseline" at 1G; without a "baseline", the data from the other two subjects was useless for the initial study. The words used for the test were: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, frequency, enter, CCIP, threat, step.

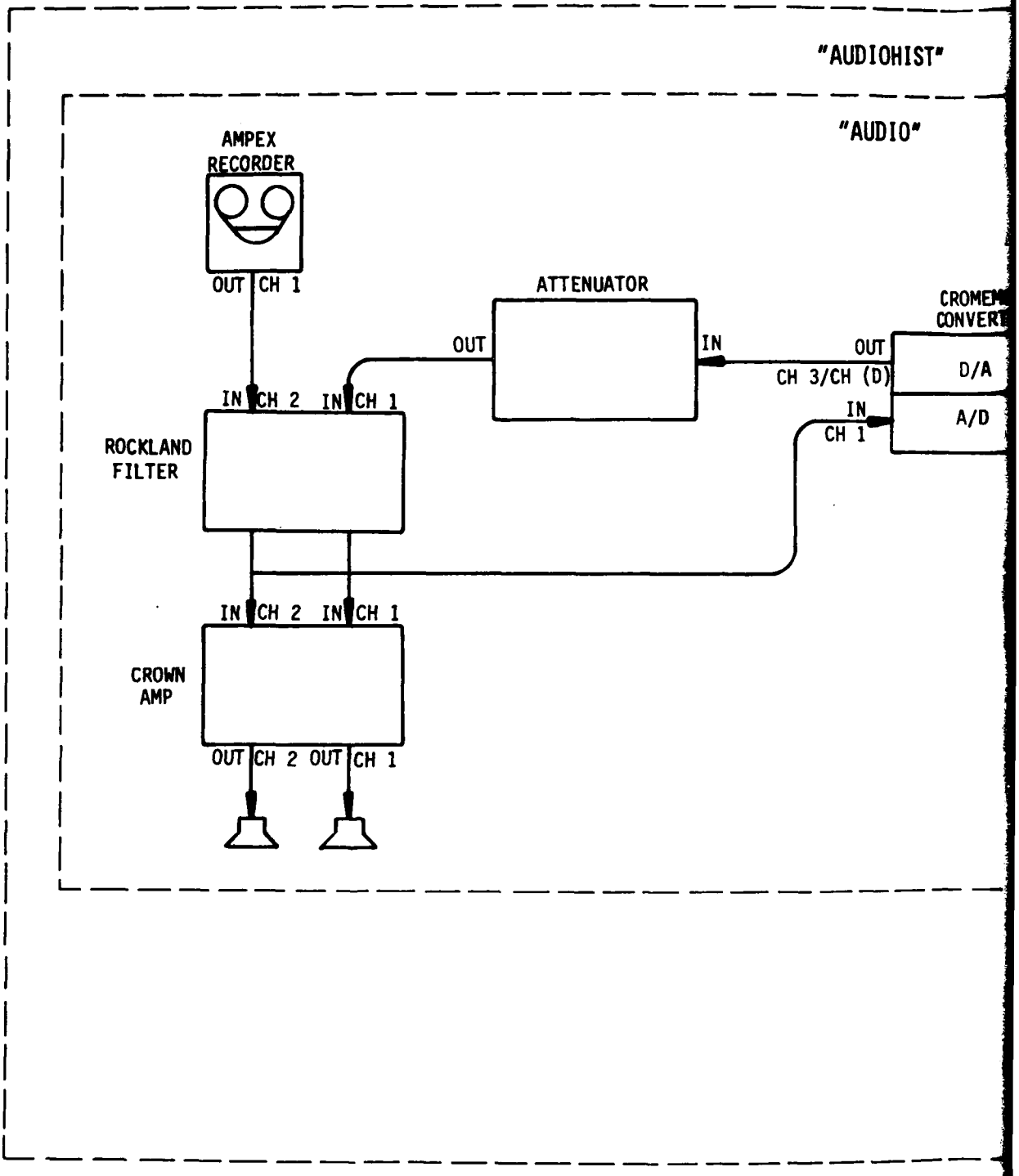
Editing

The original tapes were recorded on a 4-track, Teac 40-4, at 15 IPS. They were edited onto a 4-track, Ampex-700, at 7-1/2 IPS. The speech data was recorded on channel 1, and the editing notes on channel 2. The speed reduction and the elimination of nonspeech information reduced the 17 original tapes to three edited tapes.

Analog-to-Digital Conversion

The audio system of the Signal Processing Lab was connected as shown in Figure 2 (for configuration see Appendix A1). The sampling rate was 8 kHz with low-pass filtering at 4 kHz to prevent high-frequency aliasing (the filter blocked higher frequency harmonics while not attenuating any important speech information).

The program used to digitize the data was "audiohist" (see Appendix B2), which was produced in concert with Capt Paul Finkes (Ref 3). A simplified look at "Audiohist" can best be seen by studying


"AUDIOHIST"
"AUDIO"
AMPEX
RECORDER
OUT
CH 1
ATTENUATOR
OUT
IN
OUT
CH 3/CH (D)
D/A
IN
CH 1
A/D
IN
CH 2
IN
CH 1
ROCKLAND
FILTER
IN
CH 2
IN
CH 1
CROWN
AMP
OUT
CH 2
OUT
CH 1

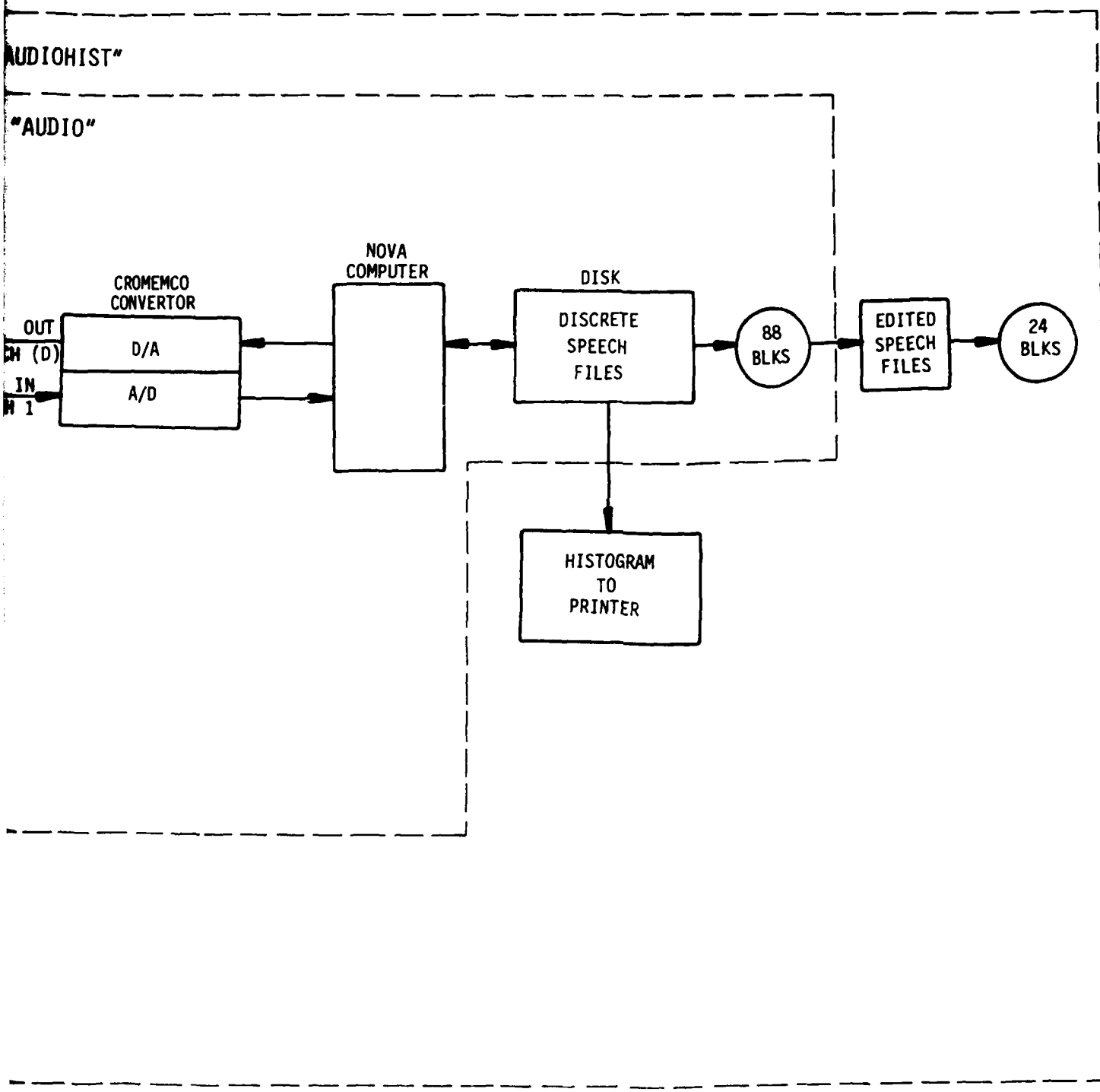


Figure 2.
Flowgraph for Programs 'AUDIO' and 'AUDIOHIST'

program "Audio", which details only the digitizing function (see Appendix B1). "Audiohist" added voltage-level checks, editing of the file size, and histogram production (see Figure 2).

The original digitized file size was 88 disk blocks. These were 256 integer word blocks, for a total word length of:

$$\text{Word length} = 88 \times 256 = 22528 \text{ integer words} \quad (1)$$

Sampling at 8 kHz made the original file time length:

$$\text{Time length} = 22528/8000 = 2.82 \text{ seconds} \quad (2)$$

Most of the words were less than one second long, but the tape-recorder-turn-on time and coordination with energizing the computer sampling function required a longer sampling window. The files were then checked for clipping and edited to 24 blocks or 0.77 seconds in length. Both of these processes were performed from within "Audiohist." (NOTE: The word "CCIP" was the longest word and had to be extended to 32 blocks. Because of the difficulty which this block length inconsistency posed, "CCIP" was eliminated from the initial analysis. It could have been included and treated as a singular case, but that seemed inefficient for first-time testing. The files then consisted of 6144 discrete amplitude values (24 blocks X 256 words = 6144 words) that were spaced 1/8000 of a second, or 125 μsec apart.

The voltage range of the A/D Converter in the Cromemco is ±5 volts. These voltage amplitudes were stored as 12 bit, two's

complement, binary numbers; with the most significant bit (MSB), which is the sign bit, extended to fill the full 16 bit integer word of the Nova Computer. This leaves 11 bits to contain the voltage values. If all 11 bits are set, the full dynamic range of the sampler has been reached, and higher values will be clipped.

The full-range values decode as $\pm 2047_{10}$ (which is $\pm 2^{11}-1$). So:

$$+5.0 \text{ volts} = 2047 \tag{3}$$

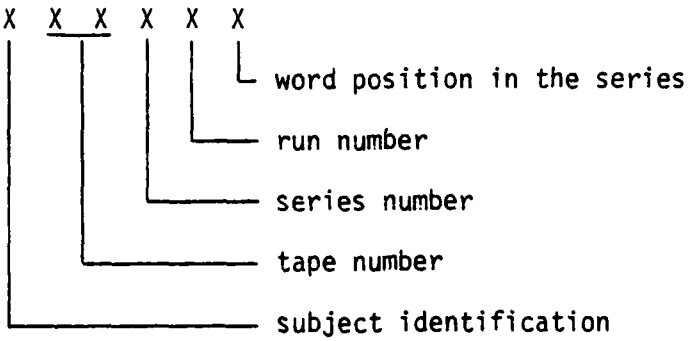
and

$$+1.0 \text{ volts} = +2047/5 = +409.4 \tag{4}$$

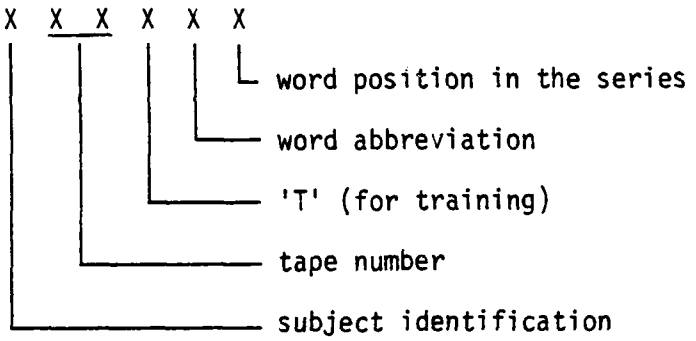
(NOTE: The internally-stored, computer representation of the analog voltage values is in two's complement form; therefore, the transformation shown in equations (3) and (4) must be used to properly recover the actual voltage values.)

All of the filenames, G-levels, words, and original tape numbers for subject 'C' are in Appendix A2. There were three subjects: 'C', 'M', and 'S'; 17 data tapes, one or two word series (depending on G-level); three to five runs per series (depending on G-level); and seven or eight words per series. (The runs were individual events, or spins, in the centrifuge. The word series were different ways in which the words were ordered for presentation to the pilot on the visual display.) A list of all filenames for all words is in Appendix A4.

Each word was assigned a different filename. The general filename format is either:



or



Example: If Subject 'C', on tape number 3, during series 1, run 2, said the word of interest as the seventh utterance of that run and series, the filename would be:

C 03 1 2 7

or, if the word of interest was 'enter' and the utterance was the

fifth one during the training mode, the file name would be:

C 03 T E 5

The filenames are rather complicated, but were formatted as a reference to the original tape documentation (see Appendix A3).

III Data Reduction

Discrete Fourier Transforms (DFT)

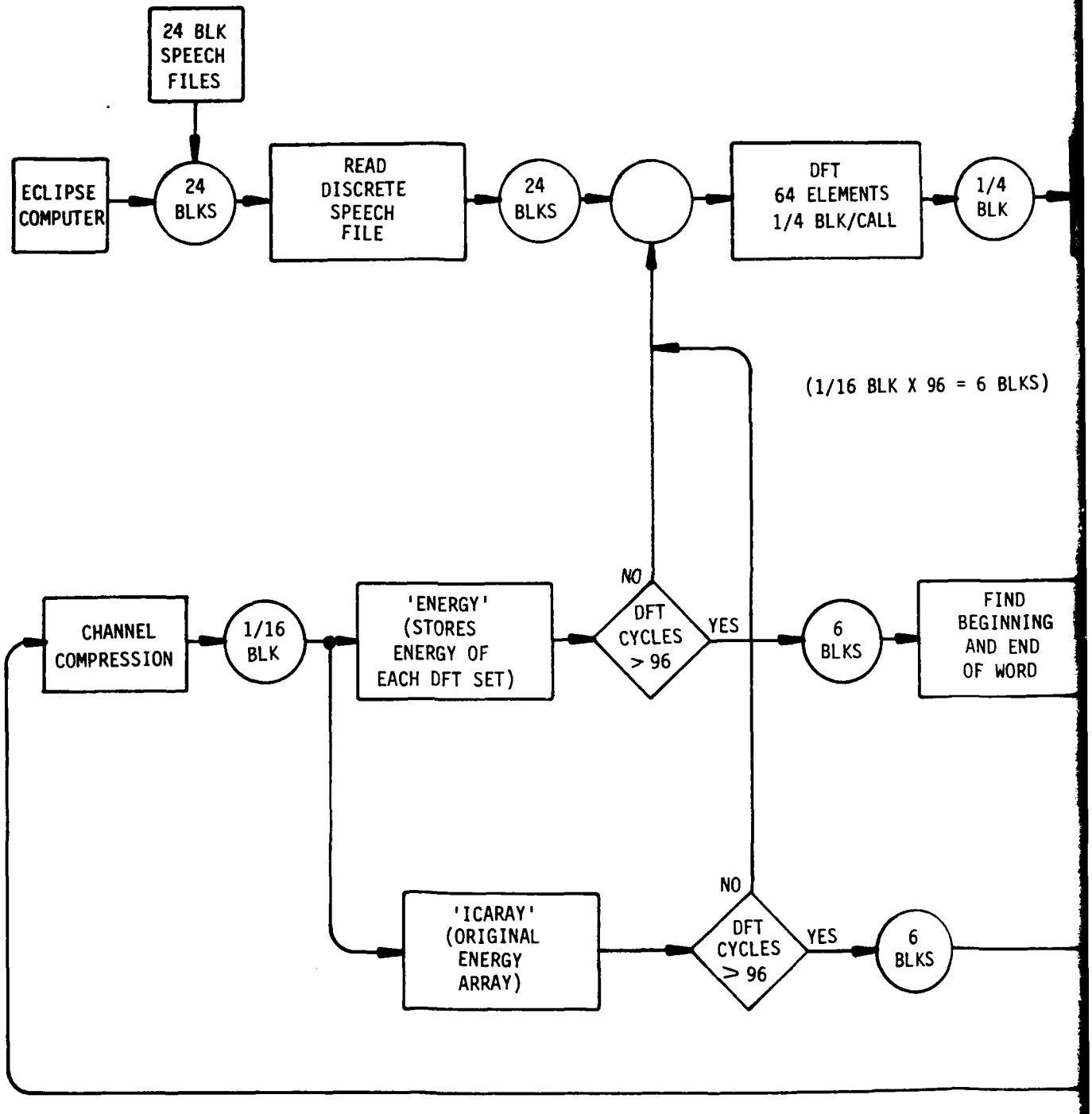
The first data reduction step, after editing, was to find the frequency content of the words. A Hanning Window was initially considered because of its advertised reduction in high frequency aliasing; but since Neyman (Ref 5) reported no increased performance with this window, a Rectangular Window was used for simplicity.

Performing a DFT on the speech files is equivalent to passing the words through a bank of audio filters and noting the amplitude value of each filter. The DFT operation is incorporated in program "FT32V" (see Figure 3 for flowgraph; and Appendix B3 for program listing). The 24 block, or 6144 element, speech files were DFT processed at a rate of 64 elements per "Call' to 'DFT4' (DFT subroutine). The 64 element output, from 'DFT4', has only 32 unique values: The first element is the DC content of the speech file; the next 31 elemental amplitudes (or frequency amplitudes) are integer multiples of 125 Hz, ranging from DC to 3875 Hz (see Table 1). The frequency separation is found from:

$$\frac{\text{Sampling Frequency}}{\text{\# Elements Processed}} = \text{Frequency Separation} \qquad (5)$$

or specifically:

$$\frac{8000 \text{ Hz}}{64} = 125 \text{ Hz} \qquad (6)$$


24 BLK SPEECH FILES
ECLIPSE COMPUTER
24 BLKS
READ DISCRETE SPEECH FILE
24 BLKS
DFT 64 ELEMENTS 1/4 BLK/CALL
1/4 BLK
(1/16 BLK X 96 = 6 BLKS)
NO
DFT CYCLES > 96
YES
6 BLKS
FIND BEGINNING AND END OF WORD
'ENERGY' (STORES ENERGY OF EACH DFT SET)
1/16 BLK
CHANNEL COMPRESSION
NO
DFT CYCLES > 96
YES
6 BLKS
'ICARAY' (ORIGINAL ENERGY ARRAY)

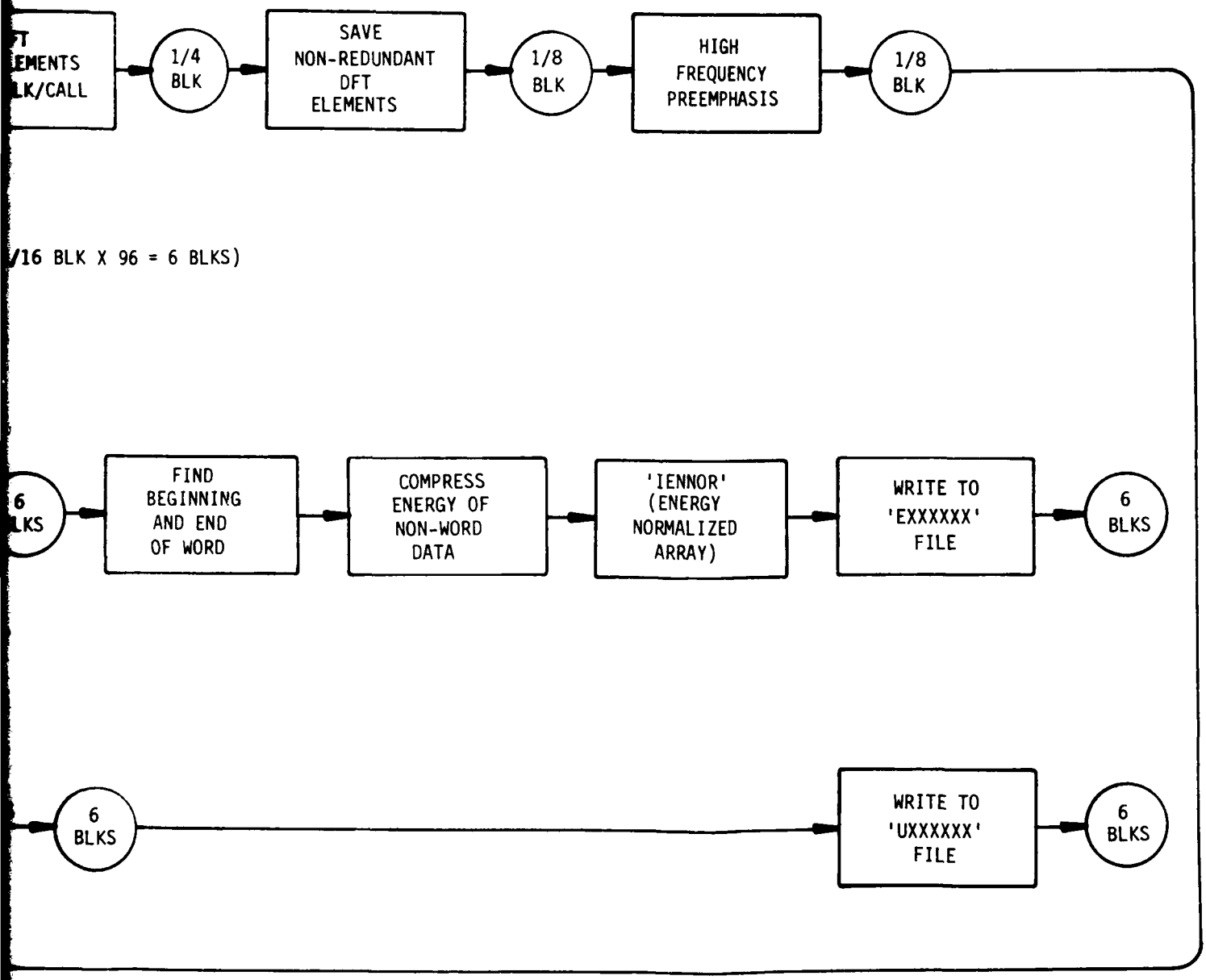


Figure 3.
Flowgraph for Program 'FT32V'

TABLE I

Elemental Frequency Values of DFT Process
Program 'FT32V'

FREQUENCY	(1)	= 0.00Hz	FREQUENCY	(17)	= 2000.00Hz
FREQUENCY	(2)	= 125.00Hz	FREQUENCY	(18)	= 2125.00Hz
FREQUENCY	(3)	= 250.00Hz	FREQUENCY	(19)	= 2250.00Hz
FREQUENCY	(4)	= 375.00Hz	FREQUENCY	(20)	= 2375.00Hz
FREQUENCY	(5)	= 500.00Hz	FREQUENCY	(21)	= 2500.00Hz
FREQUENCY	(6)	= 625.00Hz	FREQUENCY	(22)	= 2625.00Hz
FREQUENCY	(7)	= 750.00Hz	FREQUENCY	(23)	= 2750.00Hz
FREQUENCY	(8)	= 875.00Hz	FREQUENCY	(24)	= 2875.00Hz
FREQUENCY	(9)	= 1000.00Hz	FREQUENCY	(25)	= 3000.00Hz
FREQUENCY	(10)	= 1125.00Hz	FREQUENCY	(26)	= 3125.00Hz
FREQUENCY	(11)	= 1250.00Hz	FREQUENCY	(27)	= 3250.00Hz
FREQUENCY	(12)	= 1375.00Hz	FREQUENCY	(28)	= 3375.00Hz
FREQUENCY	(13)	= 1500.00Hz	FREQUENCY	(29)	= 3500.00Hz
FREQUENCY	(14)	= 1625.00Hz	FREQUENCY	(30)	= 3625.00Hz
FREQUENCY	(15)	= 1750.00Hz	FREQUENCY	(31)	= 3750.00Hz
FREQUENCY	(16)	= 1875.00Hz	FREQUENCY	(32)	= 3875.00Hz

The size of one of the time slices (of 64 elements) is:

$$64 \text{ X } 125 \text{ } \mu\text{sec} = 8 \text{ msec} \tag{7}$$

This time-slice size is less than the shortest possible identifiable speech sound (which is approximately 10 msec). The block length of each time slice is:

$$\frac{256 \text{ words/block}}{64 \text{ words}} = 1/4 \text{ block} \tag{8}$$

Saving only the nonredundant DFT elements left 1/8 block. The next step in Figure 3, logarithmically increased, or preemphasized the magnitude of the high frequency components. The need for preemphasis arises because of the energy distribution of speech across the frequency spectrum: most of the speech energy is concentrated in the frequencies below 300 Hz; and above 500 Hz, the energy must be preemphasized to permit energy comparisons with the lower frequencies on the same scale. Several forms of preemphasis have been used (Refs 5:19-22; 7:669-670), but an increase of 6 dB/octave, starting at 500 Hz was used because it experimentally produced the desired high frequency highlighting on the spectrograms of the words. Preemphasis is also believed to closely simulate the processing performed by the ear thereby treating the data in a more human oriented manner.

The next data reduction step, shown in Figure 3, was channel compression. Adjacent pairs of the 32 element arrays were combined

and averaged into 16 elements (again a nonreversible process). This left a file size of 1/16 block. Two copies of this 1/16 block file were made; one which maintained the original energy of the word and one which was later energy-normalized. Energy normalization was accomplished by dividing each element in the file by the square root of the sum of the squares of all elements--according to Parseval's relation (Ref 6:125):

$$E_n = (x_1^2 + x_2^2 + \ldots + x_{32}^2)^{1/2} \tag{9}$$

where

E_n = Normalizing energy

x_i = Elemental values of the 32 component vector produced by 'DFT4'

The normalized vector/array/or file was then found from:

$$x_{i_n} = (\frac{x_1}{E_n} + \frac{x_2}{E_n} + \ldots + \frac{x_{32}}{E_n}) \tag{10}$$

This guaranteed that no single element was greater than one, and that the total energy of the file equalled one (1). The step compensated for energy, or volume, fluctuations that could have arisen from variances in: record-levels; tape quality; equipment temperature; ambient air temperature; and most predominantly, speaker energy, or

volume. None of these variances, unless excessive, thwart human hearing, which suggests that something akin to energy-normalization may be routinely occurring in the function of the ear and brain.

The preceding steps were repeated 96 times to complete the processing of all 24 blocks (6144 elements), which produced six (6) blocks of processed data (96 X 1/16 block = 6 blocks). The un-normalized files were saved directly on disk. The energy-normalized files were further processed to find the beginning and end of the word, and suppress the energy of the nonword data, before being saved. (The energy-normalized files had an 'E' prefix added to the speech filename; the unnormalized files had a 'U' prefix added.)

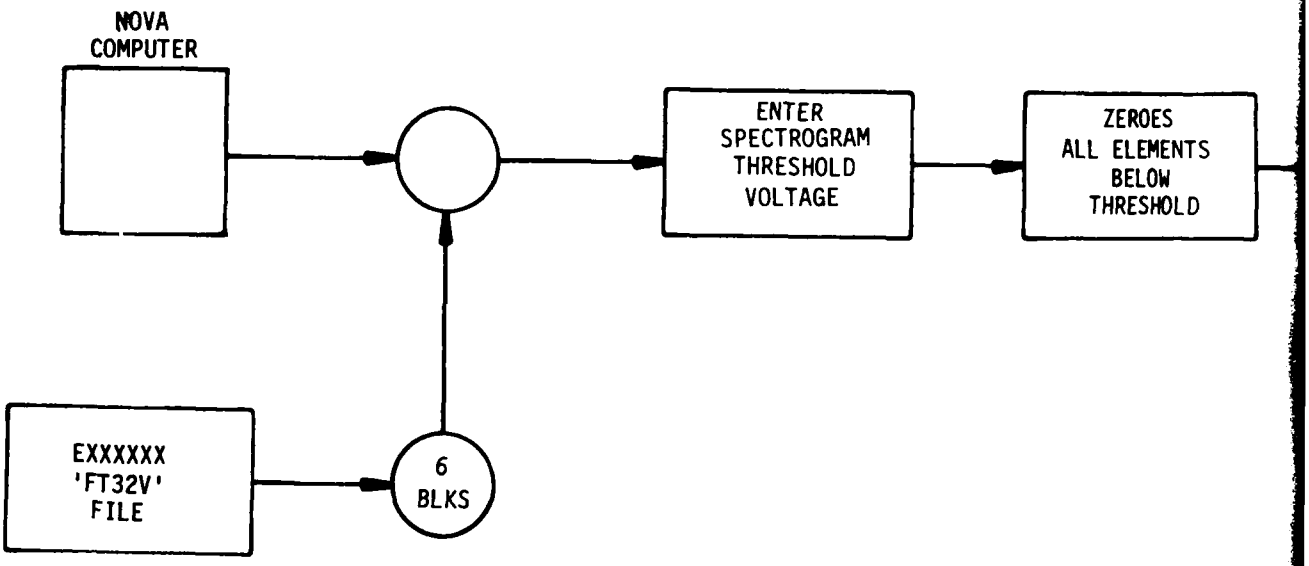
IV Feature Extraction

Spectrograms

Spectrograms were produced for data-quality verification; a step compelled by the extensive processing and the number of non-reversible processes, which were performed. The spectrograms of the digitized speech files produced by "SPECGRAM32" (see Figure 4 for flow-graph; Appendix B4 for program listing) were compared to the ones produced by previously proven programs (Ref 2). The parameters within 'FT32V' were then tuned for proper high-frequency preemphasis, and non-word energy suppression. The spectrograms of one utterance of the full 14-word vocabulary are in Appendix C2.

Study of the spectrograms, permitted word identification through all six G-levels; indicating that a major portion of the word-identification frequencies were retained. (NOTE: Frequency variance was not ruled out as a possible source of distortion, at this point; however, with the initial objective being to find the main source of distortion, the apparent small variance in frequency was bypassed in search of greater changes.)

The spectrograms showed that the most obvious change in a word from one G-level to another, was a shift in energy along the time axis. This could result from a change in the time needed to say a particular word at different G-levels; that is, if the effort required to say any word was increased from 1G to 2G, thereby requiring more time to complete the utterance; and if that variance was any calculable and predictable function, linear or nonlinear then a distortion function could be defined by that relationship.


NOVA
COMPUTER
ENTER
SPECTROGRAM
THRESHOLD
VOLTAGE
ZEROES
ALL ELEMENTS
BELOW
THRESHOLD
EXXXXXX
'FT32V'
FILE
6
BLKS

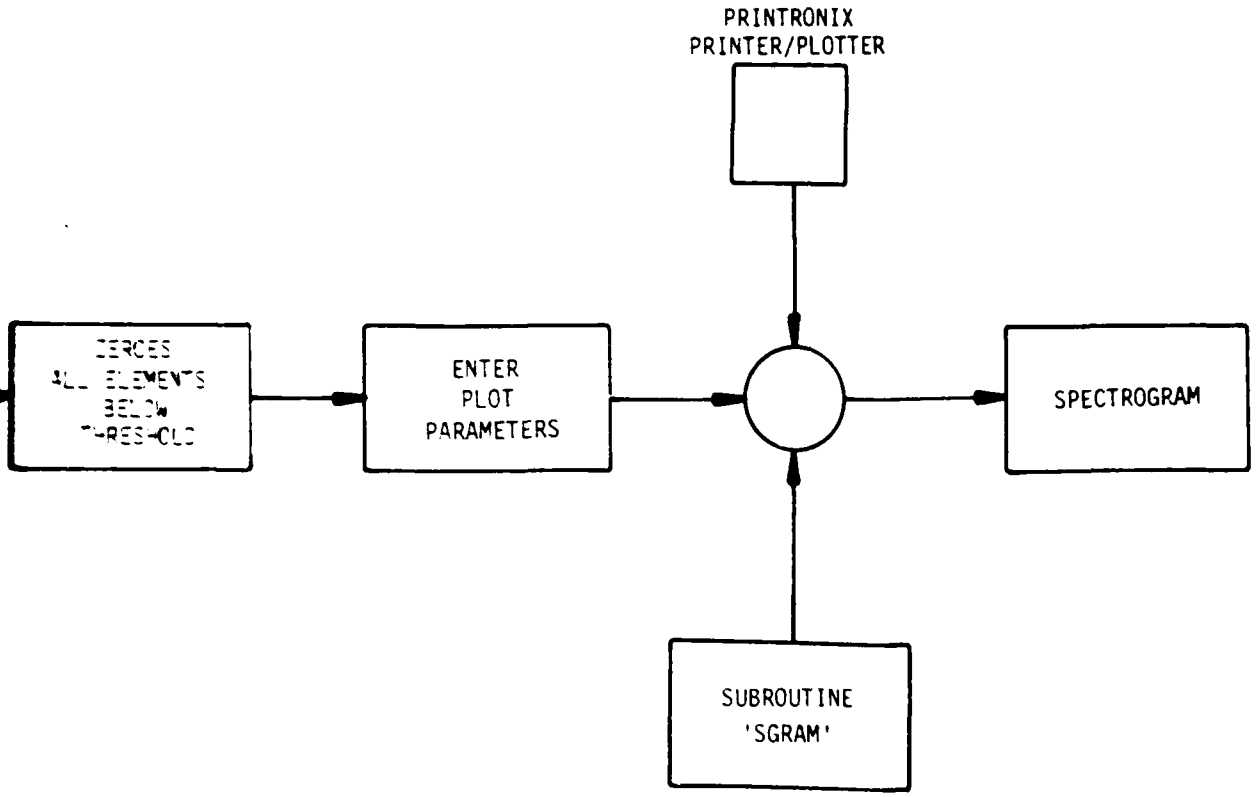


Figure 4.
Flowgraph for Program 'SPECGRAM32'

Time Axis Analysis

Initial indications were toward just such a relationship: Checking a sample utterance of 'ZERO' at 1G and 2G showed that the 2G word was more than 30 msec longer than the one at 1G. Seemingly, the energy had shifted--and significantly. Further checks through a small auxiliary program (not shown here), showed that the average of the word lengths for the five training utterances of 'O' at 2G was also more than 30 msec longer than the same average at 1G. (Data produced by the word-start and word-end feature of 'FT32V' was used for this comparison with a voltage threshold of 1.0 volt.)

Because of the possible significance of this indication, the now increased need for accuracy, and the fact that 'FT32V' was far too slow and complex to use for the extraction of this small data set, another special-purpose program was written: 'FSTART' (see Appendix B5). 'FSTART' established the word-start and word-end (hereafter referred to as: word-start/end) voltage threshold by the amplitude of the non-word noise in the file. Thereby ruling out the effects of noise-level variance from one file to another. The percent above that threshold, which would be identified as word data, was preset at 75% or selectable interactively. As a back-up procedure, the amplitude of the frequency components, produced by 'DFT4', were processed in a manner similar to the voltage threshold. The difference being that the voltage threshold level was established by checking each of the 6144 elements in the speech file for a threshold and word-start/end indication. While the frequency components were checked for a threshold and word-start/end indication in 1/4 block increments, and in the frequency domain--

specifically, at the low-frequency end of the spectrum (125 Hz to 375 Hz). Further justification for using this frequency-change-detection procedure is: 1) From speech plots such as those in Appendix C1, the word-start/end would be visually identified by the frequency change which initially and terminally differentiated the word data from the noise, and 2) From an audio playback of the words, the word-start/end would be audibly detected when the amplitude of the word-data frequencies were large enough to be discriminated from the background noise. 'FSTART' modeled these two human functions, but operated interactively to permit intervention and invocation of engineering judgment whenever the machine made obvious errors. If the word-start/end had been properly found, the voltage and frequency checks should complement each other; large differences could be an indication of a poorly identified word-length. The threshold percent levels could then be increased to insure that the identified word-length was not miscued by noise spikes.

Using 'FSTART', the word-length average for the five training utterances of 'O', at 1G and 2G, were again checked and found to be comparable to the data produced by 'FT32V'. 'FSTART' also calculated the word variance; that is, the difference between the longest and shortest word-lengths. (See Appendix C3 for 'FSTART' output.) The output results are also shown graphically in Figures 5-18, for G-levels 1-5 (the 6G tape was too corrupted by noise for meaningful output or comparison). Study of these graphs showed the "initial indication" described earlier in almost all of the words; that indication was toward a large word-length variance from 1G to 2G, but that variance

was not sustained through all G-levels. The shift from 1G to 2G is predominantly the largest and the most surprising, because what has been called 1G throughout this report, for simplicity, was actually at 1.4G. (This is the lowest spin rate which the ARML considers sufficient motion for the extraction of baseline data.)

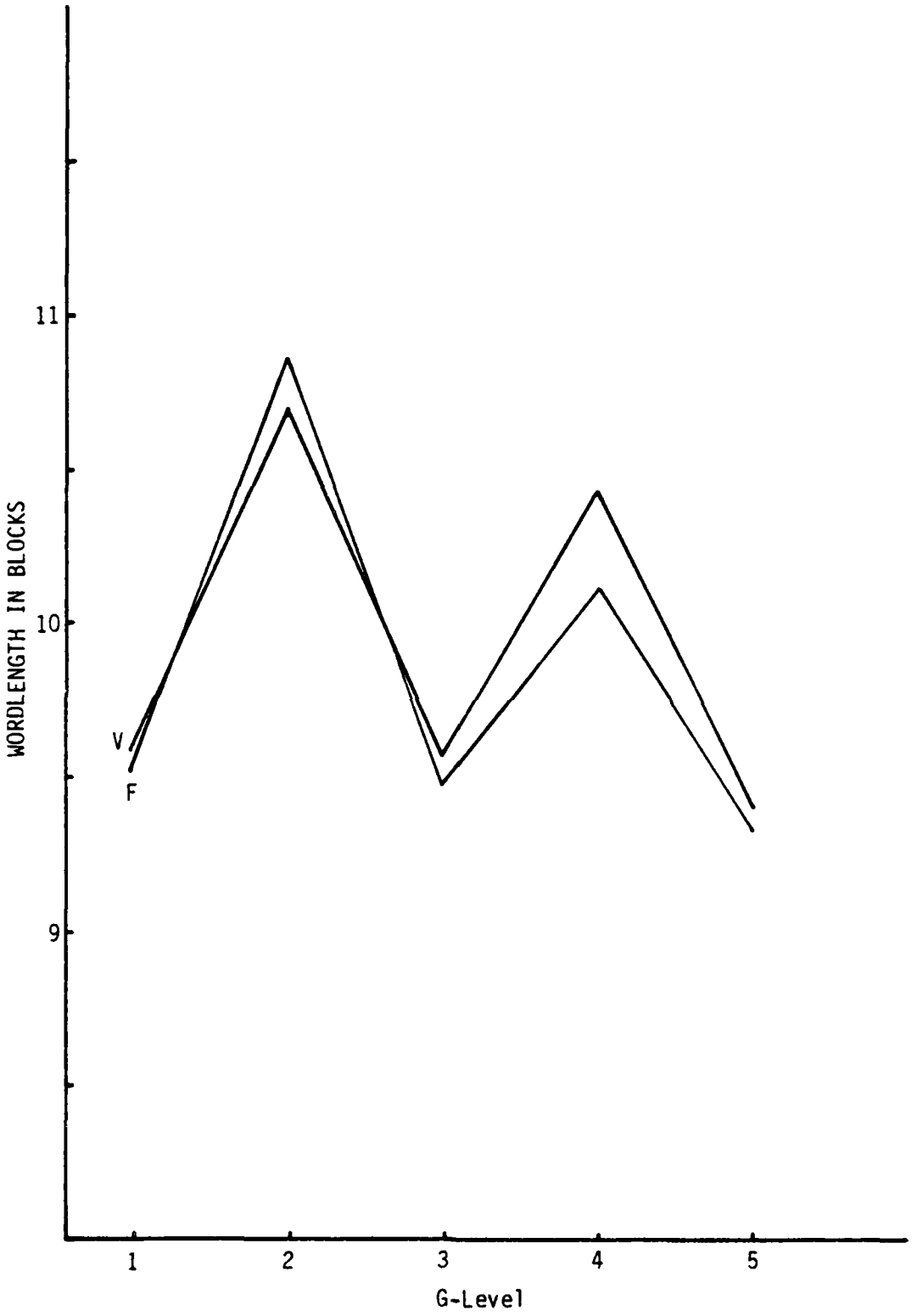


Figure 5. Wordlength Variance of '0'

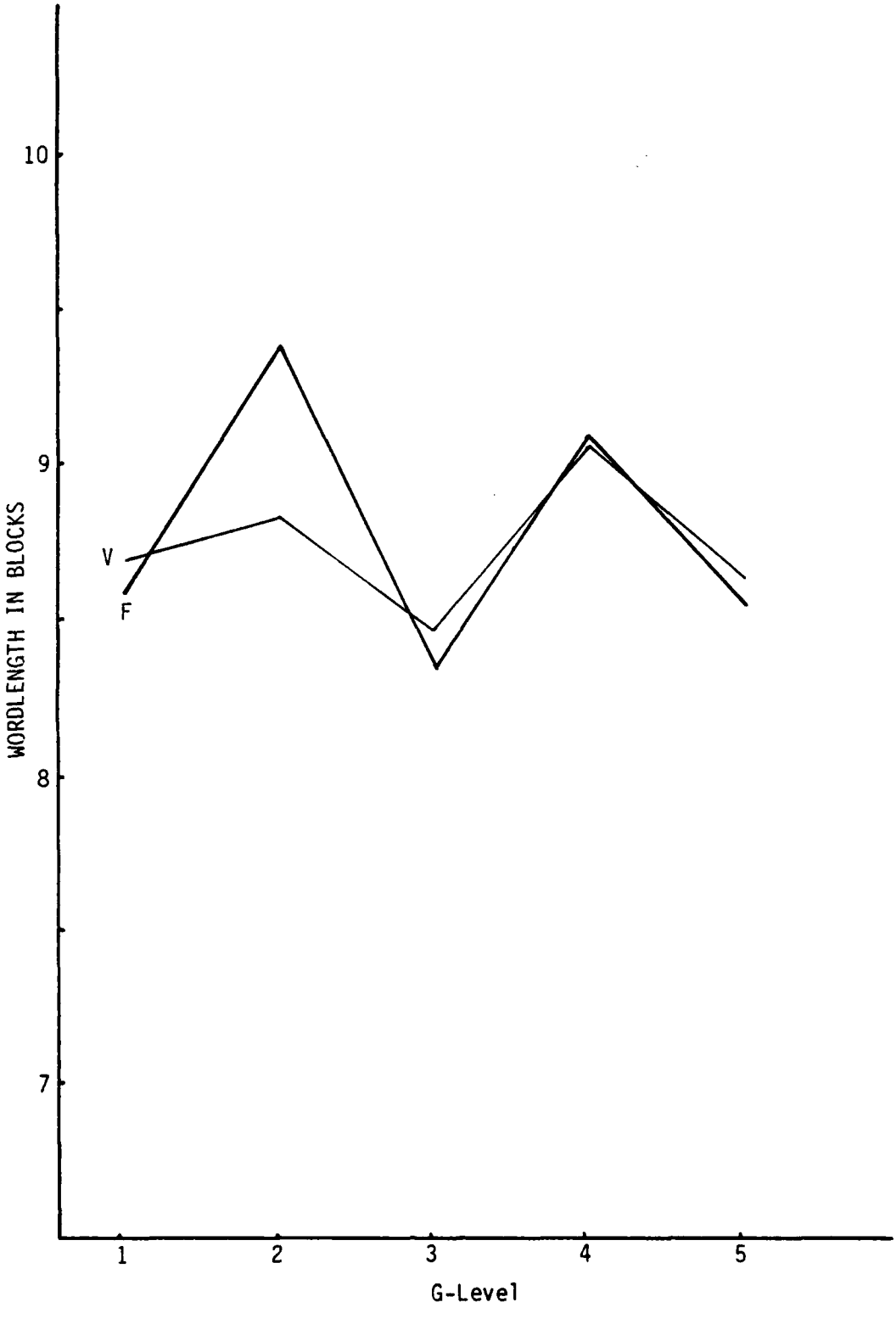


Figure 6. Wordlength Variance of '1'

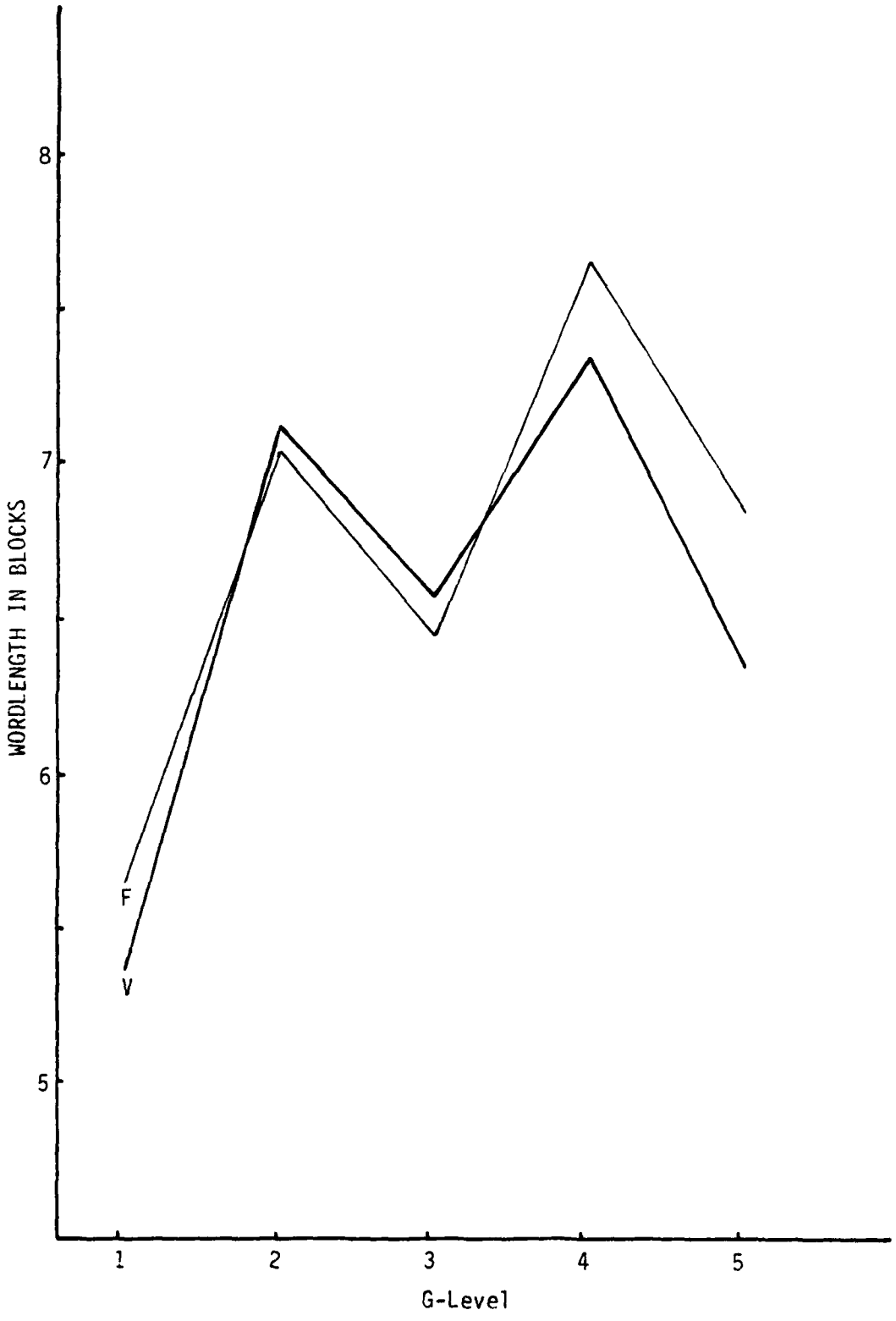


Figure 7. Wordlength Variance of '2'

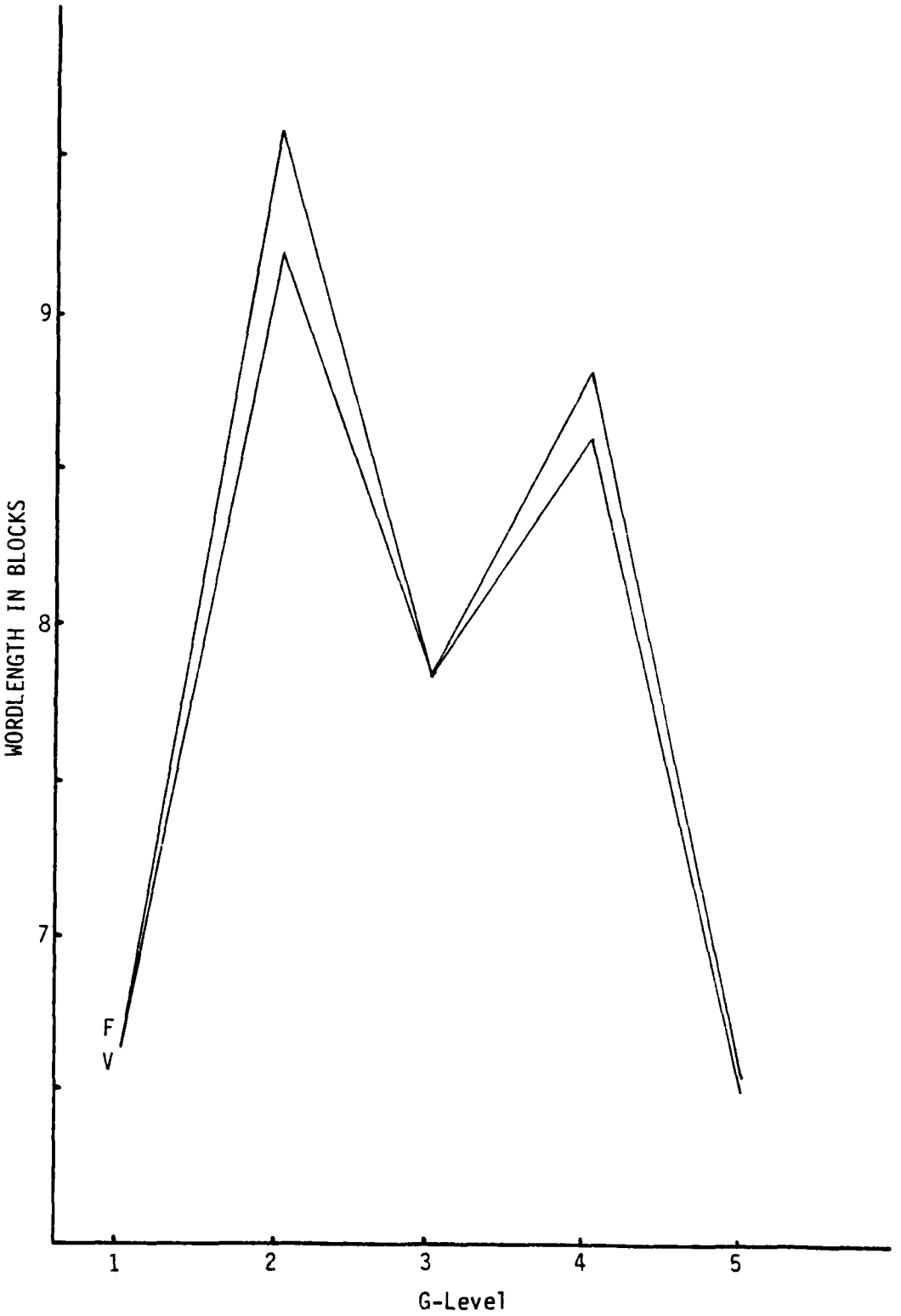


Figure 8. Wordlength Variance of '3'

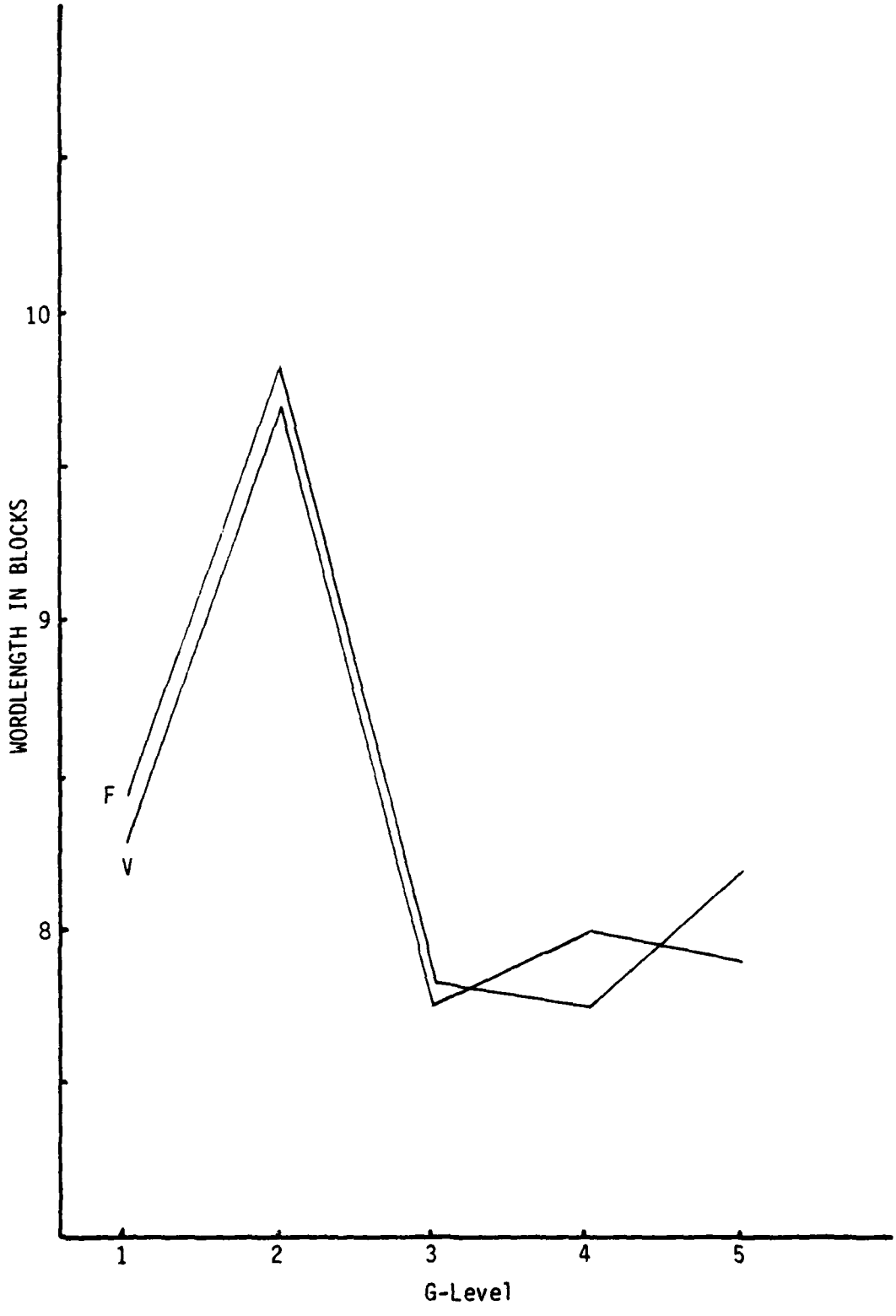


Figure 9. Wordlength Variance of '4'

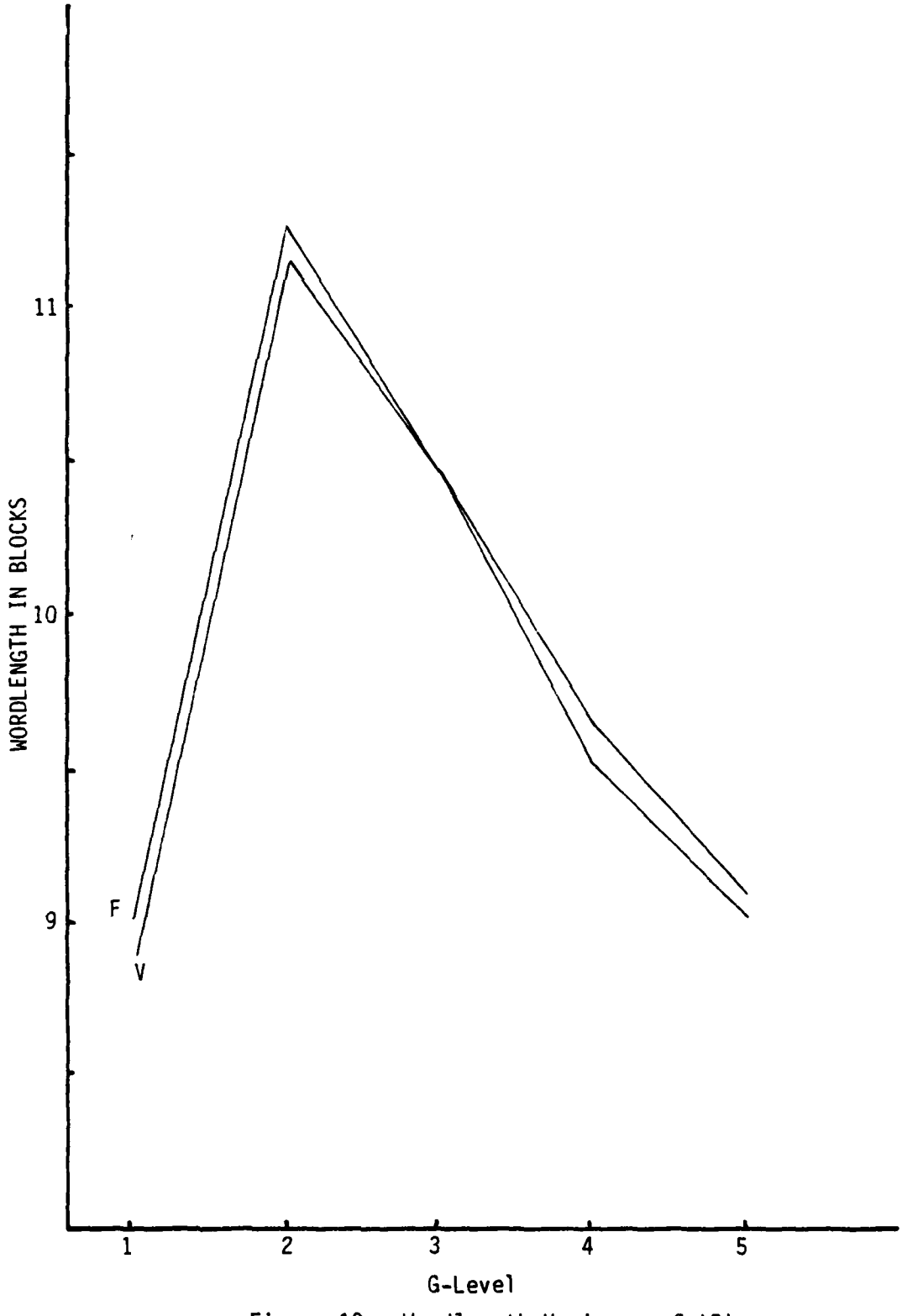


Figure 10. Wordlength Variance of '5'

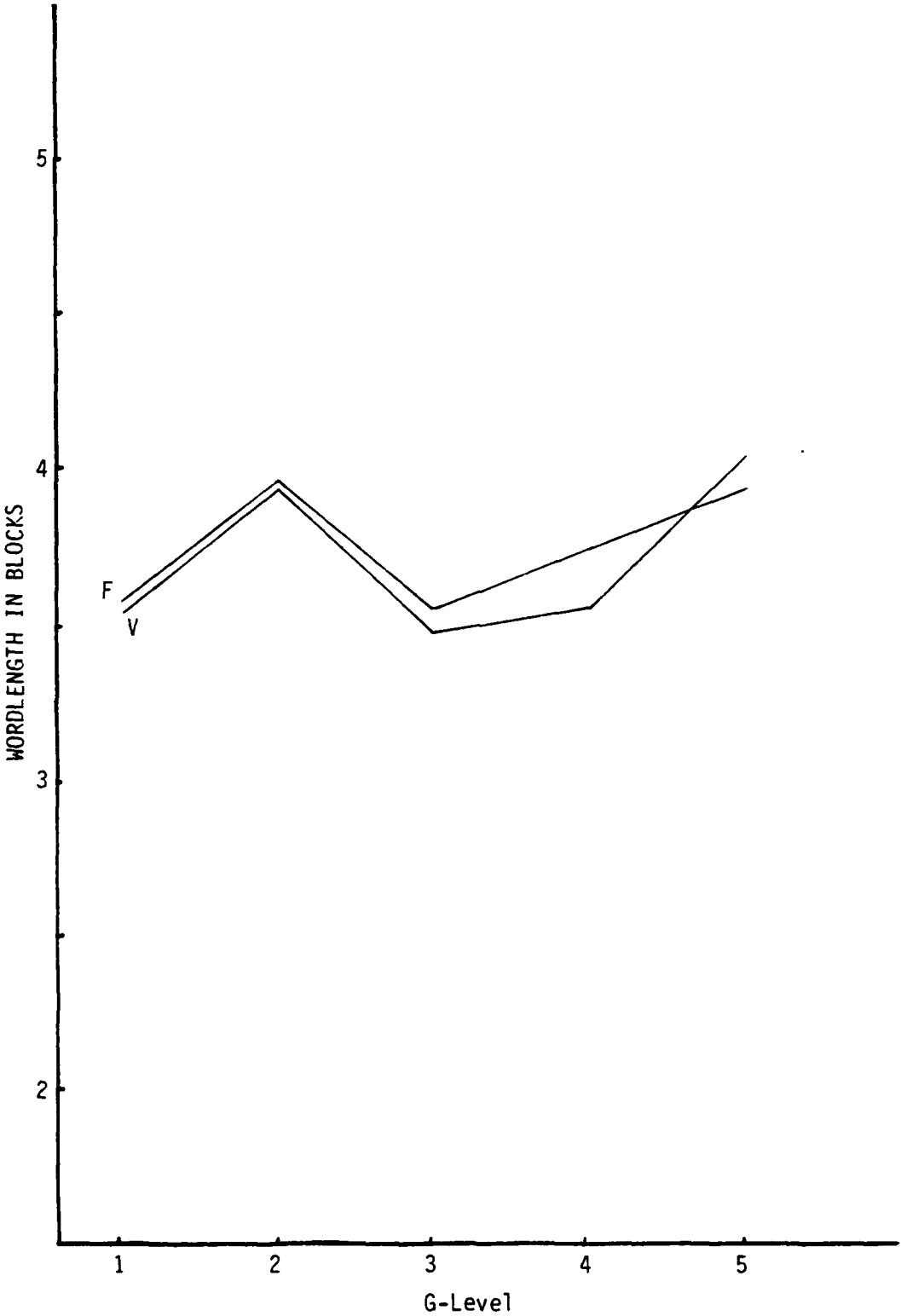


Figure 11. Wordlength Variance of '6'

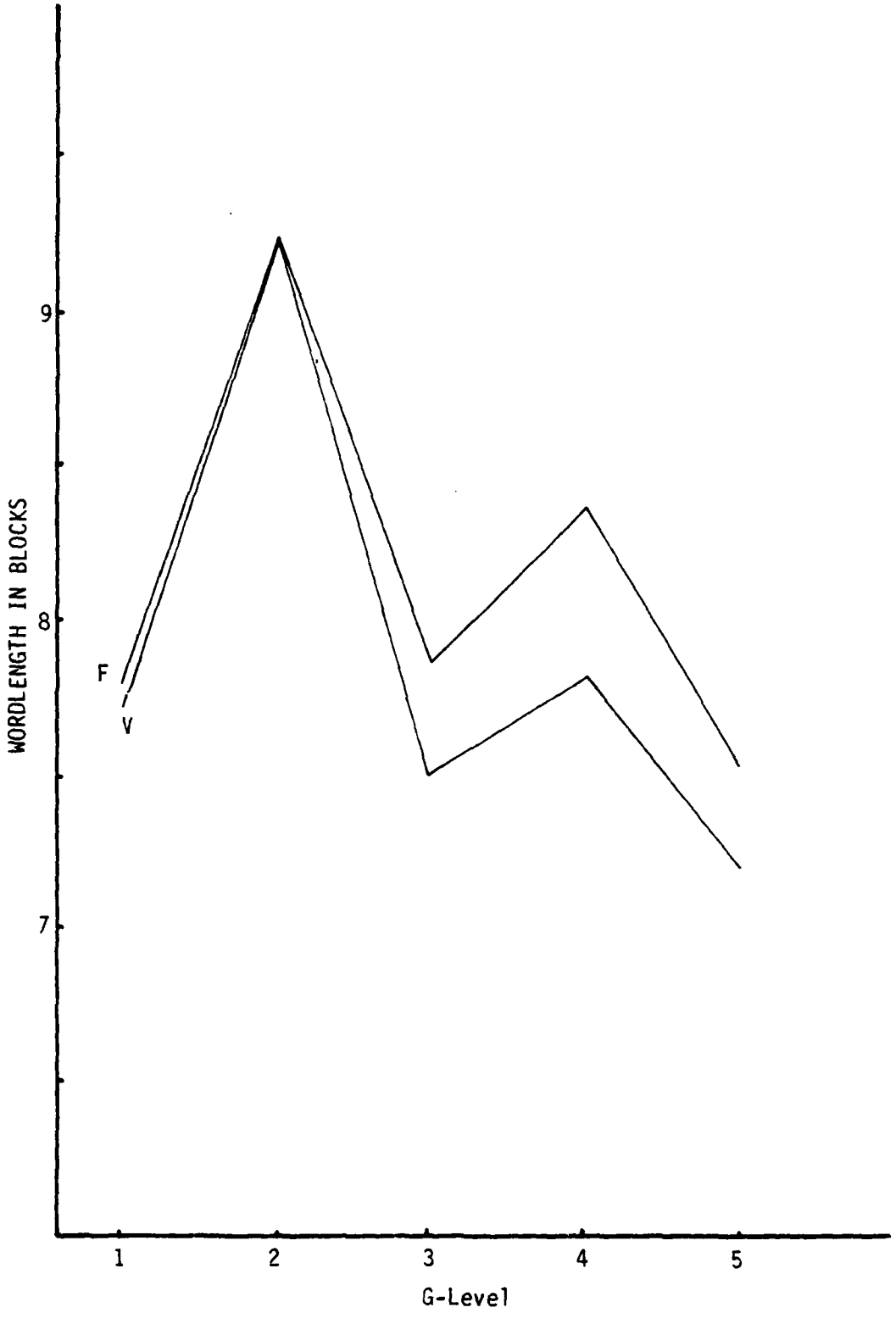


Figure 12. Wordlength Variance of '7'

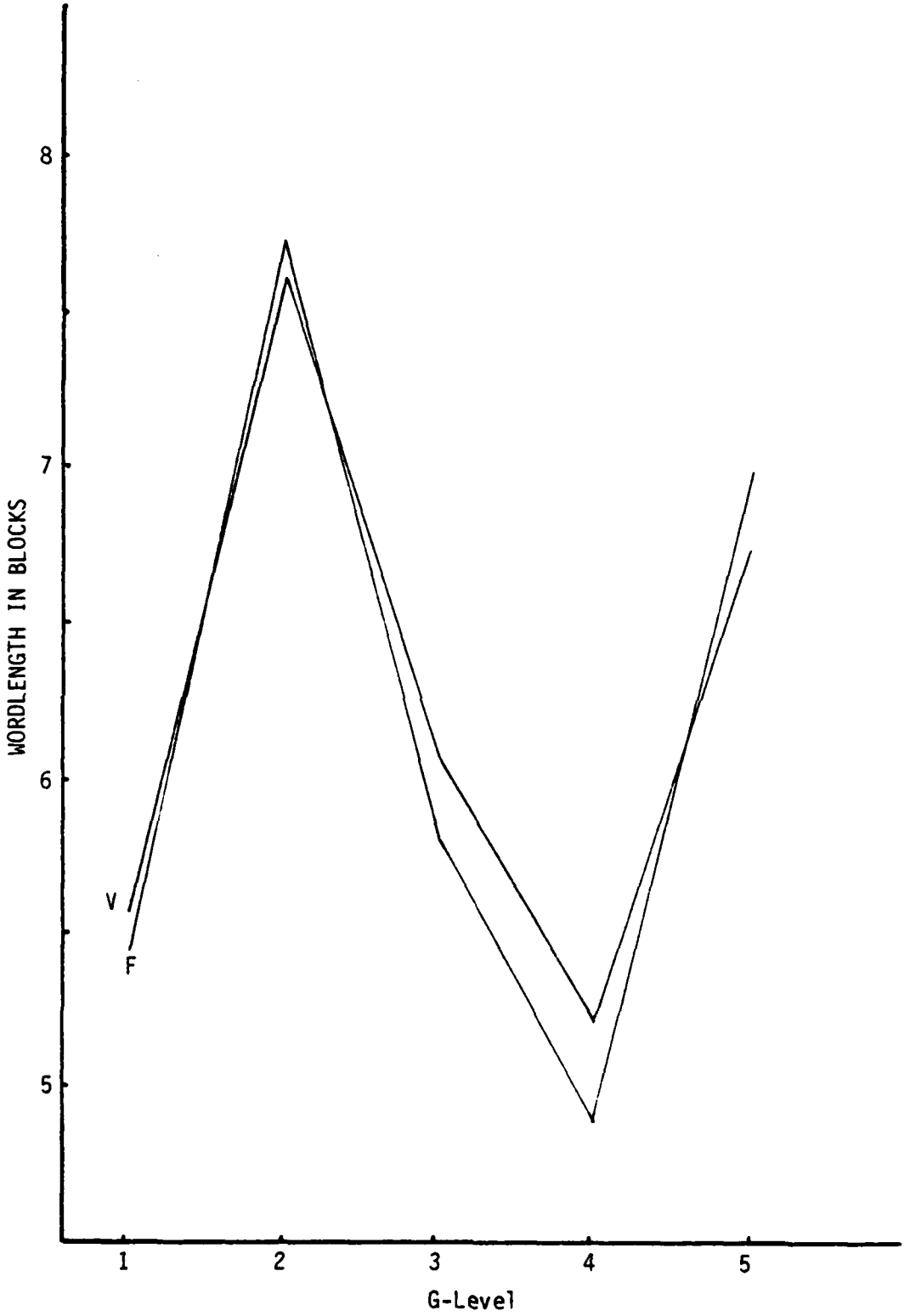


Figure 13. Wordlength Variance of '8'

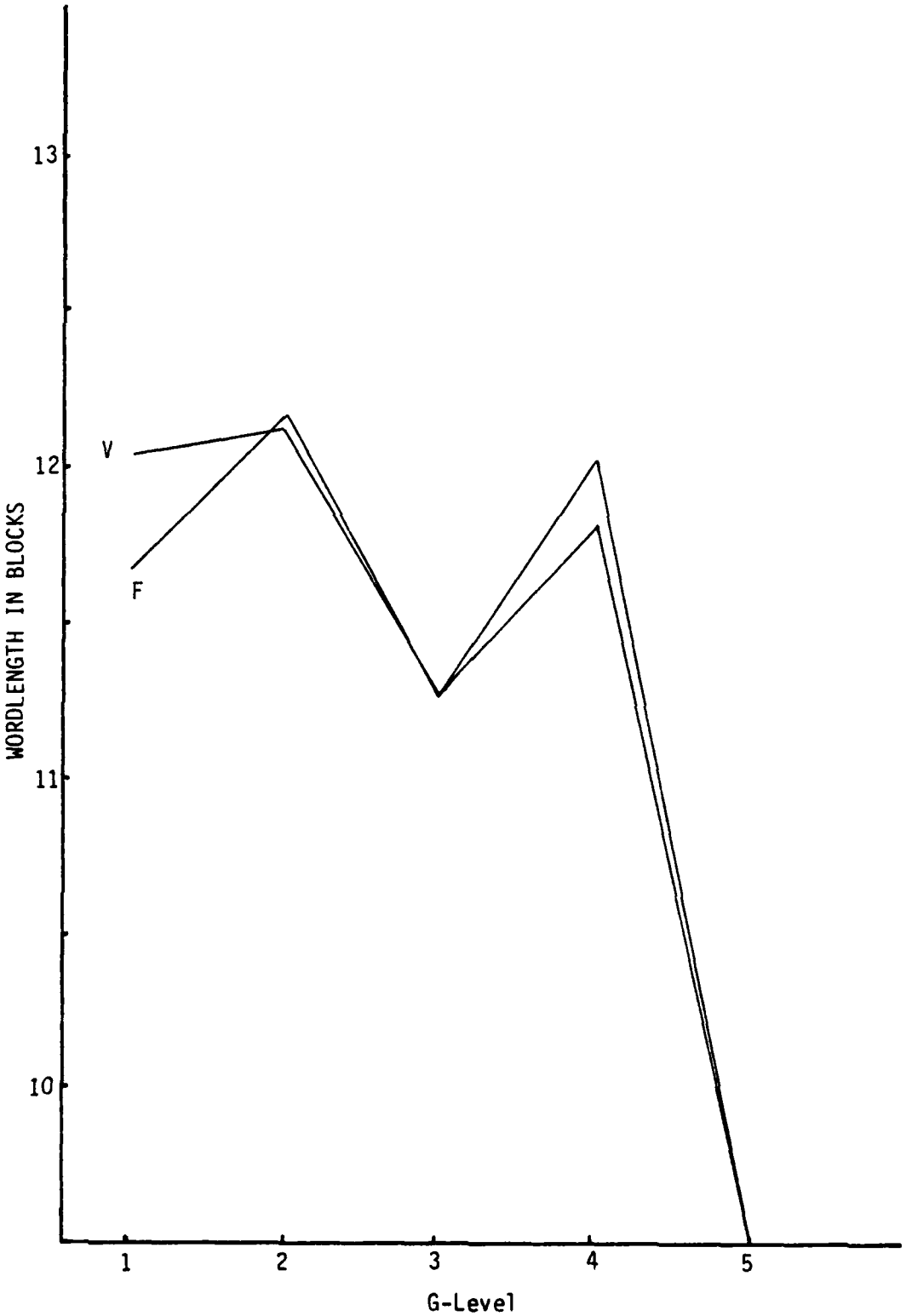


Figure 14. Wordlength Variance of '9'

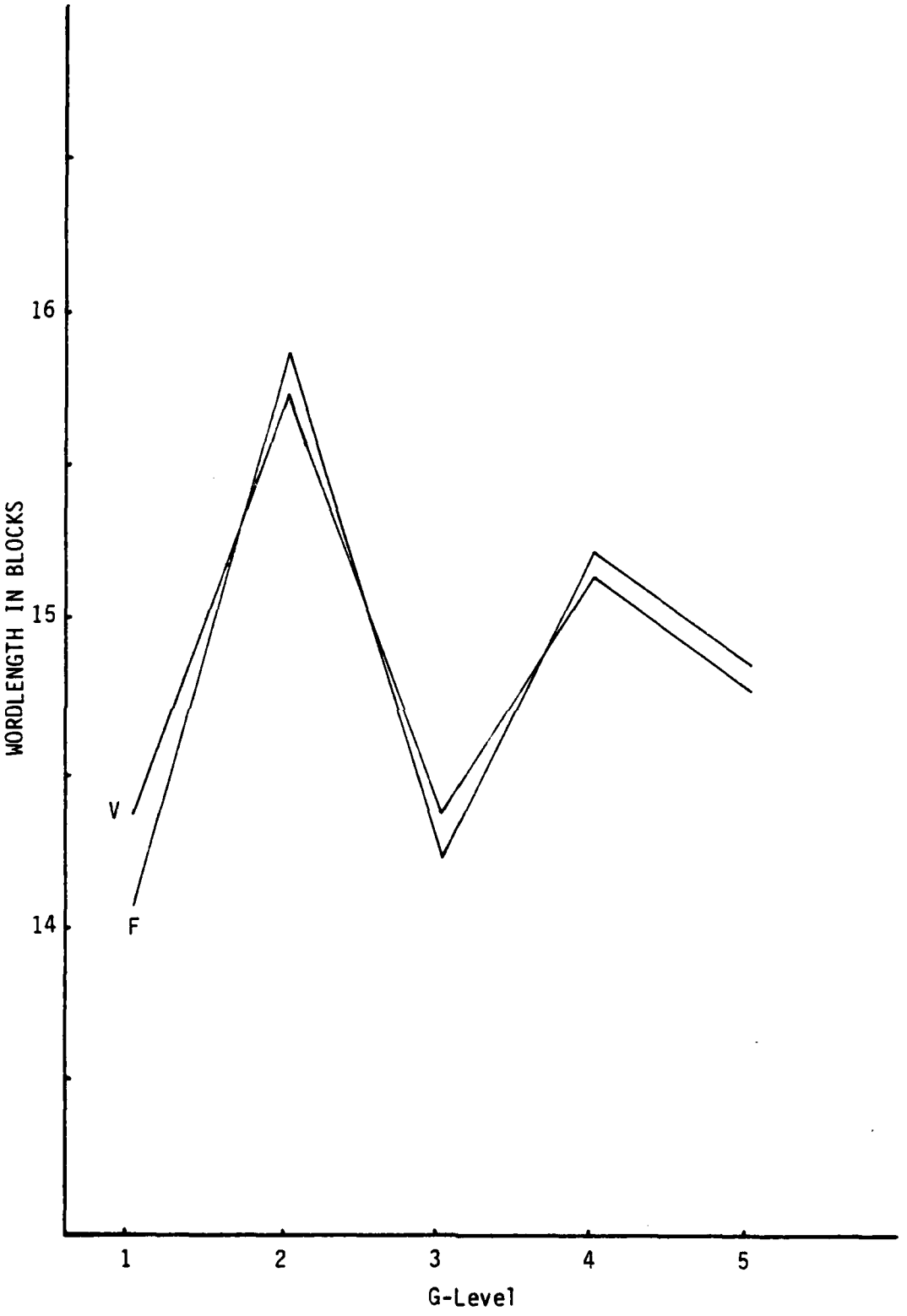


Figure 15. Wordlength Variance of 'F'

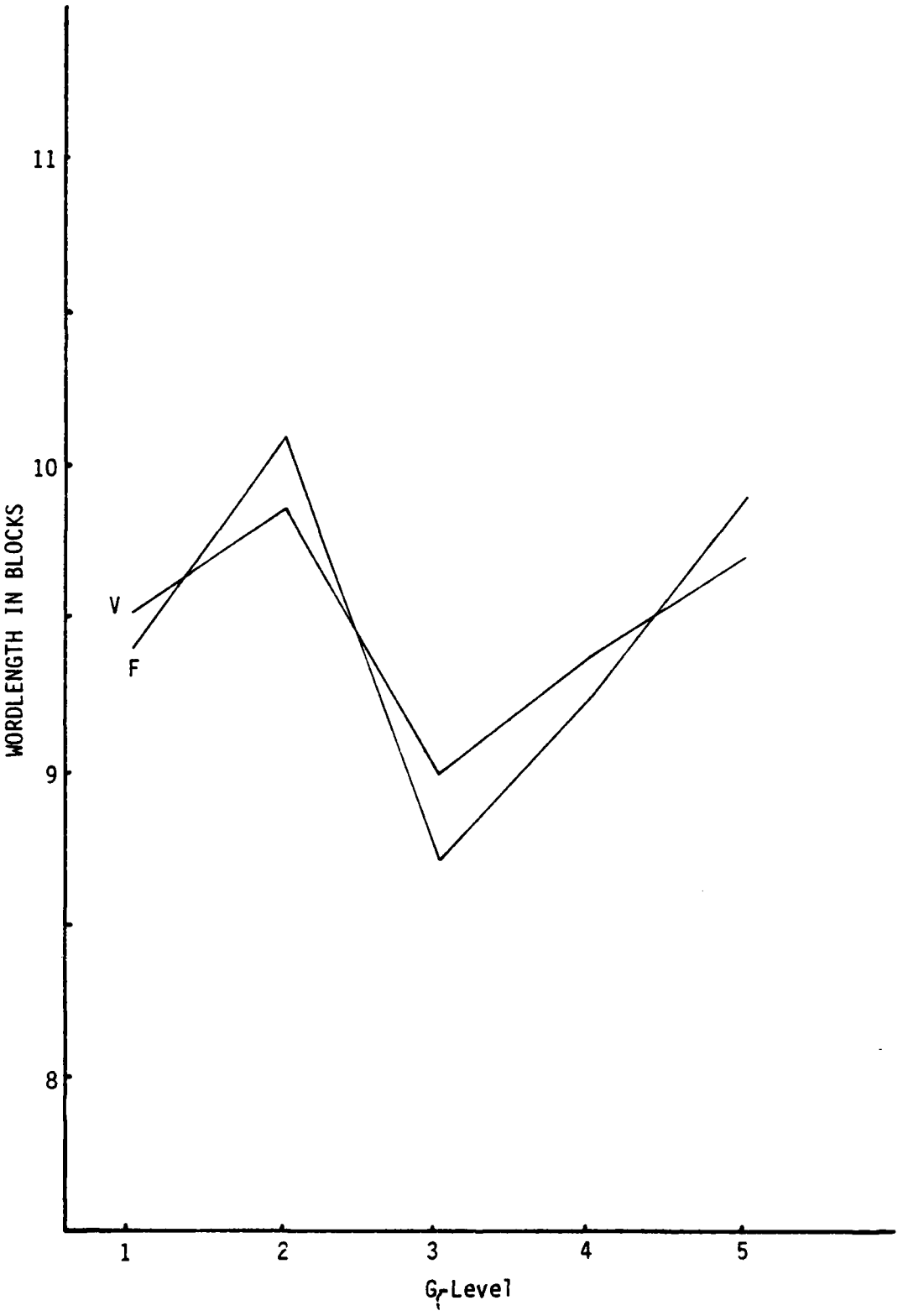


Figure 16. Wordlength Variance of 'E'

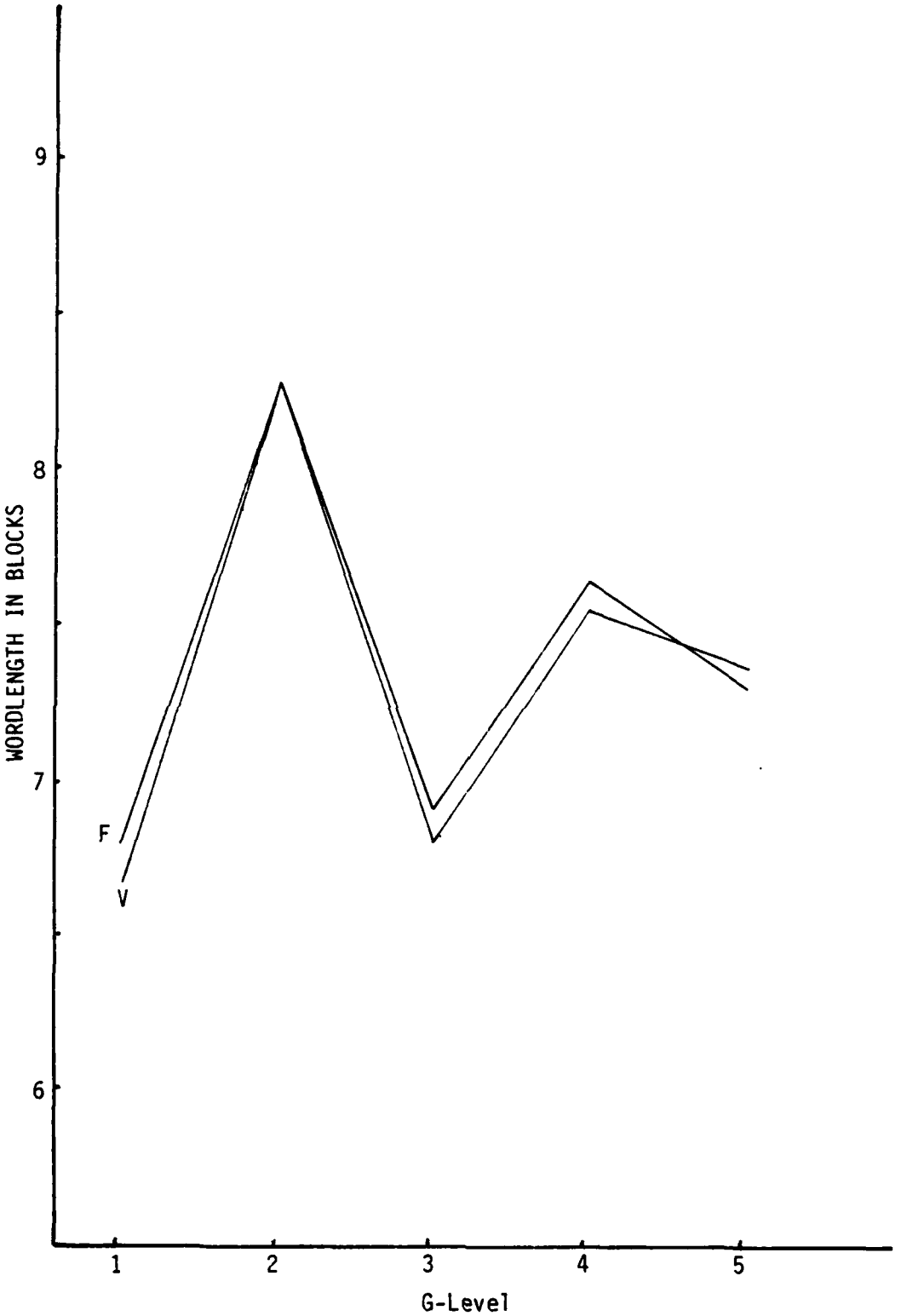


Figure 17. Wordlength Variance of 'T'

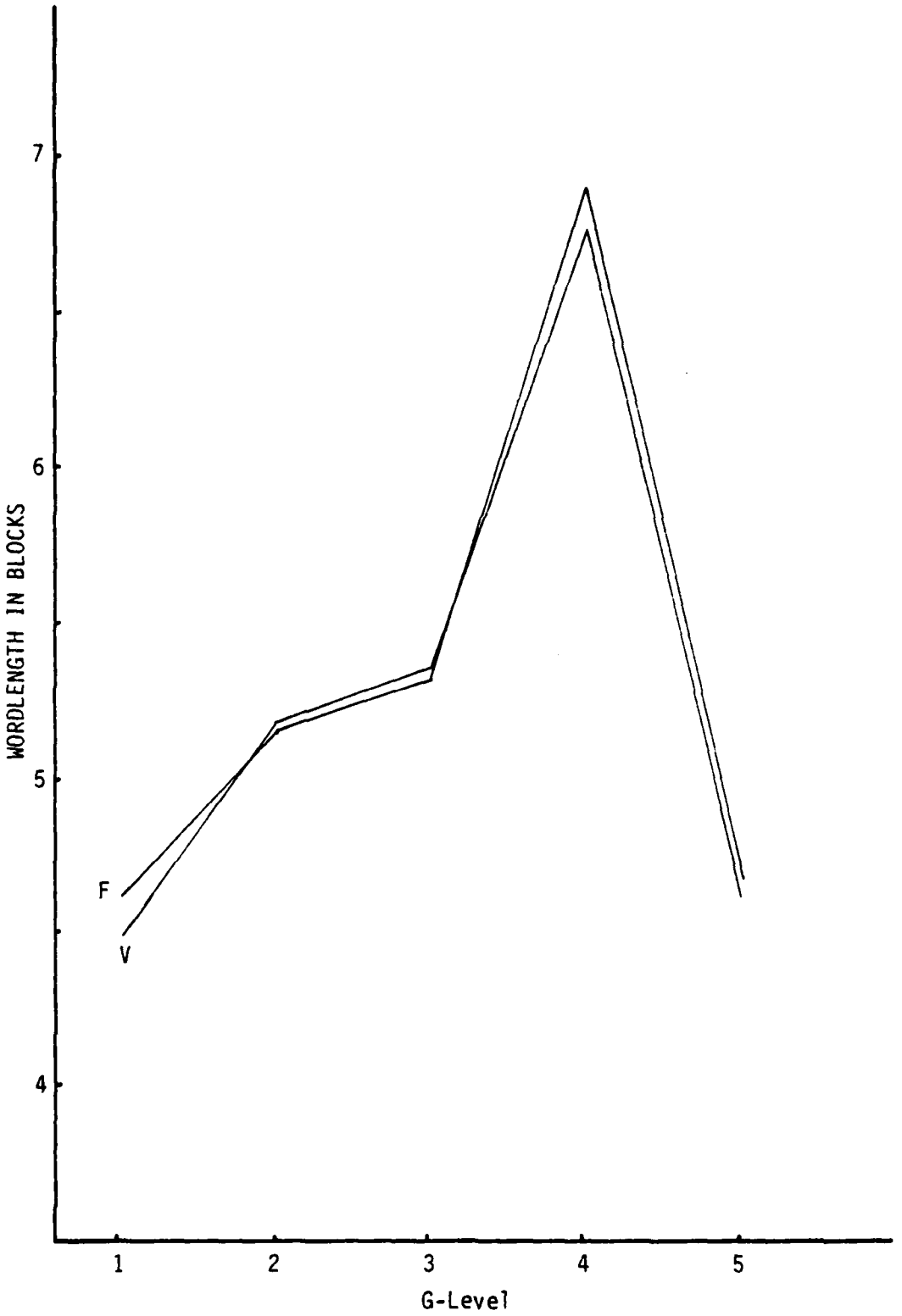


Figure 18. Wordlength Variance of 'S'

V Conclusions

Study of the 'FSTART' output (in Appendix C3) showed that, with few exceptions, the variance of a word within any single G-level was greater than the variance of that word from one G-level to another. These two variances were at best, statistically based observations, without direct mathematical correlation; therefore, there could be no meaningful comparisons. However, this result clearly showed that the uncontrolled, or unreported, variables were of greater significance and impact than the presumed control variable, which was G-level. This variance within a G-level is a good guideline for maximum word variation needed for a word recognizer. The time distortion, or energy shift along the time axis is a phenomenon of human speech--words cannot be sequentially or randomly repeated for an exact amount of time. If a time-warping function is incorporated into a word-recognition algorithm, and if it can permit up to a 200 msec wordlength variation, then the recognizer should work as well at 5G as it does at 1G, from a time-distortion consideration. Therefore, if word-recognition failures occur, they should be attributable to frequency changes.

This final analysis was based upon a data set which was a massively reduced subset of the potential processing capability of the files produced by 'FT32V'; but the categorization, for time distortion, needed no further processing on a data set which was this badly noise corrupted.

VI Recommendations

The noise level--in particular, the 60 Hz and associated harmonics--caused serious problems with obtaining the desired distortion and categorization accuracy. Although the frequency content of the speech information could be analyzed despite the noise, the voltage levels could not be accurately evaluated. This undesirable noise should have been easily eliminated. The centrifuge recordings should be reaccomplished with better quality control and test hook-up design to insure proper signal/noise ratio. Then a quality baseline could be permanently evaluated and stored in the Speech Processing Lab for future work with frequency distortion and noise corruption.

Many samples of each word are also going to be required to permit prototype construction of those words. Approximately 10 mega bytes of data was processed during this study, but no more than five utterances of any given word at a single G-level were available; many more will be required.

As stated in the Conclusions Chapter, the gravity variances should be easily accommodated by a speech recognizer which works at 1G. However, the results in this report suggests the presence of uncontrolled and unreported, data-varying, driving forces of significant magnitudes. Figure 19 shows the average wordlength of all words, which was computed from the average sum of the wordlength of all 14 words at each gravity level. These forces may be physiological, psychological, and/or environmental; for instance: time of day, time since last meal, physiological vital signs (heart rate, respiration rate, and blood pressure), amount of brain wave activity, fatigue/

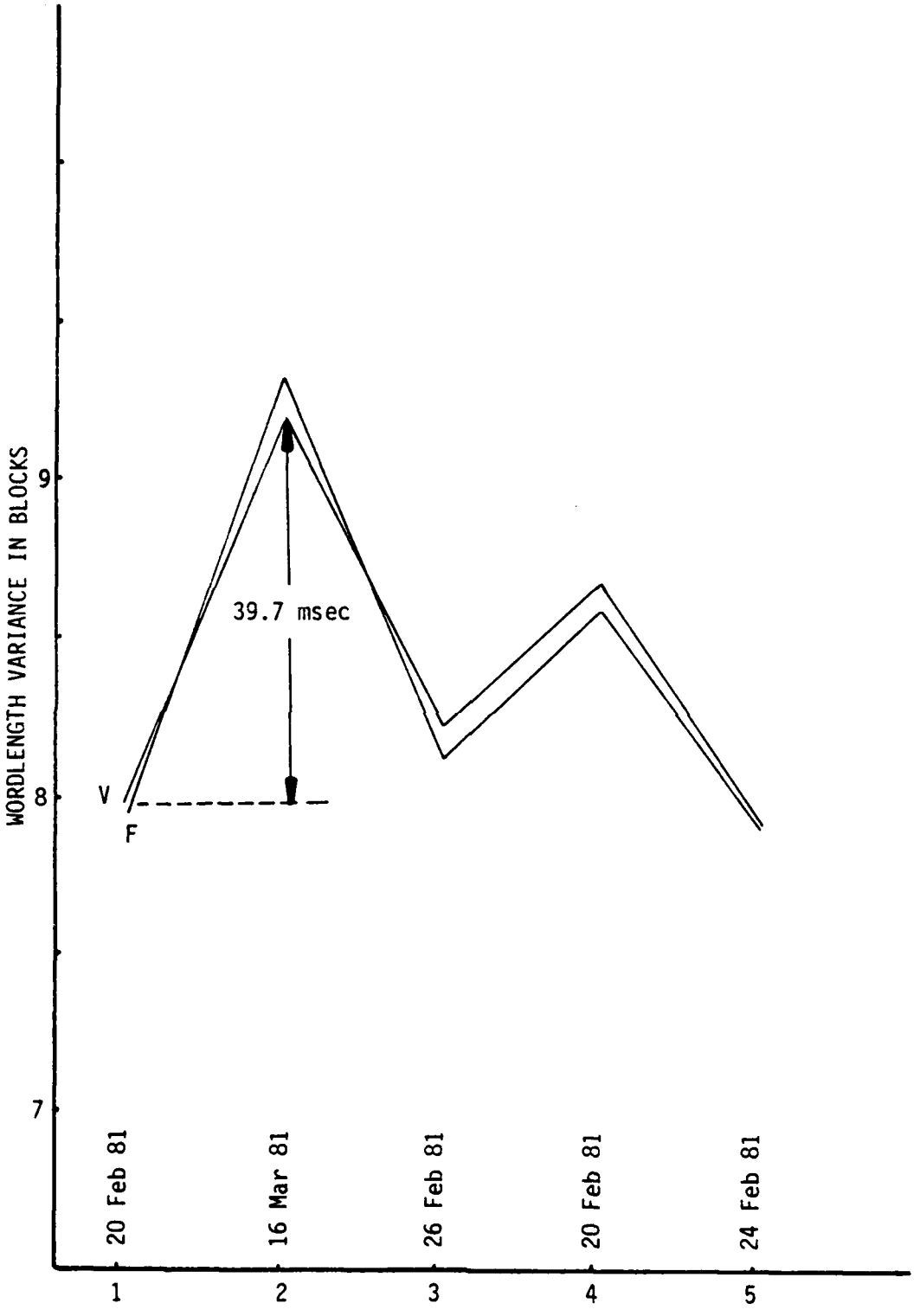


Figure 19. Average Wordlength of All Words

alertness, temperature, humidity, ambient brightness level, etc.

Further categorization of the seemingly uncorrelated results, in this report, will require extensive investigation of these biological factors. The limited set of these factors which are reportable/measurable may not be controllable; thereby, making them interesting but of no practical value. Verification of that fact would be the final testimony that the innate wordlength variance must be accepted as a normal occurrence in human speech. A suggested alternate approach would then be to perform finer gravity increments and analytically compare that data with the variance curves presented in this report.

A final note: As speech recognition techniques are studied, one cannot help but be impressed with the extreme difficulty of receiving, processing, understanding, and acting upon a spoken command--something which my three-year old does very well; but only if he wants to. If we could only machine duplicate an unmoody three-year-old!

Bibliography

1. Bergland, G. D. "A Guided Tour of the Fast Fourier Transform," IEEE Spectrum 6:41-52 (July 1969).

2. Felke, Mark A. Automatic Recognition of Phonemes in Continuous Speech. MS Thesis. Wright-Patterson AFB, Ohio: School of Engineering, AFIT, December 1980 (AFIT/GE/EE/80D-20) (This thesis is available from the Defense Document Center.)

3. Finkes, Paul F. Jr. G-Stress Effects On Speech Recognition. MS Thesis. Wright-Patterson AFB, Ohio: School of Engineering, AFIT, December 1981 (AFIT/GE/EE/81D-19) (This thesis is available from the Defense Document Center.)

4. Levine, Nadine E. Application of Discriminant Analysis Techniques to G-Stress Analysis in Computer Voice Decoding. MS Thesis. Wright-Patterson AFB, Ohio: School of Engineering, AFIT, December 1980 (AFIT/GCS/EE/80D-11) (This thesis is available from the Defense Document Center.)

5. Neyman, Ralph. Computer Identification of Phonemes in Continuous Speech. MS Thesis. Wright-Patterson AFB, Ohio: School of Engineering, AFIT, December 1976 (AFIT/GE/EE/76D-10) (This thesis is available from the Defense Document Center.)

6. Oppenheim, Alan V. and Ronald W. Schafer. Digital Signal Processing. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1975.

7. Rabiner, Lawrence and Ronald Schafer. "Digital Representation of Speech Signals," Proceedings of the IEEE, 63:662-677 (April 1975).

8. Ruth, John C. Technical director for the F16, advanced fighter division, General Dynamics, Inc., Statement made at a Seminar on Speech Processing, April 1981.

9. Sundberg, Johan. "The Acoustics of the Singing Voice," Scientific America, pg 83 (March 1977).

APPENDIX A1

APPENDIX A1 CONFIGURATION OF AUDIO EQUIPMENT

AMPEX ATR-700 TAPE RECORDER	
CONTROL NAME	SETTINGS
CH 1 (ON HEAD COVER)	REPRO
CH 2 (ON HEAD COVER)	REPRO
HEAD (ON HEAD COVER)	2T
CH 1 RECORD	SAFE
CH 2 RECORD	SAFE
SPEED	HIGH (7-1/2 IPS)
REEL	SMALL
VARI-SPEED	OFF
EDIT	OFF
CH 1 'A' RECORD LEVEL	OFF
CH 1 'B' RECORD LEVEL	OFF
CH 2 'A' RECORD LEVEL	OFF
CH 2 'B' RECORD LEVEL	OFF
RECORD EQ	1
RECORD BIAS	1
RECORD LEVEL	1
CH 1 MONITOR	TAPE
CH 2 MONITOR	TAPE
MASTER RECORD	OFF
CH 1 OUTPUT	VARIABLE (MEAN OF 8)
CH 2 OUTPUT	VARIABLE (MEAN OF 8)
HEADPHONES	PLUGGED IN
CH 1 HEADPHONE VOLUME	FULL
CH 2 HEADPHONE VOLUME	FULL
ROCKLAND FILTER	
CONTROL NAME	SETTINGS
CUT OFF FREQ	4.00 X 1k
ØdB GAIN/20dB GAIN	ØdB
FLAT AMPL/FLAT DELAY	FLAT AMPL
HI PASS/LO PASS	LO PASS
(BOTH CHANNELS HAVE THE SAME SETTING)	
CROWN AMPLIFIER D75/ATTENUATOR	
CONTROL NAME	SETTINGS
VOLUME CONTROLS SET AS NEEDED	
ATTENUATOR	ALL SET TO 'Ø'

APPENDIX A2

FILES	SUBJECT	G-LVL	WORD	TAPE
C03T01	SUBJECT-C	1.4G'S	'0'	TAPE 3
C03T02	SUBJECT-C	1.4G'S	'0'	TAPE 3
C03T03	SUBJECT-C	1.4G'S	'0'	TAPE 3
C03T04	SUBJECT-C	1.4G'S	'0'	TAPE 3
C03T05	SUBJECT-C	1.4G'S	'0'	TAPE 3
C03T11	SUBJECT-C	1.4G'S	'1'	TAPE 3
C03T12	SUBJECT-C	1.4G'S	'1'	TAPE 3
C03T13	SUBJECT-C	1.4G'S	'1'	TAPE 3
C03T14	SUBJECT-C	1.4G'S	'1'	TAPE 3
C03T15	SUBJECT-C	1.4G'S	'1'	TAPE 3
C03T21	SUBJECT-C	1.4G'S	'2'	TAPE 3
C03T22	SUBJECT-C	1.4G'S	'2'	TAPE 3
C03T23	SUBJECT-C	1.4G'S	'2'	TAPE 3
C03T24	SUBJECT-C	1.4G'S	'2'	TAPE 3
C03T25	SUBJECT-C	1.4G'S	'2'	TAPE 3
C03T31	SUBJECT-C	1.4G'S	'3'	TAPE 3
C03T32	SUBJECT-C	1.4G'S	'3'	TAPE 3
C03T33	SUBJECT-C	1.4G'S	'3'	TAPE 3
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C03T35	SUBJECT-C	1.4G'S	'3'	TAPE 3
C03T41	SUBJECT-C	1.4G'S	'4'	TAPE 3
C03T42	SUBJECT-C	1.4G'S	'4'	TAPE 3
C03T43	SUBJECT-C	1.4G'S	'4'	TAPE 3
C03T44	SUBJECT-C	1.4G'S	'4'	TAPE 3
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C03T94	SUBJECT-C	1.4G'S	'9'	TAPE 3
C03T95	SUBJECT-C	1.4G'S	'9'	TAPE 3
C03TC1	SUBJECT-C	1.4G'S	CCIP	TAPE 3

FILES	SUBJECT	G-LVL	WORD	TAPE
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C03TC3	SUBJECT-C	1.4G'S	CCIP	TAPE 3
C03TC4	SUBJECT-C	1.4G'S	CCIP	TAPE 3
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C03TE2	SUBJECT-C	1.4G'S	ENTER	TAPE 3
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C13TF1	SUBJECT-C	2 G'S	FREQUENCY	TAPE 13
C13TF2	SUBJECT-C	2 G'S	FREQUENCY	TAPE 13
C13TF3	SUBJECT-C	2 G'S	FREQUENCY	TAPE 13
C13TF4	SUBJECT-C	2 G'S	FREQUENCY	TAPE 13
C13TF5	SUBJECT-C	2 G'S	FREQUENCY	TAPE 13
C13TS1	SUBJECT-C	2 G'S	STEP	TAPE 13
C13TS2	SUBJECT-C	2 G'S	STEP	TAPE 13
C13TS3	SUBJECT-C	2 G'S	STEP	TAPE 13
C13TS4	SUBJECT-C	2 G'S	STEP	TAPE 13
C13TS5	SUBJECT-C	2 G'S	STEP	TAPE 13
C13TT1	SUBJECT-C	2 G'S	THREAT	TAPE 13
C13TT2	SUBJECT-C	2 G'S	THREAT	TAPE 13
C13TT3	SUBJECT-C	2 G'S	THREAT	TAPE 13
C13TT4	SUBJECT-C	2 G'S	THREAT	TAPE 13
C13TT5	SUBJECT-C	2 G'S	THREAT	TAPE 13
C09T01	SUBJECT-C	3 G'S	'0'	TAPE 9
C09T02	SUBJECT-C	3 G'S	'0'	TAPE 9
C09T03	SUBJECT-C	3 G'S	'0'	TAPE 9
C09T04	SUBJECT-C	3 G'S	'0'	TAPE 9

FILES	SUBJECT	G-LVL	WORD	TAPE
C09T05	SUBJECT-C	3 G'S	'0'	TAPE 9
C09T11	SUBJECT-C	3 G'S	'1'	TAPE 9
C09T12	SUBJECT-C	3 G'S	'1'	TAPE 9
C09T13	SUBJECT-C	3 G'S	'1'	TAPE 9
C09T14	SUBJECT-C	3 G'S	'1'	TAPE 9
C09T15	SUBJECT-C	3 G'S	'1'	TAPE 9
C09T21	SUBJECT-C	3 G'S	'2'	TAPE 9
C09T22	SUBJECT-C	3 G'S	'2'	TAPE 9
C09T23	SUBJECT-C	3 G'S	'2'	TAPE 9
C09T24	SUBJECT-C	3 G'S	'2'	TAPE 9
C09T25	SUBJECT-C	3 G'S	'2'	TAPE 9
C09T31	SUBJECT-C	3 G'S	'3'	TAPE 9
C09T32	SUBJECT-C	3 G'S	'3'	TAPE 9
C09T33	SUBJECT-C	3 G'S	'3'	TAPE 9
C09T34	SUBJECT-C	3 G'S	'3'	TAPE 9
C09T35	SUBJECT-C	3 G'S	'3'	TAPE 9
C09T41	SUBJECT-C	3 G'S	'4'	TAPE 9
C09T42	SUBJECT-C	3 G'S	'4'	TAPE 9
C09T43	SUBJECT-C	3 G'S	'4'	TAPE 9
C09T44	SUBJECT-C	3 G'S	'4'	TAPE 9
C09T45	SUBJECT-C	3 G'S	'4'	TAPE 9
C09T51	SUBJECT-C	3 G'S	'5'	TAPE 9
C09T52	SUBJECT-C	3 G'S	'5'	TAPE 9
C09T53	SUBJECT-C	3 G'S	'5'	TAPE 9
C09T54	SUBJECT-C	3 G'S	'5'	TAPE 9
C09T55	SUBJECT-C	3 G'S	'5'	TAPE 9
C09T61	SUBJECT-C	3 G'S	'6'	TAPE 9
C09T62	SUBJECT-C	3 G'S	'6'	TAPE 9
C09T63	SUBJECT-C	3 G'S	'6'	TAPE 9
C09T64	SUBJECT-C	3 G'S	'6'	TAPE 9
C09T65	SUBJECT-C	3 G'S	'6'	TAPE 9
C09T71	SUBJECT-C	3 G'S	'7'	TAPE 9
C09T72	SUBJECT-C	3 G'S	'7'	TAPE 9
C09T73	SUBJECT-C	3 G'S	'7'	TAPE 9
C09T74	SUBJECT-C	3 G'S	'7'	TAPE 9
C09T75	SUBJECT-C	3 G'S	'7'	TAPE 9
C09T81	SUBJECT-C	3 G'S	'8'	TAPE 9
C09T82	SUBJECT-C	3 G'S	'8'	TAPE 9
C09T83	SUBJECT-C	3 G'S	'8'	TAPE 9
C09T84	SUBJECT-C	3 G'S	'8'	TAPE 9
C09T85	SUBJECT-C	3 G'S	'8'	TAPE 9
C09T91	SUBJECT-C	3 G'S	'9'	TAPE 9
C09T92	SUBJECT-C	3 G'S	'9'	TAPE 9
C09T93	SUBJECT-C	3 G'S	'9'	TAPE 9
C09T94	SUBJECT-C	3 G'S	'9'	TAPE 9
C09T95	SUBJECT-C	3 G'S	'9'	TAPE 9
C09TC1	SUBJECT-C	3 G'S	CCIP	TAPE 9
C09TC2	SUBJECT-C	3 G'S	CCIP	TAPE 9
C09TC3	SUBJECT-C	3 G'S	CCIP	TAPE 9
C09TC4	SUBJECT-C	3 G'S	CCIP	TAPE 9
C09TC5	SUBJECT-C	3 G'S	CCIP	TAPE 9

FILES	SUBJECT	G-LVL	WORD	TAPE
C09TE1	SUBJECT-C	3 G'S	ENTER	TAPE 9
C09TE2	SUBJECT-C	3 G'S	ENTER	TAPE 9
C09TE3	SUBJECT-C	3 G'S	ENTER	TAPE 9
C09TE4	SUBJECT-C	3 G'S	ENTER	TAPE 9
C09TE5	SUBJECT-C	3 G'S	ENTER	TAPE 9
C09TF1	SUBJECT-C	3 G'S	FREQUENCY	TAPE 9
C09TF2	SUBJECT-C	3 G'S	FREQUENCY	TAPE 9
C09TF3	SUBJECT-C	3 G'S	FREQUENCY	TAPE 9
C09TF4	SUBJECT-C	3 G'S	FREQUENCY	TAPE 9
C09TF5	SUBJECT-C	3 G'S	FREQUENCY	TAPE 9
C09TS1	SUBJECT-C	3 G'S	STEP	TAPE 9
C09TS2	SUBJECT-C	3 G'S	STEP	TAPE 9
C09TS3	SUBJECT-C	3 G'S	STEP	TAPE 9
C09TS4	SUBJECT-C	3 G'S	STEP	TAPE 9
C09TS5	SUBJECT-C	3 G'S	STEP	TAPE 9
C09TT1	SUBJECT-C	3 G'S	THREAT	TAPE 9
C09TT2	SUBJECT-C	3 G'S	THREAT	TAPE 9
C09TT3	SUBJECT-C	3 G'S	THREAT	TAPE 9
C09TT4	SUBJECT-C	3 G'S	THREAT	TAPE 9
C09TT5	SUBJECT-C	3 G'S	THREAT	TAPE 9
C04128	SUBJECT-C	4 G'S	'0'	TAPE 4
C04136	SUBJECT-C	4 G'S	'0'	TAPE 4
C04226	SUBJECT-C	4 G'S	'0'	TAPE 4
C04255	SUBJECT-C	4 G'S	'0'	TAPE 4
C04121	SUBJECT-C	4 G'S	'1'	TAPE 4
C04146	SUBJECT-C	4 G'S	'1'	TAPE 4
C04217	SUBJECT-C	4 G'S	'1'	TAPE 4
C04224	SUBJECT-C	4 G'S	'1'	TAPE 4
C04247	SUBJECT-C	4 G'S	'1'	TAPE 4
C04132	SUBJECT-C	4 G'S	'2'	TAPE 4
C04151	SUBJECT-C	4 G'S	'2'	TAPE 4
C04231	SUBJECT-C	4 G'S	'2'	TAPE 4
C04244	SUBJECT-C	4 G'S	'2'	TAPE 4
C04113	SUBJECT-C	4 G'S	'3'	TAPE 4
C04123	SUBJECT-C	4 G'S	'3'	TAPE 4
C04142	SUBJECT-C	4 G'S	'3'	TAPE 4
C04236	SUBJECT-C	4 G'S	'3'	TAPE 4
C04252	SUBJECT-C	4 G'S	'3'	TAPE 4
C04122	SUBJECT-C	4 G'S	'4'	TAPE 4
C04148	SUBJECT-C	4 G'S	'4'	TAPE 4
C04226	SUBJECT-C	4 G'S	'4'	TAPE 4
C04254	SUBJECT-C	4 G'S	'4'	TAPE 4
C04116	SUBJECT-C	4 G'S	'5'	TAPE 4
C04127	SUBJECT-C	4 G'S	'5'	TAPE 4
C04143	SUBJECT-C	4 G'S	'5'	TAPE 4
C04214	SUBJECT-C	4 G'S	'5'	TAPE 4
C04235	SUBJECT-C	4 G'S	'5'	TAPE 4
C04245	SUBJECT-C	4 G'S	'5'	TAPE 4
C04115	SUBJECT-C	4 G'S	'6'	TAPE 4
C04125	SUBJECT-C	4 G'S	'6'	TAPE 4
C04141	SUBJECT-C	4 G'S	'6'	TAPE 4

FILES	SUBJECT	G-LVL	WORD	TAPE
C04233	SUBJECT-C	4 G'S	'5'	TAPE 4
C04242	SUBJECT-C	4 G'S	'6'	TAPE 4
C04125	SUBJECT-C	4 G'S	'7'	TAPE 4
C04145	SUBJECT-C	4 G'S	'7'	TAPE 4
C04222	SUBJECT-C	4 G'S	'7'	TAPE 4
C04256	SUBJECT-C	4 G'S	'7'	TAPE 4
C04111	SUBJECT-C	4 G'S	'8'	TAPE 4
C04136	SUBJECT-C	4 G'S	'8'	TAPE 4
C04144	SUBJECT-C	4 G'S	'8'	TAPE 4
C04227	SUBJECT-C	4 G'S	'8'	TAPE 4
C04240	SUBJECT-C	4 G'S	'0'	TAPE 4
C04137	SUBJECT-C	4 G'S	'9'	TAPE 4
C04155	SUBJECT-C	4 G'S	'9'	TAPE 4
C04212	SUBJECT-C	4 G'S	'9'	TAPE 4
C04221	SUBJECT-C	4 G'S	'9'	TAPE 4
C04241	SUBJECT-C	4 G'S	'9'	TAPE 4
C04131	SUBJECT-C	4 G'S	CCIP	TAPE 4
C04155	SUBJECT-C	4 G'S	CCIP	TAPE 4
C04215	SUBJECT-C	4 G'S	CCIP	TAPE 4
C04237	SUBJECT-C	4 G'S	CCIP	TAPE 4
C04243	SUBJECT-C	4 G'S	CCIP	TAPE 4
C04114	SUBJECT-C	4 G'S	ENTER	TAPE 4
C04134	SUBJECT-C	4 G'S	ENTER	TAPE 4
C04147	SUBJECT-C	4 G'S	ENTER	TAPE 4
C04225	SUBJECT-C	4 G'S	ENTER	TAPE 4
C04257	SUBJECT-C	4 G'S	ENTER	TAPE 4
C04117	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04133	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04152	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04213	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04223	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04253	SUBJECT-C	4 G'S	FREQUENCY	TAPE 4
C04135	SUBJECT-C	4 G'S	STEP	TAPE 4
C04154	SUBJECT-C	4 G'S	STEP	TAPE 4
C04211	SUBJECT-C	4 G'S	STEP	TAPE 4
C04232	SUBJECT-C	4 G'S	STEP	TAPE 4
C04251	SUBJECT-C	4 G'S	STEP	TAPE 4
C04112	SUBJECT-C	4 G'S	THREAT	TAPE 4
C04124	SUBJECT-C	4 G'S	THREAT	TAPE 4
C04157	SUBJECT-C	4 G'S	THREAT	TAPE 4
C04216	SUBJECT-C	4 G'S	THREAT	TAPE 4
C04234	SUBJECT-C	4 G'S	THREAT	TAPE 4
C04246	SUBJECT-C	4 G'S	THREAT	TAPE 4
C08T01	SUBJECT-C	5 G'S	'0'	TAPE 8
C08T02	SUBJECT-C	5 G'S	'0'	TAPE 8
C08T03	SUBJECT-C	5 G'S	'0'	TAPE 8
C08T04	SUBJECT-C	5 G'S	'0'	TAPE 8
C08T05	SUBJECT-C	5 G'S	'0'	TAPE 8
C08T11	SUBJECT-C	5 G'S	'1'	TAPE 8
C08T12	SUBJECT-C	5 G'S	'1'	TAPE 8
C08T13	SUBJECT-C	5 G'S	'1'	TAPE 8

FILES	SUBJECT	G-LVL	MODE	TAPE
C0CT14	SUBJECT-C	5 G'S	'1'	TAPE
C0CT15	SUBJECT-C	5 G'S	'1'	TAPE
C0CT21	SUBJECT-C	5 G'S	'2'	TAPE
C0CT22	SUBJECT-C	5 G'S	'2'	TAPE
C0CT23	SUBJECT-C	5 G'S	'2'	TAPE
C0CT24	SUBJECT-C	5 G'S	'2'	TAPE
C0CT25	SUBJECT-C	5 G'S	'2'	TAPE
C0CT31	SUBJECT-C	5 G'S	'3'	TAPE
C0CT32	SUBJECT-C	5 G'S	'3'	TAPE
C0CT33	SUBJECT-C	5 G'S	'3'	TAPE
C0CT34	SUBJECT-C	5 G'S	'3'	TAPE
C0CT35	SUBJECT-C	5 G'S	'3'	TAPE
C0CT41	SUBJECT-C	5 G'S	'4'	TAPE
C0CT42	SUBJECT-C	5 G'S	'4'	TAPE
C0CT43	SUBJECT-C	5 G'S	'4'	TAPE
C0CT44	SUBJECT-C	5 G'S	'4'	TAPE
C0CT45	SUBJECT-C	5 G'S	'4'	TAPE
C0CT51	SUBJECT-C	5 G'S	'5'	TAPE
C0CT52	SUBJECT-C	5 G'S	'5'	TAPE
C0CT53	SUBJECT-C	5 G'S	'5'	TAPE
C0CT54	SUBJECT-C	5 G'S	'5'	TAPE
C0CT55	SUBJECT-C	5 G'S	'5'	TAPE
C0CT61	SUBJECT-C	5 G'S	'6'	TAPE
C0CT62	SUBJECT-C	5 G'S	'6'	TAPE
C0CT63	SUBJECT-C	5 G'S	'6'	TAPE
C0CT64	SUBJECT-C	5 G'S	'6'	TAPE
C0CT65	SUBJECT-C	5 G'S	'6'	TAPE
C0CT71	SUBJECT-C	5 G'S	'7'	TAPE
C0CT72	SUBJECT-C	5 G'S	'7'	TAPE
C0CT73	SUBJECT-C	5 G'S	'7'	TAPE
C0CT74	SUBJECT-C	5 G'S	'7'	TAPE
C0CT75	SUBJECT-C	5 G'S	'7'	TAPE
C0CT81	SUBJECT-C	5 G'S	'8'**	TAPE
C0CT82	SUBJECT-C	5 G'S	'8'**	TAPE
C0CT83	SUBJECT-C	5 G'S	'8'**	TAPE
C0CT84	SUBJECT-C	5 G'S	'8'**	TAPE
C0CT85	SUBJECT-C	5 G'S	'8'**	TAPE
C0CT91	SUBJECT-C	5 G'S	'9'	TAPE
C0CT92	SUBJECT-C	5 G'S	'9'	TAPE
C0CT93	SUBJECT-C	5 G'S	'9'	TAPE
C0CT94	SUBJECT-C	5 G'S	'9'	TAPE
C0CT95	SUBJECT-C	5 G'S	'9'	TAPE
C0CTC1	SUBJECT-C	5 G'S	CCIP	TAPE
C0CTC2	SUBJECT-C	5 G'S	CCIP	TAPE
C0CTC3	SUBJECT-C	5 G'S	CCIP	TAPE
C0CTC4	SUBJECT-C	5 G'S	CCIP	TAPE
C0CTC5	SUBJECT-C	5 G'S	CCIP	TAPE
C0CTE1	SUBJECT-C	5 G'S	ENTER	TAPE
C0CTE2	SUBJECT-C	5 G'S	ENTER	TAPE
C0CTE3	SUBJECT-C	5 G'S	ENTER	TAPE
C0CTE4	SUBJECT-C	5 G'S	ENTER	TAPE

FILES	SUBJECT	G-LVL	WORD	TAPE
C08TE5	SUBJECT-C	5 G'S	ENTER	TAPE 8
C08TF1	SUBJECT-C	5 G'S	FREQUENCY	TAPE 8
C08TF2	SUBJECT-C	5 G'S	FREQUENCY	TAPE 8
C08TF3	SUBJECT-C	5 G'S	FREQUENCY	TAPE 8
C08TF4	SUBJECT-C	5 G'S	FREQUENCY	TAPE 8
C08TF5	SUBJECT-C	5 G'S	FREQUENCY	TAPE 8
C08TS1	SUBJECT-C	5 G'S	STEP	TAPE 8
C08TS2	SUBJECT-C	5 G'S	STEP	TAPE 8
C08TS3	SUBJECT-C	5 G'S	STEP	TAPE 8
C08TS4	SUBJECT-C	5 G'S	STEP	TAPE 8
C08TS5	SUBJECT-C	5 G'S	STEP	TAPE 8
C08TT1	SUBJECT-C	5 G'S	THREAT	TAPE 8
C08TT2	SUBJECT-C	5 G'S	THREAT	TAPE 8
C08TT3	SUBJECT-C	5 G'S	THREAT	TAPE 8
C08TT4	SUBJECT-C	5 G'S	THREAT	TAPE 8
C08TT5	SUBJECT-C	5 G'S	THREAT	TAPE 8
C12T01	SUBJECT-C	6 G'S	'0'	TAPE 12
C12T02	SUBJECT-C	6 G'S	'0'	TAPE 12
C12T03	SUBJECT-C	6 G'S	'0'	TAPE 12
C12T04	SUBJECT-C	6 G'S	'0'	TAPE 12
C12T05	SUBJECT-C	6 G'S	'0'	TAPE 12
C12T11	SUBJECT-C	6 G'S	'1'	TAPE 12
C12T12	SUBJECT-C	6 G'S	'1'	TAPE 12
C12T13	SUBJECT-C	6 G'S	'1'	TAPE 12
C12T14	SUBJECT-C	6 G'S	'1'	TAPE 12
C12T15	SUBJECT-C	6 G'S	'1'	TAPE 12
C12T21	SUBJECT-C	6 G'S	'2'	TAPE 12
C12T22	SUBJECT-C	6 G'S	'2'	TAPE 12
C12T23	SUBJECT-C	6 G'S	'2'	TAPE 12
C12T24	SUBJECT-C	6 G'S	'2'	TAPE 12
C12T25	SUBJECT-C	6 G'S	'2'	TAPE 12
C12T31	SUBJECT-C	6 G'S	'3'	TAPE 12
C12T32	SUBJECT-C	6 G'S	'3'	TAPE 12
C12T33	SUBJECT-C	6 G'S	'3'	TAPE 12
C12T34	SUBJECT-C	6 G'S	'3'	TAPE 12
C12T35	SUBJECT-C	6 G'S	'3'	TAPE 12
C12T41	SUBJECT-C	6 G'S	'4'	TAPE 12
C12T42	SUBJECT-C	6 G'S	'4'	TAPE 12
C12T43	SUBJECT-C	6 G'S	'4'	TAPE 12
C12T44	SUBJECT-C	6 G'S	'4'	TAPE 12
C12T45	SUBJECT-C	6 G'S	'4'	TAPE 12
C12T51	SUBJECT-C	6 G'S	'5'	TAPE 12
C12T52	SUBJECT-C	6 G'S	'5'	TAPE 12
C12T53	SUBJECT-C	6 G'S	'5'	TAPE 12
C12T54	SUBJECT-C	6 G'S	'5'	TAPE 12
C12T55	SUBJECT-C	6 G'S	'5'	TAPE 12
C12T61	SUBJECT-C	6 G'S	'6'	TAPE 12
C12T62	SUBJECT-C	6 G'S	'6'	TAPE 12
C12T63	SUBJECT-C	6 G'S	'6'	TAPE 12
C12T64	SUBJECT-C	6 G'S	'6'	TAPE 12
C12T65	SUBJECT-C	6 G'S	'6'	TAPE 12

FILES	SUBJECT	G-LVL	WORD	TAPE
C12T71	SUBJECT-C	6 G'S	'7'	TAPE 12
C12T72	SUBJECT-C	6 G'S	'7'	TAPE 12
C12T73	SUBJECT-C	6 G'S	'7'	TAPE 12
C12T74	SUBJECT-C	6 G'S	'7'	TAPE 12
C12T75	SUBJECT-C	6 G'S	'7'	TAPE 12
C12T81	SUBJECT-C	6 G'S	'8'	TAPE 12
C12T82	SUBJECT-C	6 G'S	'8'	TAPE 12
C12T83	SUBJECT-C	6 G'S	'8'	TAPE 12
C12T84	SUBJECT-C	6 G'S	'8'	TAPE 12
C12T85	SUBJECT-C	6 G'S	'8'	TAPE 12
C12T91	SUBJECT-C	6 G'S	'9'	TAPE 12
C12T92	SUBJECT-C	6 G'S	'9'	TAPE 12
C12T93	SUBJECT-C	6 G'S	'9'	TAPE 12
C12T94	SUBJECT-C	6 G'S	'9'	TAPE 12
C12T95	SUBJECT-C	6 G'S	'9'	TAPE 12
C12TC1	SUBJECT-C	6 G'S	CCIP	TAPE 12
C12TC2	SUBJECT-C	6 G'S	CCIP	TAPE 12
C12TC3	SUBJECT-C	6 G'S	CCIP	TAPE 12
C12TC4	SUBJECT-C	6 G'S	CCIP	TAPE 12
C12TC5	SUBJECT-C	6 G'S	CCIP	TAPE 12
C12TE1	SUBJECT-C	6 G'S	ENTER	TAPE 12
C12TE2	SUBJECT-C	6 G'S	ENTER	TAPE 12
C12TE3	SUBJECT-C	6 G'S	ENTER	TAPE 12
C12TE4	SUBJECT-C	6 G'S	ENTER	TAPE 12
C12TE5	SUBJECT-C	6 G'S	ENTER	TAPE 12
C12TF1	SUBJECT-C	6 G'S	FREQUENCY	TAPE 12
C12TF2	SUBJECT-C	6 G'S	FREQUENCY	TAPE 12
C12TF3	SUBJECT-C	6 G'S	FREQUENCY	TAPE 12
C12TF4	SUBJECT-C	6 G'S	FREQUENCY	TAPE 12
C12TF5	SUBJECT-C	6 G'S	FREQUENCY	TAPE 12
C12TS1	SUBJECT-C	6 G'S	STEP	TAPE 12
C12TS2	SUBJECT-C	6 G'S	STEP	TAPE 12
C12TS3	SUBJECT-C	6 G'S	STEP	TAPE 12
C12TS4	SUBJECT-C	6 G'S	STEP	TAPE 12
C12TS5	SUBJECT-C	6 G'S	STEP	TAPE 12
C12TT1	SUBJECT-C	6 G'S	THREAT	TAPE 12
C12TT2	SUBJECT-C	6 G'S	THREAT	TAPE 12
C12TT3	SUBJECT-C	6 G'S	THREAT	TAPE 12
C12TT4	SUBJECT-C	6 G'S	THREAT	TAPE 12
C12TT5	SUBJECT-C	6 G'S	THREAT	TAPE 12

* BAD TAPE RECORDING?
** DOES NOT SOUND LIKE '8'
*** WRONG SEQUENCE

APPENDIX A3

TAPE #	G-LEVEL	SERIES	RUN	REMARKS	WORD #: 1	2	3	4	5	6	7	8
1	1.4			Baseline/No Mask								
2				Missing								
3				Baseline/15 Words/Repeated 5 times								
4	4	1	1	No Training	8	T	3	E	6	5	F	
		1	2		1	4	3	T	7	6	5	0
		1	3			2	F	E	S	8	9	
		1	4		6	3	5	8	7	1	E	
		1	5		2	F	9	S	C	0	T	
		2	1		S	9	F	5	C	T	1	
		2	2		9	7	F	1	E	0	8	4
		2	3		2	S	6	T	5	3	C	
		2	4		9	6	C	2	5	T	1	8
		2	5		S	3	F	4	0	7	E	
5	5	1	1		1	4	8	S	3	E	7	F
		1	2		C	9	5	2	T	6	0	
		1	3		1	5	0	9	C	6	2	F
		1	4		4	S	7	E	3	T	8	
		1	5		7	2	C	E	4	F	5	6
		2	1		9	T	8	3	S	1	0	
		2	2		8	C	T	7	4	2	E	F
		2	3		1	5	S	6	3	0	9	
		2	4		T	3	7	1	S	4	6	2
		2	5		0	F	E	C	8	9	5	
7	4	1	1		5	E	3	S	T	6	9	0
		1	2		1	4	C	7	8	F	2	
		1	3		F	7	0	9	T	C	5	6
		1	4		2	4	8	3	E	S	1	
		1	5		1	T	C	E	9	S	8	6
		2	1		0	F	2	5	3	4	7	
		2	2		T	1	F	4	9	6	S	7
		2	3		3	E	2	0	C	8	5	
		2	4		1	8	4	2	F	5	S	6
		2	5		7	9	C	T	E	0	3	

TAPE #	G-LEVEL	SERIES	RUN	REMARKS	WORD #: 1	2	3	4	5	6	7	8
8	5	1	1		F	C	4	5	T	9	0	E
		1	2		6	8	1	2	F	5	E	0
		1	3		2	T	S	5	F	C	6	1
		1	4		7	E	3	0	8	9	4	
		1	5		T	F	E	1	7	8	9	S
		2	1		2	C	4	3	0	6	5	
		2	2		8	E	9	6	7	T	3	F
		2	3		6	8	1	2	F	5	E	0
		2	4		9	7	4	S	C	3	T	
		2	5		2	T	S	5	F	C	6	1
9	3	1	1		9	2	C	0	S	8	4	
		1	2		5	F	C	S	9	3	8	6
		1	3		0	2	4	1	T	E	7	
		1	4		5	2	T	4	C	F	8	6
		1	5		0	S	1	3	9	E	7	
		2	1		7	0	8	F	E	5	4	
		2	2		S	3	9	1	C	T	2	
		2	3		F	7	2	E	1	3	9	0
		2	4		6	C	T	4	5	8	S	
		2	5		F	6	0	4	1	7	2	C
10	4	1	1		4	8	6	7	E	2	9	
		1	2		C	5	3	F	0	8	6	9
		1	3		7	2	4	T	1	E	S	
		1	4		3	7	S	9	6	8	1	4
		1	5		0	T	E	C	F	2	5	
		2	1		2	7	9	0	5	F	E	4
		2	2		3	C	1	T	S	8	6	
		2	3		E	5	T	8	9	3	4	1
		2	4		0	F	6	S	C	2	7	
		2	5		2	3	S	4	8	C	1	T

TAPE #	G-LEVEL	SERIES	RUN	REMARKS	WORD #: 1	2	3	4	5	6	7	8
11	6	1	1		6	7	T	0	F	C	1	
		1	2		C	F	1	9	4	6	T	7
		1	3		E	S	5	0	2	3	8	
		2	1		8	9	4	5	3	2	E	S
		2	2		6	7	T	0	F	C	1	
		2	3		C	F	1	9	4	6	T	7
12	6	1	1		4	0	1	F	7	9	C	5
		1	2		6	2	4	8	3	E	S	
		1	3		0	S	1	T	C	E	9	8
		2	1		6	F	2	5	3	4	7	
		2	2		T	1	F	4	9	6	S	7
		2	3		3	E	2	0	C	8	5	
13	2	1	1		5	C	7	3	E	4	8	1
		1	2		2	0	F	S	6	T	9	
		1	3		3	6	7	T	S	4	5	E
		1	4		8	9	0	1	2	C	F	
		1	5		2	4	7	E	1	C	3	T
		2	1		8	F	6	9	5	S	0	
		2	2		S	0	4	T	F	2	5	
		2	3		2	6	S	3	9	4	F	0
		2	4		E	8	5	C	7	1	T	
		2	5		S	1	4	C	T	6	9	5
14	5	1	1		T	C	F	1	9	4	6	7
		1	2		E	S	5	0	2	3	8	
		1	3		8	9	4	5	3	2	E	S
		1	4		6	7	T	0	F	C	1	
		1	5		C	F	1	9	4	6	T	7
15	6	1	1		S	9	1	C	T	2		
		1	2		F	7	2	E	1	3	9	0
		1	3		6	C	T	4	5	8	S	
		2	1		F	6	0	4	1	7	2	C
		2	2		T	8	E	5	9	S	3	
		2	3		2	0	F	S	6	T	9	

TAPE #	G-LEVEL	SERIES	RUN	REMARKS	WORD #: 1	2	3	4	5	6	7	8
16	3	1	1		1	7	S	F	9	3	5	E
		1	2		C	0	2	8	4	6	T	
		1	3		0	1	E	2	7	4	9	8
		1	4		3	C	6	5	F	T	S	
		1	5		1	4	8	S	3	E	7	F
		2	1		C	9	5	2	T	6	0	
		2	2		1	5	0	9	C	6	2	F
		2	3		4	S	7	E	3	T	8	
		2	4		7	2	C	E	4	F	5	6
		2	5		9	T	8	3	S	1	0	
17	2	1	1		F	7	8	C	9	E	5	0
		1	2		6	T	4	3	S	2	1	
		1	3		0	S	E	C	1	9	4	2
		1	4		8	T	7	3	6	5	F	
		1	5		1	4	3	T	7	6	5	0
		2	1		C	2	F	E	S	8	9	
		2	2		6	3	5	8	7	1	E	4
		2	3		2	F	9	S	C	0	T	
		2	4		8	6	T	C	4	9	3	S
		2	5		5	7	F	0	2	E	1	
18	2	1	1		S	E	F	0	2	1	3	8
		1	2		4	6	T	C	5	9	7	
		1	3		2	5	3	7	0	4	T	F
		1	4		1	8	9	E	6	S	C	
		1	5									
		2	1		6	C	0	5	9	7	T	1
		2	2		2	4	E	S	3	F	8	
		2	3		0	5	3	1	4	8	9	2
		2	4		S	7	F	C	T	6	E	
		2	5		9	7	E	4	8	1	3	T

APPENDIX A4

APPENDIX A4 PROGRAM LIST OF ALL

G-LEVEL	SUBJECT	TAPE #	0	1	2	3	4	5	6
1	C	03	T01 T02 T03 T04 T05	T11 T12 T13 T14 T15	T21 T22 T23 T24 T25	T3	T4	T5	T6
	S	No Tape							
	M	No Tape							
	C	13	122 143 217 222 238	T1 118 144 155 246 252	T2 121 145 151 225 231	T3 114 131 157 234	T4 116 136 152 223 236 253	T5 T51 T52 111 137 215 227 243 258	T6 125 132 213 232 256
2	S	18	T0 114 135 213 231	T1 116 141 218 234 256	T2 115 131 221 238	T3 117 133 225 233 257	T4 121 126 222 235 254	T5 125 132 214 232	T6 122 145 211 246
	M	17	T0 118 131 158 236 254	T1 127 135 151 226 257	T2 126 138 212 231 255	T3 124 144 153 222 247	T4 123 137 152 228 145	T5 117 146 157 223 251	T6 121 145 156 221 242
	C	09	T0 114 131 151 212 238 253	T1 134 153 224 235 255	T2 112 132 142 227 233 257	T3 126 154 222 236	T4 117 133 144 217 244 254	T5 121 141 216 245	T6 128 148 241 252
3	S	16	T0 122 131 217 223 257	T1 111 132 151 221 256	T2 123 134 214 227 242	T3 116 141 155 235 254	T4 125 136 152 231 245	T5 117 144 213 222 247	T6 126 143 216 226 248
	M	No Tape							

DIX A4 PROGRAM LIST OF ALL FILENAMES

3	4	5	6	7	8	9	F	E	C	T	S
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
14	116	T51	125	113	117	127	123	115	112	126	124
31	136	T52	132	133	141	142	147	138	146	134	135
57	152	111	213	153	211	214	212	154	156	158	216
34	223	137	232	245	242	235	225	241	244	224	221
	236	215	256			257	237		254	247	233
	253	227								255	251
		243									
		258									
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
17	121	125	122	127	118	115	113	112	124	123	111
33	126	132	145	134	142	136	138	144	147	137	146
25	222	214	211	216	227	217	226	223	212	217	224
33	235	232	246	242	236	233	243	247	244	245	241
57	254			252	255	246		253		258	
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
24	123	117	121	112	113	115	111	116	114	122	125
44	137	146	145	143	141	136	147	133	134	142	132
53	152	157	156	155	216	217	213	214	211	154	215
22	228	223	221	225	224	233	253	227	235	237	234
47	145	251	242	252	241	246		256	244	243	248
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
26	117	121	128	137	116	111	122	136	113	135	115
54	133	141	148	157	127	125	146	156	123	143	124
22	144	216	241	211	147	155	214	215	145	226	152
36	217	245	252	232	213	223	231	234	225	243	221
	244			256	246	237	251		242		247
	254								258		
3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
16	125	117	126	112	124	115	114	118	121	127	113
31	136	144	143	135	138	137	145	133	142	146	147
55	152	213	216	157	153	212	158	156	211	215	154
35	231	222	226	233	237	224	228	234	225	236	232
54	245	247	248	241	253	251	246	244	243	252	255

G-LEVEL	SUBJECT	TAPE #	0	1	2	3	4	5	6
	C	04	128 156 226 255	121 146 217 224 247	132 151 231 244	113 123 142 236 252	122 148 228 254	116 127 143 214 235 215	115 126 141 233 242
4	S	10	T0 125 151 214 241	T1 135 147 223 238 257	T2 116 132 156 211 246 251	T3 123 141 221 236 252	T4 111 133 148 218 237 254	T5 122 157 215 232	T6 113 127 145 227 243
	M	No Tape							
	C	08	T0 117 128 144 215 238	T1 123 138 154 233 258	T2 131 211 234 251	T3 143 214 227 246	T4 113 147 213 244	T5 114 126 134 217 236 254	T6 121 137 216 224 231 257
5	S	05	T0 127 133 217 236 251	T1 111 131 216 231 244	T2 124 137 152 226 248	T3 115 145 214 235 242	T4 112 141 155 225 245	T5 123 132 157 232 257	T6 126 136 158 234 247
	M	14	T0 124 144	T1 114 147 153	T2 125 136	T3 126 135	T4 116 133 155	T5 123 134	T6 117 141 156
	C	12	T0 112 131 234	T1 113 133 222	T2 122 213 233	T3 125 215 231	T4 111 123 216 224	T5 118 214 237	T6 118 214 237
6	S	15	T0 114 134 224	T1 117 123 227 133	T2 135 216	T3 136 215	T4 125 213 235	T5 133 214	T6 111 126 221 236
	M	15	T0 128 213 232	T1 114 125 215	T2 117 123 217 231	T3 112 126 227	T4 134 214	T5 135 224	T6 131 212 235

3	4	5	6	7	8	9	F	E	C	T	S
113	122	116	115	125	111	137	117	114	155	112	135
123	148	127	126	145	136	153	133	134	215	124	154
142	228	143	141	222	144	212	152	147	237	157	211
236	254	214	233	256	227	221	213	225	243	216	232
252		235	242		248	241	223	257		234	251
		215					253			246	
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
123	111	122	113	114	112	117	124	115	121	134	137
141	133	157	127	131	126	128	155	136	154	152	143
221	148	215	145	142	146	144	216	153	222	224	225
236	218	232	227	212	226	213	242	217	245	233	244
252	237		243	247	234	235		231	256	258	253
	254				255						
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
143	113	114	121	141	122	116	111	118	112	115	133
214	147	126	137	155	145	146	125	127	136	132	158
227	213	134	216	225	156	157	135	142	212	151	244
246	244	217	224	242	221	223	152	153	245	226	253
		236	231		232	241	228	222	256	247	
		254	257				235	237		252	
							255				
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
115	112	123	126	117	113	122	118	116	121	125	114
145	141	132	136	143	147	134	138	144	135	146	142
214	155	157	158	151	213	211	156	154	153	212	215
235	225	232	234	224	221	237	238	227	222	235	233
242	245	257	247	243	255	256	252	253	254	241	245
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
126	116	123	117	118	127	115	113	121	112	111	122
135	133	134	141	142	131	132	145	137	146	143	138
	155		156	158		154	152		151	157	
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
125	111	118	118	115	124	116	114	126	117	134	127
215	123	214	214	217	138	137	212	136	135	221	132
231	216	237	237	228	236	225	223	232	235		227
	224										
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
136	125	133	111	112	137	124	115	131	116	113	132
215	213	214	126	128	211	212	122	217	121	127	218
	235		221	222		234	225		226	223	
			236	238			232		231	237	
T3	T4	T5	T6	T7	T8	T9	TF	TE	TC	TT	TS
112	134	135	131	122	136	113	121	124	115	116	111
126	214	224	212	216	222	127	211	223	132	133	137
227			235			225	233		218	221	226
						237				236	234

APPENDIX B1

```
C********************** AUDIO TRANSFER ROUTINE **************************
C                        VIA SUBROUTINE CHANNEL
C
C                        PROGRAM FILE NAME: "AUDIO"
C*****************************************************************************
C
C       THE PURPOSE OF THIS ROUTINE IS TO ESTABLISH AND INITIALIZE
C       CALL PARAMETERS NEEDED FOR A SUBROUTINE NAMED "CHANNEL".
C       "CHANNEL" PERMITS THE TRANSFER OF AUDIO DATA FROM THE FOUR
C       CHANNEL TAPE DECK THROUGH THE CROMEMCO A/D; D/A CONVERTOR
C       AND CREATES A DISK FILE OF THE DIGITIZED SPEECH.
C
C       CALL PARAMETERS IN THIS LISTING ARE AN ABBREVIATED
C       FORM OF THE PARAMETERS AS THEY APPEAR IN THE
C       THESIS WHICH ORIGINATED 'CHANNEL': AFIT/GE/EE/81D-2;
C       CAPT FREDEL AND CAPT BEASLEY.  THE ORIGINAL PARAMETERS
C       ARE IN PARENTHESIS WITHIN THIS LISTING.
C
C
C*****************************************************************************
C
        DIMENSION IPY(4)
        INTEGER IT,DIR,MO,PC,DC,FN(7),DD,DY,ER,SE,I,CROERR,NOVERR
C
    1   IT=2            ;CALL PARAMETER (ITASK) ASSIGNMENT
C
C***** THE TASK OPTIONS ARE:
C       (0) WHICH REQUIRES NO PARAMETERS
C        ---USED FOR DATA TRANSFER FROM NOVA TO Z-80 OR Z-80 TO NOVA
C       (1) WHICH REQUIRES TWO PARAMETERS:
C        ---PARAMETER ONE IS: SAMPLE TIME (2MHZ/SAMPLE RATE)
C        ---PARAMETER TWO IS: CHANNEL# (1 FOR INPUT; 3 FOR OUTPUT
C                                       AS CURRENTLY WIRED)
C       (2) WHICH REQUIRES FOUR PARAMETERS:
C        ---PARAMETER ONE IS: START ADDRESS (GENERALLY EQUALS 1)
C        ---PARAMETER TWO IS: WORD LENGTH (SAMPLE RATE TIMES
                                           SAMPLE LENGTH)
C        ---PARAMETER THREE IS: SAMPLE TIME (SEE PARAMETER ONE,
                                             TASK ONE)
C        ---PARAMETER FOUR IS: CHANNEL # (SAME AS PARAMETER TWO;
                                          TASK ONE)
C*****
C
        ACCEPT " ENTER DATA DIRECTION--0 FOR INPUT; 1 FOR OUTPUT: ",DIR
C
        MO=2            ;CALL PARAMETER (MODE) ASSIGNMENT
C
C***** THE MODE OPTIONS ARE:
C       (0) FOR NO DATA TRANSFER
C       (1) FOR DATA TRANSFER VIA PROGRAMMED I/O
C        ---FOR MODE (1), CALL PARAMETER (DCOUNT) IS THE # OF DATA WORDS
C       (2) FOR DATA TRANSFER VIA DATA CHANNEL
C        ---FOR MODE (2), CALL PARAMETER (DCOUNT) IS THE # OF DISK BLOCKS
C           IN EACH CHANNEL BLOCK--RANGE=(1-16)
C       (3) ABORT TASK
```

```
C*****
C
      PC=4           ;CALL PARAMETER (PCNT) ASSIGNMENT.
C                     MUST AGREE WITH (ITASK) REQUIREMENTS!!!
C
      DC=1           ;CALL PARAMETER (DCOUNT) ASSIGNMENT.
C                     MUST AGREE WITH (MODE) REQUIREMENTS!!!
C                     (DCOUNT) IS THE # OF BLOCKS THAT WILL BE
C                     TRANSFERRED BETWEEN 'HANDSHAKES'.
C
      ACCEPT " ENTER FILENAME: "
C
      READ(11,20)FN(1)
   20 FORMAT(S13)
      IF (DIR.EQ.1) GOTO 30
      CALL DELETE(FN); ALLOWS A FILE TO BE REUSED BY CLEARING IT.
C
   30 DB=60          ;CALL PARAMETER (DCHBLKS) ASSIGNMENT.
C                     THESE ARE 256 WORD BLOCKS.  THE NUMBER
C                     OF BLOCKS NEEDED=(WORD LENGTH/256)
C
      DY=1           ;CALL PARAMETER (DARRAY) ASSIGNMENT.
C                     THE # OF DATA WORDS IN DY MUST
C                     AGREE WITH (DCOUNT).
C
C***** ELEMENTS OF CALL PARAMETER (PARRAY) ARE ESTABLISHED
C      AS SPECIFIED UNDER 'TASK OPTIONS'---DESCRIBED ABOVE.
C
      IPY(1)=1
C
      IPY(2)=22528   ; THE NUMBER OF WORDS IN 88 BLOCKS.
C                      MAX 'CHOPS' BUFFER SIZE: 0D00 (HEX)
C
      IPY(3)=250
C
      IF (DIR.EQ.0) IPY(4)=1
C
C***** CHANNEL ASSIGNMENT IS: 1 (INPUT CHANNEL AS CURRENTLY WIRED)
C
      IF (DIR.EQ.1) IPY(4)=3
C
C***** CHANNEL ASSIGNMENT IS: 3 (OUTPUT CHANNEL AS CURRENTLY WIRED)
C
C
      ER=0           ; CALL PARAMETER (ERROR) RETURNED FROM 'CHANNEL'.
      SE=0           ; CALL PARAMETER (SYSERR) RETURNED FROM 'CHANNEL'.
C
C
C
C
      CALL CHANNEL(IT, DIR, IO, PC, DC, FN, DB, DY, IPY, ER, SE)
```

```
C
      TYPE "*****CALL TO 'CHANNEL' COMPLETE*****"
C
C
C
C
C
C***** BIT MANIPULATION FOR RETURNED ERROR CODE
C
C       (ERROR) HAS TWO, EIGHT BIT FIELDS:
C       --LEFT EIGHT BITS (MOST SIG)= ERROR IN 'CHANNEL'
C       --RIGHT EIGHT BITS (LEAST SIG)= ERROR IN 'CHOPS'
C       ----(ERROR)=0 IF NO ERROR OCCURED
C       (SYSERR) CONTAINS 'RDOS' SYSTEM ERRORS
C       --THESE ARE FORTRAN ERROR CODES
C       ----(SYSERR)=1 IF NO ERROR OCCURED
C
      CROERR=15.AND.ER
      MOVERR=ISHFT(-256.AND.ER,-8)
      IF (CROERR.EQ.0.AND.MOVERR.EQ.0
     1     .OR.CROERR.EQ.11.AND.MOVERR.EQ.52) GOTO 35
      TYPE " ********************"
      IF (DTEST(ER,15)) TYPE " * ABORT INITIATED * "
      TYPE " ********************"
C
      TYPE " ERROR CODE IS: ",ER

C
C
C*****
C
      TYPE " PAR CNT IS: ",PC
C
      TYPE " DCOUNT= ",DC
C
      TYPE " DARRAY= ",DY
C
      TYPE " SYSERR= ",SE
C
      TYPE " PARRAY(1)= ",IPY(1)
C
      TYPE " PARRAY(2)= ",IPY(2)
C
      TYPE " PARRAY(3)= ",IPY(3)
C
      TYPE " PARRAY(4)= ",IPY(4)
C
      TYPE " CROMEMOO ERROR RETURNED: ",CROERR  ;I/O CHANNEL ERROR
                                                 ONLY.

C
      CALL BCLR(MOVERR,7)      ;CLEARS MSB OF CHANNEL ERROR IF SET.
C
```

```
      TYPE " NOVA ERROR RETURNED: ",NOVERR     ;CHANNEL ERROR ONLY.

35    ACCEPT " DO YOU WISH TO RUN AGAIN? ---0 FOR YES; 1 FOR NO: ",I

      IF (I.EQ.0) GOTO 1
      STOP
      END
```

APPENDIX B2

```
C*****************************************************************
C*                                                               *
C*                    PROGRAM  AUDICHIST                         *
C*                                                               *
C*          (GENERATES HISTOGRAM OF A DATA FILE)                 *
C*                                                               *
C*****************************************************************
C
C                         **CAUTION**
C                      THIS PROGRAM CALLS
C                      SUBPROGRAM AUDIOMOD
C
C     AUDICHIST IS A FORTRAN IV PROGRAM WITH A NUMBER OF
C    AUDIO INPUT/OUTPUT AND EVALUATION OPTIONS.  IT PROVIDES
C    BASIC INPUT/OUTPUT OF AUDIO SIGNALS AS DESCRIBED IN THE
C    AUDIOMOD (AUDIO MODULE) DESCRIPTION.  THIS  PROGRAM
C    EVALUATES UP TO 80 BLOCKS OF DIGITIZED VOICE DATA  AND
C    RETURNS SOME BASIC PARAMETERS OF THE DATA.  THE HARD
C    COPY PRINTOUTS CAN BE USED TO IDENTIFY TIME FRAMES
C    CONTAINING NO VOICE DATA VS THOSE HAVING DATA.  THIS
C    INFORMATION CAN ALSO BE USED TO ADJUST THE DRIVE LEVEL
C    TO THE "CHOPS" A/D CONVERTER.  THE INPUT LEVEL SHOULD
C    BE  OPTIMIZED TO MAKE MAXIMUM USE OF THE +5 TO -5 VOLT
C    RANGE OF THE A/D CONVERTER WITHOUT CLIPPING THE INCOM-
C    ING WAVEFORM.
C
C     THE AUDIOHIST  PROGRAM  EXTRACTS AND OPERATES ON
C    ONE DATA BLOCK (.032 SECONDS OF DATA) AT A TIME.
C    EACH OF THE 256 WORD INCREMENTS ARE EVALUATED FOR THE
C    CLIPPING COUNT , THE PEAK LEVEL IN THE FILE, AND THE
C    NUMBER OF SAMPLE VALUES WHICH FALL INTO A VOLTAGE VS
C    DATA BLOCK BIN. THE EVALUATION CONSIDERS ONLY MAGNITUDE
C    AND NOT THE POLARITY OF THE SAMPLE.
C
C   THIS PROGRAM IS COMPILED AND LOADED USING THE FOLLOWING
C    COMMANDS:
C
C   FORT AUDICHIST
C   RLDR AUDICHIST FORT.LB
C
C*****************************************************************
C
C         NOTE: THE A/D CONVERTER IS LIMITED TO A RANGE OF +5
C           TO -5 VOLTS WHICH ARE CONVERTED TO AN INTEGER
C           VALUE WHICH RANGES FROM +2047 TO -2048.  THE
C           OUTPUT OF THE D/A CONVERTER ACCEPTS THIS SAME
C           RANGE OF INTEGER VALUES AND OUTPUTS A SIGNAL
C           BETWEEN +2.5 AND -2.5 VOLTS.
C
C              *** AUDIOHIST VARIABLES ***
C
C         NOTE: CHANNEL 4 IS USED TO ACCESS FILENAM
```

```
C
C   NOTE: ALL VARIABLES AND ARRAYS ARE INTEGERS UNLESS
C         OTHERWISE INDICATED
C
C   FILENAM-THIS IS A CHARACTER ARRAY WHICH SPECIFIES
C           THE NAME OF THE FILE TO BE EVALUATED
C
C   FILEOUT-THIS IS A CHARACTER ARRAY WHICH SPECIFIES
C           A HISTOGRAM STORAGE FILE
C
C   AUHSTX- THIS IS A TRANSFER FILE USED TO TRANSFER DATA
C           BETWEEN AUDIOHIST AND THE SUB PROGRAM AUDIOMOD
C
C   COM-    THIS IS A CHARACTER ARRAY USED TO STORE
C           PRINT OUT COMMENTS
C
C   VL-     THIS IS A 22 BY 10 ARRAY USED TO STORE
C           EVALUATED SIGNAL DATA
C
C   VLC-    REPEAT OF ABOVE FOR COMPRESSED DISPLAY
C
C   BYPASS- LOGICAL VARIABLE USED TO BYPASS THE
C           INSTRUCTIONS FOR CREATING AN OUTPUT FILE
C
C   BYPASS2-LOGICAL VALUE USED TO BYPASS COMPRESSION
C           MODULE
C
C   BYPASS3-LOGICAL VALUE USED TO DO QUICK VOLTAGE
C           AND CLIP COUNT MEASURE OF A FILE
C
C   MAXLVLS-THIS VARIABLE IS USED TO STORE THE MAXIMUM
C           LEVEL ENCOUNTERED DURING THE EVALUATION OF
C           256 SAMPLES (2.75 SECONDS OF DATA)
C
C   MAXLVLSC-REPEAT OF ABOVE FOR COMPRESSED DISPLAY
C
C   MVOLTS- 22 VARIABLE REAL ARRAY WHICH CONTAINS THE
C           COMPUTED VOLTAGE MAXIMUM
C
C   MVOLTSC-        REPEAT OF ABOVE FOR COMPRESSED DISPLAY
C
C   CLPCNT- 22 VARIABLE ARRAY USED TO COUNT THE NUMBER
C           OF TIMES A SAMPLE VALUE EXCEEDS THE RANGE
C           OF THE A/D CONVERTER
C
C   CLPCNTC-REPEAT OF ABOVE FOR COMPRESSED DISPLAY
C
C   VSAMPLE-ARRAY OF 2048 VALUES FOR TEMPORARY STORAGE
C           OF VOICE SAMPLE DATA READ FROM FILE
C
C   ERROR-  ERROR VALUE RETURNED FROM LIBRARY CALL
C           ROUTINES
```

```
C
C    SBLK-    STARTING BLOCK LOCATION WITHIN FILE
C             BEING EVALUATED
C
C    BLKC-    NUMBER OF DATA BLOCKS TO BE EVALUATED (256
C             SAMPLES PER BLOCK)
C
C    ST-      ARRAY FOR FILE STATUS DATA
C
C    CH-      OUTPUT CHANNEL- 10=CRT, 1=LPT, 7=FILEOUT
C
C    KI-      COLUMN COUNT FOR OUTPUT MODULE OF PROGRAM
C
C    IN-      DUMMY VARIABLE USED TO SELECT OPTIONS
C
C    T-       TEST VALUE USED IN DO LOOP TO SAVE ON
C             EXECUTION TIME
C
C*************************************************************
C
            INTEGER VL(88,10),MAXLVL(88),CLPCNT(88),VSAMPLE(256),
     :      ERROR,SBLK,FILENAM(7),TEST,IN,CH,KI,FILEOUT(7),BLKC,
     :      COM(40),ST(22),VLC(11,10),CLPCNTC(22),MAXLVLC(22)
    REAL MVOLTS(88),MVOLTSC(22)
    LOGICAL BYPASS,BYPASS2,BYPASS3,BYPASS4
    BYPASS=.FALSE.

C*************************************************************
C*** REQUEST INITIAL INPUT OF FILE NAME AND BLOCK COUNT
C*** BLOCK COUNT IS LIMIT CHECKED AND ADJUSTED IF REQUIRED
C*** ALSO CHECK OPTION OF TRANSFER TO AUDIOMOD
C*************************************************************
1   ACCEPT "<15>ENTER FILENAME TO BE EVALUATED: "
    BYPASS4=.FALSE.
    READ (11,25) FILENAM(1)
25  FORMAT (S13)
    ACCEPT"<15><15>OPTIONS:<15> 1 = INPUT/OUTPUT AU",
     :      "DIO<15> 2 = HISTOGRAM GENERATION<15><15>OPTION = ",IN
    IF(IN.NE.1)GO TO 403

C*************************************************************
C*** INTERCHANGE WITH SUBPROGRAM 'AUDIOMOD'
C*************************************************************
401 CALL CFILE("AUHSTX",2,ERROR)
    CALL OPEN (5,"AUHSTX",2,ERROR)
    WRITE(5,404)FILENAM
404 FORMAT(" ",S13)
    CALL FCLOS(5)
    TYPE"CALLING SUB PROGRAM 'AUDIOMOD'"
    CALL FSWAP("AUDIOMOD.SV")
    TYPE"RETURNED TO MAIN PROGRAM"
    BYPASS4=.FALSE.
```

```
    CALL OPEN (5,"AUHSTX",2,ERROR)
    READ(5,402)IN
402 FORMAT(I2)
    CALL RESET
    CALL DELETE ("AUHSTX")
    IF(IN.EQ.6)GO TO 1
    IF(IN.EQ.7)GO TO 15
    IF(IN.NE.5)GO TO 403
    BYPASS4=.TRUE.
    BLKC=80

C*** CONTINUE WITH BLOCK COUNT AND CHECKS***************
403 CALL STAT (FILENAM,ST,ERROR)
    IF(ERROR.EQ.1)GO TO 7
    ACCEPT"<15><15>**********************************",
     :      "*************************<15>*<15>*      ",
     :      "             FILE STATUS CALL<15>"
    GO TO 4


7   ACCEPT"<15><15>"
    IF(BYPASS4)GO TO 405
    ACCEPT"ENTER NUMBER OF BLOCKS TO BE EXAMINED"
    ACCEPT"<15>IF BLOCK COUNT IS LESS THAN 80"
    ACCEPT" EXCESS<15>DATA BLOCKS ARE PROCESS"
    ACCEPT"ED AS '0's<15>"
    N=ST(9)+1
    TYPE" BLOCK COUNT IN THE FILE IS:",N
    ACCEPT"<15>BLOCK COUNT TO BE EVALUATED = ",BLKC
405 IF(BLKC.GT.ST(9).OR.BLKC.LT.1)BLKC=ST(9)+1


C*************************************************************
C*** OPEN FILENAM ON CHANNEL 4 AND CHECK FOR SYS ERRORS
C*************************************************************
    CALL OPEN(4,FILENAM,ERROR)
    IF(ERROR.EQ.1)GO TO 3
    ACCEPT"<15><15>**********************************",
     :      "*************************<15>*<15>*      ",
     :      "           CALL TO OPEN FILE<15>"
    GO TO 4


C*************************************************************
C*** INITIALIZE VALUES
C*************************************************************
3   BYPASS2=.FALSE.
    BYPASS3=.FALSE.

    DO 17 I=1,22
       INVOLTSC(I)=0.0
       MAXLVLC(I)=0
```

```
      CLPCNTC(I)=0
17    CONTINUE

      DO 18 I=1,11

         DO 19 J=1,10
            VLC(I,J)=0
19       CONTINUE

18    CONTINUE

      DO 6 I=1,88
         CLPCNT(I)=0
         MAXLVL(I)=0
         AVGLTS(I)=0.0

         DO 5 J=1,10
            VL(I,J)=0
5        CONTINUE

6     CONTINUE

C*************************************************************
C*** OPTION SELECT FOR VOLTAGE AND CLIP COUNT ONLY
C*************************************************************
      IF(BYPASS4)GO TO 406
      ACCEPT"<15>OPTION:"
      ACCEPT"<15> 1 = DO FULL EVALUATION<15>"
      ACCEPT" 2 = COMPRESSED VOLTAGE AND CLIP COUNT ONLY"
      ACCEPT"<15><15>OPTION= ",IN
      IF (IN.EQ.2)BYPASS3=.TRUE.


C*************************************************************
C*** THE FOLLOWING NESTED DO LOOPS PULL DATA FROM FILENAM
C*** AND EVALUATE IT BLOCK BY BLOCK
C*************************************************************
406   TYPE "ENTER EVAL DO LOOPS (88)<15>"
      IF(BYPASS4)BYPASS3=.TRUE.
      IF(BYPASS4)GO TO 407
      DO 101 I=1,BLKC
         SBLK=(I-1)
         CALL RDBLK(4,SBLK,VSAMPLE,1,ERROR)
         IF(ERROR.EQ.1)GO TO 8
         ACCEPT"<15><15>*********************************",
     :          "*************************<15>*<15>*        ",
     :          "            CALL TO READ BLOCK<15>"
           TYPE"*            LAST BLOCK IN DATA FILE IS:",ST(9)
           TYPE"*             ATTEMPTING TO READ BLOCK:  ",SBLK
         GO TO 4

8        DO 102 J=1,256
```

```
            T=IABS(VSAMPLE(J))
            IF(T.GT.MAXLVL(I))MAXLVL(I)=T
            IF(T.GE.2046)CLPCNT(I)=CLPCNT(I)+1
            IF(BYPASS3)GO TO 102
            IF(T.LE.2048.AND.T.GT.1843)VL(I,1)=VL(I,1)+1
            IF(T.LE.1843.AND.T.GT.1638)VL(I,2)=VL(I,2)+1
            IF(T.LE.1638.AND.T.GT.1434)VL(I,3)=VL(I,3)+1
            IF(T.LE.1434.AND.T.GT.1230)VL(I,4)=VL(I,4)+1
            IF(T.LE.1230.AND.T.GT.1024)VL(I,5)=VL(I,5)+1
            IF(T.LE.1024.AND.T.GT.819)VL(I,6)=VL(I,6)+1
            IF(T.LE.819.AND.T.GT.614)VL(I,7)=VL(I,7)+1
            IF(T.LE.614.AND.T.GT.410)VL(I,8)=VL(I,8)+1
            IF(T.LE.410.AND.T.GT.205)VL(I,9)=VL(I,9)+1
            IF(T.LE.205.AND.T.GE.20)VL(I,10)=VL(I,10)+1
102     CONTINUE

    TYPE 1
       VOLTS(I)=(MAXLVL(I)/2048.)*5.0
101 CONTINUE

    IF(BYPASS3)GO TO 301
    GO TO 29

C*** QUICK EVAL FOR VOLTAGE AND CLIP COUNT
407 DO 408 I=1,BLKC
       SBLK=I-1
       CALL RDBLK(4,SBLK,VSAMPLE,1,IER)

       DO 409 J=1,256
          T=IABS(VSAMPLE(J))
          IF(T.GT.MAXLVL(I))MAXLVL(I)=T
          IF(T.GE.2046)CLPCNT(I)=CLPCNT(I)+1
409     CONTINUE

    TYPE 1
       VOLTS(I)=(MAXLVL(I)/2048.)*5.0
408 CONTINUE
    GO TO 301

C*************************************************************
C*** SELECT HISTOGRAM DISPLAY OPTIONS
C*************************************************************
29  ACCEPT"<15><7>"
    ACCEPT"SELECT HISTOGRAM DISPLAY OPTION:<15><7>"
    ACCEPT" 1 = DISPLAY ON SCREEN <15><7>"
    ACCEPT" 2 = PRINT EXPANDED DISPLAY<15><7>"
    ACCEPT" 3 = TRANSFER TO FILE IN PRINTER FORMAT<15><7>"
    ACCEPT"OPTION = ",IN

C*************************************************************
C*** ESTABLISH PARAMETERS AND FILES BEFORE GOING TO
C*** OUTPUT MODULES - CALLS TO CREATE FILE AND APPEND FILE
```

```
C*** ARE CHECKED FOR ERRORS
C*************************************************************
    IF(IN-2)10,11,12
11  CH=12
    GO TO 97

12  IF(BYPASS)GO TO 95
    ACCEPT"<15>ENTER YOUR OUTPUT FILE NAME: "
    READ(11,2)FILEOUT(1)
2   FORMAT(S13)
    CALL CFILW(FILEOUT,2,ERROR)
    IF(ERROR.EQ.12)GO TO 27
    IF(ERROR.EQ.1)GO TO 9
    ACCEPT"<15><15>*********************************",
     :      "*****************************<15>*<15>*      ",
     :      "              CALL TO CREATE A FILE<15>"
    GO TO 4

27  ACCEPT"<15><15>*********************************",
     :      "**************<15>*<15>*            NON-FAT",
     :      "AL ERROR<15>*<15>*          FILE ALREADY E",
     :      "XISTS<15>**************************************",
     :      "**********<15>"
    ACCEPT"OPTIONS:<15> 1 = TERMINATE PROGRAM<15> 2 =",
     :      " SELECT ANOTHER FILE<15> 3 = APPEND TO SEL",
     :      "ECTED FILE<15>OPTION= ",IN
    IF(IN.EQ.2)GO TO 12
    IF(IN.EQ.3)GO TO 9
    GO TO 15

9   CALL APPEND(7,FILEOUT,3,ERROR)
    IF(ERROR.EQ.1)GO TO 16
    ACCEPT"<15><15>*********************************",
     :      "**********************<15>*<15>*                ",
     :      "   CALL TO APPEND A FILE<15>"
    GO TO 4

16  BYPASS=.TRUE.
95  CH=7


C*************************************************************
C*** OUTPUT HISTOGRAM TO PRINTER OR FILE
C*** LOOP 107 CONTROLS PAGING - LOOP 105 CREATES TABLES
C*************************************************************
97  ACCEPT"<15><15>COMMENT OPTION FOR LABELING PRINTOUT:"
    TYPE"INCLUDE UP TO 79 SPACES OF TEXT"
    ACCEPT"INPUT TEXT: "
    READ (11,209)CON(1)
209 FORMAT(S79)
    N=0
    NC=1
```

```
      NN=21
      NNC=22
      DO 107 IL1=1,2
         WRITE(CH,211)FILENAM(1),ST(9),BLKC,IL1
211      FORMAT(" "//" FILENAME: ",S13,"LAST CLOCK ",
     :           "IN FILE: ",I3,10X," NUMBER OF BLOCKS ",
     :           "EVALUATED:",I3,13X,"**PAGE",I2,"**")
         WRITE(CH,213)COM(1)
213      FORMAT(" COMMENTS: ",S79)

         DO 105 IL2=1,2
            WRITE (CH,201)
201         FORMAT(40X,"HISTOGRAM-VOLTAGE HITS VS"
     :              " SAMPLE BLOCKS"/"   VOLTS  ")
            RV=5.0

            DO 106 IK=1,10
               WRITE(CH,203)RV,(VL(J,IK),J=NC,NNC)
203            FORMAT(5X,F3.1,"--|",22("----|"),/10X," ",
     :                 22(I4,"|"))
               RV=RV-0.5
106         CONTINUE

            WRITE (CH,205)(NVOLTS(I),I=NC,NNC),(CLPCNT(I)
     :                 ,I=NC,NNC)
205         FORMAT(5X"0.05-|",22("----|")/" -------",
     :              "--|",22("----|")/" MAX VOLTS|",22(F4.2,"|")
     :              /" ---------|",22("----|")/" CLIPCO"
     :           "UNT|",22(I4,"|")/" ---------|",22("----|"))
            WRITE(CH,207)(I,I=N,NN)
207         FORMAT(9X,22(I5)/109X,"DATA BLOCKS")
            N=N+22
            NC=NC+22
            NN=N+21
            NNC=NC+21
            TYPE"COMPLETED PAGE",IL1,"   TABLE",IL2
            IF(BLKC.LE.22)GO TO 111
            IF(IL1.EQ.2.AND.BLKC.LE.66)GO TO 111
            IF(IL1.EQ.2.AND.IL2.EQ.2)GO TO 111
105      CONTINUE

         IF(IL1.EQ.1.AND.BLKC.LE.44)GO TO 111
         WRITE(CH,217)
217      FORMAT("1")
107   CONTINUE

111   WRITE(CH,218)
218   FORMAT("1")
      ACCEPT"<15>**************************************",
     :      "*******"
      ACCEPT"<15>*"
      ACCEPT"<15>*            OUTPUT COMPLETE"
```

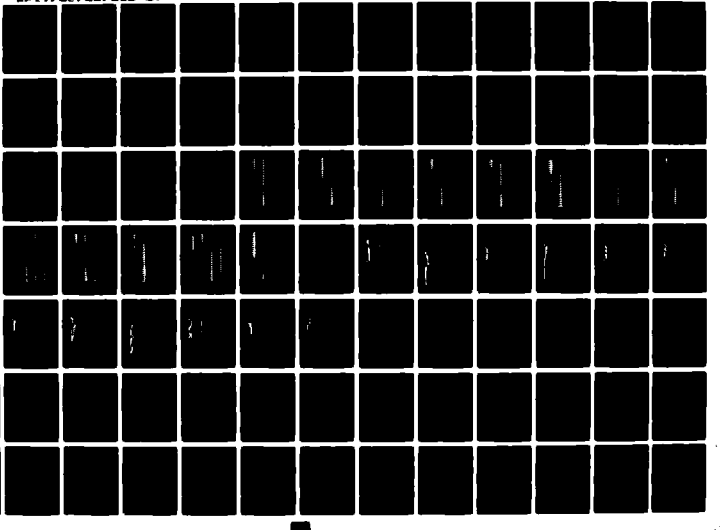
```
      ACCEPT"<15>*"
      ACCEPT"<15>*****************************************",
       :       "********"

C*************************************************************
C*** CONTINUATION OPTIONS AFTER PRINTING EXPANDED DATA
C*************************************************************
      ACCEPT"<15>"
      ACCEPT"SELECT AN OPTION<15>"
      ACCEPT" 1 = EVALUATE ANOTHER FILE<15>"
      ACCEPT" 2 = DISPLAY COMPRESSED HISTOGRAM",
       :       " ON SCREEN<15>"
      ACCEPT" 3 = TERMINATE HISTOGRAM EVAL<15>"
      ACCEPT" 4 = MAKE ANOTHER COPY<15><15>"
      ACCEPT"OPTION = ",IN
      IF(IN.EQ.4)GO TO 97
      IF(CH.NE.7)GO TO 109
109   IF(IN-2)26,10,15
26    CALL FCLOS(4)
      GO TO 1

C*************************************************************
C*** COMPRESS HISTOGRAM ARRAY TO 11 COLUMNS BY 10 ROWS
C*************************************************************
10    KI=11
      CH=10
      IF(BYPASS2)GO TO 99

      DO 22 J=1,10
         DO 21 K=1,11
               TEMPVL=0
            DO 20 L=1,3
               TEMPVL=TEMPVL+VL(3*(K-1)+L,J)
20          CONTINUE
            VLC(K,J)=TEMPVL
21       CONTINUE

22    CONTINUE


C*************************************************************
C*** COMPRESS REMAINING DATA VALUES
C*************************************************************

301   KI=11
      CH=10

      DO 24 K=1,22
         KT=4*(K-1)
         KL=0
         TEMPOT=0
```

```
      DO 23 L=1,4
         KS=KT+L
         TEMPCT=TEMPCT+CLPCNT(KS)
         IF(MAXLVL(KS).GT.ML)ML=MAXLVL(KS)
23    CONTINUE

      CLPCNTC(K)=TEMPCT
      MAXLVLC(K)=ML
      MVOLTSC(K)=(MAXLVLC(K)/2040.)*5.0
24  CONTINUE

    IF(BYPASS3)GO TO 302
    BYPASS2=.TRUE.

C*************************************************************
C*** OUTPUT COMPRESSED HISTOGRAM TO SCREEN
C*************************************************************
99  WRITE (CH,200)
200 FORMAT("1VOLTS",6X,"HISTOGRAM-VOLTAGE HITS VS",
     :      " SAMPLE BLOCKS")
    RV=5.0

    DO 103 I=1,10
       WRITE(CH,202)RV,(VLC(J,I),J=1,KI)
202    FORMAT(" ",F3.1,"-",11("----+")/5X,
     :      "|",11(I4,"|"))
       RV=RV-0.5
103 CONTINUE

    WRITE(CH,204)(I,I=0,80,8)
204 FORMAT(" 0.0-|",11("----+")/1X,11(I5),"  BLOCKS")
    ACCEPT"ENTER ANY INTEGER TO CONTINUE.",DUMMY

C*************************************************************
C*** DISPLAY REMAINING DATA VALUES ON SCREEN
C*************************************************************
302 WRITE(CH,206)
206 FORMAT("1","SAMPLE BLOCKS ",'  MAX VOLTAGE  "
     :      "  CLIP COUNT  ")

    DO 104 I=1,22
       K=(4*I)-1
       L=K-3
       WRITE (CH,208)L,K,MVOLTSC(I),CLPCNTC(I)
208    FORMAT(" ",2X,I2," thru ",I2,"   ",5X,
     :     F4.2,5X,"'",5X,I4,5X,"  ")
104 CONTINUE

    ACCEPT"ENTER ANY INTEGER TO CONTINUE:",DUMMY
    IF(BYPASS4)CALL FCLOS (4)
    IF(BYPASS4)GO TO 401
    IF (BYPASS3)GO TO 13
```

AD-A115 540 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOO--ETC F/G 17/2
TIME AXIS ANALYSIS OF GRAVITY DISTORTED SPEECH.(U)
DEC 81 J C HUNTER
AFIT/GE/EE/81D-27

UNCLASSIFIED NL

2 + 3
AD-A115 540



```
C*************************************************************
C*** CONTINUATION OPTIONS AFTER SCREEN DISPLAY
C*************************************************************
    ACCEPT"<15>"
          ACCEPT"SELECT AN OPTION<15>"
          ACCEPT" 1 = EVALUATE ANOTHER FILE<15>"
          ACCEPT" 2 = REPEAT HISTOGRAM DISPLAY<15>"
          ACCEPT" 3 = TERMINATE HISTOGRAM EVAL<15>"
          ACCEPT" 4 = SELECT EXPANDED DISPLAY<15>"
          ACCEPT"OPTION = ",IN
    IF(IN.EQ.4)GO TO 29
    IF(IN-2)13,14,15
13  CALL FCLOS (4)
    GO TO 1

14  GO TO 99

C*************************************************************
C*** FORTRAN IV SYSTEM ERROR OUTPUT AND CONTINUE OPTIONS
C*************************************************************
4   TYPE"<7>*        <7>   FORTRAN<7> IV SYSTEM ERRO",
     :      "R CODE=",ERROR
    ACCEPT"* <7>           <7>SEE FORTRA<7>N IV USERS",
     :      "<7> MANUAL PAGE B-7<15>*<15>*              ",
     :      "    NON-FATAL <7>PROGRAM AB<7>ORT<15>*<15>",
     :      "********<7>**********<7>**********<7>***",
     :      "********<7>**********<7>**********<15>><7>",
    ACCEPT"OPTIONS:<15> 1 = READ NEW FILE<15> 2 = TER",
     .      "MINATE PROGRAM<15><15>OPTION = ",IN
    IF(IN.NE.1) GO TO 15
    CALL FCLOS(4)
    GO TO 1


15  CALL RESET
    END
```

```
C*****************************************************************
C*                                                               *
C*                          AUDIOMOD                             *
C*                                                               *
C*                       (AUDIO MODULE)                          *
C*                                                               *
C*****************************************************************
C
C         THIS IS A FORTRAN SUBPROGRAM WHICH IS SWAPPED
C     WITH THE MAIN PROGRAM AUDIOHIST.  SEPARATE .SV FILES
C     ARE NECESSARY FOR BOTH THE MAIN PROGRAM AND THIS SUB-
C     PROGRAM.  PROGRAM SWAPPING IS NECESSARY BECAUSE THE
C     COMBINED PROGRAMS EXCEED THE CORE STORAGE OF THE NOVA
C     COMPUTER.  AUDIOMOD IS USED TO CREATE,PLAYBACK, AND
C     EDIT AUDIO FILES.
C
C         LOADING OF THIS SUB PROGRAM MUST BE ACCOMPLISHED
C     USING THE FOLLOWING CLI COMMAND:
C
C     RLDR AUDIOMOD CHANNEL SANDS CANDR DCHTX DCHRX FORT.LB
C
C         THIS MODULE ESTABLISHES AND INITIALIZES THE CALL
C     PARAMETERS NEEDED FOR SUBROUTINE "CHANNEL" (VERSION
C     1.1).  "CHANNEL" IS USED TO TRANSFER AUDIO DATA FROM A
C     TAPE DECK, MICROPHONE OR OTHER SOURCE THROUGH THE CROM-
C     ENCO A/D CONVERTER TO A DISK FILE IT CREATES. "CHANNEL"
C     IS ALSO USED TO TRANSFER AUDIO DATA THROUGH THE CROM-
C     ENCO TO RECREATE THE ORIGINAL INPUT.
C
C*****************************************************************
C
C         VARIABLES USED IN THIS MODULE ARE THE SAME AS THOSE
C     USED IN "CHANNEL".  SEE AFIT/GE/EE/81D-2 WRITEN BY CAPT
C     BEASLEY AND CAPT FREDEL, OR A COPY OF THE "CHANNEL" ROU-
C     TINE CONTAINED IN DISK STORAGE ON THE AFIT DIGITAL PRO-
C     CESSING LAB'S NOVA/ECLIPSE COMPUTER.
C
C*****************************************************************
C
C                 *** AUDIO I/O VARIABLES ***
C       ITASK-  TASK OPTIONS:
C               0-DATA TRANSFER TO CROMENCO (2 PARAMETERS)
C               1-I/O OPTION, TWO PARAMETERS REQUIRED:
C                 SAMPLE TIME (2*MHZ/DESIRED SAMPLE RATE)
C                 CHANNEL NUMBER (1=INPUT,  0=OUTPUT)
C               2-I/O OPTION, FOUR PARAMETERS REQUIRED:
C                 STARTING ADDRESS (USUALLY 1)
C                 NUMBER OF WORDS (MAX = 22000)
C                 SAMPLE TIME(SEE ABOVE,USUALLY 250 FOR 8KHZ)
C                 CHANNEL NUMBER (1=INPUT, 3=OUTPUT)
C
C       MODE-   MODE OPTIONS:
C               0-NO DATA TRANSFER
```

```
C               1-DATA TRANSFER VIA PROGRAMMED I/O. FOR THIS
C                 MODE DCOUNT IS THE NUMBER OF DATA WORDS
C               2-DATA TRANSFER VIA DATA CHANNEL.  FOR THIS
C                 MODE DCOUNT IS THE NUMBER OF DISK BLOCKS IN
C                 EACH CHANNEL BLOCK (1 TO 16 BLOCKS TRANSFER-
C                 ED BETWEEN HANDSHAKES)
C               3-ABORT TASK
C
C       ST-     ARRAY FOR FILE STATUS
C
C       CONTROL-VARIABLE USED FOR PROGRAM ROUTING
C
C       DIR-    DIRECTION (0 = INPUT, 1 = OUTPUT)
C
C       START-  STARTING BLOCK FOR EDIT FUNCTION
C
C       BLOCKS- NUMBER OF BLOCKS FOR EDIT FUNCTION
C
C       PCNT-   PARAMETER COUNT (MUST AGREE WITH ITASK REQUIRE-
C               MENTS ABOVE)
C
C       DCOUNT- SPECIFIES DATA WORDS TO BE TRANSFERED IN MODE
C               1 OR THE NUMBER OF DISK BLOCKS IN EACH DATA
C               CHANNEL FOR MODE 2
C
C       DCHBLKS-SPECIFIES INPUT/OUTPUT FILE SIZE IN DATA
C               BLOCKS OF 256 WORDS EACH, CURRENTLY LIMITED TO
C               88 DATA BLOCKS
C
C       DARRAY- ARRAY CONTAINING DATA FOR THE OUTPUT MODE 1
C               TASK (MUST AGREE WITH DCOUNT)
C
C       PARRAY- ARRAY USED TO PASS TASK PARAMETERS (SEE ITASK
C               ABOVE)
C
C       ERROR-  CALL PARAMETER RETURNED FROM 'CHANNEL', TWO
C               EIGHT BIT FIELDS:
C               0to7-'CHANNEL' ERROR
C               8to15-'CHOPS' ERROR
C
C       SYSERR- CALL PARAMETER RETURNED FROM 'CHANNEL' INDI-
C               CATING RDOS ERRORS (SYSERR=1 IF NO ERRORS)
C
C       AUHSTX- THIS IS THE TRANSFER FILE USED TO TRANSFER
C               CONTROL AND DATA BETWEEN THE MAIN PROGRAM AND
C               THE SUBPROGRAM AUDIOMOD
C
C*************************************************************
      INTEGER PARRAY(4),DARRAY,ITASK,DIR,MODE,PCNT,ST(22),
     : DCOUNT,DCHBLKS,ERROR,SYSERR,CRCERR,MOVERR,FILENAM(7),
     : CONTROL,START,BLOCKS,TEMP(256)
      TYPE"CONTROL TRANSFERED TO 'AUDIOMOD'"
```

```
C*************************************************************
C*** READ FILE AND SET  VALUES
C*************************************************************
      CALL OPEN(5,"AUHSTX",2,IER)
      READ(5,404)FILENAM(1)
404   FORMAT(S13)
400   WRITE(10,401)FILENAM(1)
401   FORMAT(" FILENAME: ",S13)
      REWIND 5
      ITASK=2
      MODE=2
      PCNT=4
      DCOUNT=1
      DARRAY=1
      PARRAY(1)=1
      PARRAY(3)=250

C*************************************************************
C*** CHECK FILE STATUS
C*************************************************************
      CALL STAT(FILENAM,ST,IER)
      DCHOLKS=ST(9)+1
      CONTROL=0
      IF(IER.EQ.1.OR.IER.EQ.13)GO TO 411
      ACCEPT"<15><15><15><15>**************************",
     :  "*******************<15>*     NON-FATAL ERR",
     :  "OR<15>*      CALL FOR FILE STATUS<15>"
      TYPE"*      SYSTEM ERROR CODE = ",IER
      ACCEPT"*      SEE PAGE B-7 OF FORTRAN IV USERS MAN",
     :  "UAL<15>**************************************",
     :  "**********<15>"

C*************************************************************
C*** ENTER OPTIONS
C*************************************************************
411   ACCEPT"<15>OPTIONS:<15> 1 = RE",
     :  "CORD AUDIO ON GIVEN FILE<15> 2 = PLAY BACK",
     :  " AUDIO FROM GIVEN FILE<15> 3 = GO TO EDIT ",
     :  "MODULE<15> 4 = GENERATE HISTOGRAM OF CURRE",
     :  "NT FILE<15> 5 = MAX VOLTAGE AND CLIP COUNT",
     :  " OF CURRENT FILE<15> 6 = GET A NEW FILE<15>",
     :  " 7 = TERMINATE PROGRAM<15><15>OPTION = ",IN
      IF(IN.GE.4)GO TO 405

C*************************************************************
C*** OPTION 1 - RECORD
C*************************************************************
      IF(IN.NE.1)GO TO 406
      PARRAY(2)=22528
      ACCEPT"<15><15><7>**********<15><7>* WARNING *<15>",
     :  "<7>**********<15><7><15>* THIS WILL DELETE ",
     :  "YOUR CURRENT FILE AND OVER WRITE.<15><7><15>",
     :  "* DO YOU WISH TO CONTINUE OR RETURN, <15><15>",
```

```
     :  "OPTION:<15> 1 = OVERWRITE FILE<15> 2 = RET",
     :  "URN TO OPTION LIST<15><15><7>OPTION = ",IN
        IF(IN.NE.1)GO TO 411
        CALL CFILW (FILENAM,IER)
        PARRAY(4)=1
        DIR=0
        DCHBLKS=80
        GO TO 407

C*************************************************************
C*** OPTION 2 - PLAYBACK
C*************************************************************
406     IF (IN.NE.2)GO TO 408
412     PARRAY(2)=(ST(9)+1)*256
        PARRAY(4)=3
        DCOUNT=1
        DIR=1
        GO TO 407

C**** *************************************************************
C*** OPTION 3 - EDIT
C*************************************************************
408     ACCEPT"<15><15><15><15><15>EDIT OPTION:<15><15>",
     :  "ENTER DESIRED STARTING BLOCK :<15><15>STA",
     :  "RT BLOCK = ",START
        ACCEPT"<15><15><15>ENTER NUMBER OF BLOCKS DESIRED",
     :  ":<15><15>BLOCK COUNT = ",BLOCKS
        ST(9)=BLOCKS-1
        CONTROL=1
        PARRAY(1)=(START*256)+1
        GO TO 412
409     ACCEPT"<15><15><15><15>OPTIONS:<15> 1 = TRY AN",
     :  "OTHER SET OF EDIT VALUES<15> 2 = OVER WRIT",
     :  "E FILE WITH EDIT COPY<15> 3 = LEAVE EDIT F",
     :  "UNCTION<15><15>OPTION = ",IN
        IF(IN.EQ.3)GO TO 411
        IF(IN.NE.2)GO TO 408
        CALL DELETE ("AUDEDITX")
        CALL RENAM(FILENAM,"AUDEDITX",IER)
        CALL DELETE (FILENAM)
        CALL OPEN(6,"AUDEDITX",2,IER)
        CALL CFILW(FILENAM,3,IER)
        CALL OPEN(7,FILENAM,2,IER)
        N=BLOCKS-1
        DO 410 I=0,N
           CALL RDBLK(6,(START+I),TEMP,1,IER)
           CALL WRBLK(7,I,TEMP,1,IER)
           TYPE"TRANSFER LOOP",I
410     CONTINUE
        CALL FCLOS(7)
        CALL FCLOS(6)
        CALL DELETE("AUDEDITX")
        ACCEPT"<15><15>TRANSFER COMPLETE<15><15>"
```

```
        GO TO 400

C*************************************************************
C*** CALL "CHANNEL"
C*************************************************************
407     ACCEPT"<15>********************<15>*  CALLING ",
     :  "CHANNEL<15>********************<15>"
        CALL CHANNEL(ITASK,DIR,MODE,PCNT,DCOUNT,FILENAM,
     :  DCHBLKS,DARRAY,PARRAY,ERROR,SYSERR)
        ACCEPT"<15>********************<15>* CALL COMPLETE",
     :  "<15>********************<15>"

C*************************************************************
C*** CHECK FOR CHANNEL ERRORS
C*************************************************************
        CROERR=15.AND.ERROR
        NOVERR=ISHFT(-256.AND.ERROR,-8)
        IF(CROERR.EQ.0.AND.NOVERR.EQ.0.OR.CROERR.EQ.11.AND.
     :  NOVERR.EQ.32)GO TO 402
        ACCEPT"<15><15><15>*******************************",
     :  "************<15>*          NON-FATAL PROGR",
     :  "AM ERROR<15>"
        IF(BTEST(ERROR,15))ACCEPT"*                    I/O A",
     :  "BORT<15>*<15>"
        TYPE"*      SYSERR=",SYSERR
        TYPE"*      CROMEMCO ERROR=",CROERR
        CALL BCLR(NOVERR,7);CLEAR CHANNEL ERROR BIT
        TYPE"*      NOVA ERROR=",NOVERR
        TYPE"*      PCNT=",PCNT
        TYPE"*      DARRAY=",DARRAY
        TYPE"*      DIR=",DIR
        TYPE"*      PARRAY(1)=",PARRAY(1)
        TYPE"*      PARRAY(2)=",PARRAY(2)
        TYPE"*      PARRAY(3)=",PARRAY(3)
        TYPE"*      PARRAY(4)=",PARRAY(4)
        TYPE"*      ITASK=",ITASK
        TYPE"*      MODE=",MODE
        TYPE"*"
        TYPE"*      SEE 'CHANNEL' USERS MANUAL"
        TYPE"*******************************************"
        PAUSE
402     IF (CONTROL.EQ.0)GO TO 400
        GO TO 409

C*************************************************************
C*** WRITE INTO "AUHSTX" AND RETURN TO MAIN PROGRAM
C*************************************************************
409     WRITE(5,403)IN
403     FORMAT(" ",I2)
        CALL RESET
        CALL FBACK
        END
```

APPENDIX B3

```
C*************************************************************************
C
C                DISCRETE FOURIER TRANSFORM ROUTINE
C                     PROGRAM FILE NAME: "FT32V"
C
C*************************************************************************
C
C       THIS ROUTINE EXERCISES FORTRAN SUBROUTINES.  THE PROCESS:
C          1) OPENS A FILE OF DISCRETE SPEECH
C          2) READS FROM THAT FILE
C          3) CREATES TWO NEW FILES
C          4) OPENS THOSE NEW FILES
C          5) PERFORMS A DISCRETE FOURIER TRANSFORM
C          6) PREEMPHASIZES HIGH FREQ COMPONENTS FROM 500HZ TO 4000HZ
C          7) COMPRESSES THE NUMBER OF FREQUENCY CHANNELS TO 16
C          8) SAVES ONE ARRAY THAT HAS BEEN PROCESSED THROUGH
C             STEPS (1-7) ONLY
C          9) PERFORMS ENERGY NORMALIZATION ON ANOTHER ARRAY
C             A) FINDS BEGINNING AND END OF ENERGY-NORMALIZED WORD
C             B) COMPRESSES 'NON-WORD' ENERGY
C         10) WRITES BOTH ARRAYS TO A PERMANENT FILE
C
C
C       SEE 'FORTRAN IV USER'S MANUAL' FOR FURTHER EXPLANATION OF
C       SUBROUTINES AND ASSOCIATED PARAMETERS.
C
C       THIS PROGRAM MUST BE COMPILED, LOADED, AND RUN ON THE ECLIPSE
C       COMPUTER.
C
C       THE 'EDFT.LB' AND 'FORT.LB' FILES MUST BOTH BE LOADED WITH THIS
C       ROUTINE---SHOULD IT BECOME NECESSARY TO RECOMPILE 'FT32V' !!!
C
C*************************************************************************
C
       INTEGER CH,FN(7),FLN(7),FILN(7),ER,STB,SIZE,SB,SSD,FREQ1
       REAL ARAY (32,96),CARAY(16,96),ENERGY(96),LTDL
       COMPLEX CIFT (64)
       INTEGER IFT(6144),IENNOR(16,96),ICARAY(16,96)
C
C*************************************************************************
C
C       'IFT' WILL RECEIVE DATA DURING 'RDBLK' CALL.
C       'CIFT' WILL CONTAIN THE COMPLEX FORM OF 'IFT'
C       'IENNOR' WILL CONTAIN THE ENERGY-NORMALIZED,
C        INTEGER TRUNCATION OF 'CARAY''.
C       'ARAY' WILL CONTAIN THE COMPLEX ABSOLUTE VALUE OF THE DFT DATA
C       'CARAY' WILL CONTAIN THE CHANNEL COMPRESSED 'ARAY' DATA
C       'ICARAY' WILL CONTAIN THE INTEGER TRUNCATION OF 'CARAY'
C
C*************************************************************************
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'OPEN'
```

```
C       OF DISCRETE SPEECH FILE.
C
   1    CH=3      ; ARBITRARY CHANNEL ASSIGNMENT--RANGE:0-63
C                  CHANNELS 6-15 ARE ASSIGNED TO DEVICES.
C
        ACCEPT " ENTER FILENAME OF SPEECH FILE TO BE OPENED: "
        READ (11,10) FN(1)
  10    FORMAT (S13)
        MODE=1            ;MODE (1) OPENS THE FILE FOR READING ONLY
        ER=0
C
C
        CALL OPEN (CH,FN,MODE,ER)  ;ADDITIONAL PARAMETER (SIZE)
C                                          ALSO  AVAILABLE
C
C
C
        IF (ER.NE.1) TYPE "ERROR RETURNED FROM OPEN OF SPEECH FILE: ",ER
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'CFILM'
C       (TO CREATE THE ENERGY-NORMALIZED FILE)
C
        ISZ=24
C
        ACCEPT " ENTER FILENAME OF ENERGY NORMALIZED FILE: "
        READ (11,10) FLN(1)
        CALL DELETE (FLN)      ;IN CASE FILE NAME ALREADY EXIST
C
        ITYPE=3    ;TYPE '3' IS A CONTIGUOUS FILE.
C                   TYPE '2' IS A RANDOM FILE.
C                   TYPE '1' IS A SEQUENTIAL FILE.
C
        SIZE=6      ;THE NEW FILES NEED TO BE ONLY 1/4 THE SIZE OF
C                         THE SPEECH FILES.
        ER=0
C
C
        CALL CFILM (FLN,ITYPE,SIZE,ER)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'CFILM': ",ER
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'OPEN'
C       (OPENS THE ENERGY NORMALIZED FILE)
C
        CH=4
        MODE=3      ;MODE (3) OPENS THE FILE FOR RANDOM ACCESS
        ER=0
C
C
        CALL OPEN (CH,FLN,MODE,ER)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'OPEN' OF NEW FILE: ",ER
```

```
C
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'CFILW'
C       (TO CREATE THE NON ENERGY NORMALIZED FILE)
C
        ACCEPT " ENTER FILENAME OF NON ENERGY NORMALIZED FILE: "
        READ (11,10) FILN(1)
        CALL DELETE (FILN)    ;IN CASE FILENAME ALREADY EXIST
C
        ITYPE=3     ;CONTIGUOUS FILE
C
C       SIZE ALREADY ASSIGNED ABOVE
C
        ER=0
C
C
        CALL CFILW (FILN,ITYPE,SIZE,ER)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'CFILW': ",ER
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'OPEN'
C       (OPENS NON ENERGY NORMALIZED FILE)
C
        CH=5
        MODE=3    ;FILE OPENED FOR RANDOM ACCESS
        ER=0
C
C
        CALL OPEN (CH,FILN,MODE,ER)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'OPEN' OF NEW FILE: ",ER
C
C
C***** ESTABLISH VOLTAGE THRESHOLD
C
C       ENTER A THRESHOLD VOLTAGE.  THE SPEECH FILE WILL BE SEARCHED FOR
C       THE FIRST AND LAST ELEMENTS WHICH EXCEED THAT LEVEL.  THE DATA
C       BEFORE AND AFTER THOSE EVENTS WILL BE SEVERELY ATTENUATED. THIS
C       EFFECTIVELY ENHANCES THE DATA BETWEEN THOSE TWO EVENTS (WHICH
C       IS ASSUMED TO BE THE WORD DATA).
C
   3    ACCEPT " ENTER THE VOLTAGE THRESHOLD LEVEL: ",TV
C
        ITV=IFIX(TV*2047/5)  ;TRANSFORMS SPEECH FILE LEVELS TO VOLTAGE
C
        LAST=0
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'RDBLK'
C      FROM DISCRETE SPEECH FILE
C
```

```
C
      TYPE "  "
      TYPE " ***DATA TRANSFER IN PROCESS*** "
      TYPE "  "
C
      CH=3
      NB=ISZ          ;ISZ (256 WORD) BLOCKS WILL BE READ
      SB=0
      ER=0
      IBLK=0          ;RETURNED FROM 'RDBLK'--GIVES # OF BLOCKS
C                      READ IN CASE AN EOF IS ENCOUNTERED.
C
C
      CALL RDBLK (CH,SB,IFT,NB,ER,IBLK)
C
C
      IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'RDBLK': ",ER
      IF (IBLK.NE.0) TYPE " EOF ENCOUNTERED; # OF BLOCKS READ= ",IBLK
C
C***** FIND BEGINNING AND END OF WORD
C
      DO 12 I=1,6144
      IF (IFT(I).LT.ITY) GO TO 12
      IF (LAST.GT.0) GO TO 13
      IFIRST=I
      VOLTF=IFT(I)*5.0/2047.0
  13  LAST=I
  12  CONTINUE
      VOLTL=IFT(LAST)*5.0/2047.0
C
C*****
C
C     *****BEGIN FOURIER SEQUENCE****
C
C
C*************************************************************************
C
C     BY NOT ENERGY NORMALIZING THE DIGITIZED DATA BEFORE 'DFT4', THE
C     ENERGY WILL BE PRESERVED.  THE FOURIER DATA MUST THEN BE ENERGY
C     NORMALIZED TO COMPENSATE FOR VOLUME FLUCTUATIONS OF THE ANALOG
C     DATA.  NOTE THE NORMALIZING PROCEDURES AFTER THE CALL TO 'DFT4'.
C
C     THE FIRST STEP INITIALIZES 'CIFT', WHICH MUST BE OF COMPLEX FORM
C     TO BE PASSED TO 'DFT4'.
C
C     'CIFT' WILL BE OVERWRITTEN BY 'DFT4'.  (AFTER THE CALL, 'CIFT'
C     WILL CONTAIN COMPLEX FOURIER DATA).
C
C*************************************************************************
C
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'DFT4'
```

```
C
      J=1           ;'J' IS THE COLUMN INDEX OF THE TWO DIMENSION
C                        ARRAYS
      K=0           ;ARRAY INDEX FOR 'IFT'
      LAR=64        ;THE NUMBER OF ELEMENTS TO BE PASSED
      INV=0         ;FORWARD TRANSFORM
C
C
  30  DO 20 I=1,64
      CIFT(I)=IFT(I+K)
  20  CONTINUE
C
C
      CALL DFT4 (CIFT(1),LAR,INV)  ;EACH CALL WILL DFT 64 ELEMENTS.
C
C
C*****************************************************************************
C
C     IN THE FOLLOWING STEP, ONLY 32 OF THE 64 ELEMENTS WHICH WERE
C     TRANSFORMED WILL BE PRESERVED---THIS IS DUE TO THE 2 TO 1
C     REDUNDANCY INHERENT IN THE DFT PROCESS.
C
C     ALTHOUGH 'DFT4' COULD PROCESS UP TO 1024 ELEMENTS PER CALL, ONLY
C     64 ARE USED BECAUSE:
C          1)  64 GIVES BETTER RESOLUTION
C          2)  THE DATA WAS ORIGINALLY PROCESSED FOR FURTHER ANALYSIS
C              VIA 'SPSS' ROUTINES, WHICH HAVE DIFFICULTY WITH LARGE
C              VECTORS.
C
C*****************************************************************************
C
      DO 50 I=1,32
      ARAY(I,J)=CABS(CIFT(I))   ;COMPLEX, ABSOLUTE VALUE:
C                                    SQRT((A**2)+(B**2))
  50  CONTINUE
C
C     *****BEGIN HIGH FREQUENCY PREEMPHASIS*****
C
C
C*****************************************************************************
C
C     HIGH FREQUENCY PREEMPHASIS IS NECESSARY BECAUSE MOST OF THE
C     ENERGY IN SPEECH IS IN THE FREQUENCIES BELOW 300HZ.  BY 500HZ
C     THE ENERGY MUST BE PREEMPHASIZED TO STIMULATE THE FUNCTION OF
C     THE EAR.
C
C*****************************************************************************
C
      PFREQ=500.0      ;FREQ AT WHICH PREEMPHASIS BEGINS
      SFREQ=8000.0     ;SAMPLING FREQUENCY
      POB=6.0          ;THE # OF DB'S BY WHICH TO PREEMPHASIZE HIGH
C                       FREQUENCIES
      FREQ1=IFIX((PFREQ/SFREQ)*LAR)+1
```

```
C
C       THIS WILL START PREEMPHASIS AT 500HZ (THE FIFTH FREQ ELEMENT OF
C       'DFT4' OUTPUT)
C
        DO 52 I=FREQ1,32
        RI=I                ;PERMITS REAL ARITHMETIC ON THE 'DO LOOP' INDEX
C
        ARAY(I,J)=ARAY(I,J)*(10**(PDB*ALOG10(RI/FREQ1)
       1/(20*ALOG10(2.0))))
C
C       NOTE THAT RANGE OF (RI/FREQ1) IS: FROM (5/5) TO (32/5)
C       THEREBY LOGARITHMICALLY INCREASING THE AMPLITUDES AS THE
C       FREQUENCY INCREASES.
C
  52    CONTINUE
C
C
C       *****BEGIN CHANNEL COMPRESSION*****
C
C
C*************************************************************************
C
C       THE DATA IS NOW CHANNEL COMPRESSED FROM 32 TO 16 DISTINCT
C       ELEMENTS.
C
C       THIS IS DONE LINEARLY BY COMBINING ADJACENT PAIRS OF
C       ELEMENTS INTO ONE (1) AND AVERAGING THEM.
C
C       THE REASONS ARE TO PERMIT EASIER PROCESSING OF DATA AND
C       TO PERMIT MORE MEANINGFUL SPECTROGRAM REPRESENTATION.
C
C*************************************************************************
C
        K2=0
        DO 56 I=1,32,2
        K2=K2+1
        CARAY(K2,J)=(ARAY(I,J)+ARAY(I+1,J))/2.0
  56    CONTINUE
C
C
C       *****BEGIN ENERGY NORMALIZATION SEQUENCE*****
C
C
C*************************************************************************
C
C       BEFORE ENERGY NORMALIZATION IS INITIATED, A COPY OF THE
C       COMPRESSED ARRAY 'CARAY' IS SAVED TO STORE THE ENERGY
C       IN ITS ORIGINAL FORM.
C
C*************************************************************************
C
        DO 59 I=1,16
        ICARAY(I,J)=IFIX(CARAY(I,J))  ;PUTS 'CARAY' IN INTEGER FORM FOR
```

```
C                                       SUBROUTINE 'WRBLK' (WHICH MUST HAVE AN
C                                       INTEGER ARRAY)
  59    CONTINUE
C
        ENER=0
        DO 60 I=1,16
        ENER=ENER+(CARAY(I,J))**2  ;SUMS THE SQUARE OF EACH ELEMENT
  60    CONTINUE
        ENERGY(J)=SQRT(ENER)       ;ESTABLISHES ENERGY VALUE OF 'CARAY'
C
C
        K=K+64          ;NEXT 64 ELEMENTS WILL BE READ INTO 'DFT'
C
        IF (J.EQ.48) TYPE " ****BE PATIENT, THIS IS A LONG SUCKER**** "
C
        J=J+1
        IF (J.LE.96) GO TO 30    ;RETURN TO 'CALL DFT4'
C
C***** FIND THE BLOCK # FOR THE BEGINNING AND END OF THE WORD
C
        J1=IFIRST/64-2    ;FINDS BEGINNING OF WORD AND BACKS UP
C                          ONE-HALF BLOCK
        IF (J1.LE.0) GO TO 72
C
        DO 70 I=1,J1
        ENERGY(I)=5*ENERGY(I)  ;5*NON-WORD ENERGY PROVIDES ATTENUATION
  70    CONTINUE
C
  72    J2=LAST/64+2     ;FINDS LAST DATA AND ADVANCES ONE-HALF BLOCK
        IF (J2.LE.0) GO TO 76
C
        DO 74 I=J2,96
        ENERGY(I)=5*ENERGY(I)
  74    CONTINUE
C
  76    STBL=IFIRST/256.0-0.5   ;ASSIGNS STARTING BLOCK
        LTBL=LAST/256.0+0.5     ;ASSIGNS LAST BLOCK PLUS ONE-HALF
        BLL=LTBL-STBL           ;ASSIGNS BLOCK LENGTH
C
        TYPE "  "
        TYPE "***DATA TRANSFER IS COMPLETE***"
        TYPE "  "
        WRITE (10,80) FIN(1),TV,STBL,LTBL,BLL
  80    FORMAT (" FILENAME: ",S13,//," THE THRESHOLD VOLTAGE= ",F5.2,/,
     1 " STARTING BLOCK= ",F6.2,/,"     LAST BLOCK= ",F6.2,/,"   BLOCK
     1 LENGTH= ",F6.2,//)
C
        ACCEPT " DO YOU WISH TO RESET THRESHOLD VOLTAGE FOR ANOTHER
     1 RUN???---0 FOR YES; 1 FOR NO: ",L2
        IF (L2.EQ.0) GO TO 3
C
C***** COMPLETE ENERGY NORMALIZATION
```

```
C
        DO 95 J=1,96
        DO 90 I=1,16
        CARAY(I,J)=CARAY(I,J)/ENERGY(J)     ;ENERGY NORMALIZED MAGNITUDE
C                                            OF ARRAY AFTER 'DFT4'
        IENNOR(I,J)=IFIX (2047*CARAY(I,J))   ;INTEGER VERSION OF 'CARAY'
C
  90    CONTINUE
  95    CONTINUE
C
C*************************************************************************
C
C       '2047' IS A SCALING FACTOR WHICH WILL RESTATE THE ENERGY
C       NORMALIZED ELEMENTS OF 'IENNOR' IN TERMS OF THE VALUES OF
C       THE ORIGINAL DISCRETE SPEECH FILE.  FOR MORE DETAILS
C       SEE (INSERT THESIS REF.)
C
C*************************************************************************
C
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'WRBLK'
C       (WRITES TO ENERGY-NORMALIZED FILE)
C
        CH=4
        STB=0
        NUMB=6          ;# OF BLOCKS TO BE WRITTEN (ONLY SIX BLOCKS ARE
C                        WRITTEN FOR THE 24 BLOCK SPEECH FILES BECAUSE
C                        OF THE 4 TO 1 REDUCTION)
C
        ER=0
        IBLK=0          ;# OF BLOCKS WRITTEN IN THE EVENT THAT A DISK
C                        FULL OCCURS.
C
C
        CALL WRBLK (CH,STB,IENNOR,NUMB,ER,IBLK)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'WRBLK' (IENNOR): ",ER
        IF (IBLK.NE.0) TYPE " THE DISK IS FULL. "
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'WRBLK'
C       (WRITES TO NON ENERGY-NORMALIZED FILE)
C
        CH=5
        STB=0
        NUMB=6
        ER=0
        IBLK=0
C
C
        CALL WRBLK (CH,STB,ICARAY,NUMB,ER,IBLK)
C
```

```
C
      IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'URBLK' (ICARAY): ",ER
      IF (IBLK.NE.0) TYPE " THE DISK IS FULL "
      TYPE "***DATA TRANSFER TO NEW FILES IS COMPLETE***"
      TYPE "  "
C
      CALL RESET    ;CLOSES ALL FILES
C
      ACCEPT " DO YOU WISH TO PROCESS ANOTHER FILE?
     1 ---0 FOR YES; 1 FOR NO: ",LL
C
      IF (LL.EQ.0) GOTO 1
C
      END
```

APPENDIX B4

```
C*****************************************************************************
C
C                          SPECTROGRAM ROUTINE
C                      PROGRAM FILENAME: "SPECGRAM32"
C                           DIR DPCF:HUNTER
C
C*****************************************************************************
C
C       THIS ROUTINE PRODUCES A SPECTROGRAM FROM A FILE WHICH MUST
C       CONTAIN AN ENERGY-NORMALIZED, HIGH FREQUENCY EMPHASIZED,
C       AND CHANNEL COMPRESSED DISCRETE FOURIER TRANSFORM OF A FILE OF
C       DISCRETE SPEECH. THE DFT FILES WERE PRODUCED BY PROGRAM "FT32V".
C       "FT32V"  SCALES THE DATA BY MULTIPLYING ALL ELEMENTS BY '2047'
C       THIS NUMBER IS THE FULL SCALE VALUE (11 BITS) OF THE ORCHECO
C       D/A CONVERTOR.  THIS SCALING PERMITS THE ENERGY-NORMALIZED DFT
C       TO BE EASILY COMPARED WITH THE ORIGINAL DISCRETE SPEECH DATA,
C       WHEN PLOTTED ON THE SAME SCALE (SEE THESIS)
C
C*****************************************************************************
C
C       PROCEDURE:
C          1) THE DFT FILE IS OPENED
C          2) THE DFT FILE IS READ INTO AN INTEGER ARRAY
C          3) SPECTROGRAM VARIABLES ARE ESTABLISHED
C          4) PRINTRONIX PLOTTER FUNCTION VARIABLES ARE ESTABLISHED
C          5) THE ELEMENTAL MAGNITUDES ARE ADJUSTED FOR PRINTER
C              COMPATABILITY
C
C*****************************************************************************
C
C
        INTEGER SYM1(10),SYM2(10),SYM3(10),SYM4(10),SYM5(10),SYM6(10)
        INTEGER FN(7),CH,BYTE,WORD,MODE,ER,SD,LB,SARAY(16,96)
        COMMON/BLK/SYM1,SYM2,SYM3,SYM4,SYM5,SYM6
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'OPEN'
C       (OPENS 'FT32V' FILE)
C
   1    CH=2
        ACCEPT " ENTER FILENAME OF 'FT32V' FILE TO BE OPENED: "
        READ (11,2) FN(1)
   2    FORMAT (S13)
C
        MODE=1      ;OPENS FILE FOR READING ONLY
        ER=0
C
C
        CALL OPEN (CH,FN,MODE,ER)
C
C
        IF(ER.NE.1) TYPE " ERROR RETURNED FROM 'OPEN': ",ER
C
```

```
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'RDBLK'
C       (FROM 'FT32V' FILE)
C
        SB=0    ;THE FIRST BLOCK TO BE READ FROM THE SPEECH FILE
C
        CH=2
        NB=6            ;ALL SIX (256 WORD) BLOCKS WILL BE READ PER CALL
        ER=0
        IBLK=0          ;RETURNED FROM 'RDBLK'---GIVES THE # OF BLOCKS
C                        READ IN CASE AN EOF IS ENCOUNTERED
C
C
C
   3    CALL RDBLK (CH,SB,SARAY,NB,ER,IBLK)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'RDBLK': ",ER
        IF (IBLK.NE.0) TYPE " EOF ENCOUNTERED; # OF BLOCKS READ= ",IBLK
C
C***** ESTABLISH PRINTRONIX PLOTTER FUNCTION VARIABLES (THESE CODES
C       ARE 'ASCII' CHARACTERS---IN 'OCTAL' FORMAT)
C       (SEE 'PRINTRONIX APPLICATION NOTES' #102370 FOR MORE DETAILS)
C
        IPLOT=005K      ;PLOT COMMAND
        ILF=012K        ;PRINT LINE OF DATA
        IDASH=177K      ;DASH USED FOR SCALE ON SPECTROGRAM
        IBL=0           ;BLANK INSURES THAT COMPLETE WORD IS OUTPUT
C
C***** ADJUST MAGNITUDES OF ARRAY ELEMENTS
C
        TYPE "  "
        TYPE " THE THRESHOLD VOLTAGE RANGE IS: '0.0-5.0' VOLTS "
        TYPE "  "
C
        ACCEPT " ENTER SPECTROGRAM THRESHOLD VOLTAGE: ",TV
C
        ITV=IFIX(TV*2047/5)
C
        DO 10 J=1,96
        DO 20 I=1,16
C
        IF (SARAY(I,J).LE.ITV) SARAY(I,J)=0    ;ZEROES VALUES BELOW
C                                               THRESHOLD
C
        SARAY(I,J)=IFIX((FLOAT(SARAY(I,J))/2047)*10.0)+1
C
C       TO INSURE THAT THE VALUES ARE NOW BETWEEN 1 AND 10:
C
        IF (SARAY(I,J).LE.0) SARAY(I,J)=1
        IF (SARAY(I,J).GT.10) SARAY(I,J)=10
  20    CONTINUE
  10    CONTINUE
C
```

```
C***** ESTABLISH SPECTROGRAM VARIABLES
C
      ICOUNT=1      ;PRINTS A DASH AFTER 10 VECTORS
C
      TYPE " SELECT THE # OF REPETITIONS OF THE CHARACTERS "
      TYPE "  "
C
      ACCEPT " ENTER THE # OF VERTICAL REPETITIONS: ",IHEIGHT
C
      ACCEPT " ENTER THE # OF HORIZONTAL REPETITIONS: ",IWIDTH
C
C***** DATA FOR SPECTROGRAM SYMBOLS.  EACH SYMBOL DEFINES 1 OF 6 DOT
C     LINES FOR 10 LEVELS OF INTENSITY
C
      DATA SYM1/100K,100K,100K,122K,122K,122K,122K,166K,177K,177K/
      DATA SYM2/100K,122K,166K,166K,177K,177K,177K,177K,177K,177K/
      DATA SYM3/100K,100K,100K,100K,100K,122K,133K,133K,133K,177K/
      DATA SYM4/100K,100K,100K,122K,122K,122K,122K,166K,177K,177K/
      DATA SYM5/100K,122K,166K,166K,177K,177K,177K,177K,177K,177K/
      DATA SYM6/100K,100K,100K,100K,122K,133K,133K,133K,133K,177K/
C
C***** PRODUCE AND OUTPUT CHARACTERS FOR SPECTROGRAM (BY SENDING ONE (1)
C     16 CHANNEL FOURIER TRANSFORM PER PLOT COMMAND)
C
      TYPE "  "
      TYPE " ***SPECTROGRAM CONSTRUCTION IN PROCESS*** "
      TYPE "  "
C
      WRITE (12,25) FN(1),IWIDTH,IHEIGHT,TV
  25  FORMAT ("1",S13,//," HORIZONTAL REPETITIONS= ",I2,/," VERTICAL
     1 REPETITIONS= ",I2,/," THRESHOLD VOLTAGE=",F5.2,///)
C
C
C***** INITIATE SUBROUTINE SGRAM
C
      BYTE=999
C
      CALL SGRAM (BYTE)
C
      DO 900 J=1,96      ;WILL SEND (96*IWIDTH) DISTINCT VECTORS.  EACH
C                         VECTOR WILL HAVE 16 FREQUENCY ELEMENTS
      DO 500 KK=1,IWIDTH
C
      CALL SGRAM (IPLOT)   ;SEND PLOT COMMAND TO PRINTRONIX
C
C***** SEND 1ST DOT ROW
C
      DO 30 I=1,16
      K=SARAY(I,J)
      DO 30 L=1,IHEIGHT       ;# OF VERTICAL REPETITIONS
C
      CALL SGRAM (SYM1(K))
```

```
C
  30    CONTINUE
C
        CALL SGRAM (ILF)      ;SEND LINEFEED
C
        CALL SGRAM (IPLOT)
C
C***** SEND 2ND DOT ROW
C
        DO 40 I=1,16
        K=SARAY(I,J)
        DO 40 L=1,IHEIGHT
C
        CALL SGRAM (SYM2(K))
C
  40    CONTINUE
C
        CALL SGRAM (ILF)
C
        CALL SGRAM (IPLOT)
C
C***** SEND 3RD DOT ROW
C
        DO 50 I=1,16
        K=SARAY(I,J)
        DO 50 L=1,IHEIGHT
C
        CALL SGRAM (SYM3(K))
C
  50    CONTINUE
C
        CALL SGRAM (ILF)
C
        CALL SGRAM (IPLOT)
C
C***** SEND 4TH DOT ROW
C
        DO 60 I=1,16
        K=SARAY(I,J)
        DO 60 L=1,IHEIGHT
C
        CALL SGRAM (SYM4(K))
C
  60    CONTINUE
C
        CALL SGRAM (ILF)
C
        CALL SGRAM (IPLOT)
C
C***** SEND 5TH DOT ROW
C
        DO 70 I=1,16
```

```
        K=SARAY(I,J)
        DO 70 L=1,IHEIGHT
C
        CALL SGRAM (SYM5(K))
C
  70    CONTINUE
C
        CALL SGRAM (ILF)
C
        CALL SGRAM (IPLOT)
C
C***** SEND 5TH DOT ROW
C
        DO 80 I=1,16
        K=SARAY(I,J)
        DO 80 L=1,IHEIGHT
C
        CALL SGRAM (SYM6(K))
C
  80    CONTINUE
C
C
C*****  PRINT A DASH AFTER EVERY 10 VECTORS
C
        IF (ICOUNT.NE.10) GOTO 90
C
        CALL SGRAM (IDASH)
C
        ICOUNT=0
  90    CALL SGRAM (ILF)
        ICOUNT=ICOUNT+1
 500    CONTINUE
C
        CALL SGRAM (IBL)  ;SEND A BLANK TO INSURE LAST CHARACTER SENT
C
 900    CONTINUE
C
        TYPE "  "
        TYPE " ***SPECTROGRAM CONSTRUCTION COMPLETE*** "
        TYPE "  "
C
C
        ACCEPT " DO YOU WISH TO RESET THRESHOLD VOLTAGE AND RUN AGAIN?
     1---0 FOR YES;              1 FOR NO: ",K5
C
        IF (K5.EQ.0) GO TO 3
C
        CALL RESET     ;CLOSES ALL FILES
C
        ACCEPT " DO YOU WISH TO PRODUCE ANOTHER SPECTROGRAM FROM ANOTHER
     1 FILE?---0 FOR YES;       1 FOR NO: ",KK
C
```

```
        IF (KK.EQ.0) GOTO 1
C
        STOP
        END



C*************************************************************************
C
C                    SUBROUTINE SGRAM
C
C*************************************************************************
C
        SUBROUTINE SGRAM (BYTE)
C
        INTEGER BYTE,WORD
C
        IF (BYTE.EQ.999)  IFLAG=0   ;INITIALIZES SUBROUTINE
        MASK=177400K
        IF (IFLAG.NE.0) GOTO 180
C
C***** PACK 1ST BYTE INTO 'WORD'
C
        WORD=BYTE
        IFLAG=1
C
        RETURN
        C
        C***** PACK 2ND BYTE INTO 'WORD'
C
 180    WORD=ISHFT(WORD,8)
        WORD=IAND(WORD,MASK)
        WORD=IOR(WORD,BYTE)
C
        WRITE BINARY (12) WORD
        IFLAG=0
C
        RETURN
C
        END
```

APPENDIX B5

```
C*************************************************************************
C
C                DISCRETE FOURIER TRANSFORM ROUTINE
C                     PROGRAM FILE NAME: "FSTART"
C
C*************************************************************************
C
C       THIS PROGRAM MUST BE COMPILED, LOADED, AND RUN ON THE ECLIPSE
C       COMPUTER.
C
C       THE 'EDFT.LB' AND 'FORT.LB' FILES MUST BOTH BE LOADED WITH THIS
C       ROUTINE---SHOULD IT BECOME NECESSARY TO RECOMPILE 'FSTART' !!!
C
C*************************************************************************
C
        INTEGER CH,FN(7),ER
        INTEGER WORD(7),GLEV(7)
        REAL ARAY(32,96),LTBL,ALTH(8),BLL(8)
        COMPLEX CIFT (64)
        INTEGER IFT(6144),FREQCK(96)
C
C*************************************************************************
C
        ICNT=1
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'OPEN'
C      OF DISCRETE SPEECH FILE.
C
   1    CH=5      ; ARBITRARY CHANNEL ASSIGNMENT--RANGE:0-63
C                  CHANNELS 6-15 ARE ASSIGNED TO DEVICES.
C
        ACCEPT "ENTER FILENAME OF SPEECH FILE TO BE OPENED: "
        READ (11,10) FN(1)
  10    FORMAT (S13)
        MODE=1           ;MODE (1) OPENS THE FILE FOR READING ONLY
        ER=0
C
C
        CALL OPEN (CH,FN,MODE,ER)  ;ADDITIONAL PARAMETER (SIZE)
C                                          ALSO AVAILABLE
C
C
        IF (ER.NE.1) TYPE "ERROR RETURNED FROM OPEN OF SPEECH FILE: ",ER
C
        ISZ=24
C
C***** ESTABLISH VOLTAGE THRESHOLD
C
C       THE SPEECH FILE WILL BE SEARCHED FOR THE FIRST AND LAST
C       ELEMENTS WHICH EXCEED THAT LEVEL.  THOSE DATA POINTS
C       ARE ASSUMED TO BE THE WORD.
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'RDBLK'
```

```
C       FROM DISCRETE SPEECH FILE
C
C
C
        TYPE "  "
        TYPE " ***DATA TRANSFER IN PROCESS*** "
        TYPE "  "
C
        CH=3
        NB=ISZ          ;ISZ*(256 WORD) BLOCKS WILL BE READ
        SB=0
        ER=0
        IBLK=0          ;RETURNED FROM 'RDBLK'--GIVES # OF BLOCKS
C                        READ IN CASE AN EOF IS ENCOUNTERED.
C
C
C
        CALL RDBLK (CH,SB,IFT,NB,ER,IBLK)
C
C
        IF (ER.NE.1) TYPE " ERROR RETURNED FROM 'RDBLK': ",ER
        IF (IBLK.NE.0) TYPE " EOF ENCOUNTERED; # OF BLOCKS READ= ",IBLK
C
C***** FIND BEGINNING AND END OF WORD
C
        ITV=0
        JA=1
        JB=8
        DO 5 JC=1,6144
        DO 3 I=JA,JB
        ITV=ITV+IABS(IFT(I))    ;FIND THRESHOLD VOLTAGE
    3   CONTINUE
C
        ITV=ITV/8                ;AVERAGE THRESHOLD VOLTAGE
        IF (ITV.GT.150) GO TO 6  ;150 IS APPROX. EQUAL TO 0.4V
        JA=JA+1
        JB=JB+1
    5   CONTINUE
C
    6   VPER=0.75    ;PRESETS PERCENT OF THRESHOLD TO 75%
        GO TO 11     ;BYPASSES INPUT OF VOLTAGE THRESHOLD UNLESS RESET
C
    7   ACCEPT "ENTER VOLTAGE THRESHOLD PERCENT: ",VPER
        VPER=VPER/100
C
   11   ITVCK=ITV+(VPER*ITV)    ;ADDS PERCENT OVER THRESHOLD TO
C                                THRESHOLD VALUE.  THIS IS THE VALUE USED
C                                TO CHECK THE FILES.
C
        LAST=0
        DO 12 I=1,6144
        IF (IFT(I).LT.ITVCK) GO TO 12
        IF (LAST.GT.0) GO TO 13
```

```
        IFIRST=I
   13   LAST=I
   12   CONTINUE
C
C*****
C
        TYPE " "
        TYPE " ***FOURIER SEQUENCE IN PROCESS*** "
        TYPE "  "
C
C*************************************************************************
C
C       'CIFT' WILL BE OVERWRITTEN BY 'DFT4'.  (AFTER THE CALL, 'CIFT'
C       WILL CONTAIN COMPLEX FOURIER DATA).
C
C*************************************************************************
C
C
C***** ESTABLISH PARAMETERS FOR SUBROUTINE 'DFT4'
C
        J=1             ;'J' IS THE COLUMN INDEX OF THE TWO DIMENSION
C                               ARRAYS
        K=0             ;ARRAY INDEX FOR 'IFT'
        LAR=64          ;THE NUMBER OF ELEMENTS TO BE PASSED
        INV=0           ;FORWARD TRANSFORM
C
C
   30   DO 20 I=1,64
        CIFT(I)=IFT(I+K)
   20   CONTINUE
C
C
        CALL DFT4 (CIFT(1),LAR,INV)  ;EACH CALL WILL DFT 64 ELEMENTS.
C
C
C*************************************************************************
C
C       IN THE FOLLOWING STEP, ONLY 32 OF THE 64 ELEMENTS WHICH WERE
C       TRANSFORMED WILL BE PRESERVED---THIS IS DUE TO THE 2 TO 1
C       REDUNDANCY INHERENT IN THE DFT PROCESS.
C
C       ALTHOUGH 'DFT4' COULD PROCESS UP TO 1024 ELEMENTS PER CALL, ONLY
C       64 ARE USED BECAUSE:
C            1)  64 GIVES BETTER RESOLUTION
C            2)  THE DATA WAS ORIGINALLY PROCESSED FOR FURTHER ANALYSIS
C                VIA 'SPSS' ROUTINES, WHICH HAVE DIFFICULTY WITH LARGE
C                VECTORS.
C
C*************************************************************************
C
        DO 50 I=1,32
        ARAY(I,J)=CABS(CIFT(I))    ;COMPLEX, ABSOLUTE VALUE:
C                                       SQRT((A**2)+(B**2))
```

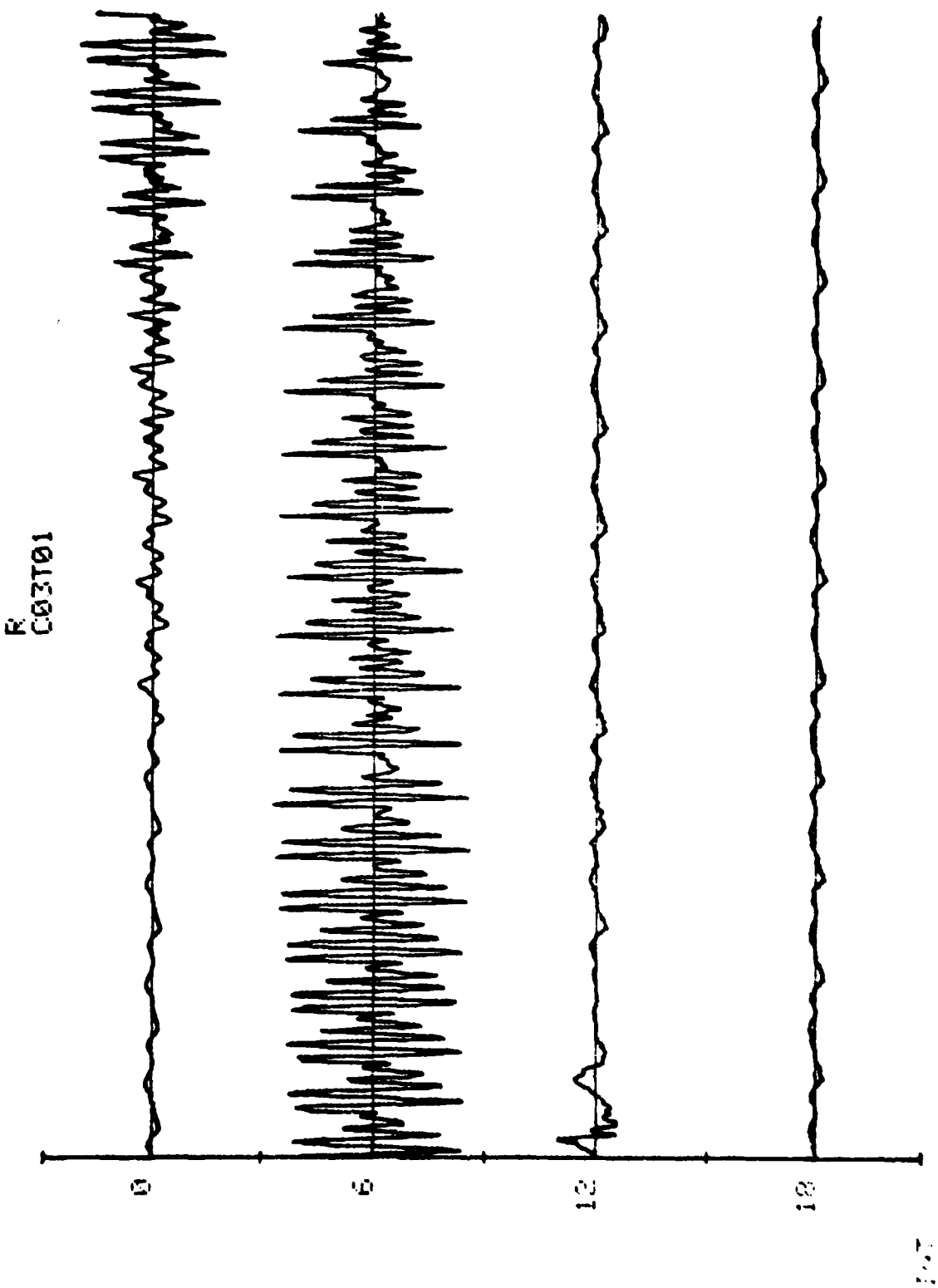
```
  50    CONTINUE
C
       FREQCK(J)=0
       DO 51 I=2,32
       FREQCK(J)=FREQCK(J)+IFIX(ARAY(I,J)/4)    ;THE 'FREQCK(J)' VALUE
C                                                 IS DIVIDED BY '4' TO
C                                                 LIMIT THE FILE SIZE.
C                                                 THE '4' IS ARBITRARY.

  51    CONTINUE
C
       K=K+64          ;NEXT 64 ELEMENTS WILL BE READ INTO 'DFT'
C
       IF (J.EQ.48) TYPE " ***HALF-WAY***"
C
       J=J+1
       IF (J.LE.96) GO TO 30     ;RETURN TO 'CALL DFT4'
C
C***** FIND THE BLOCK # FOR THE BEGINNING AND END OF THE WORD
C
       ITHR=0
       JE=1
       JF=4
       DO 56 JD=1,92
       DO 54 I=JE,JF
       ITHR=ITHR+FREQCK(I)    ;FIND FREQ THRESHOLD
  54    CONTINUE
C
       ITHR=ITHR/4    ;AVERAGE FREQ THRESHOLD
       IF (ITHR.GT.2000) GO TO 58    ;'2000' IS A MEDIUM LARGE NUMBER
C                                     WHICH INSURES THAT ACTUAL DATA IS
C                                     BEING CHECKED FOR THRESHOLD.

       JE=JE+1
       JF=JF+1
  56    CONTINUE
C
  58    TV=ITV*5.0/2047.0    ;CONVERTS TO VOLTAGE
       TVCK=ITVCK*5.0/2047.0
C
       TYPE "  "
       TYPE "THRESHOLD VOLTAGE= ",TV
       TYPE "    CHECKED LEVEL= ",TVCK
C
       TYPE "  "
       TYPE "THRESHOLD FREQUENCY AMPLITUDE= ",ITHR
       TYPE "  "
C
       IIII=75    ;FREQ THRESHOLD PRESET TO 75
       GO TO 450     ;BYPASSES FREQCK(I) OUTPUT UNLESS THRESHOLD
C                     IS RESET
 400    DO 63 J=1,96
```

```
      TYPE " FREQCK(",J,")=",FREQCK(J)
 65   CONTINUE
      TYPE "  "
      ACCEPT "ENTER FREQUENCY THRESHOLD PERCENT: ",ITTT
 450  FPER=FLOAT(ITTT)/100.0+1.0
      DO 64 J=1,96
      IF (FREQCK(J).LE.(FPER*ITHR)) GO TO 64    ;SEARCHES FOR FREQ
                                                 START OF WORD
C
      IFFR=J-1    ;BACKS UP 1/4 OF A BLOCK
      GO TO 65
 64   CONTINUE
      TYPE "***BEGINNING NOT FOUND***"
 65   IF (IFFR.LT.1) IFFR=1
      DO 66 J=IFFR,95
      IF (FREQCK(J).LE.(FPER*ITHR)) GO TO 66    ;SEARCHES FOR FREQ
                                                 END OF WORD
C
      LST=J+1    ;ADDS 1/4 OF A BLOCK
 66   CONTINUE
C
      FFR=FLOAT(IFFR)*64/256    ;CONVERTS TO BLOCKS
      ALST=FLOAT(LST)*64/256
      ALTH(ICNT)=ALST-FFR
C
      STBL=IFIRST/256.0-0.25    ;ASSIGNS STARTING BLOCK
      LTBL=LAST/256.0+0.25      ;ASSIGNS LAST BLOCK PLUS 1/4
      BLL(ICNT)=LTBL-STBL       ;ASSIGNS BLOCK LENGTH
C
      WRITE (10,160) FN(1),STBL,FFR,LTBL,ALST,BLL(ICNT),ALTH(ICNT)
 160  FORMAT (" FILENAME: ",S13,//," FIRST VOLT CK BLOCK= ",F5.2,
     1"     FIRST FREQ CK BLOCK= ",F6.2,/,"  LAST VOLT CK BLOCK= ",F6.2,
     1"      LAST FREQ CK BLOCK= ",F6.2,/,"   VOLT BLOCK LENGTH= ",F6.2,
     1"         FREQ BLOCK LENGTH= ",F6.2,//)
C
C
      TYPE "  "
      TYPE "***DATA TRANSFER IS COMPLETE***"
      TYPE "  "
      ACCEPT "DO YOU WISH TO RESET FREQ THRESHOLD PERCENT???
     1--0 FOR YES; 1 FOR NO: ",IJK
      IF (IJK.EQ.0) GO TO 400
C
      ACCEPT "DO YOU WISH TO RESET VOLTAGE THRESHOLD PERCENT???
     1--0 FOR YES; 1 FOR NO: ",JJ9
      IF (JJ9.EQ.0) GO TO 7
C
      WRITE (12,160) FN(1),STBL,FFR,LTBL,ALST,BLL(ICNT),ALTH(ICNT)
C
      TYPE "  "
C
      CALL RESET    ;CLOSES ALL FILES
C
      ACCEPT "DO YOU WISH TO PROCESS ANOTHER FILE?
```

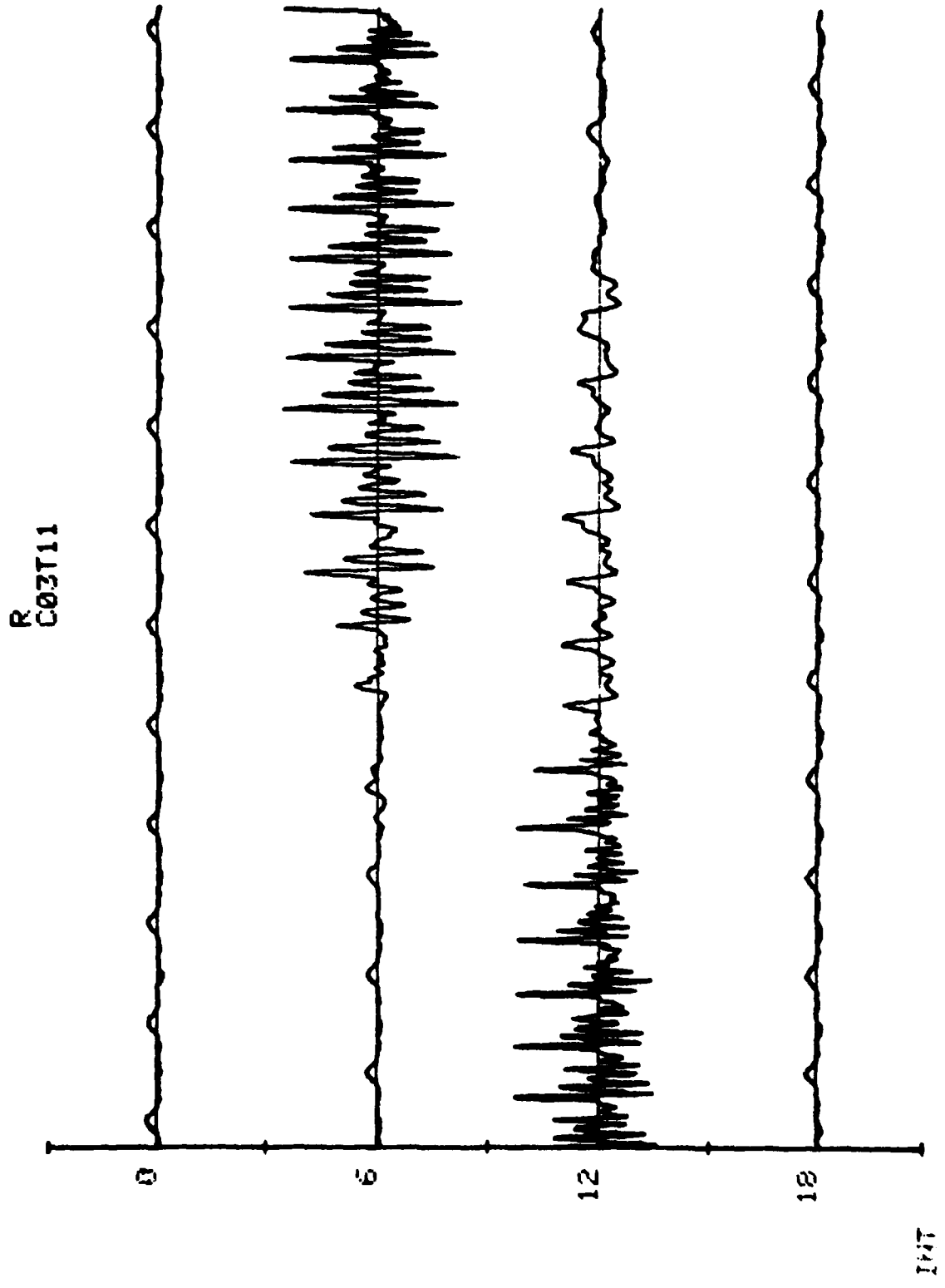
```
     1 ---0 FOR YES; 1 FOR NO: ",LL
C
        IF (LL.EQ.1) GOTO 500
        ICNT=ICNT+1
        GO TO 1
C
 500    TYPE "  "
        ACCEPT "ENTER WORD WHICH WAS JUST PROCESSED: "
        READ (11,10) WORD(1)
        TYPE "  "
        ACCEPT "ENTER G-LEVEL: "
        READ (11,10) GLEV(1)
        TYPE "  "
        FAVER=0.0      ;FREQ BLOCK AVERAGE
        FLONG=0.0      ;LONGEST FREQ BLOCK
        FSHORT=100.0   ;SHORTEST FREQ BLOCK
        DO 300 I=1,ICNT
        FAVER=FAVER+ALTH(I)    ;SUMS BLOCK LENGTHS
        IF (ALTH(I).GT.FLONG) FLONG=ALTH(I)
        IF (ALTH(I).LT.FSHORT) FSHORT=ALTH(I)
 300    CONTINUE
        FAVER=FAVER/ICNT    ;AVERAGES BLOCK LENGTHS
        FVAR=FLONG-FSHORT    ;VARIANCE IN BLOCK LENGTH
C
C
        VAVER=0.0     ;VOLT BLOCK AVERAGE
        VLONG=0.0
        VSHORT=100.0
        DO 310 I=1,ICNT
        VAVER=VAVER+BLL(I)
        IF (BLL(I).GT.VLONG) VLONG=BLL(I)
        IF (BLL(I).LT.VSHORT) VSHORT=BLL(I)
 310    CONTINUE
        VAVER=VAVER/ICNT
        VVAR=VLONG-VSHORT
C
        WRITE (10,340)
 340    FORMAT ("            FREQUENCY")
        WRITE (10,350) WORD(1),GLEV(1),FVAR,FAVER
 350    FORMAT (" ****************************",/," *
     1            *",/," *      WORD =   ",S12,"*",/," *   G-LEVEL =    "
     1 ,S12,"*",/," *  VARIANCE = ",F6.2,"        *",/," *   AVERAGE
     1 = ",F6.2,"        *",/," *                          *",/,
     1 " ****************************",/)
        WRITE (10,360)
 360    FORMAT ("             VOLTAGE")
        WRITE (10,350) WORD(1),GLEV(1),VVAR,VAVER
C
        WRITE (10,370) TV,TVCK,ITHR
 370    FORMAT (" VOLTAGE THRESHOLD= ",F5.2,/,"  VOLTAGE CK LEVEL= ",
     1  F5.2,/,"    FREQ THRESHOLD=",I3,/)
C
```

```
      WRITE (12,340)
      WRITE (12,350) WORD(1),GLEV(1),FVAR,FAVER
      WRITE (12,360)
      WRITE (12,350) WORD(1),GLEV(1),VVAR,VAVER
      WRITE (12,370) TV,TVCK,ITHR
C
      STOP
      END
```

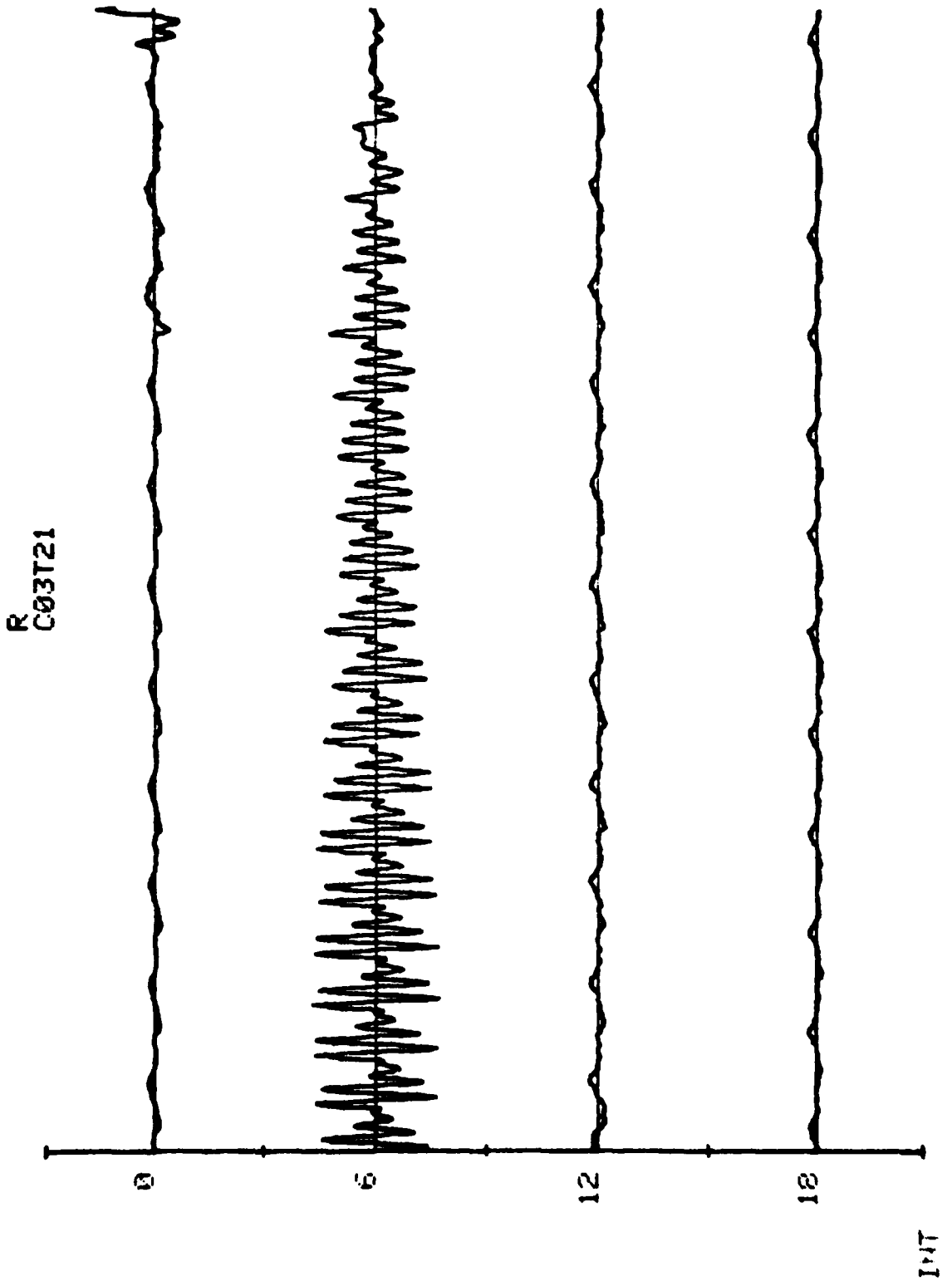
APPENDIX C1

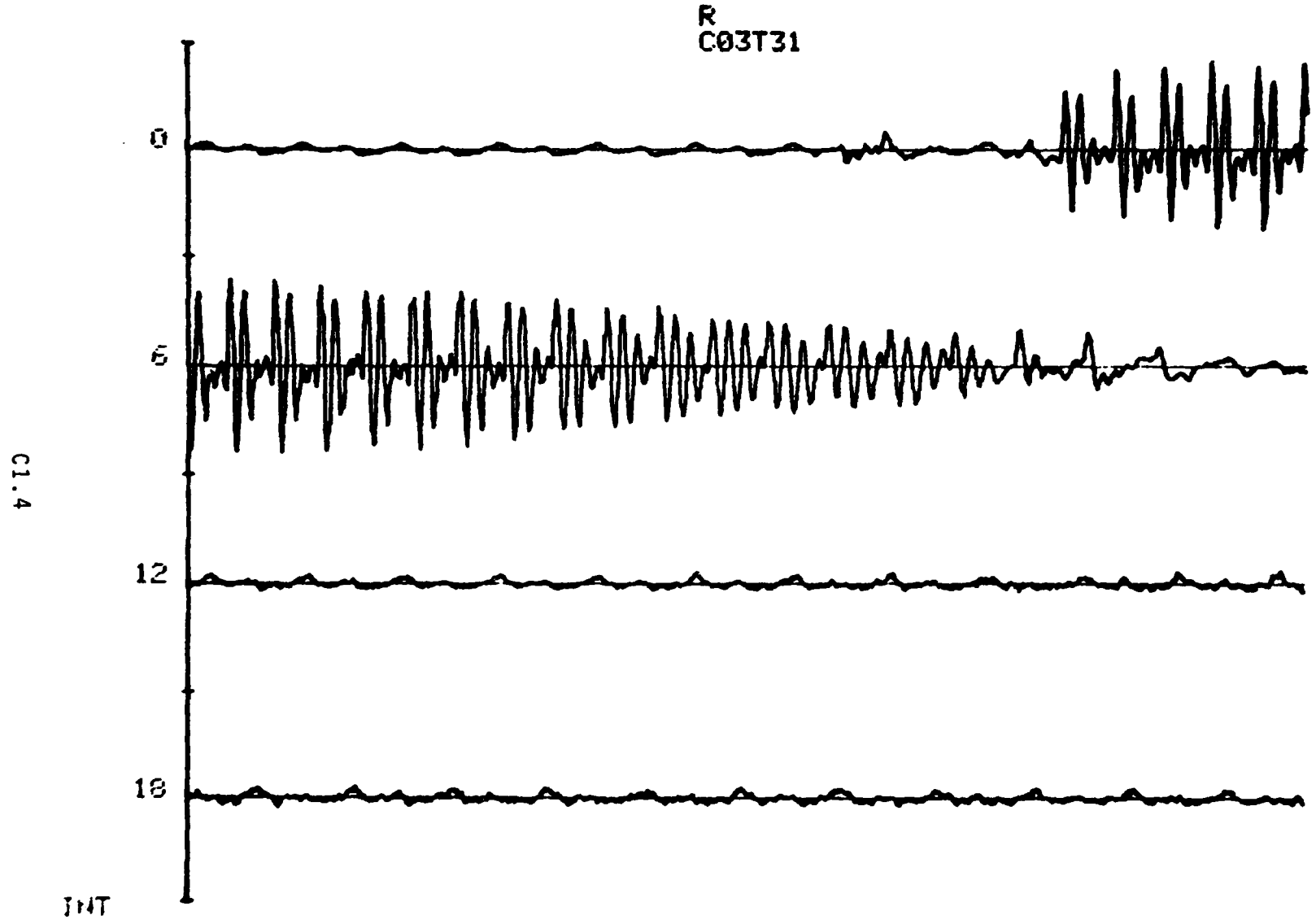


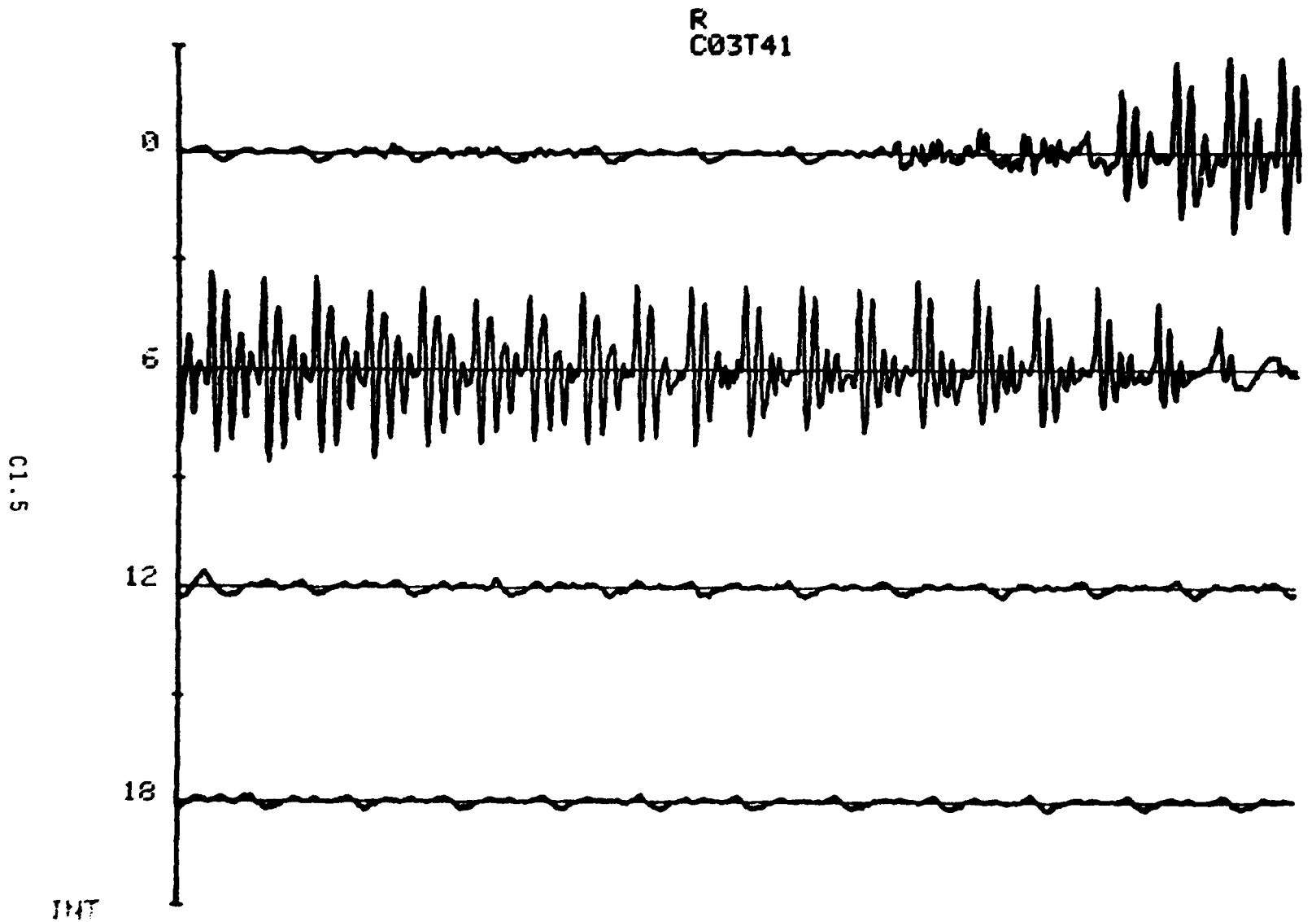
C1.1

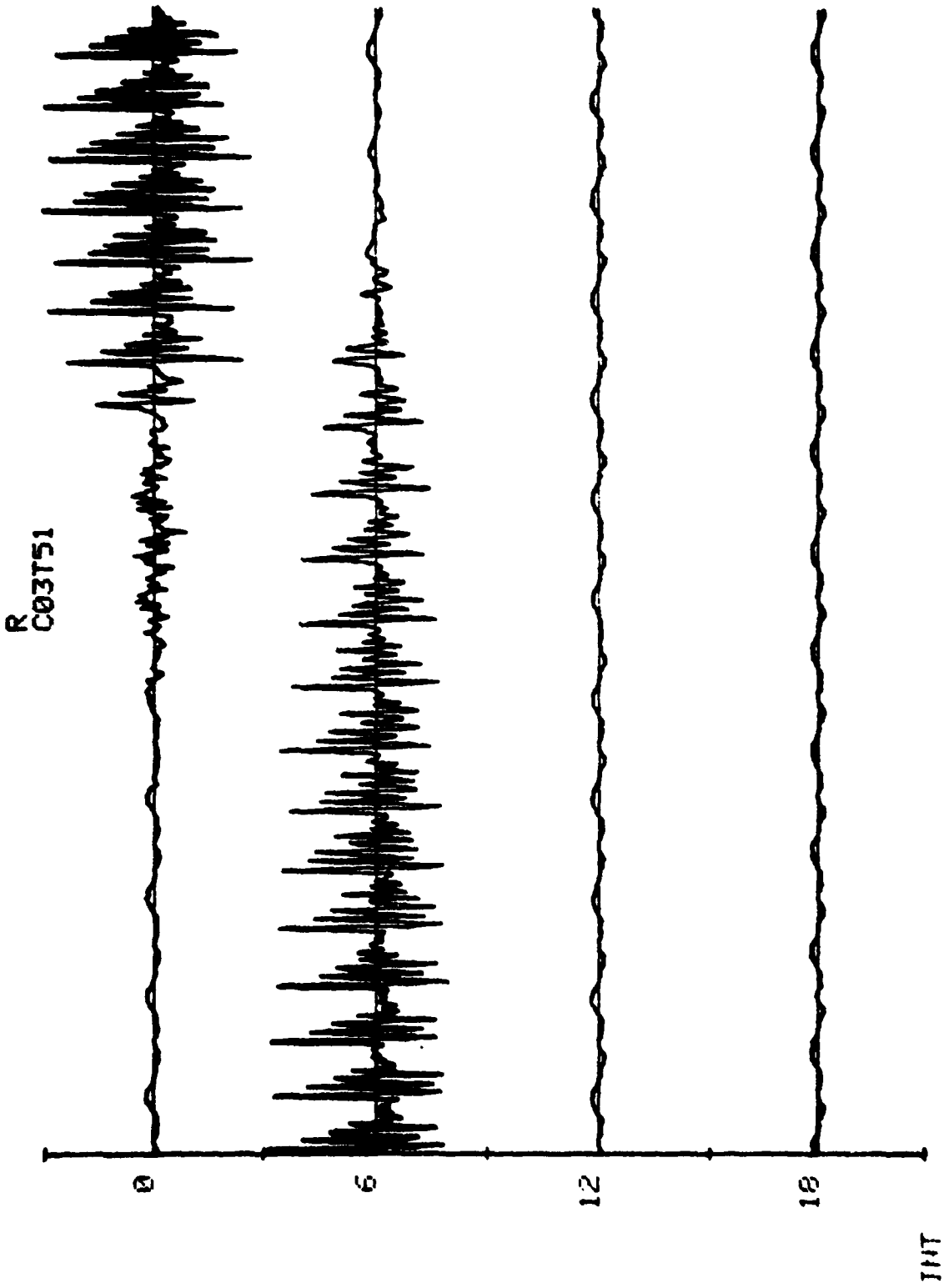


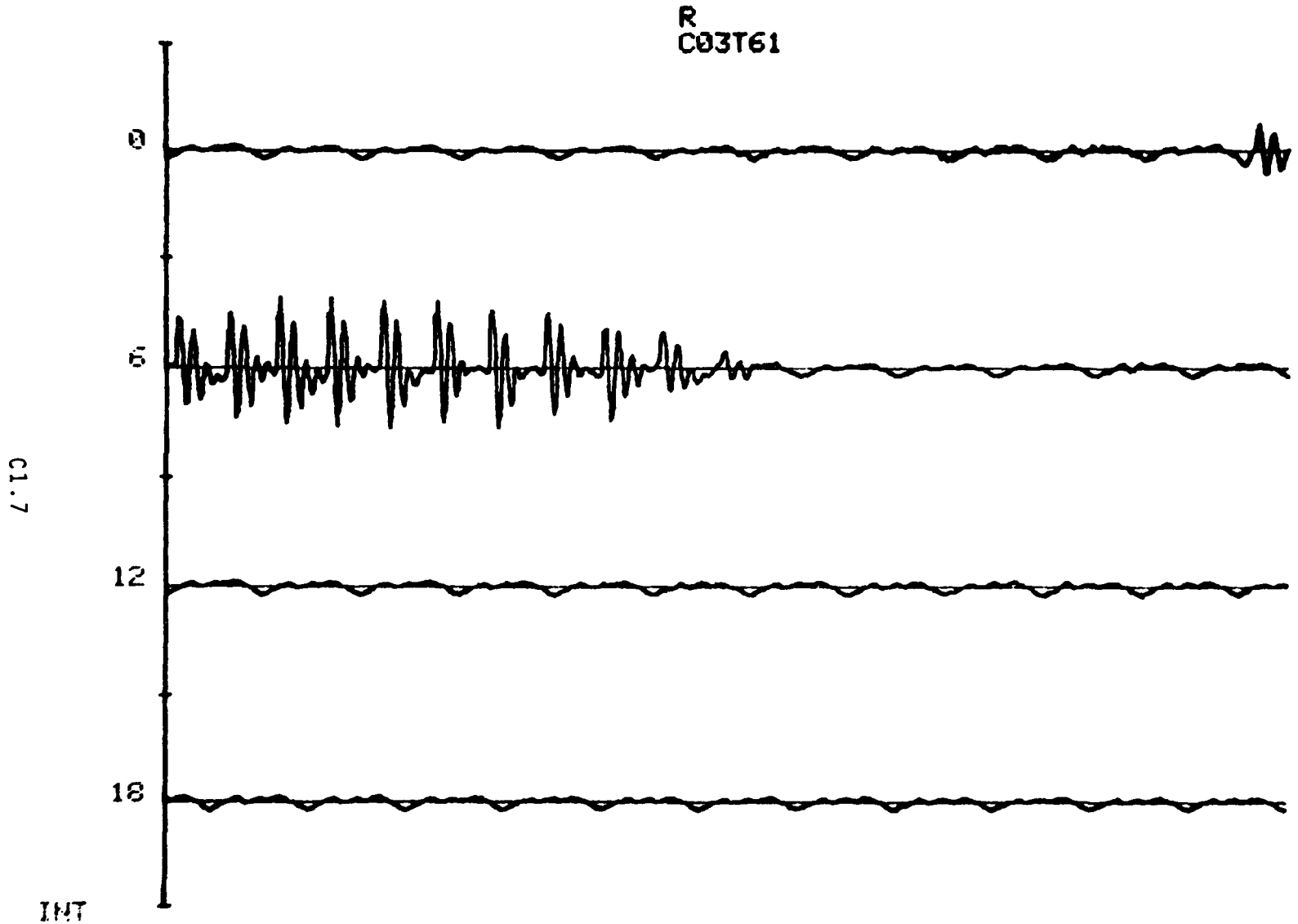
C1.2

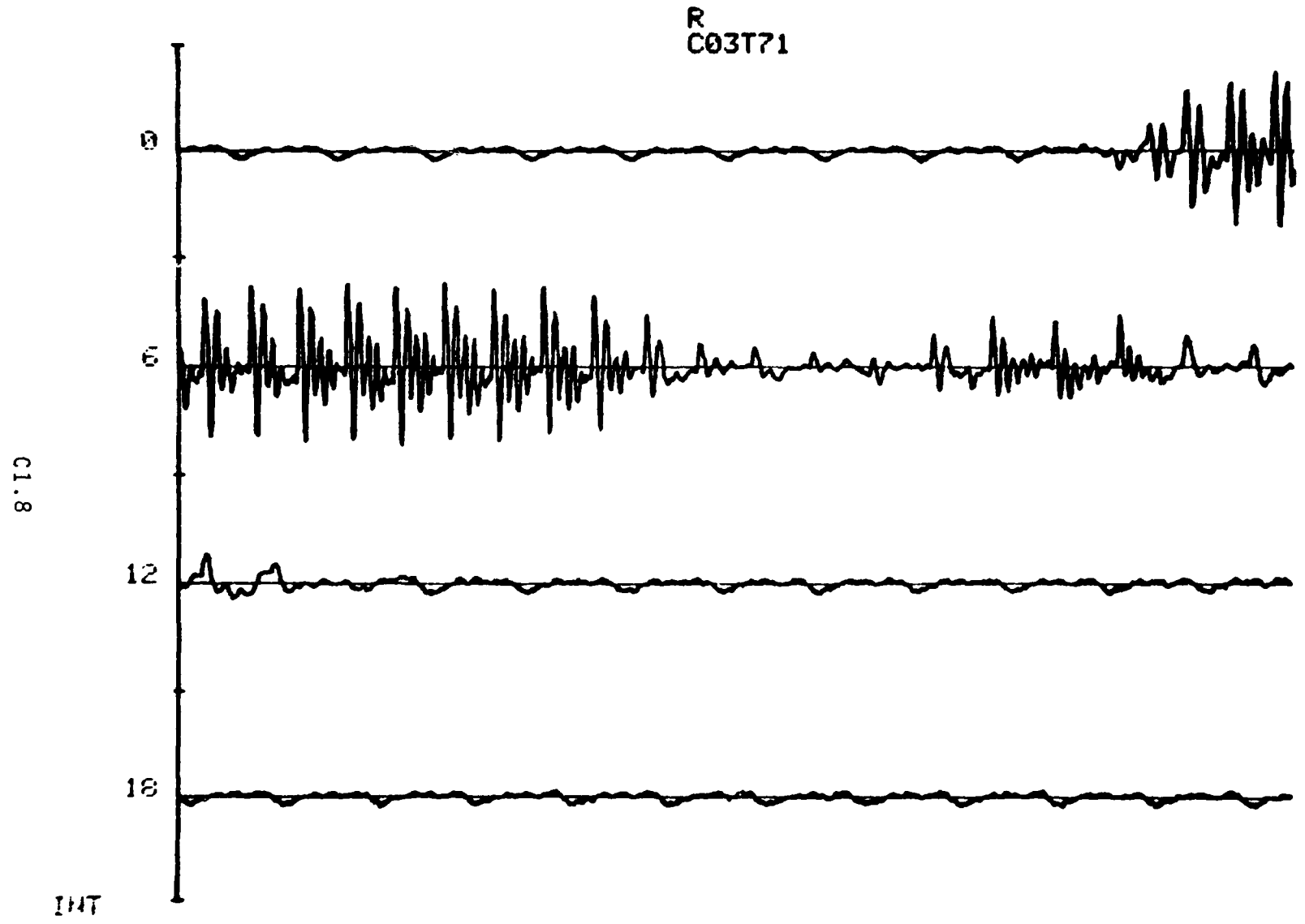

R
C03T21
0
6
12
18
INT

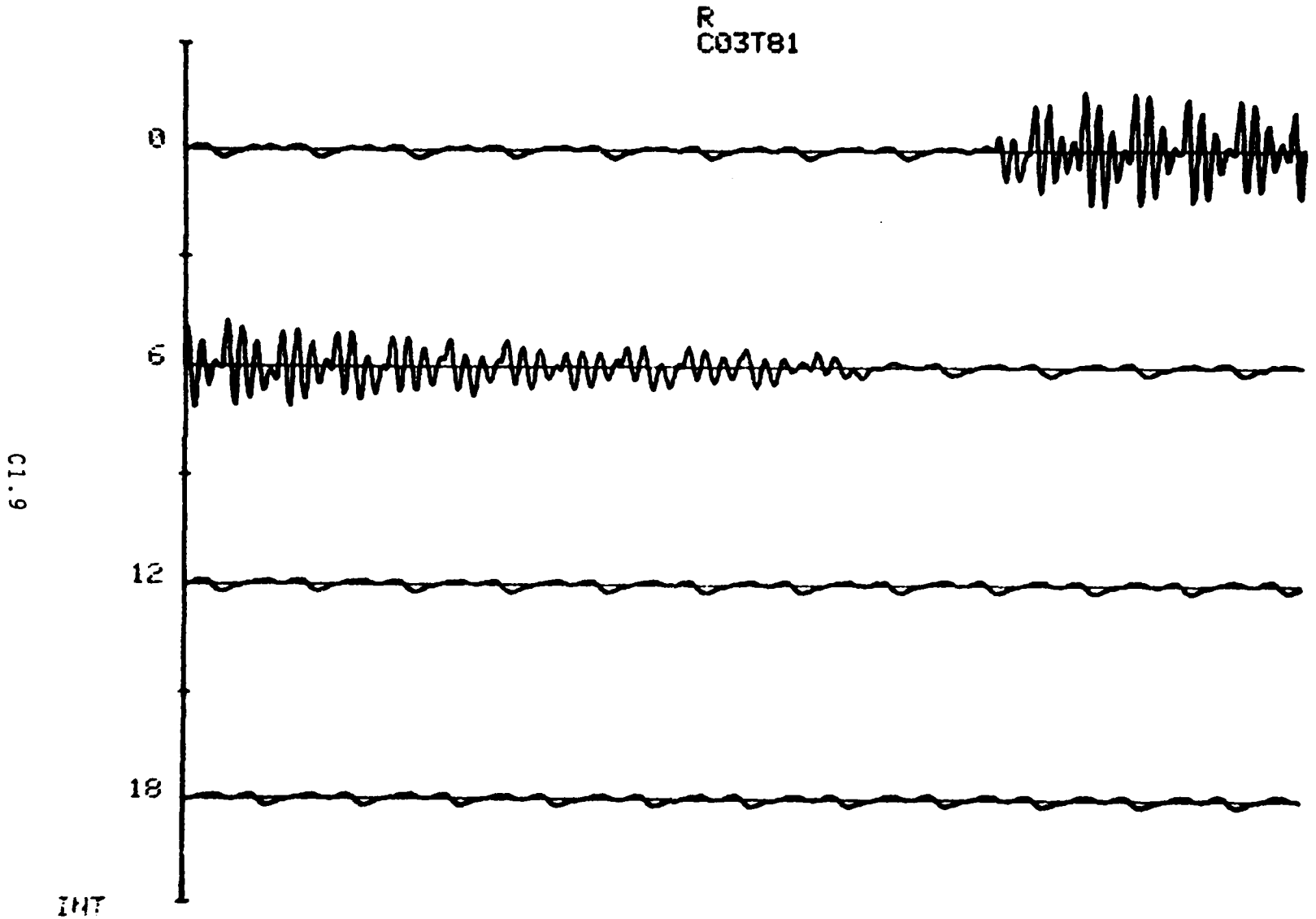

R
C03T31
0
6
12
18
INT
C1.4

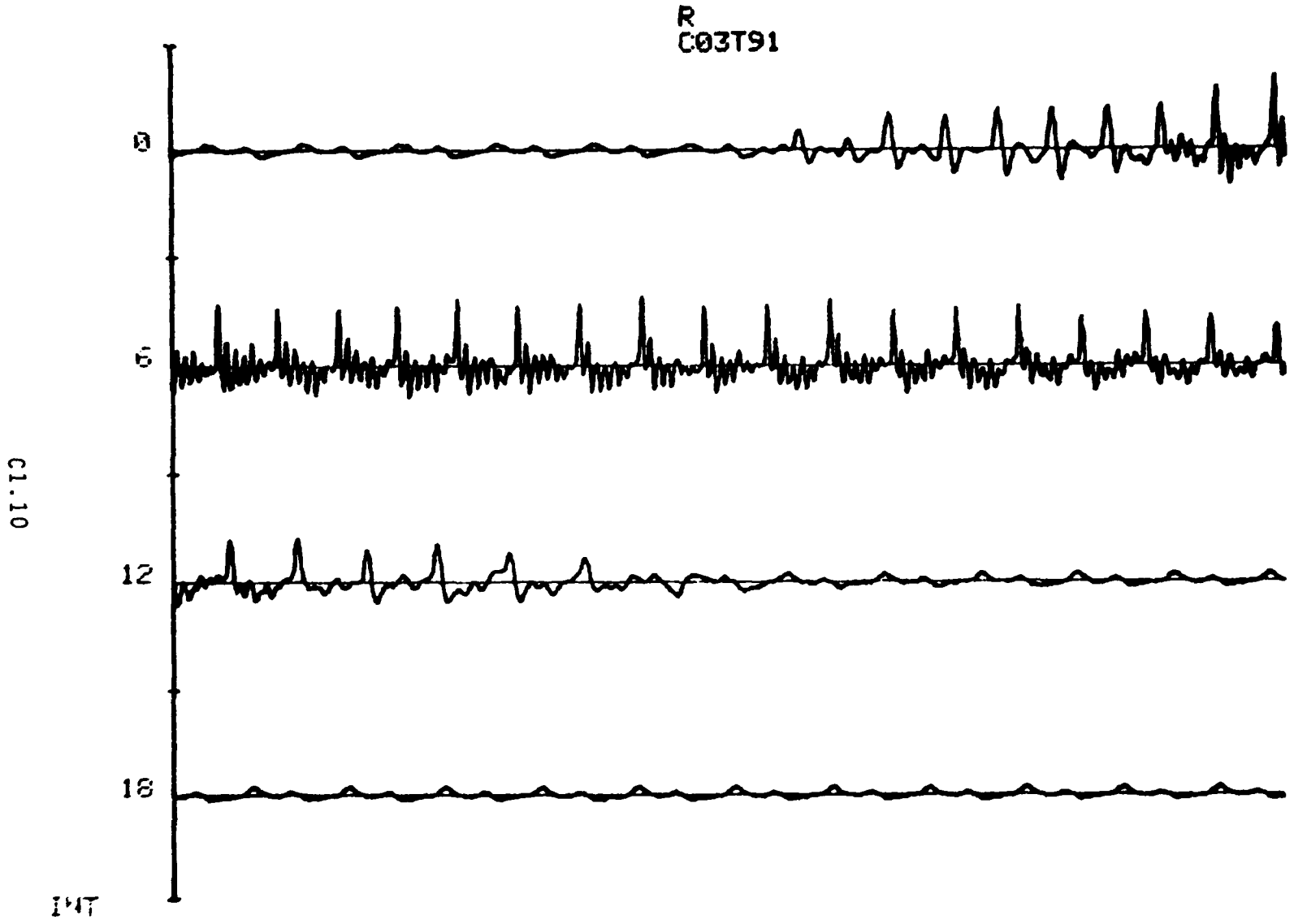

R
C03T41
0
6
12
18
C1.5
INT

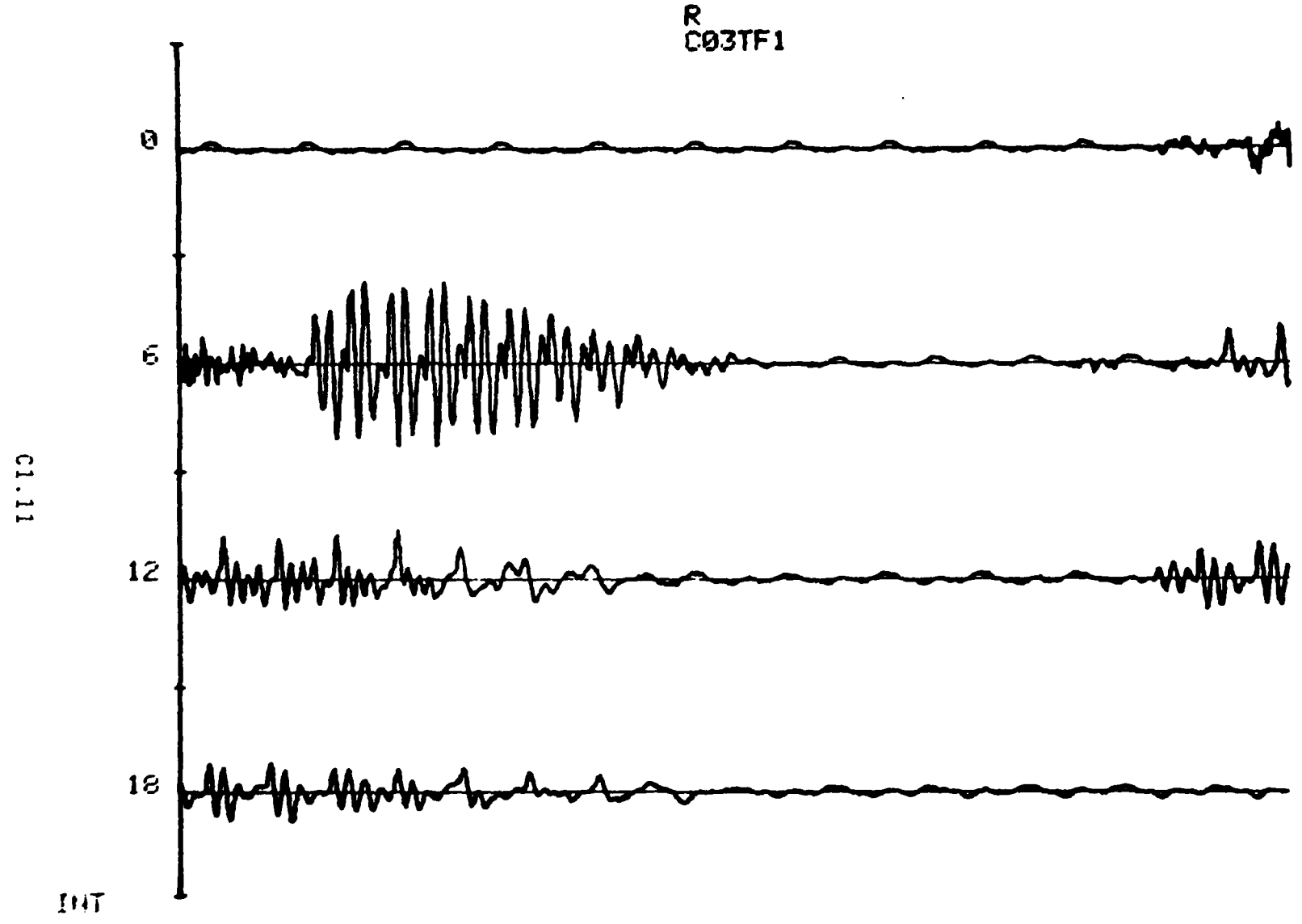

R
C03T51
0
6
12
18
INT

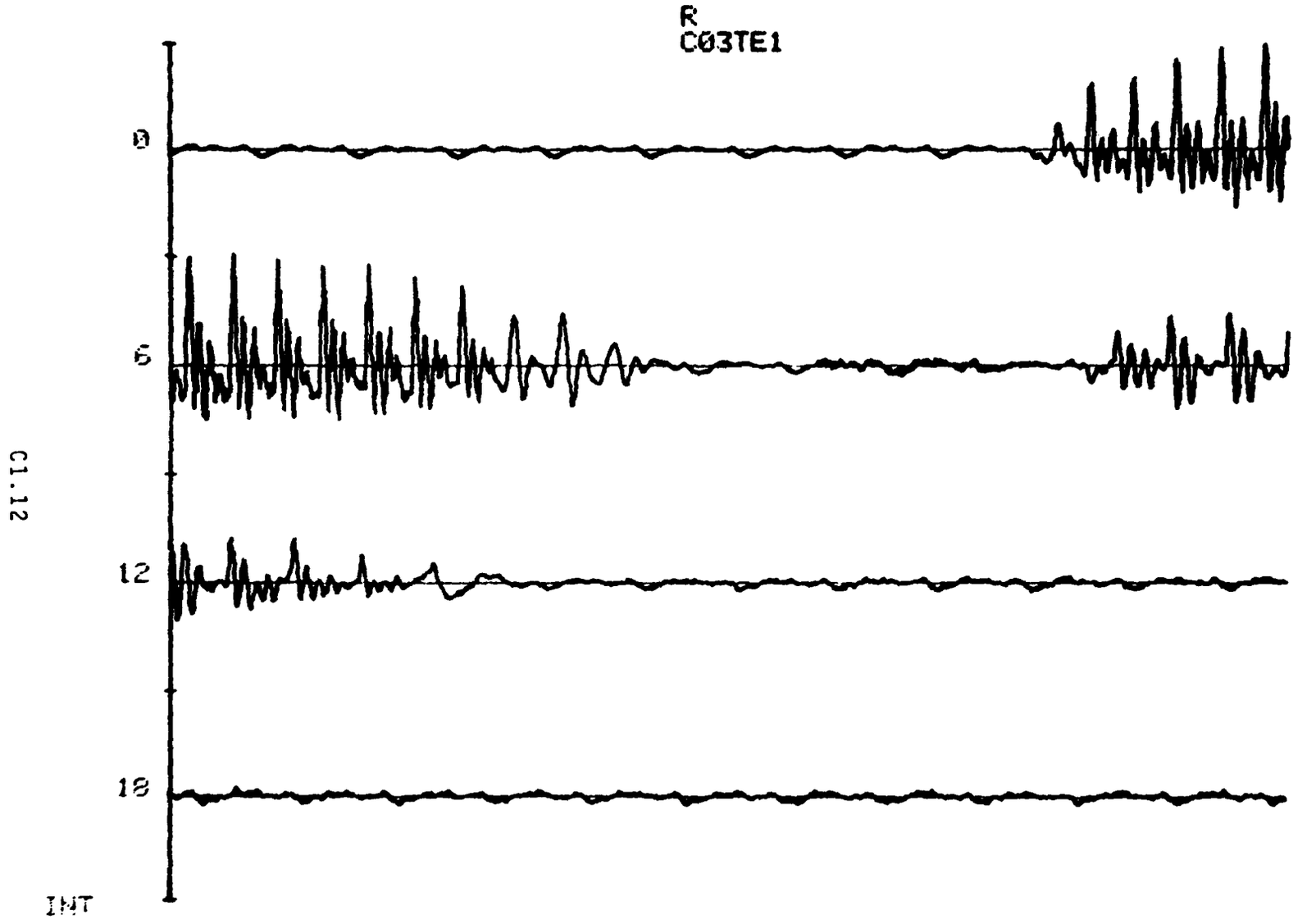

R
C03T61
0
6
12
18
C1.7
INT

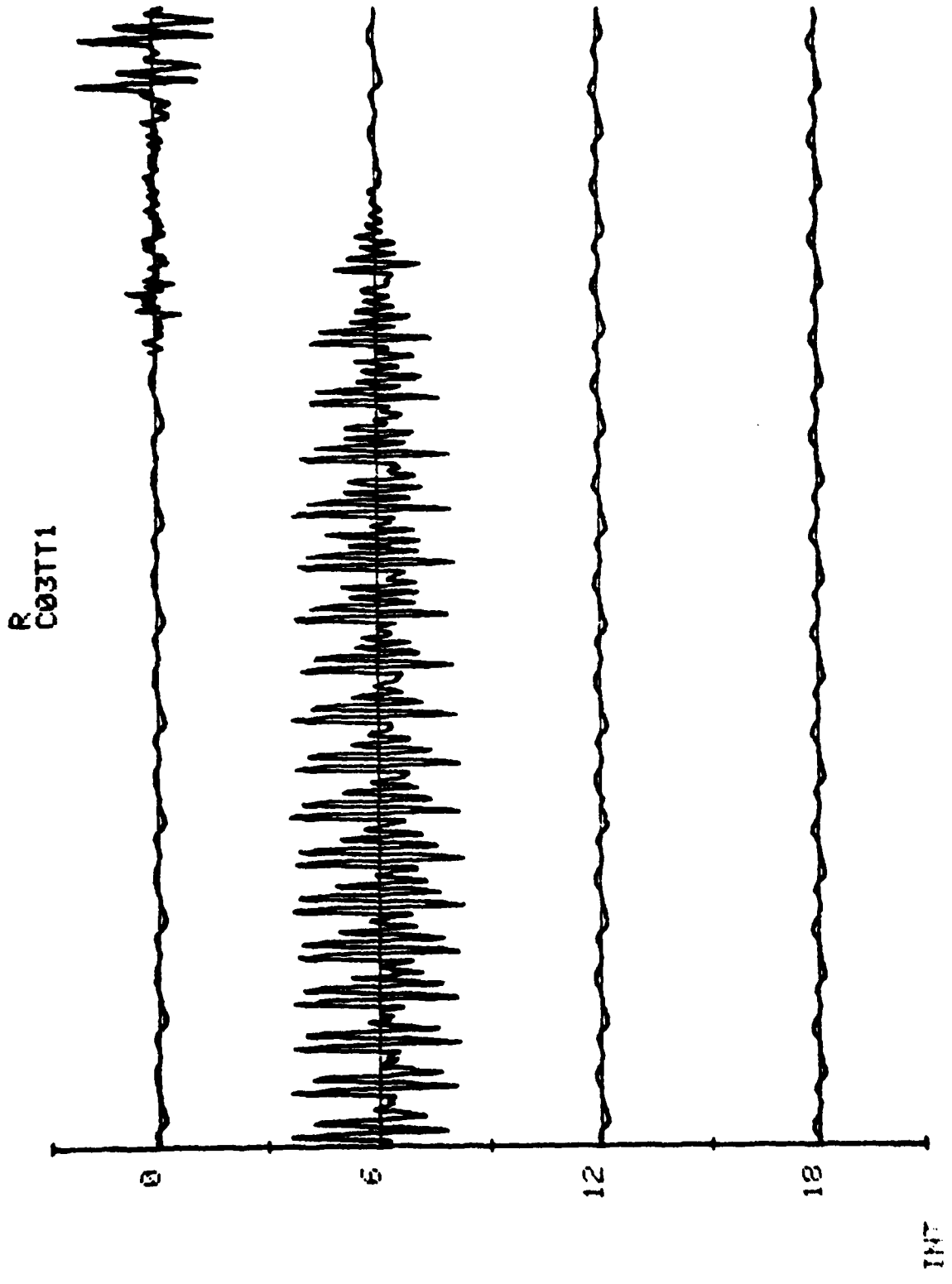

R
C03T71
0
6
12
18
C1.8
INT

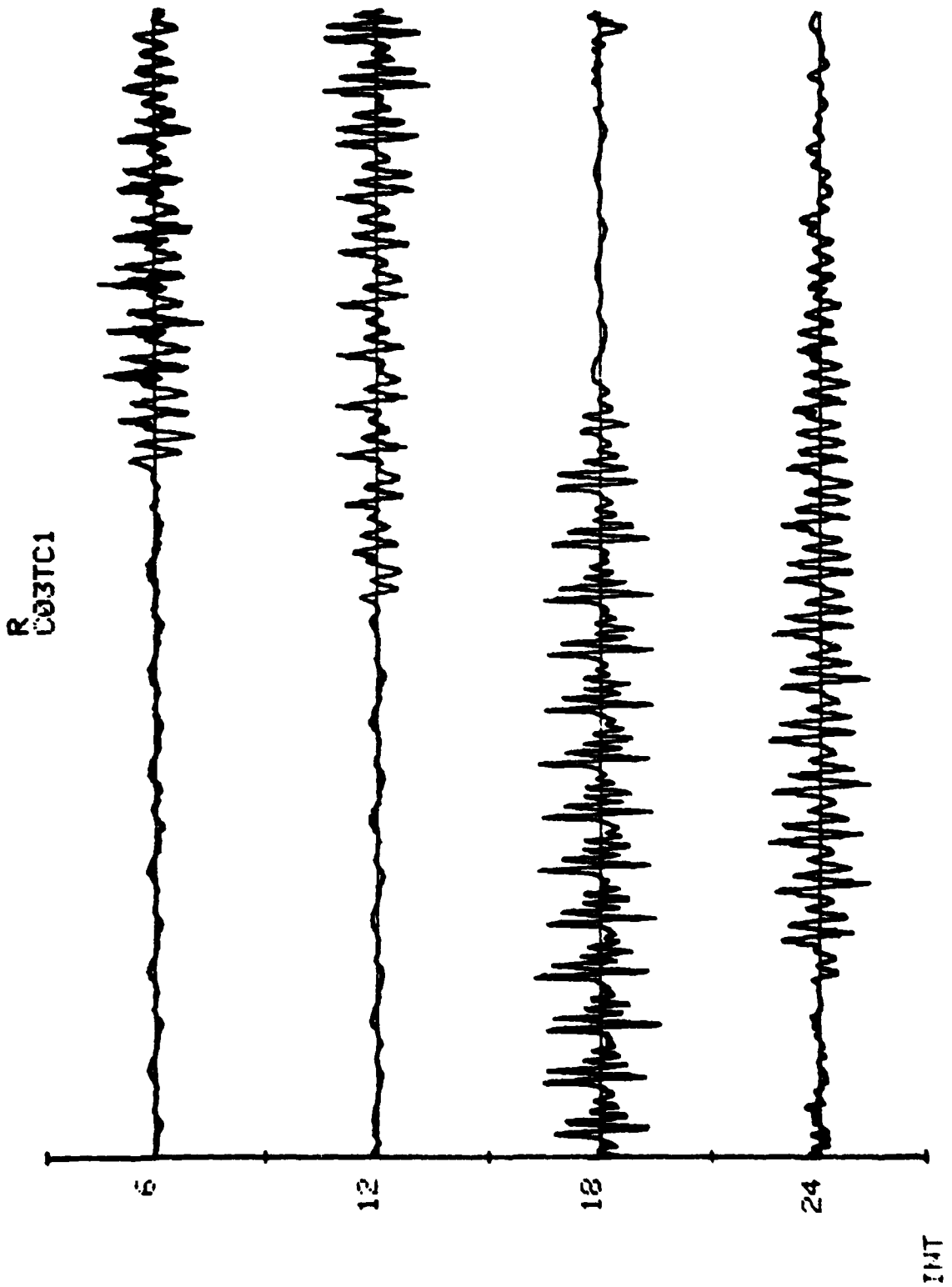

R
C03T81
0
6
12
18
C1.9
INT

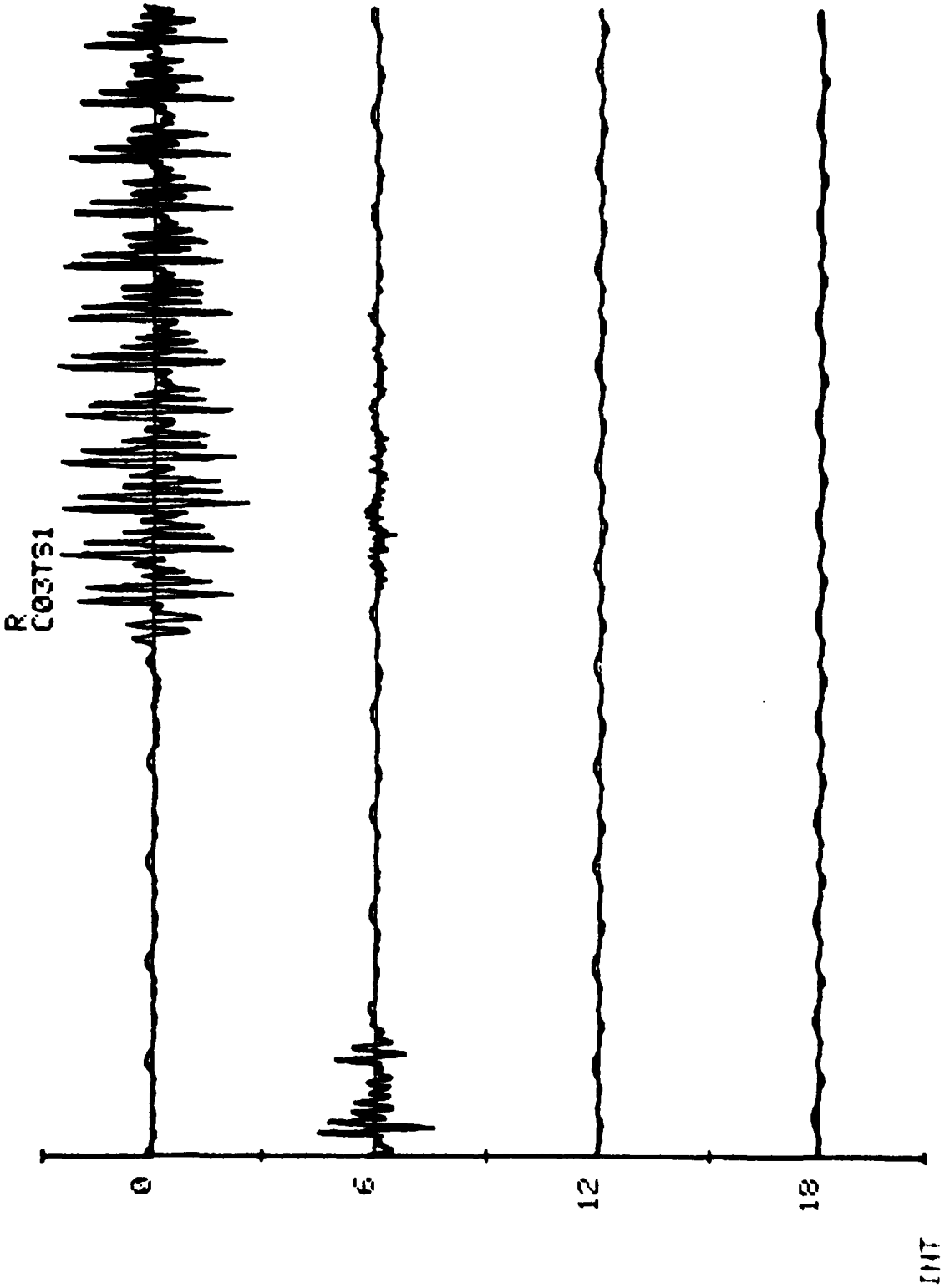

R
C03T91
0
6
12
18
C1.10
INT


R
C03TF1
0
6
12
18
C1.11
INT


R
C03TE1
0
6
12
18
C1.12
INT


R
C03TT1
0
6
12
18
HHT


R
C03TC1
6
12
18
24
INT

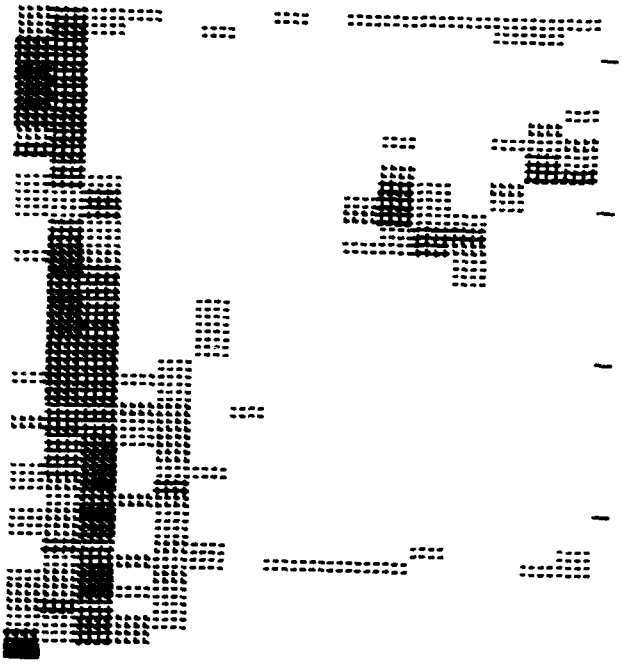


C1.15

APPENDIX C2

EC03T01

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

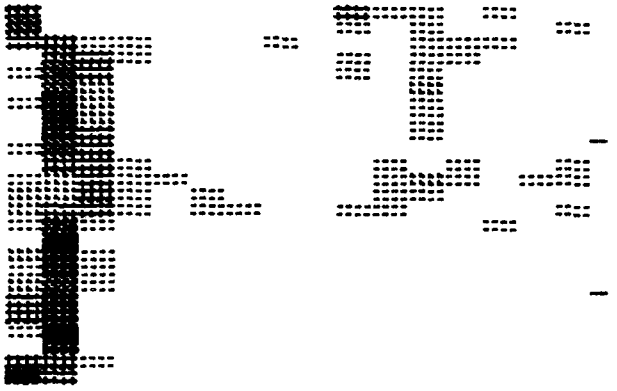


EC03T11

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

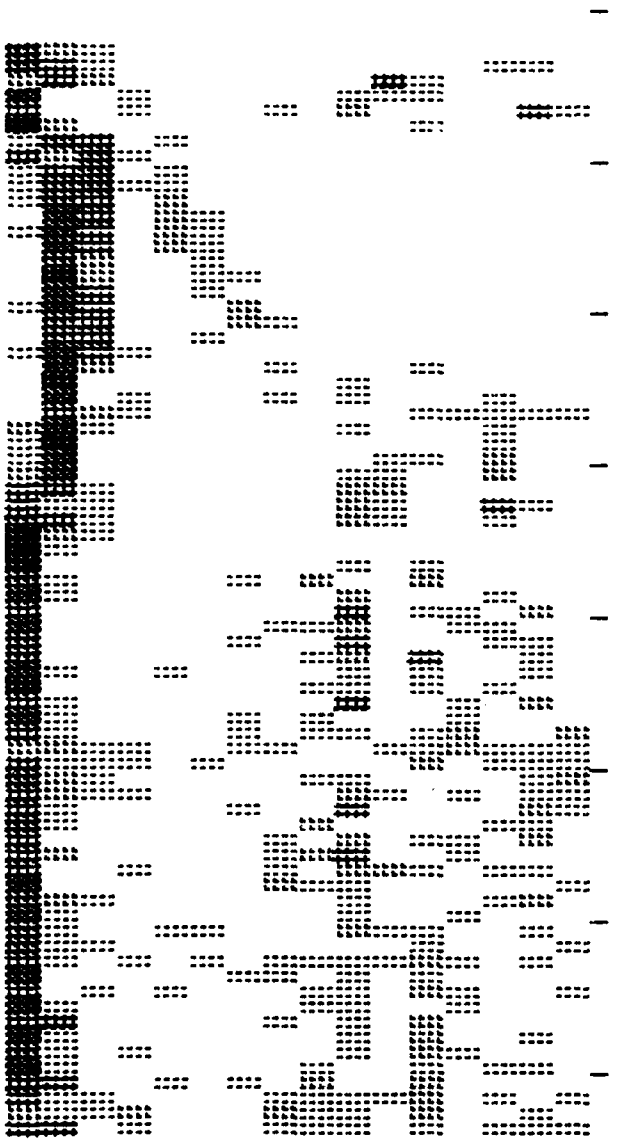
EC03T21

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



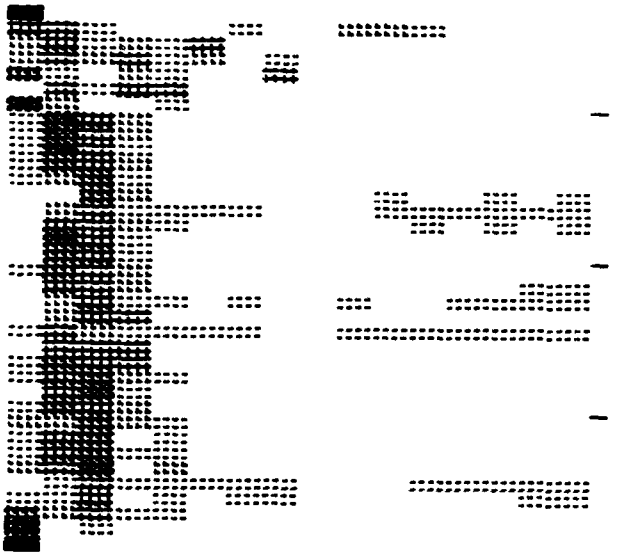
EC03T31

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



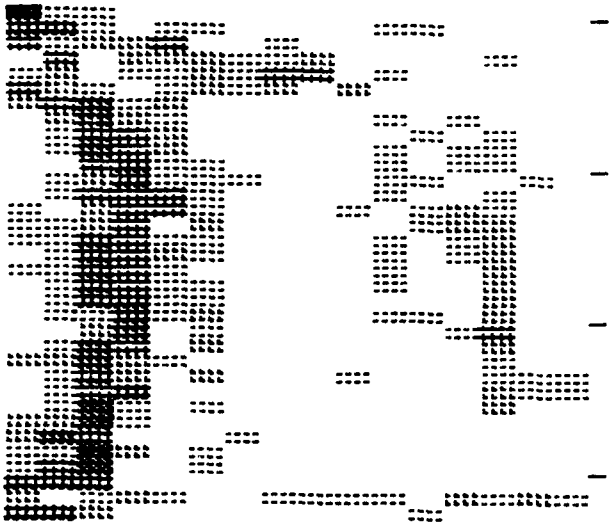
EC03T41

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



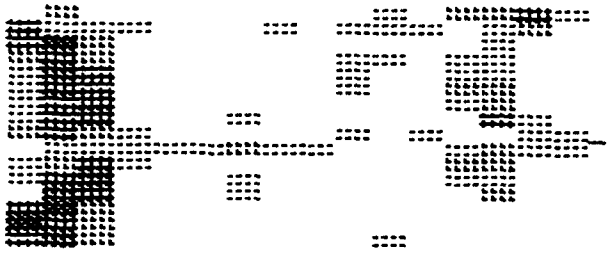
EC03T51

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



EC03T61

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

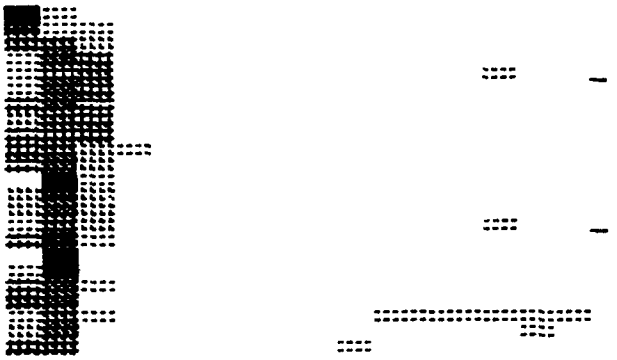


EC03T71

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

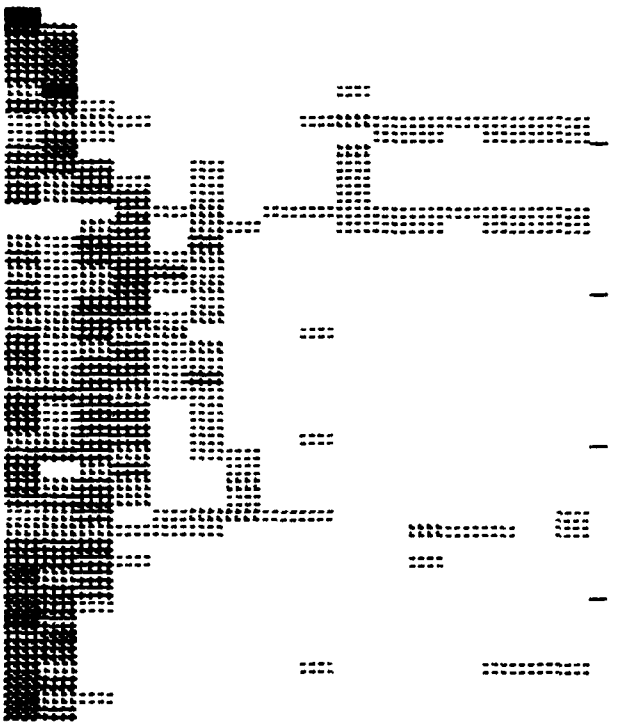
EC03T81

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



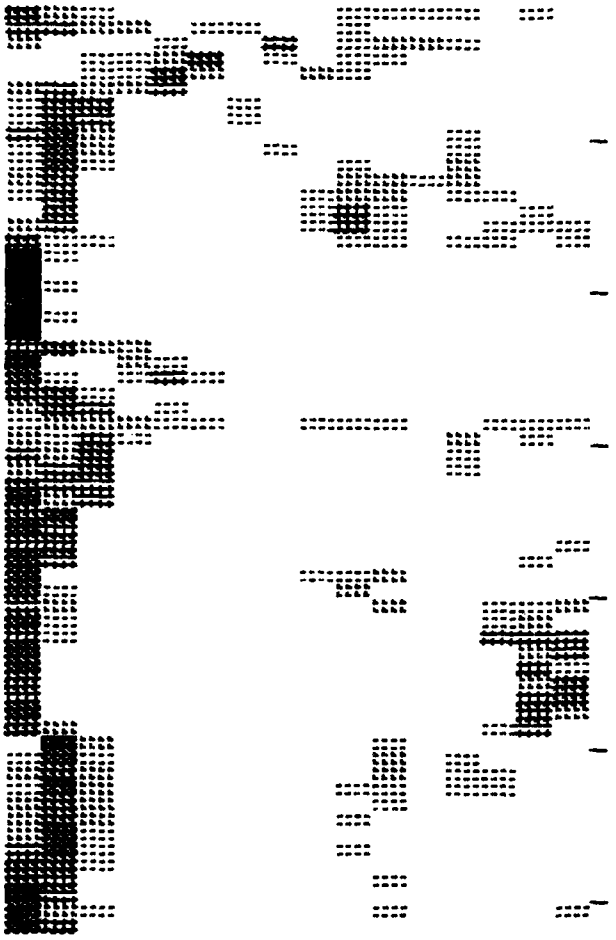
EC03T91

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



ECO3TF1

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

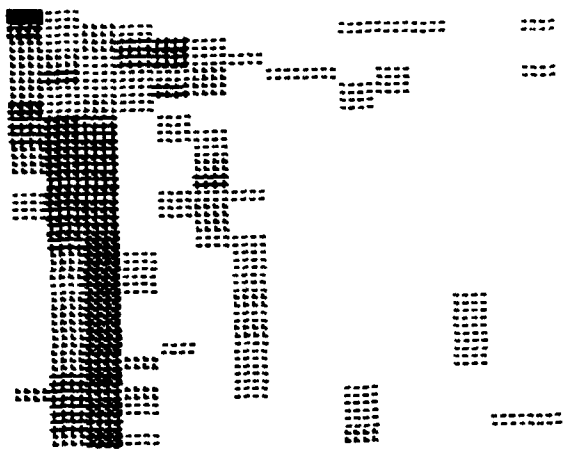


EC03TE1

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00

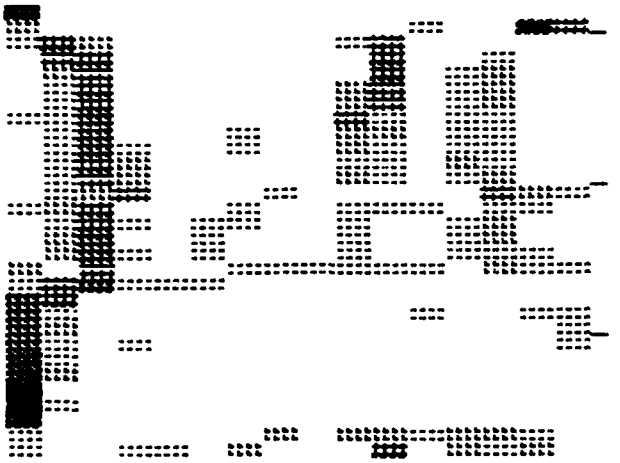
EC03TT1

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



EC03TS1

HORIZONTAL REPETITIONS= 1
VERTICAL REPETITIONS= 2
THRESHOLD VOLTAGE= 1.00



APPENDIX C3

FILENAME: C03T01

FIRST VOLT CK BLOCK=	2.23	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	12.69	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	10.46	FREQ BLOCK LENGTH=	10.50

FILENAME: C03T02

FIRST VOLT CK BLOCK=	3.38	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	13.71	LAST FREQ CK BLOCK=	13.75
VOLT BLOCK LENGTH=	10.34	FREQ BLOCK LENGTH=	10.25

FILENAME: C03T03

FIRST VOLT CK BLOCK=	6.86	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	15.16	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	9.30	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T04

FIRST VOLT CK BLOCK=	7.06	FIRST FREQ CK BLOCK=	7.25
LAST VOLT CK BLOCK=	15.76	LAST FREQ CK BLOCK=	16.00
VOLT BLOCK LENGTH=	8.70	FREQ BLOCK LENGTH=	8.75

FILENAME: C03T05

FIRST VOLT CK BLOCK=	7.02	FIRST FREQ CK BLOCK=	7.25
LAST VOLT CK BLOCK=	16.52	LAST FREQ CK BLOCK=	16.75
VOLT BLOCK LENGTH=	9.50	FREQ BLOCK LENGTH=	9.50

FREQUENCY

WORD =	0
G-LEVEL =	1
VARIANCE =	1.75
AVERAGE =	9.60

VOLTAGE

WORD =	0
G-LEVEL =	1
VARIANCE =	1.76
AVERAGE =	9.66

VOLTAGE THRESHOLD= 0.43
VOLTAGE CK LEVEL= 0.74
FREQ THRESHOLD= 2403

FILENAME: C13T01

FIRST VOLT OK BLOCK=	1.00	FIRST FREQ OK BLOCK=	1.75
LAST VOLT OK BLOCK=	13.11	LAST FREQ OK BLOCK=	13.50
VOLT BLOCK LENGTH=	11.51	FREQ BLOCK LENGTH=	11.75

FILENAME: C13T02

FIRST VOLT OK BLOCK=	3.35	FIRST FREQ OK BLOCK=	3.00
LAST VOLT OK BLOCK=	13.00	LAST FREQ OK BLOCK=	14.00
VOLT BLOCK LENGTH=	10.35	FREQ BLOCK LENGTH=	11.00

FILENAME: C13T03

FIRST VOLT OK BLOCK=	2.79	FIRST FREQ OK BLOCK=	3.00
LAST VOLT OK BLOCK=	13.26	LAST FREQ OK BLOCK=	13.25
VOLT BLOCK LENGTH=	10.46	FREQ BLOCK LENGTH=	10.25

FILENAME: C13T04

FIRST VOLT OK BLOCK=	6.45	FIRST FREQ OK BLOCK=	6.50
LAST VOLT OK BLOCK=	17.01	LAST FREQ OK BLOCK=	17.25
VOLT BLOCK LENGTH=	10.55	FREQ BLOCK LENGTH=	10.75

FREQUENCY

WORD =	0
Q-LEVEL =	2
VARIANCE =	1.50
AVERAGE =	10.94

VOLTAGE

WORD =	0
Q-LEVEL =	2
VARIANCE =	1.05
AVERAGE =	10.77

VOLTAGE THRESHOLD= 0.37
VOLTAGE OK LEVEL= 0.65
FREQ THRESHOLD= 2124

FILENAME: C09T01

FIRST VOLT OK BLOCK=	4.12	FIRST FREQ OK BLOCK=	4.25
LAST VOLT OK BLOCK=	12.07	LAST FREQ OK BLOCK=	13.00
VOLT BLOCK LENGTH=	8.05	FREQ BLOCK LENGTH=	8.75

FILENAME: C09T02

FIRST VOLT OK BLOCK=	4.34	FIRST FREQ OK BLOCK=	4.50
LAST VOLT OK BLOCK=	13.00	LAST FREQ OK BLOCK=	13.50
VOLT BLOCK LENGTH=	8.66	FREQ BLOCK LENGTH=	9.00

FILENAME: C09T03

FIRST VOLT OK BLOCK=	5.14	FIRST FREQ OK BLOCK=	5.25
LAST VOLT OK BLOCK=	14.00	LAST FREQ OK BLOCK=	13.75
VOLT BLOCK LENGTH=	8.86	FREQ BLOCK LENGTH=	8.50

FILENAME: C09T04

FIRST VOLT OK BLOCK=	3.79	FIRST FREQ OK BLOCK=	3.75
LAST VOLT OK BLOCK=	15.28	LAST FREQ OK BLOCK=	15.50
VOLT BLOCK LENGTH=	11.50	FREQ BLOCK LENGTH=	11.75

FILENAME: C09T05

FIRST VOLT OK BLOCK=	3.84	FIRST FREQ OK BLOCK=	4.50
LAST VOLT OK BLOCK=	14.17	LAST FREQ OK BLOCK=	14.25
VOLT BLOCK LENGTH=	10.33	FREQ BLOCK LENGTH=	9.75

FREQUENCY

WORD =	0
G-LEVEL =	3
VARIANCE =	3.25
AVERAGE =	9.55

VOLTAGE

WORD =	0
G-LEVEL =	3
VARIANCE =	2.84
AVERAGE =	9.64

VOLTAGE THRESHOLD= 0.37
VOLTAGE OK LEVEL= 0.64
FREQ THRESHOLD= 2355

FILENAME: C04126

FIRST VOLT CK BLOCK=	4.74	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	15.40	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	10.66	FREQ BLOCK LENGTH=	11.00

FILENAME: C04156

FIRST VOLT CK BLOCK=	3.48	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	15.16	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	11.68	FREQ BLOCK LENGTH=	10.75

FILENAME: C04226

FIRST VOLT CK BLOCK=	3.33	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	12.84	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	9.51	FREQ BLOCK LENGTH=	9.75

FILENAME: C04255

FIRST VOLT CK BLOCK=	4.01	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	14.15	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	10.14	FREQ BLOCK LENGTH=	9.25

FREQUENCY

WORD =	0
G-LEVEL =	4
VARIANCE =	1.75
AVERAGE =	10.19

VOLTAGE

WORD =	0
G-LEVEL =	4
VARIANCE =	2.17
AVERAGE =	10.50

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.93
FREQ THRESHOLD= 2245

FILENAME: C06T01

FIRST VOLT CK BLOCK=	4.31	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	12.16	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.87	FREQ BLOCK LENGTH=	8.00

FILENAME: C06T02

FIRST VOLT CK BLOCK=	2.65	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	11.66	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	9.01	FREQ BLOCK LENGTH=	9.25

FILENAME: C06T03

FIRST VOLT CK BLOCK=	4.72	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	14.53	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	9.81	FREQ BLOCK LENGTH=	10.00

FILENAME: C06T04

FIRST VOLT CK BLOCK=	3.83	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	14.06	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	10.23	FREQ BLOCK LENGTH=	10.00

FILENAME: C06T05

FIRST VOLT CK BLOCK=	3.55	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	13.93	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	10.37	FREQ BLOCK LENGTH=	9.75

FREQUENCY

WORD =	0
G-LEVEL =	5
VARIANCE =	2.00
AVERAGE =	9.40

VOLTAGE

WORD =	0
G-LEVEL =	5
VARIANCE =	2.50
AVERAGE =	9.46

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.56
FREQ THRESHOLD= 2255

FILENAME: C03T11

FIRST VOLT CK BLOCK=	3.17	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	16.65	LAST FREQ CK BLOCK=	16.75
VOLT BLOCK LENGTH=	0.48	FREQ BLOCK LENGTH=	0.50

FILENAME: C03T12

FIRST VOLT CK BLOCK=	3.04	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	11.84	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	0.00	FREQ BLOCK LENGTH=	0.50

FILENAME: C03T13

FIRST VOLT CK BLOCK=	4.06	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	13.15	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	0.29	FREQ BLOCK LENGTH=	0.00

FILENAME: C03T14

FIRST VOLT CK BLOCK=	1.45	FIRST FREQ CK BLOCK=	1.75
LAST VOLT CK BLOCK=	10.46	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	9.05	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T15

FIRST VOLT CK BLOCK=	4.40	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	13.30	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	8.90	FREQ BLOCK LENGTH=	9.00

FREQUENCY

WORD =	1
G-LEVEL =	1
VARIANCE =	1.00
AVERAGE =	8.60

VOLTAGE

WORD =	1
G-LEVEL =	1
VARIANCE =	0.74
AVERAGE =	8.70

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2144

FILENAME: C13T11

FIRST VOLT OK BLOCK=	2.25	FIRST FREQ OK BLOCK=	2.25
LAST VOLT OK BLOCK=	10.00	LAST FREQ OK BLOCK=	10.00
VOLT BLOCK LENGTH=	8.75	FREQ BLOCK LENGTH=	9.75

FILENAME: C13T12

FIRST VOLT OK BLOCK=	3.14	FIRST FREQ OK BLOCK=	3.25
LAST VOLT OK BLOCK=	11.90	LAST FREQ OK BLOCK=	11.75
VOLT BLOCK LENGTH=	8.75	FREQ BLOCK LENGTH=	8.50

FILENAME: C13T13

FIRST VOLT OK BLOCK=	3.72	FIRST FREQ OK BLOCK=	3.75
LAST VOLT OK BLOCK=	12.74	LAST FREQ OK BLOCK=	13.00
VOLT BLOCK LENGTH=	9.02	FREQ BLOCK LENGTH=	9.25

FILENAME: C13T14

FIRST VOLT OK BLOCK=	3.93	FIRST FREQ OK BLOCK=	4.00
LAST VOLT OK BLOCK=	12.52	LAST FREQ OK BLOCK=	13.75
VOLT BLOCK LENGTH=	8.59	FREQ BLOCK LENGTH=	9.75

FILENAME: C13T15

FIRST VOLT OK BLOCK=	5.16	FIRST FREQ OK BLOCK=	4.75
LAST VOLT OK BLOCK=	14.26	LAST FREQ OK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.10	FREQ BLOCK LENGTH=	9.75

FREQUENCY

```
*****************************
*                           *
*      WORD =   1           *
*   G-LEVEL =   2           *
*  VARIANCE =   1.25        *
*   AVERAGE =   9.40        *
*                           *
*****************************
```

VOLTAGE

```
*****************************
*                           *
*      WORD =   1           *
*   G-LEVEL =   2           *
*  VARIANCE =   0.51        *
*   AVERAGE =   8.84        *
*                           *
*****************************
```

VOLTAGE THRESHOLD= 0.38
VOLTAGE OK LEVEL= 0.67
FREQ THRESHOLD= 2018

FILENAME: C09T11

FIRST VOLT CK BLOCK=	0.76	FIRST FREQ CK BLOCK=	1.00
LAST VOLT CK BLOCK=	9.05	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	8.25	FREQ BLOCK LENGTH=	9.50

FILENAME: C09T12

FIRST VOLT CK BLOCK=	1.12	FIRST FREQ CK BLOCK=	1.25
LAST VOLT CK BLOCK=	9.13	LAST FREQ CK BLOCK=	9.25
VOLT BLOCK LENGTH=	8.01	FREQ BLOCK LENGTH=	8.00

FILENAME: C09T13

FIRST VOLT CK BLOCK=	6.32	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	14.87	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	8.54	FREQ BLOCK LENGTH=	7.00

FILENAME: C09T14

FIRST VOLT CK BLOCK=	6.20	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	16.69	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	10.50	FREQ BLOCK LENGTH=	9.50

FILENAME: C09T15

FIRST VOLT CK BLOCK=	6.33	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	13.38	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	7.05	FREQ BLOCK LENGTH=	7.75

FREQUENCY

WORD =	1
G-LEVEL =	3
VARIANCE =	2.50
AVERAGE =	8.35

VOLTAGE

WORD =	1
G-LEVEL =	3
VARIANCE =	3.45
AVERAGE =	8.47

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2029

FILENAME: C04121

FIRST VOLT OK BLOCK=	7.23	FIRST FREQ OK BLOCK=	7.50
LAST VOLT OK BLOCK=	18.26	LAST FREQ OK BLOCK=	18.50
VOLT BLOCK LENGTH=	11.03	FREQ BLOCK LENGTH=	11.00

FILENAME: C04146

FIRST VOLT OK BLOCK=	5.42	FIRST FREQ OK BLOCK=	5.50
LAST VOLT OK BLOCK=	13.75	LAST FREQ OK BLOCK=	13.75
VOLT BLOCK LENGTH=	8.33	FREQ BLOCK LENGTH=	8.25

FILENAME: C04217

FIRST VOLT OK BLOCK=	4.86	FIRST FREQ OK BLOCK=	4.25
LAST VOLT OK BLOCK=	13.59	LAST FREQ OK BLOCK=	12.75
VOLT BLOCK LENGTH=	8.73	FREQ BLOCK LENGTH=	8.50

FILENAME: C04224

FIRST VOLT OK BLOCK=	8.99	FIRST FREQ OK BLOCK=	9.00
LAST VOLT OK BLOCK=	17.23	LAST FREQ OK BLOCK=	17.25
VOLT BLOCK LENGTH=	8.24	FREQ BLOCK LENGTH=	8.25

FILENAME: C04247

FIRST VOLT OK BLOCK=	2.66	FIRST FREQ OK BLOCK=	2.75
LAST VOLT OK BLOCK=	12.22	LAST FREQ OK BLOCK=	12.25
VOLT BLOCK LENGTH=	9.56	FREQ BLOCK LENGTH=	9.50

FREQUENCY

WORD =	1
G-LEVEL =	4
VARIANCE =	2.75
AVERAGE =	9.10

VOLTAGE

WORD =	1
G-LEVEL =	4
VARIANCE =	2.79
AVERAGE =	9.18

VOLTAGE THRESHOLD= 0.42
VOLTAGE OK LEVEL= 0.84
FREQ THRESHOLD= 2574

FILENAME: C08T11

FIRST VOLT CK BLOCK=	1.54	FIRST FREQ CK BLOCK=	1.75
LAST VOLT CK BLOCK=	10.40	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	8.86	FREQ BLOCK LENGTH=	8.50

FILENAME: C08T12

FIRST VOLT CK BLOCK=	5.91	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	14.84	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	8.93	FREQ BLOCK LENGTH=	8.75

FILENAME: C08T13

FIRST VOLT CK BLOCK=	5.42	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	13.34	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	7.92	FREQ BLOCK LENGTH=	7.75

FILENAME: C08T14

FIRST VOLT CK BLOCK=	4.19	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	13.60	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	9.41	FREQ BLOCK LENGTH=	9.25

FILENAME: C08T15

FIRST VOLT CK BLOCK=	2.30	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	10.33	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	8.02	FREQ BLOCK LENGTH=	8.50

FREQUENCY

WORD =	1
G-LEVEL =	5
VARIANCE =	1.50
AVERAGE =	8.55

VOLTAGE

WORD =	1
G-LEVEL =	5
VARIANCE =	1.48
AVERAGE =	8.63

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2017

FILENAME: C03T21

FIRST VOLT CK BLOCK=	5.56	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	11.64	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	6.08	FREQ BLOCK LENGTH=	6.25

FILENAME: C03T22

FIRST VOLT CK BLOCK=	4.04	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	9.54	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	5.50	FREQ BLOCK LENGTH=	6.00

FILENAME: C03T23

FIRST VOLT CK BLOCK=	4.97	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	10.38	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	5.41	FREQ BLOCK LENGTH=	5.75

FILENAME: C03T24

FIRST VOLT CK BLOCK=	4.12	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	8.82	LAST FREQ CK BLOCK=	9.25
VOLT BLOCK LENGTH=	4.70	FREQ BLOCK LENGTH=	5.00

FILENAME: C03T25

FIRST VOLT CK BLOCK=	5.79	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	11.01	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	5.22	FREQ BLOCK LENGTH=	5.25

FREQUENCY

WORD =	2
G-LEVEL =	1
VARIANCE =	1.25
AVERAGE =	5.65

VOLTAGE

WORD =	2
G-LEVEL =	1
VARIANCE =	1.38
AVERAGE =	5.38

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.67
FREQ THRESHOLD= 2064

FILENAME: C13T21

FIRST VOLT CK BLOCK=	3.97	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	11.38	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	7.41	FREQ BLOCK LENGTH=	6.75

FILENAME: C13T22

FIRST VOLT CK BLOCK=	6.10	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	13.27	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	7.17	FREQ BLOCK LENGTH=	7.50

FILENAME: C13T23

FIRST VOLT CK BLOCK=	4.79	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	10.93	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	6.14	FREQ BLOCK LENGTH=	6.75

FILENAME: C13T24

FIRST VOLT CK BLOCK=	3.93	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	12.80	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	8.87	FREQ BLOCK LENGTH=	8.75

FILENAME: C13T25

FIRST VOLT CK BLOCK=	3.32	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	9.36	LAST FREQ CK BLOCK=	9.00
VOLT BLOCK LENGTH=	6.04	FREQ BLOCK LENGTH=	5.50

FREQUENCY

WORD =	2
G-LEVEL =	2
VARIANCE =	3.25
AVERAGE =	7.05

VOLTAGE

WORD =	2
G-LEVEL =	2
VARIANCE =	2.82
AVERAGE =	7.13

VOLTAGE THRESHOLD= 0.40
VOLTAGE CK LEVEL= 0.69
FREQ THRESHOLD= 2809

FILENAME: C09T21

FIRST VOLT CK BLOCK=	2.84	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	11.65	LAST FREQ CK BLOCK=	12.50
VOLT BLOCK LENGTH=	8.81	FREQ BLOCK LENGTH=	8.00

FILENAME: C09T22

FIRST VOLT CK BLOCK=	4.73	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	11.06	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	6.33	FREQ BLOCK LENGTH=	6.50

FILENAME: C09T23

FIRST VOLT CK BLOCK=	4.63	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	10.14	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	5.51	FREQ BLOCK LENGTH=	5.75

FILENAME: C09T24

FIRST VOLT CK BLOCK=	5.91	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	12.57	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	6.66	FREQ BLOCK LENGTH=	6.00

FILENAME: C09T25

FIRST VOLT CK BLOCK=	4.07	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	9.72	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	5.65	FREQ BLOCK LENGTH=	6.00

FREQUENCY

WORD =	2
G-LEVEL =	3
VARIANCE =	2.25
AVERAGE =	6.45

VOLTAGE

WORD =	2
G-LEVEL =	3
VARIANCE =	3.30
AVERAGE =	6.59

VOLTAGE THRESHOLD= 0.42
VOLTAGE CK LEVEL= 0.73
FREQ THRESHOLD= 2435

FILENAME: C04132

FIRST VOLT CK BLOCK=	4.50	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	11.28	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	6.68	FREQ BLOCK LENGTH=	7.00

FILENAME: C04231

FIRST VOLT CK BLOCK=	7.46	FIRST FREQ CK BLOCK=	7.50
LAST VOLT CK BLOCK=	13.93	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	6.48	FREQ BLOCK LENGTH=	7.25

FILENAME: C04244

FIRST VOLT CK BLOCK=	3.02	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	11.95	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	8.93	FREQ BLOCK LENGTH=	8.75

FREQUENCY

WORD =	2
G-LEVEL =	4
VARIANCE =	1.75
AVERAGE =	7.67

VOLTAGE

WORD =	2
G-LEVEL =	4
VARIANCE =	2.45
AVERAGE =	7.36

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2715

FILENAME: C08T21

FIRST VOLT CK BLOCK=	3.45	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	9.39	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	5.46	FREQ BLOCK LENGTH=	6.25

FILENAME: C08T22

FIRST VOLT CK BLOCK=	4.46	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	12.29	LAST FREQ CK BLOCK=	12.50
VOLT BLOCK LENGTH=	7.83	FREQ BLOCK LENGTH=	8.00

FILENAME: C08T23

FIRST VOLT CK BLOCK=	5.41	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	10.77	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	5.36	FREQ BLOCK LENGTH=	5.50

FILENAME: C08T24

FIRST VOLT CK BLOCK=	3.56	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	10.46	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	6.90	FREQ BLOCK LENGTH=	7.00

FILENAME: C08T25

FIRST VOLT CK BLOCK=	6.68	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	11.81	LAST FREQ CK BLOCK=	11.50
VOLT BLOCK LENGTH=	5.13	FREQ BLOCK LENGTH=	7.50

FREQUENCY

WORD =	2
G-LEVEL =	5
VARIANCE =	2.50
AVERAGE =	6.35

VOLTAGE

WORD =	2
G-LEVEL =	5
VARIANCE =	2.70
AVERAGE =	6.34

VOLTAGE THRESHOLD=	0.38
VOLTAGE CK LEVEL=	0.94
FREQ THRESHOLD=	2112

FILENAME: C03T31

FIRST VOLT CK BLOCK=	3.48	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	11.47	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	7.99	FREQ BLOCK LENGTH=	7.75

FILENAME: C03T32

FIRST VOLT CK BLOCK=	3.43	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	10.08	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	6.65	FREQ BLOCK LENGTH=	6.75

FILENAME: C03T33

FIRST VOLT CK BLOCK=	1.72	FIRST FREQ CK BLOCK=	1.75
LAST VOLT CK BLOCK=	8.32	LAST FREQ CK BLOCK=	8.50
VOLT BLOCK LENGTH=	6.60	FREQ BLOCK LENGTH=	6.75

FILENAME: C03T34

FIRST VOLT CK BLOCK=	4.20	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	10.30	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	6.09	FREQ BLOCK LENGTH=	6.25

FILENAME: C03T35

FIRST VOLT CK BLOCK=	3.98	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	9.92	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	5.94	FREQ BLOCK LENGTH=	5.75

FREQUENCY

WORD =	3
G-LEVEL =	1
VARIANCE =	2.00
AVERAGE =	6.65

VOLTAGE

WORD =	3
G-LEVEL =	1
VARIANCE =	2.05
AVERAGE =	6.65

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.76
FREQ THRESHOLD= 3225

FILENAME: C13T31

FIRST VOLT CK BLOCK=	9.70	FIRST FREQ CK BLOCK=	9.75
LAST VOLT CK BLOCK=	18.93	LAST FREQ CK BLOCK=	19.00
VOLT BLOCK LENGTH=	9.23	FREQ BLOCK LENGTH=	9.25

FILENAME: C13T32

FIRST VOLT CK BLOCK=	4.34	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	13.54	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	9.20	FREQ BLOCK LENGTH=	9.75

FILENAME: C13T33

FIRST VOLT CK BLOCK=	4.75	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	14.00	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	9.26	FREQ BLOCK LENGTH=	9.50

FILENAME: C13T34

FIRST VOLT CK BLOCK=	4.36	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	13.64	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.28	FREQ BLOCK LENGTH=	10.00

FILENAME: C13T35

FIRST VOLT CK BLOCK=	5.67	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	14.73	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	9.06	FREQ BLOCK LENGTH=	9.50

FREQUENCY

WORD =	3
G-LEVEL =	2
VARIANCE =	0.75
AVERAGE =	9.60

VOLTAGE

WORD =	3
G-LEVEL =	2
VARIANCE =	0.22
AVERAGE =	9.20

VOLTAGE THRESHOLD= 0.41
VOLTAGE CK LEVEL= 0.72
FREQ THRESHOLD= 2071

FILENAME: C09T31

FIRST VOLT CK BLOCK=	5.47	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	13.56	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	8.19	FREQ BLOCK LENGTH=	8.50

FILENAME: C09T32

FIRST VOLT CK BLOCK=	3.09	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	11.14	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	8.05	FREQ BLOCK LENGTH=	8.00

FILENAME: C09T33

FIRST VOLT CK BLOCK=	4.59	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	12.76	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	8.17	FREQ BLOCK LENGTH=	8.25

FILENAME: C09T34

FIRST VOLT CK BLOCK=	4.55	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	12.40	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.85	FREQ BLOCK LENGTH=	7.50

FILENAME: C09T35

FIRST VOLT CK BLOCK=	5.05	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	11.96	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	6.91	FREQ BLOCK LENGTH=	7.00

FREQUENCY

WORD =	3
G-LEVEL =	3
VARIANCE =	1.50
AVERAGE =	7.85

VOLTAGE

WORD =	3
G-LEVEL =	3
VARIANCE =	1.28
AVERAGE =	7.83

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.67
FREQ THRESHOLD= 2217

FILENAME: C04113

FIRST VOLT CK BLOCK=	3.61	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	12.95	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	9.35	FREQ BLOCK LENGTH=	9.25

FILENAME: C04123

FIRST VOLT CK BLOCK=	5.53	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	13.18	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	7.66	FREQ BLOCK LENGTH=	7.50

FILENAME: C04236

FIRST VOLT CK BLOCK=	6.20	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	16.07	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	9.86	FREQ BLOCK LENGTH=	9.25

FILENAME: C04252

FIRST VOLT CK BLOCK=	6.50	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	14.96	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	8.46	FREQ BLOCK LENGTH=	8.50

FREQUENCY

WORD =	3
G-LEVEL =	4
VARIANCE =	1.75
AVERAGE =	8.62

VOLTAGE

WORD =	3
G-LEVEL =	4
VARIANCE =	2.21
AVERAGE =	8.85

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.96
FREQ THRESHOLD= 2640

FILENAME: C00T31

FIRST VOLT OK BLOCK=	3.03	FIRST FREQ OK BLOCK=	4.00
LAST VOLT OK BLOCK=	9.09	LAST FREQ OK BLOCK=	9.50
VOLT BLOCK LENGTH=	5.96	FREQ BLOCK LENGTH=	5.50

FILENAME: C00T32

FIRST VOLT OK BLOCK=	4.11	FIRST FREQ OK BLOCK=	4.00
LAST VOLT OK BLOCK=	10.18	LAST FREQ OK BLOCK=	10.75
VOLT BLOCK LENGTH=	6.08	FREQ BLOCK LENGTH=	6.75

FILENAME: C00T33

FIRST VOLT OK BLOCK=	2.50	FIRST FREQ OK BLOCK=	2.75
LAST VOLT OK BLOCK=	8.92	LAST FREQ OK BLOCK=	9.75
VOLT BLOCK LENGTH=	6.41	FREQ BLOCK LENGTH=	7.00

FILENAME: C00T34

FIRST VOLT OK BLOCK=	3.04	FIRST FREQ OK BLOCK=	3.00
LAST VOLT OK BLOCK=	11.16	LAST FREQ OK BLOCK=	11.00
VOLT BLOCK LENGTH=	8.12	FREQ BLOCK LENGTH=	8.00

FILENAME: C00T35

FIRST VOLT OK BLOCK=	2.22	FIRST FREQ OK BLOCK=	2.50
LAST VOLT OK BLOCK=	8.32	LAST FREQ OK BLOCK=	7.75
VOLT BLOCK LENGTH=	6.10	FREQ BLOCK LENGTH=	5.25

FREQUENCY

WORD =	3
G-LEVEL =	5
VARIANCE =	2.75
AVERAGE =	3.30

VOLTAGE

WORD =	3
G-LEVEL =	5
VARIANCE =	2.16
AVERAGE =	6.54

VOLTAGE THRESHOLD= 0.38
VOLTAGE OK LEVEL= 1.14
FREQ THRESHOLD= 2123

FILENAME: C03T41

FIRST VOLT CK BLOCK=	3.32	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	10.59	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	9.30	FREQ BLOCK LENGTH=	8.25

FILENAME: C03T42

FIRST VOLT CK BLOCK=	6.59	FIRST FREQ CK BLOCK=	8.25
LAST VOLT CK BLOCK=	15.97	LAST FREQ CK BLOCK=	18.25
VOLT BLOCK LENGTH=	9.38	FREQ BLOCK LENGTH=	10.00

FILENAME: C03T43

FIRST VOLT CK BLOCK=	3.60	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	12.56	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	8.96	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T44

FIRST VOLT CK BLOCK=	5.52	FIRST FREQ CK BLOCK=	8.50
LAST VOLT CK BLOCK=	12.76	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	7.24	FREQ BLOCK LENGTH=	7.50

FILENAME: C03T45

FIRST VOLT CK BLOCK=	3.36	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	11.09	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	7.43	FREQ BLOCK LENGTH=	7.50

FREQUENCY

WORD =	4
G-LEVEL =	1
VARIANCE =	2.50
AVERAGE =	8.45

VOLTAGE

WORD =	4
G-LEVEL =	1
VARIANCE =	2.14
AVERAGE =	8.30

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.34
FREQ THRESHOLD= 2205

FILENAME: C13T41

FIRST VOLT CK BLOCK=	4.11	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	12.13	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	8.02	FREQ BLOCK LENGTH=	8.25

FILENAME: C13T42

FIRST VOLT CK BLOCK=	14.94	FIRST FREQ CK BLOCK=	15.00
LAST VOLT CK BLOCK=	24.22	LAST FREQ CK BLOCK=	24.00
VOLT BLOCK LENGTH=	9.29	FREQ BLOCK LENGTH=	9.00

FILENAME: C13T43

FIRST VOLT CK BLOCK=	7.26	FIRST FREQ CK BLOCK=	7.00
LAST VOLT CK BLOCK=	18.07	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	10.80	FREQ BLOCK LENGTH=	11.50

FILENAME: C13T44

FIRST VOLT CK BLOCK=	10.90	FIRST FREQ CK BLOCK=	11.00
LAST VOLT CK BLOCK=	21.26	LAST FREQ CK BLOCK=	21.25
VOLT BLOCK LENGTH=	10.36	FREQ BLOCK LENGTH=	10.25

FILENAME: C13T45

FIRST VOLT CK BLOCK=	5.57	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	15.62	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	10.05	FREQ BLOCK LENGTH=	10.25

FREQUENCY

WORD =	4
G-LEVEL =	2
VARIANCE =	3.25
AVERAGE =	9.85

VOLTAGE

WORD =	4
G-LEVEL =	2
VARIANCE =	2.79
AVERAGE =	9.70

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2192

FILENAME: C09T41

FIRST VOLT CK BLOCK=	5.28	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	13.54	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	8.26	FREQ BLOCK LENGTH=	8.00

FILENAME: C09T42

FIRST VOLT CK BLOCK=	4.60	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	13.09	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	8.50	FREQ BLOCK LENGTH=	8.50

FILENAME: C09T43

FIRST VOLT CK BLOCK=	2.49	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	9.68	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	7.19	FREQ BLOCK LENGTH=	7.75

FILENAME: C09T45

FIRST VOLT CK BLOCK=	3.15	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	10.24	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	7.09	FREQ BLOCK LENGTH=	7.00

FREQUENCY

WORD =	4
G-LEVEL =	3
VARIANCE =	1.50
AVERAGE =	7.81

VOLTAGE

WORD =	4
G-LEVEL =	3
VARIANCE =	1.41
AVERAGE =	7.76

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.64
FREQ THRESHOLD= 2008

FILENAME: 004122

FIRST VOLT CK BLOCK=	5.12	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	13.66	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	8.55	FREQ BLOCK LENGTH=	7.50

FILENAME: 004148

FIRST VOLT CK BLOCK=	5.38	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	13.90	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	8.02	FREQ BLOCK LENGTH=	8.25

FILENAME: 004226

FIRST VOLT CK BLOCK=	6.46	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	14.25	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	7.79	FREQ BLOCK LENGTH=	7.75

FILENAME: 004254

FIRST VOLT CK BLOCK=	3.75	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	11.41	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	7.66	FREQ BLOCK LENGTH=	7.50

FREQUENCY

WORD =	4
G-LEVEL =	4
VARIANCE =	0.75
AVERAGE =	7.75

VOLTAGE

WORD =	4
G-LEVEL =	4
VARIANCE =	0.89
AVERAGE =	8.00

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 1.11
FREQ THRESHOLD= 2246

FILENAME: C08T41

FIRST VOLT CK BLOCK=	2.45	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	10.14	LAST FREQ CK BLOCK=	10.25
VOLT BLOCK LENGTH=	7.69	FREQ BLOCK LENGTH=	8.00

FILENAME: C08T42

FIRST VOLT CK BLOCK=	1.93	FIRST FREQ CK BLOCK=	2.00
LAST VOLT CK BLOCK=	10.04	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	8.10	FREQ BLOCK LENGTH=	8.75

FILENAME: C08T43

FIRST VOLT CK BLOCK=	3.63	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	12.89	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	9.26	FREQ BLOCK LENGTH=	9.25

FILENAME: C08T44

FIRST VOLT CK BLOCK=	2.38	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	9.81	LAST FREQ CK BLOCK=	10.00
VOLT BLOCK LENGTH=	7.43	FREQ BLOCK LENGTH=	7.75

FILENAME: C08T45

FIRST VOLT CK BLOCK=	4.99	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	12.00	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.01	FREQ BLOCK LENGTH=	7.25

FREQUENCY

WORD =	4
G-LEVEL =	5
VARIANCE =	2.00
AVERAGE =	8.20

VOLTAGE

WORD =	4
G-LEVEL =	5
VARIANCE =	2.25
AVERAGE =	7.90

VOLTAGE THRESHOLD= 0.43
VOLTAGE CK LEVEL= 1.28
FREQ THRESHOLD= 2966

FILENAME: C03T51

FIRST VOLT CK BLOCK=	2.61	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	10.75	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	3.14	FREQ BLOCK LENGTH=	3.25

FILENAME: C03T52

FIRST VOLT CK BLOCK=	6.17	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	15.04	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	8.87	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T53

FIRST VOLT CK BLOCK=	3.16	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	12.49	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	9.33	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T54

FIRST VOLT CK BLOCK=	7.62	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	15.70	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	8.08	FREQ BLOCK LENGTH=	9.00

FILENAME: C03T55

FIRST VOLT CK BLOCK=	3.25	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	13.18	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	9.93	FREQ BLOCK LENGTH=	9.75

FREQUENCY

WORD =	5
G-LEVEL =	1
VARIANCE =	1.50
AVERAGE =	9.00

VOLTAGE

WORD =	5
G-LEVEL =	1
VARIANCE =	1.35
AVERAGE =	8.87

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.78
FREQ THRESHOLD= 2236

FILENAME: C13T51

FIRST VOLT CK BLOCK=	4.66	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	14.98	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	10.32	FREQ BLOCK LENGTH=	10.75

FILENAME: C13T52

FIRST VOLT CK BLOCK=	6.09	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	16.79	LAST FREQ CK BLOCK=	16.50
VOLT BLOCK LENGTH=	10.70	FREQ BLOCK LENGTH=	10.25

FILENAME: C13T53

FIRST VOLT CK BLOCK=	6.09	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	18.08	LAST FREQ CK BLOCK=	18.25
VOLT BLOCK LENGTH=	11.99	FREQ BLOCK LENGTH=	12.25

FILENAME: C13T54

FIRST VOLT CK BLOCK=	6.25	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	17.69	LAST FREQ CK BLOCK=	17.75
VOLT BLOCK LENGTH=	11.44	FREQ BLOCK LENGTH=	12.00

FILENAME: C13T55

FIRST VOLT CK BLOCK=	3.44	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	14.70	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	11.25	FREQ BLOCK LENGTH=	11.00

FREQUENCY

WORD =	5
G-LEVEL =	2
VARIANCE =	2.00
AVERAGE =	11.25

VOLTAGE

WORD =	5
G-LEVEL =	2
VARIANCE =	1.68
AVERAGE =	11.14

VOLTAGE THRESHOLD= 0.42
VOLTAGE CK LEVEL= 0.74
FREQ THRESHOLD= 2445

FILENAME: C09T51

FIRST VOLT OK BLOCK=	4.53	FIRST FREQ OK BLOCK=	4.75
LAST VOLT OK BLOCK=	14.37	LAST FREQ OK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.34	FREQ BLOCK LENGTH=	9.75

FILENAME: C09T52

FIRST VOLT OK BLOCK=	1.68	FIRST FREQ OK BLOCK=	1.75
LAST VOLT OK BLOCK=	12.10	LAST FREQ OK BLOCK=	12.25
VOLT BLOCK LENGTH=	10.42	FREQ BLOCK LENGTH=	10.50

FILENAME: C09T53

FIRST VOLT OK BLOCK=	2.30	FIRST FREQ OK BLOCK=	2.50
LAST VOLT OK BLOCK=	13.27	LAST FREQ OK BLOCK=	13.50
VOLT BLOCK LENGTH=	10.97	FREQ BLOCK LENGTH=	11.00

FILENAME: C09T54

FIRST VOLT OK BLOCK=	4.28	FIRST FREQ OK BLOCK=	4.50
LAST VOLT OK BLOCK=	15.82	LAST FREQ OK BLOCK=	15.75
VOLT BLOCK LENGTH=	11.54	FREQ BLOCK LENGTH=	11.25

FILENAME: C09T55

FIRST VOLT OK BLOCK=	5.61	FIRST FREQ OK BLOCK=	5.75
LAST VOLT OK BLOCK=	15.15	LAST FREQ OK BLOCK=	15.50
VOLT BLOCK LENGTH=	9.55	FREQ BLOCK LENGTH=	9.75

FREQUENCY

WORD =	5
G-LEVEL =	3
VARIANCE =	1.50
AVERAGE =	10.45

VOLTAGE

WORD =	5
G-LEVEL =	3
VARIANCE =	2.00
AVERAGE =	10.46

VOLTAGE THRESHOLD= 0.38
VOLTAGE OK LEVEL= 0.56
FREQ THRESHOLD= 2212

FILENAME: C04116

FIRST VOLT CK BLOCK=	4.79	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	14.93	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	10.14	FREQ BLOCK LENGTH=	9.50

FILENAME: C04127

FIRST VOLT CK BLOCK=	5.76	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	16.42	LAST FREQ CK BLOCK=	16.75
VOLT BLOCK LENGTH=	10.66	FREQ BLOCK LENGTH=	10.75

FILENAME: C04143

FIRST VOLT CK BLOCK=	6.50	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	14.59	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	8.10	FREQ BLOCK LENGTH=	8.25

FILENAME: C04214

FIRST VOLT CK BLOCK=	3.91	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	13.19	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	9.28	FREQ BLOCK LENGTH=	9.25

FILENAME: C04235

FIRST VOLT CK BLOCK=	4.92	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	14.77	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.85	FREQ BLOCK LENGTH=	9.75

FREQUENCY

WORD =	5
G-LEVEL =	4
VARIANCE =	2.50
AVERAGE =	9.50

VOLTAGE

WORD =	5
G-LEVEL =	4
VARIANCE =	2.57
AVERAGE =	9.61

VOLTAGE THRESHOLD=	0.38
VOLTAGE CK LEVEL=	0.76
FREQ THRESHOLD=	2261

FILENAME: C08T51

FIRST VOLT CK BLOCK=	2.96	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	10.79	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	7.83	FREQ BLOCK LENGTH=	7.50

FILENAME: C08T52

FIRST VOLT CK BLOCK=	4.07	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	13.30	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	9.23	FREQ BLOCK LENGTH=	8.75

FILENAME: C08T53

FIRST VOLT CK BLOCK=	4.64	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	14.09	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	9.45	FREQ BLOCK LENGTH=	9.50

FILENAME: C08T54

FIRST VOLT CK BLOCK=	6.31	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	16.43	LAST FREQ CK BLOCK=	16.50
VOLT BLOCK LENGTH=	10.12	FREQ BLOCK LENGTH=	10.00

FILENAME: C08T55

FIRST VOLT CK BLOCK=	3.35	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	12.14	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	8.80	FREQ BLOCK LENGTH=	9.25

FREQUENCY

WORD =	5
G-LEVEL =	5
VARIANCE =	2.50
AVERAGE =	9.00

VOLTAGE

WORD =	5
G-LEVEL =	5
VARIANCE =	2.29
AVERAGE =	9.09

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.93
FREQ THRESHOLD= 2700

FILENAME: 003T61

FIRST VOLT OK BLOCK=	3.58	FIRST FREQ OK BLOCK=	3.75
LAST VOLT OK BLOCK=	9.25	LAST FREQ OK BLOCK=	9.25
VOLT BLOCK LENGTH=	3.67	FREQ BLOCK LENGTH=	3.50

FILENAME: 003T62

FIRST VOLT OK BLOCK=	4.99	FIRST FREQ OK BLOCK=	5.00
LAST VOLT OK BLOCK=	8.55	LAST FREQ OK BLOCK=	8.75
VOLT BLOCK LENGTH=	3.57	FREQ BLOCK LENGTH=	3.75

FILENAME: 003T63

FIRST VOLT OK BLOCK=	3.66	FIRST FREQ OK BLOCK=	3.75
LAST VOLT OK BLOCK=	7.25	LAST FREQ OK BLOCK=	7.50
VOLT BLOCK LENGTH=	3.59	FREQ BLOCK LENGTH=	3.75

FILENAME: 003T64

FIRST VOLT OK BLOCK=	8.54	FIRST FREQ OK BLOCK=	8.75
LAST VOLT OK BLOCK=	11.92	LAST FREQ OK BLOCK=	12.00
VOLT BLOCK LENGTH=	3.39	FREQ BLOCK LENGTH=	3.25

FILENAME: 003T65

FIRST VOLT OK BLOCK=	4.69	FIRST FREQ OK BLOCK=	4.75
LAST VOLT OK BLOCK=	8.08	LAST FREQ OK BLOCK=	8.25
VOLT BLOCK LENGTH=	3.39	FREQ BLOCK LENGTH=	3.50

FREQUENCY

```
**********************************
*                                *
*       WORD =   6               *
*    G-LEVEL =   1               *
*   VARIANCE =   0.50            *
*    AVERAGE =   3.55            *
*                                *
**********************************
```

VOLTAGE

```
**********************************
*                                *
*       WORD =   6               *
*    G-LEVEL =   1               *
*   VARIANCE =   0.29            *
*    AVERAGE =   3.52            *
*                                *
**********************************
```

VOLTAGE THRESHOLD= 0.30
VOLTAGE OK LEVEL= 0.66
FREQ THRESHOLD= 2574

FILENAME: C13T61

FIRST VOLT CK BLOCK=	6.04	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	9.64	LAST FREQ CK BLOCK=	10.00
VOLT BLOCK LENGTH=	3.60	FREQ BLOCK LENGTH=	3.75

FILENAME: C13T62

FIRST VOLT CK BLOCK=	9.27	FIRST FREQ CK BLOCK=	9.50
LAST VOLT CK BLOCK=	12.82	LAST FREQ CK BLOCK=	12.75
VOLT BLOCK LENGTH=	3.55	FREQ BLOCK LENGTH=	3.25

FILENAME: C13T63

FIRST VOLT CK BLOCK=	4.12	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	8.48	LAST FREQ CK BLOCK=	8.50
VOLT BLOCK LENGTH=	4.36	FREQ BLOCK LENGTH=	4.25

FILENAME: C13T64

FIRST VOLT CK BLOCK=	6.69	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	10.77	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	4.08	FREQ BLOCK LENGTH=	4.25

FILENAME: C13T65

FIRST VOLT CK BLOCK=	6.45	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	10.57	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	4.12	FREQ BLOCK LENGTH=	4.25

FREQUENCY

WORD =	6
G-LEVEL =	2
VARIANCE =	1.00
AVERAGE =	3.95

VOLTAGE

WORD =	6
G-LEVEL =	2
VARIANCE =	0.82
AVERAGE =	3.94

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2286

FILENAME: C09T61

FIRST VOLT CK BLOCK=	2.23	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	5.54	LAST FREQ CK BLOCK=	5.75
VOLT BLOCK LENGTH=	3.30	FREQ BLOCK LENGTH=	3.50

FILENAME: C09T62

FIRST VOLT CK BLOCK=	1.25	FIRST FREQ CK BLOCK=	1.50
LAST VOLT CK BLOCK=	4.83	LAST FREQ CK BLOCK=	5.00
VOLT BLOCK LENGTH=	3.58	FREQ BLOCK LENGTH=	3.50

FILENAME: C09T63

FIRST VOLT CK BLOCK=	6.13	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	9.49	LAST FREQ CK BLOCK=	9.50
VOLT BLOCK LENGTH=	3.36	FREQ BLOCK LENGTH=	3.25

FILENAME: C09T64

FIRST VOLT CK BLOCK=	4.99	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	8.71	LAST FREQ CK BLOCK=	9.00
VOLT BLOCK LENGTH=	3.72	FREQ BLOCK LENGTH=	4.00

FILENAME: C09T65

FIRST VOLT CK BLOCK=	4.09	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	7.59	LAST FREQ CK BLOCK=	7.75
VOLT BLOCK LENGTH=	3.50	FREQ BLOCK LENGTH=	3.50

FREQUENCY

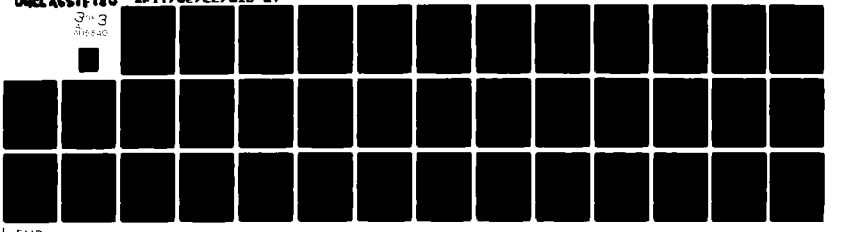
WORD =	6
G-LEVEL =	3
VARIANCE =	0.75
AVERAGE =	3.55

VOLTAGE

WORD =	6
G-LEVEL =	3
VARIANCE =	0.42
AVERAGE =	3.49

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.54
FREQ THRESHOLD= 2220

AD-A115 540 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOO--ETC F/G 17/2
TIME AXIS ANALYSIS OF GRAVITY DISTORTED SPEECH.(U)
DEC 81 J C HUNTER
UNCLASSIFIED AFIT/GE/EE/81D-27 NL



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FILENAME: C04115

FIRST VOLT CK BLOCK=	3.32	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	6.74	LAST FREQ CK BLOCK=	6.75
VOLT BLOCK LENGTH=	3.42	FREQ BLOCK LENGTH=	4.00

FILENAME: C04141

FIRST VOLT CK BLOCK=	12.83	FIRST FREQ CK BLOCK=	12.75
LAST VOLT CK BLOCK=	16.55	LAST FREQ CK BLOCK=	16.75
VOLT BLOCK LENGTH=	3.72	FREQ BLOCK LENGTH=	4.00

FILENAME: C04233

FIRST VOLT CK BLOCK=	6.77	FIRST FREQ CK BLOCK=	7.00
LAST VOLT CK BLOCK=	10.34	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	3.57	FREQ BLOCK LENGTH=	3.50

FILENAME: C04242

FIRST VOLT CK BLOCK=	2.93	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	6.44	LAST FREQ CK BLOCK=	6.50
VOLT BLOCK LENGTH=	3.51	FREQ BLOCK LENGTH=	3.50

FREQUENCY

WORD =	6
G-LEVEL =	4
VARIANCE =	0.50
AVERAGE =	3.75

VOLTAGE

WORD =	6
G-LEVEL =	4
VARIANCE =	0.30
AVERAGE =	3.56

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2064

FILENAME: C00T61

FIRST VOLT CK BLOCK=	5.52	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	9.52	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	4.00	FREQ BLOCK LENGTH=	4.00

FILENAME: C00T62

FIRST VOLT CK BLOCK=	6.52	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	10.68	LAST FREQ CK BLOCK=	10.75
VOLT BLOCK LENGTH=	4.17	FREQ BLOCK LENGTH=	4.00

FILENAME: C00T63

FIRST VOLT CK BLOCK=	4.10	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	8.49	LAST FREQ CK BLOCK=	8.50
VOLT BLOCK LENGTH=	4.31	FREQ BLOCK LENGTH=	4.25

FILENAME: C00T64

FIRST VOLT CK BLOCK=	6.10	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	10.16	LAST FREQ CK BLOCK=	10.00
VOLT BLOCK LENGTH=	4.07	FREQ BLOCK LENGTH=	3.75

FILENAME: C00T65

FIRST VOLT CK BLOCK=	4.91	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	8.71	LAST FREQ CK BLOCK=	8.75
VOLT BLOCK LENGTH=	3.80	FREQ BLOCK LENGTH=	3.75

FREQUENCY

WORD =	6
G-LEVEL =	5
VARIANCE =	0.50
AVERAGE =	3.95

VOLTAGE

WORD =	6
G-LEVEL =	5
VARIANCE =	0.51
AVERAGE =	4.07

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2027

FILENAME: C03T71

FIRST VOLT OK BLOCK=	4.98	FIRST FREQ OK BLOCK=	5.00
LAST VOLT OK BLOCK=	12.80	LAST FREQ OK BLOCK=	13.00
VOLT BLOCK LENGTH=	7.83	FREQ BLOCK LENGTH=	8.00

FILENAME: C03T72

FIRST VOLT OK BLOCK=	4.38	FIRST FREQ OK BLOCK=	4.50
LAST VOLT OK BLOCK=	11.95	LAST FREQ OK BLOCK=	11.75
VOLT BLOCK LENGTH=	7.56	FREQ BLOCK LENGTH=	7.25

FILENAME: C03T73

FIRST VOLT OK BLOCK=	5.03	FIRST FREQ OK BLOCK=	5.75
LAST VOLT OK BLOCK=	13.02	LAST FREQ OK BLOCK=	14.00
VOLT BLOCK LENGTH=	8.19	FREQ BLOCK LENGTH=	8.25

FILENAME: C03T74

FIRST VOLT OK BLOCK=	5.36	FIRST FREQ OK BLOCK=	5.50
LAST VOLT OK BLOCK=	12.71	LAST FREQ OK BLOCK=	13.00
VOLT BLOCK LENGTH=	7.35	FREQ BLOCK LENGTH=	7.50

FILENAME: C03T75

FIRST VOLT OK BLOCK=	4.07	FIRST FREQ OK BLOCK=	4.25
LAST VOLT OK BLOCK=	11.74	LAST FREQ OK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.67	FREQ BLOCK LENGTH=	8.00

FREQUENCY

WORD =	7
G-LEVEL =	1
VARIANCE =	1.00
AVERAGE =	7.80

VOLTAGE

WORD =	7
G-LEVEL =	1
VARIANCE =	0.84
AVERAGE =	7.72

VOLTAGE THRESHOLD= 0.37
VOLTAGE OK LEVEL= 0.64
FREQ THRESHOLD= 2032

FILENAME: C13T71

FIRST VOLT CK BLOCK=	5.90	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	14.53	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	8.63	FREQ BLOCK LENGTH=	8.00

FILENAME: C13T72

FIRST VOLT CK BLOCK=	6.84	FIRST FREQ CK BLOCK=	7.00
LAST VOLT CK BLOCK=	15.62	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	8.77	FREQ BLOCK LENGTH=	8.50

FILENAME: C13T73

FIRST VOLT CK BLOCK=	5.71	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	15.05	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	9.34	FREQ BLOCK LENGTH=	10.00

FILENAME: C13T74

FIRST VOLT CK BLOCK=	7.29	FIRST FREQ CK BLOCK=	7.50
LAST VOLT CK BLOCK=	18.08	LAST FREQ CK BLOCK=	17.75
VOLT BLOCK LENGTH=	10.79	FREQ BLOCK LENGTH=	10.25

FILENAME: C13T75

FIRST VOLT CK BLOCK=	5.37	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	14.11	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	8.74	FREQ BLOCK LENGTH=	9.50

FREQUENCY

WORD =	7
G-LEVEL =	2
VARIANCE =	2.25
AVERAGE =	9.25

VOLTAGE

WORD =	7
G-LEVEL =	2
VARIANCE =	2.16
AVERAGE =	9.26

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.57
FREQ THRESHOLD= 2370

FILENAME: C09T71

FIRST VOLT CK BLOCK=	3.64	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	14.45	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	10.81	FREQ BLOCK LENGTH=	11.75

FILENAME: C09T72

FIRST VOLT CK BLOCK=	2.02	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	10.09	LAST FREQ CK BLOCK=	9.00
VOLT BLOCK LENGTH=	8.07	FREQ BLOCK LENGTH=	6.75

FILENAME: C09T73

FIRST VOLT CK BLOCK=	4.47	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	12.15	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	7.68	FREQ BLOCK LENGTH=	6.50

FILENAME: C09T74

FIRST VOLT CK BLOCK=	4.26	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	8.87	LAST FREQ CK BLOCK=	8.75
VOLT BLOCK LENGTH=	4.61	FREQ BLOCK LENGTH=	4.25

FILENAME: C09T75

FIRST VOLT CK BLOCK=	2.95	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	11.18	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	8.23	FREQ BLOCK LENGTH=	8.25

FREQUENCY

WORD =	7
G-LEVEL =	3
VARIANCE =	7.50
AVERAGE =	7.50

VOLTAGE

WORD =	7
G-LEVEL =	3
VARIANCE =	6.20
AVERAGE =	7.88

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2064

FILENAME: C04125

FIRST VOLT CK BLOCK=	2.87	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	11.72	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	8.85	FREQ BLOCK LENGTH=	8.00

FILENAME: C04145

FIRST VOLT CK BLOCK=	5.48	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	15.30	LAST FREQ CK BLOCK=	12.50
VOLT BLOCK LENGTH=	7.82	FREQ BLOCK LENGTH=	7.00

FILENAME: C04222

FIRST VOLT CK BLOCK=	3.36	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	11.68	LAST FREQ CK BLOCK=	11.50
VOLT BLOCK LENGTH=	8.32	FREQ BLOCK LENGTH=	8.00

FILENAME: C04256

FIRST VOLT CK BLOCK=	3.39	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	11.94	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	8.55	FREQ BLOCK LENGTH=	8.25

FREQUENCY

WORD =	7
G-LEVEL =	4
VARIANCE =	1.25
AVERAGE =	7.81

VOLTAGE

WORD =	7
G-LEVEL =	4
VARIANCE =	1.02
AVERAGE =	8.38

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2502

FILENAME: C00T71

FIRST VOLT CK BLOCK=	5.25	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	13.24	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	7.99	FREQ BLOCK LENGTH=	7.75

FILENAME: C00T72

FIRST VOLT CK BLOCK=	6.66	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	14.07	LAST FREQ CK BLOCK=	13.75
VOLT BLOCK LENGTH=	7.41	FREQ BLOCK LENGTH=	7.00

FILENAME: C00T73

FIRST VOLT CK BLOCK=	7.07	FIRST FREQ CK BLOCK=	7.25
LAST VOLT CK BLOCK=	14.06	LAST FREQ CK BLOCK=	14.25
VOLT BLOCK LENGTH=	6.99	FREQ BLOCK LENGTH=	7.00

FILENAME: C00T74

FIRST VOLT CK BLOCK=	3.89	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	11.37	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	7.48	FREQ BLOCK LENGTH=	6.50

FILENAME: C00T75

FIRST VOLT CK BLOCK=	5.79	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	13.51	LAST FREQ CK BLOCK=	13.75
VOLT BLOCK LENGTH=	7.72	FREQ BLOCK LENGTH=	7.75

FREQUENCY

WORD =	7
G-LEVEL =	5
VARIANCE =	1.25
AVERAGE =	7.20

VOLTAGE

WORD =	7
G-LEVEL =	5
VARIANCE =	1.00
AVERAGE =	7.52

VOLTAGE THRESHOLD= 0.41
VOLTAGE CK LEVEL= 0.71
FREQ THRESHOLD= 2404

FILENAME: C03T01

FIRST VOLT CK BLOCK=	4.11	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	9.65	LAST FREQ CK BLOCK=	9.50
VOLT BLOCK LENGTH=	5.54	FREQ BLOCK LENGTH=	5.25

FILENAME: C03T02

FIRST VOLT CK BLOCK=	5.58	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	12.16	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	6.59	FREQ BLOCK LENGTH=	6.00

FILENAME: C03T03

FIRST VOLT CK BLOCK=	3.91	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	9.13	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	5.22	FREQ BLOCK LENGTH=	5.75

FILENAME: C03T04

FIRST VOLT CK BLOCK=	2.66	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	7.31	LAST FREQ CK BLOCK=	7.25
VOLT BLOCK LENGTH=	4.65	FREQ BLOCK LENGTH=	4.50

FILENAME: C03T05

FIRST VOLT CK BLOCK=	5.37	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	11.28	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	5.91	FREQ BLOCK LENGTH=	5.75

FREQUENCY

WORD =	8
G-LEVEL =	1
VARIANCE =	1.50
AVERAGE =	5.45

VOLTAGE

WORD =	8
G-LEVEL =	1
VARIANCE =	1.93
AVERAGE =	5.50

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2056

FILENAME: C13T81

FIRST VOLT CK BLOCK=	5.71	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	14.73	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	9.02	FREQ BLOCK LENGTH=	9.00

FILENAME: C13T82

FIRST VOLT CK BLOCK=	5.23	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	11.53	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	6.30	FREQ BLOCK LENGTH=	6.50

FILENAME: C13T83

FIRST VOLT CK BLOCK=	2.41	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	8.35	LAST FREQ CK BLOCK=	8.50
VOLT BLOCK LENGTH=	5.93	FREQ BLOCK LENGTH=	6.00

FILENAME: C13T84

FIRST VOLT CK BLOCK=	4.31	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	10.67	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	6.36	FREQ BLOCK LENGTH=	6.50

FILENAME: C13T85

FIRST VOLT CK BLOCK=	7.72	FIRST FREQ CK BLOCK=	7.75
LAST VOLT CK BLOCK=	18.24	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	10.52	FREQ BLOCK LENGTH=	10.75

FREQUENCY

WORD =	8
G-LEVEL =	2
VARIANCE =	4.75
AVERAGE =	7.75

VOLTAGE

WORD =	8
G-LEVEL =	2
VARIANCE =	4.58
AVERAGE =	7.62

VOLTAGE THRESHOLD= 0.40
VOLTAGE CK LEVEL= 0.69
FREQ THRESHOLD= 2041

FILENAME: C09T81

FIRST VOLT CK BLOCK=	5.55	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	14.90	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	9.35	FREQ BLOCK LENGTH=	9.25

FILENAME: C09T82

FIRST VOLT CK BLOCK=	5.93	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	10.45	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	4.52	FREQ BLOCK LENGTH=	4.50

FILENAME: C09T83

FIRST VOLT CK BLOCK=	4.76	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	9.82	LAST FREQ CK BLOCK=	9.50
VOLT BLOCK LENGTH=	5.05	FREQ BLOCK LENGTH=	4.50

FILENAME: C09T84

FIRST VOLT CK BLOCK=	2.49	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	8.83	LAST FREQ CK BLOCK=	8.25
VOLT BLOCK LENGTH=	6.34	FREQ BLOCK LENGTH=	5.75

FILENAME: C09T85

FIRST VOLT CK BLOCK=	3.01	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	8.08	LAST FREQ CK BLOCK=	8.25
VOLT BLOCK LENGTH=	5.07	FREQ BLOCK LENGTH=	5.00

FREQUENCY

WORD =	8
G-LEVEL =	3
VARIANCE =	4.75
AVERAGE =	5.80

VOLTAGE

WORD =	8
G-LEVEL =	3
VARIANCE =	4.35
AVERAGE =	6.07

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.67
FREQ THRESHOLD= 2537

FILENAME: 004111

FIRST VOLT CK BLOCK=	3.03	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	9.03	LAST FREQ CK BLOCK=	10.00
VOLT BLOCK LENGTH=	5.07	FREQ BLOCK LENGTH=	6.00

FILENAME: 004136

FIRST VOLT CK BLOCK=	7.21	FIRST FREQ CK BLOCK=	7.25
LAST VOLT CK BLOCK=	11.28	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	4.07	FREQ BLOCK LENGTH=	3.75

FILENAME: 004144

FIRST VOLT CK BLOCK=	3.79	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	9.06	LAST FREQ CK BLOCK=	9.25
VOLT BLOCK LENGTH=	5.28	FREQ BLOCK LENGTH=	5.25

FILENAME: 004227

FIRST VOLT CK BLOCK=	1.67	FIRST FREQ CK BLOCK=	1.75
LAST VOLT CK BLOCK=	7.29	LAST FREQ CK BLOCK=	6.75
VOLT BLOCK LENGTH=	5.62	FREQ BLOCK LENGTH=	5.00

FILENAME: 004248

FIRST VOLT CK BLOCK=	7.01	FIRST FREQ CK BLOCK=	7.25
LAST VOLT CK BLOCK=	12.16	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	5.14	FREQ BLOCK LENGTH=	4.50

FREQUENCY

WORD =	3
G-LEVEL =	4
VARIANCE =	2.25
AVERAGE =	4.90

VOLTAGE

WORD =	3
G-LEVEL =	4
VARIANCE =	1.91
AVERAGE =	5.22

VOLTAGE THRESHOLD= 0.40
VOLTAGE CK LEVEL= 0.70
FREQ THRESHOLD= 4350

FILENAME: 005T01

FIRST VOLT OK BLOCK=	5.71	FIRST FREQ OK BLOCK=	5.00
LAST VOLT OK BLOCK=	11.42	LAST FREQ OK BLOCK=	11.75
VOLT BLOCK LENGTH=	7.71	FREQ BLOCK LENGTH=	7.25

FILENAME: 005T02

FIRST VOLT OK BLOCK=	6.45	FIRST FREQ OK BLOCK=	6.50
LAST VOLT OK BLOCK=	12.57	LAST FREQ OK BLOCK=	12.75
VOLT BLOCK LENGTH=	6.12	FREQ BLOCK LENGTH=	6.25

FILENAME: 005T03

FIRST VOLT OK BLOCK=	5.62	FIRST FREQ OK BLOCK=	5.50
LAST VOLT OK BLOCK=	12.74	LAST FREQ OK BLOCK=	13.00
VOLT BLOCK LENGTH=	7.12	FREQ BLOCK LENGTH=	7.50

FILENAME: 005T04

FIRST VOLT OK BLOCK=	2.66	FIRST FREQ OK BLOCK=	3.00
LAST VOLT OK BLOCK=	8.79	LAST FREQ OK BLOCK=	9.00
VOLT BLOCK LENGTH=	5.95	FREQ BLOCK LENGTH=	6.00

FILENAME: 005T05

FIRST VOLT OK BLOCK=	3.02	FIRST FREQ OK BLOCK=	4.00
LAST VOLT OK BLOCK=	10.75	LAST FREQ OK BLOCK=	11.00
VOLT BLOCK LENGTH=	6.03	FREQ BLOCK LENGTH=	7.00

FREQUENCY

```
*******************************
*                             *
*      WORD =   8             *
*   G-LEVEL =   5             *
*  VARIANCE =   2.25          *
*   AVERAGE =   7.00          *
*                             *
*******************************
```

VOLTAGE

```
*******************************
*                             *
*      WORD =   8             *
*   G-LEVEL =   5             *
*  VARIANCE =   1.77          *
*   AVERAGE =   6.76          *
*                             *
*******************************
```

VOLTAGE THRESHOLD= 0.43
VOLTAGE OK LEVEL= 0.35
FREQ THRESHOLD= 2061

FILENAME: C03T91

FIRST VOLT CK BLOCK=	3.12	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	14.50	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	11.38	FREQ BLOCK LENGTH=	11.25

FILENAME: C03T92

FIRST VOLT CK BLOCK=	3.89	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	15.05	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	11.17	FREQ BLOCK LENGTH=	11.25

FILENAME: C03T93

FIRST VOLT CK BLOCK=	2.11	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	15.74	LAST FREQ CK BLOCK=	16.25
VOLT BLOCK LENGTH=	13.62	FREQ BLOCK LENGTH=	13.00

FILENAME: C03T94

FIRST VOLT CK BLOCK=	4.60	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	16.00	LAST FREQ CK BLOCK=	16.00
VOLT BLOCK LENGTH=	11.39	FREQ BLOCK LENGTH=	11.25

FILENAME: C03T95

FIRST VOLT CK BLOCK=	3.92	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	16.39	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	12.47	FREQ BLOCK LENGTH=	11.50

FREQUENCY

WORD =	9
G-LEVEL =	1
VARIANCE =	1.75
AVERAGE =	11.65

VOLTAGE

WORD =	9
G-LEVEL =	1
VARIANCE =	2.46
AVERAGE =	12.01

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.34
FREQ THRESHOLD= 2445

FILENAME: C13T91

FIRST VOLT CK BLOCK=	3.49	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	15.78	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	12.29	FREQ BLOCK LENGTH=	12.25

FILENAME: C13T92

FIRST VOLT CK BLOCK=	5.63	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	16.81	LAST FREQ CK BLOCK=	17.25
VOLT BLOCK LENGTH=	11.18	FREQ BLOCK LENGTH=	11.25

FILENAME: C13T93

FIRST VOLT CK BLOCK=	4.38	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	15.71	LAST FREQ CK BLOCK=	17.00
VOLT BLOCK LENGTH=	11.32	FREQ BLOCK LENGTH=	11.75

FILENAME: C13T94

FIRST VOLT CK BLOCK=	2.95	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	14.54	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	11.59	FREQ BLOCK LENGTH=	11.75

FILENAME: C13T95

FIRST VOLT CK BLOCK=	2.87	FIRST FREQ CK BLOCK=	3.30
LAST VOLT CK BLOCK=	17.04	LAST FREQ CK BLOCK=	17.25
VOLT BLOCK LENGTH=	14.16	FREQ BLOCK LENGTH=	13.75

FREQUENCY

WORD =	9
G-LEVEL =	2
VARIANCE =	2.50
AVERAGE =	12.15

VOLTAGE

WORD =	9
G-LEVEL =	2
VARIANCE =	2.98
AVERAGE =	12.11

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.74
FREQ THRESHOLD= 2534

FILENAME: C09T91

FIRST VOLT CK BLOCK=	4.13	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	13.47	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	9.34	FREQ BLOCK LENGTH=	9.50

FILENAME: C09T92

FIRST VOLT CK BLOCK=	5.33	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	17.98	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	12.65	FREQ BLOCK LENGTH=	13.00

FILENAME: C09T93

FIRST VOLT CK BLOCK=	3.11	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	13.89	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	10.77	FREQ BLOCK LENGTH=	10.75

FILENAME: C09T94

FIRST VOLT CK BLOCK=	5.20	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	17.00	LAST FREQ CK BLOCK=	17.00
VOLT BLOCK LENGTH=	11.80	FREQ BLOCK LENGTH=	11.75

FILENAME: C09T95

FIRST VOLT CK BLOCK=	2.54	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	14.14	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	11.60	FREQ BLOCK LENGTH=	11.25

FREQUENCY

WORD =	9
G-LEVEL =	3
VARIANCE =	3.50
AVERAGE =	11.25

VOLTAGE

WORD =	9
G-LEVEL =	3
VARIANCE =	3.31
AVERAGE =	11.23

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.64
FREQ THRESHOLD= 2356

FILENAME: C04137

FIRST VOLT CK BLOCK=	3.70	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	15.75	LAST FREQ CK BLOCK=	16.00
VOLT BLOCK LENGTH=	11.00	FREQ BLOCK LENGTH=	12.00

FILENAME: C04153

FIRST VOLT CK BLOCK=	5.08	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	17.94	LAST FREQ CK BLOCK=	17.75
VOLT BLOCK LENGTH=	12.56	FREQ BLOCK LENGTH=	12.25

FILENAME: C04212

FIRST VOLT CK BLOCK=	5.39	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	17.79	LAST FREQ CK BLOCK=	18.00
VOLT BLOCK LENGTH=	12.40	FREQ BLOCK LENGTH=	12.25

FILENAME: C04221

FIRST VOLT CK BLOCK=	3.47	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	14.28	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	10.81	FREQ BLOCK LENGTH=	10.25

FILENAME: C04241

FIRST VOLT CK BLOCK=	5.65	FIRST FREQ CK BLOCK=	6.00
LAST VOLT CK BLOCK=	17.67	LAST FREQ CK BLOCK=	18.25
VOLT BLOCK LENGTH=	12.02	FREQ BLOCK LENGTH=	12.25

FREQUENCY

WORD =	9
G-LEVEL =	4
VARIANCE =	2.00
AVERAGE =	11.80

VOLTAGE

WORD =	9
G-LEVEL =	4
VARIANCE =	2.05
AVERAGE =	12.01

VOLTAGE THRESHOLD= 0.57
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2117

FILENAME: C00T91

FIRST VOLT CK BLOCK=	10.46	FIRST FREQ CK BLOCK=	10.50
LAST VOLT CK BLOCK=	20.39	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	9.93	FREQ BLOCK LENGTH=	7.50

FILENAME: C00T92

FIRST VOLT CK BLOCK=	5.20	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	12.50	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.31	FREQ BLOCK LENGTH=	6.75

FILENAME: C00T93

FIRST VOLT CK BLOCK=	6.31	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	13.55	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	7.24	FREQ BLOCK LENGTH=	8.00

FILENAME: C00T95

FIRST VOLT CK BLOCK=	5.67	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	12.05	LAST FREQ CK BLOCK=	11.50
VOLT BLOCK LENGTH=	6.37	FREQ BLOCK LENGTH=	5.75

FREQUENCY

WORD =	9
G-LEVEL =	5
VARIANCE =	2.25
AVERAGE =	7.00

VOLTAGE

WORD =	9
G-LEVEL =	5
VARIANCE =	3.55
AVERAGE =	7.71

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.94
FREQ THRESHOLD= 2013

FILENAME: C03TF1

FIRST VOLT OK BLOCK=	5.38	FIRST FREQ OK BLOCK=	5.75
LAST VOLT OK BLOCK=	20.34	LAST FREQ OK BLOCK=	20.00
VOLT BLOCK LENGTH=	14.96	FREQ BLOCK LENGTH=	14.25

FILENAME: C03TF2

FIRST VOLT OK BLOCK=	4.21	FIRST FREQ OK BLOCK=	4.25
LAST VOLT OK BLOCK=	19.20	LAST FREQ OK BLOCK=	18.50
VOLT BLOCK LENGTH=	14.99	FREQ BLOCK LENGTH=	14.25

FILENAME: C03TF3

FIRST VOLT OK BLOCK=	1.84	FIRST FREQ OK BLOCK=	2.00
LAST VOLT OK BLOCK=	15.62	LAST FREQ OK BLOCK=	15.75
VOLT BLOCK LENGTH=	13.79	FREQ BLOCK LENGTH=	13.75

FILENAME: C03TF4

FIRST VOLT OK BLOCK=	2.30	FIRST FREQ OK BLOCK=	2.50
LAST VOLT OK BLOCK=	16.05	LAST FREQ OK BLOCK=	16.50
VOLT BLOCK LENGTH=	14.46	FREQ BLOCK LENGTH=	14.00

FILENAME: C03TF5

FIRST VOLT OK BLOCK=	2.88	FIRST FREQ OK BLOCK=	2.75
LAST VOLT OK BLOCK=	16.49	LAST FREQ OK BLOCK=	16.75
VOLT BLOCK LENGTH=	13.61	FREQ BLOCK LENGTH=	14.00

FREQUENCY

```
*********************************
*                               *
*       WORD =   F              *
*    G-LEVEL =   1              *
*   VARIANCE =   0.50           *
*    AVERAGE =  14.05           *
*                               *
*********************************
```

VOLTAGE

```
*********************************
*                               *
*       WORD =   F              *
*    G-LEVEL =   1              *
*   VARIANCE =   1.38           *
*    AVERAGE =  14.35           *
*                               *
*********************************
```

VOLTAGE THRESHOLD= 0.30
VOLTAGE OK LEVEL= 0.67
FREQ THRESHOLD= 2047

FILENAME: C13TF1

FIRST VOLT CK BLOCK=	4.65	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	19.22	LAST FREQ CK BLOCK=	19.25
VOLT BLOCK LENGTH=	14.57	FREQ BLOCK LENGTH=	14.50

FILENAME: C13TF2

FIRST VOLT CK BLOCK=	4.01	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	21.37	LAST FREQ CK BLOCK=	21.50
VOLT BLOCK LENGTH=	17.36	FREQ BLOCK LENGTH=	17.25

FILENAME: C13TF3

FIRST VOLT CK BLOCK=	3.76	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	18.85	LAST FREQ CK BLOCK=	18.75
VOLT BLOCK LENGTH=	15.09	FREQ BLOCK LENGTH=	14.75

FILENAME: C13TF4

FIRST VOLT CK BLOCK=	4.52	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	20.91	LAST FREQ CK BLOCK=	21.25
VOLT BLOCK LENGTH=	16.39	FREQ BLOCK LENGTH=	17.25

FILENAME: C13TF5

FIRST VOLT CK BLOCK=	3.03	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	18.20	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	15.12	FREQ BLOCK LENGTH=	15.50

FREQUENCY

WORD =	F
G-LEVEL =	2
VARIANCE =	2.75
AVERAGE =	15.85

VOLTAGE

WORD =	F
G-LEVEL =	2
VARIANCE =	2.80
AVERAGE =	15.71

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.68
FREQ THRESHOLD= 2129

FILENAME: C09TF1

FIRST VOLT CK BLOCK=	2.92	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	18.47	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	15.55	FREQ BLOCK LENGTH=	15.50

FILENAME: C09TF2

FIRST VOLT CK BLOCK=	2.05	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	16.54	LAST FREQ CK BLOCK=	16.75
VOLT BLOCK LENGTH=	14.49	FREQ BLOCK LENGTH=	14.25

FILENAME: C09TF3

FIRST VOLT CK BLOCK=	1.93	FIRST FREQ CK BLOCK=	2.00
LAST VOLT CK BLOCK=	15.63	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	13.70	FREQ BLOCK LENGTH=	13.25

FILENAME: C09TF4

FIRST VOLT CK BLOCK=	4.30	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	17.76	LAST FREQ CK BLOCK=	18.00
VOLT BLOCK LENGTH=	13.45	FREQ BLOCK LENGTH=	13.50

FILENAME: C09TF5

FIRST VOLT CK BLOCK=	2.24	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	16.77	LAST FREQ CK BLOCK=	17.00
VOLT BLOCK LENGTH=	14.53	FREQ BLOCK LENGTH=	14.50

FREQUENCY

WORD =	F
G-LEVEL =	3
VARIANCE =	2.25
AVERAGE =	14.20

VOLTAGE

WORD =	F
G-LEVEL =	3
VARIANCE =	2.10
AVERAGE =	14.35

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.37
FREQ THRESHOLD= 2620

FILENAME: C04117

FIRST VOLT CK BLOCK=	5.16	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	19.37	LAST FREQ CK BLOCK=	19.50
VOLT BLOCK LENGTH=	14.20	FREQ BLOCK LENGTH=	14.25

FILENAME: C04152

FIRST VOLT CK BLOCK=	5.59	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	20.03	LAST FREQ CK BLOCK=	20.00
VOLT BLOCK LENGTH=	14.45	FREQ BLOCK LENGTH=	14.25

FILENAME: C04213

FIRST VOLT CK BLOCK=	5.50	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	21.14	LAST FREQ CK BLOCK=	21.25
VOLT BLOCK LENGTH=	15.64	FREQ BLOCK LENGTH=	15.75

FILENAME: C04223

FIRST VOLT CK BLOCK=	3.50	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	18.45	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	14.95	FREQ BLOCK LENGTH=	15.25

FILENAME: C04253

FIRST VOLT CK BLOCK=	4.37	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	20.69	LAST FREQ CK BLOCK=	21.00
VOLT BLOCK LENGTH=	16.32	FREQ BLOCK LENGTH=	16.50

FREQUENCY

```
*****************************
*                           *
*       WORD =   F          *
*    G-LEVEL =   4          *
*   VARIANCE =   2.25       *
*    AVERAGE =  15.20       *
*                           *
*****************************
```

VOLTAGE

```
*****************************
*                           *
*       WORD =   F          *
*    G-LEVEL =   4          *
*   VARIANCE =   2.11       *
*    AVERAGE =  15.11       *
*                           *
*****************************
```

VOLTAGE THRESHOLD=	0.38
VOLTAGE CK LEVEL=	0.77
FREQ THRESHOLD=	2057

FILENAME: C08TF1

FIRST VOLT CK BLOCK=	3.59	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	19.16	LAST FREQ CK BLOCK=	19.00
VOLT BLOCK LENGTH=	15.57	FREQ BLOCK LENGTH=	15.25

FILENAME: C08TF2

FIRST VOLT CK BLOCK=	3.67	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	17.56	LAST FREQ CK BLOCK=	18.00
VOLT BLOCK LENGTH=	13.89	FREQ BLOCK LENGTH=	14.25

FILENAME: C08TF3

FIRST VOLT CK BLOCK=	3.07	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	18.28	LAST FREQ CK BLOCK=	18.50
VOLT BLOCK LENGTH=	15.20	FREQ BLOCK LENGTH=	15.50

FILENAME: C08TF4

FIRST VOLT CK BLOCK=	1.17	FIRST FREQ CK BLOCK=	1.25
LAST VOLT CK BLOCK=	15.41	LAST FREQ CK BLOCK=	15.50
VOLT BLOCK LENGTH=	14.24	FREQ BLOCK LENGTH=	14.25

FREQUENCY

WORD =	F
G-LEVEL =	5
VARIANCE =	1.25
AVERAGE =	14.81

VOLTAGE

WORD =	F
G-LEVEL =	5
VARIANCE =	1.60
AVERAGE =	14.73

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2560

FILENAME: C03TE1

FIRST VOLT CK BLOCK=	4.50	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	13.30	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	9.16	FREQ BLOCK LENGTH=	9.25

FILENAME: C03TE2

FIRST VOLT CK BLOCK=	4.41	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	14.07	LAST FREQ CK BLOCK=	15.00
VOLT BLOCK LENGTH=	10.46	FREQ BLOCK LENGTH=	10.50

FILENAME: C03TE3

FIRST VOLT CK BLOCK=	3.25	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	13.30	LAST FREQ CK BLOCK=	13.50
VOLT BLOCK LENGTH=	10.05	FREQ BLOCK LENGTH=	10.00

FILENAME: C03TE4

FIRST VOLT CK BLOCK=	2.37	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	11.05	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	8.68	FREQ BLOCK LENGTH=	8.75

FILENAME: C03TE5

FIRST VOLT CK BLOCK=	1.91	FIRST FREQ CK BLOCK=	2.00
LAST VOLT CK BLOCK=	11.09	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	9.18	FREQ BLOCK LENGTH=	8.50

FREQUENCY

```
*****************************
*                           *
*       WORD =   E          *
*    G-LEVEL =   1          *
*   VARIANCE =   2.00       *
*    AVERAGE =   9.40       *
*                           *
*****************************
```

VOLTAGE

```
*****************************
*                           *
*       WORD =   E          *
*    G-LEVEL =   1          *
*   VARIANCE =   1.78       *
*    AVERAGE =   9.51       *
*                           *
*****************************
```

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.77
FREQ THRESHOLD= 3001

FILENAME: C13TE1

FIRST VOLT CK BLOCK=	4.34	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	14.58	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	10.25	FREQ BLOCK LENGTH=	10.25

FILENAME: C13TE2

FIRST VOLT CK BLOCK=	2.47	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	12.19	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	9.72	FREQ BLOCK LENGTH=	9.50

FILENAME: C13TE3

FIRST VOLT CK BLOCK=	6.22	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	16.02	LAST FREQ CK BLOCK=	16.50
VOLT BLOCK LENGTH=	9.79	FREQ BLOCK LENGTH=	10.25

FILENAME: C13TE4

FIRST VOLT CK BLOCK=	5.01	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	14.63	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	9.62	FREQ BLOCK LENGTH=	10.00

FILENAME: C13TE5

FIRST VOLT CK BLOCK=	3.89	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	13.80	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.91	FREQ BLOCK LENGTH=	10.50

FREQUENCY

WORD =	E
G-LEVEL =	2
VARIANCE =	1.00
AVERAGE =	10.10

VOLTAGE

WORD =	E
G-LEVEL =	2
VARIANCE =	0.62
AVERAGE =	9.86

VOLTAGE THRESHOLD=	0.40
VOLTAGE CK LEVEL=	0.70
FREQ THRESHOLD=	2099

FILENAME: C09TE1

FIRST VOLT CK BLOCK=	0.78	FIRST FREQ CK BLOCK=	1.00
LAST VOLT CK BLOCK=	8.22	LAST FREQ CK BLOCK=	8.00
VOLT BLOCK LENGTH=	7.44	FREQ BLOCK LENGTH=	7.00

FILENAME: C09TE2

FIRST VOLT CK BLOCK=	2.06	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	11.70	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	9.62	FREQ BLOCK LENGTH=	9.00

FILENAME: C09TE3

FIRST VOLT CK BLOCK=	4.32	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	14.47	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	10.14	FREQ BLOCK LENGTH=	10.00

FILENAME: C09TE4

FIRST VOLT CK BLOCK=	3.17	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	11.77	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	8.60	FREQ BLOCK LENGTH=	8.50

FILENAME: C09TE5

FIRST VOLT CK BLOCK=	4.24	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	13.39	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	9.15	FREQ BLOCK LENGTH=	9.00

FREQUENCY

WORD =	E
G-LEVEL =	3
VARIANCE =	3.00
AVERAGE =	8.70

VOLTAGE

WORD =	E
G-LEVEL =	3
VARIANCE =	2.70
AVERAGE =	8.99

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.56
FREQ THRESHOLD= 2009

FILENAME: C04114

FIRST VOLT CK BLOCK=	0.87	FIRST FREQ CK BLOCK=	1.00
LAST VOLT CK BLOCK=	9.74	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	8.87	FREQ BLOCK LENGTH=	8.75

FILENAME: C04134

FIRST VOLT CK BLOCK=	9.43	FIRST FREQ CK BLOCK=	9.50
LAST VOLT CK BLOCK=	18.95	LAST FREQ CK BLOCK=	18.00
VOLT BLOCK LENGTH=	9.52	FREQ BLOCK LENGTH=	8.50

FILENAME: C04147

FIRST VOLT CK BLOCK=	6.60	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	15.74	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	9.14	FREQ BLOCK LENGTH=	9.00

FILENAME: C04225

FIRST VOLT CK BLOCK=	5.57	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	15.87	LAST FREQ CK BLOCK=	15.75
VOLT BLOCK LENGTH=	10.30	FREQ BLOCK LENGTH=	10.00

FILENAME: C04257

FIRST VOLT CK BLOCK=	2.81	FIRST FREQ CK BLOCK=	3.00
LAST VOLT CK BLOCK=	11.87	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	9.06	FREQ BLOCK LENGTH=	9.00

FREQUENCY

WORD =	E
G-LEVEL =	4
VARIANCE =	1.25
AVERAGE =	9.25

VOLTAGE

WORD =	E
G-LEVEL =	4
VARIANCE =	1.43
AVERAGE =	9.38

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.55
FREQ THRESHOLD= 4360

FILENAME: C00TE1

FIRST VOLT OK BLOCK=	5.76	FIRST FREQ OK BLOCK=	5.50
LAST VOLT OK BLOCK=	15.69	LAST FREQ OK BLOCK=	15.75
VOLT BLOCK LENGTH=	9.91	FREQ BLOCK LENGTH=	10.25

FILENAME: C00TE2

FIRST VOLT OK BLOCK=	5.77	FIRST FREQ OK BLOCK=	5.00
LAST VOLT OK BLOCK=	15.66	LAST FREQ OK BLOCK=	15.25
VOLT BLOCK LENGTH=	9.89	FREQ BLOCK LENGTH=	10.25

FILENAME: C00TE3

FIRST VOLT OK BLOCK=	4.52	FIRST FREQ OK BLOCK=	4.75
LAST VOLT OK BLOCK=	14.54	LAST FREQ OK BLOCK=	14.50
VOLT BLOCK LENGTH=	9.02	FREQ BLOCK LENGTH=	9.75

FILENAME: C00TE4

FIRST VOLT OK BLOCK=	9.63	FIRST FREQ OK BLOCK=	9.75
LAST VOLT OK BLOCK=	18.71	LAST FREQ OK BLOCK=	19.00
VOLT BLOCK LENGTH=	9.05	FREQ BLOCK LENGTH=	9.25

FILENAME: C00TE5

FIRST VOLT OK BLOCK=	5.19	FIRST FREQ OK BLOCK=	5.25
LAST VOLT OK BLOCK=	15.02	LAST FREQ OK BLOCK=	15.25
VOLT BLOCK LENGTH=	9.83	FREQ BLOCK LENGTH=	10.00

FREQUENCY

WORD =	E
G-LEVEL =	5
VARIANCE =	1.00
AVERAGE =	9.90

VOLTAGE

WORD =	E
G-LEVEL =	5
VARIANCE =	0.08
AVERAGE =	9.70

VOLTAGE THRESHOLD= 0.30
VOLTAGE OK LEVEL= 0.67
FREQ THRESHOLD= 2010

FILENAME: 003TT1

FIRST VOLT CK BLOCK=	4.15	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	11.05	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	6.89	FREQ BLOCK LENGTH=	7.00

FILENAME: 003TT2

FIRST VOLT CK BLOCK=	2.65	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	8.99	LAST FREQ CK BLOCK=	9.25
VOLT BLOCK LENGTH=	6.34	FREQ BLOCK LENGTH=	7.00

FILENAME: 003TT3

FIRST VOLT CK BLOCK=	3.32	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	9.35	LAST FREQ CK BLOCK=	9.50
VOLT BLOCK LENGTH=	6.04	FREQ BLOCK LENGTH=	6.00

FILENAME: 003TT4

FIRST VOLT CK BLOCK=	3.15	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	9.55	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	6.39	FREQ BLOCK LENGTH=	6.50

FILENAME: 003TT5

FIRST VOLT CK BLOCK=	5.32	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	13.00	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	7.68	FREQ BLOCK LENGTH=	7.50

FREQUENCY

WORD =	T
G-LEVEL =	1
VARIANCE =	1.50
AVERAGE =	6.80

VOLTAGE

WORD =	T
G-LEVEL =	1
VARIANCE =	1.64
AVERAGE =	6.67

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.65
FREQ THRESHOLD= 2390

FILENAME: C13TT1

FIRST VOLT CK BLOCK=	6.08	FIRST FREQ CK BLOCK=	6.25
LAST VOLT CK BLOCK=	14.45	LAST FREQ CK BLOCK=	14.50
VOLT BLOCK LENGTH=	8.37	FREQ BLOCK LENGTH=	8.25

FILENAME: C13TT2

FIRST VOLT CK BLOCK=	3.64	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	11.81	LAST FREQ CK BLOCK=	12.00
VOLT BLOCK LENGTH=	8.17	FREQ BLOCK LENGTH=	8.25

FILENAME: C13TT3

FIRST VOLT CK BLOCK=	3.01	FIRST FREQ CK BLOCK=	3.25
LAST VOLT CK BLOCK=	11.08	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	8.07	FREQ BLOCK LENGTH=	8.00

FILENAME: C13TT4

FIRST VOLT CK BLOCK=	2.54	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	10.85	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	8.31	FREQ BLOCK LENGTH=	8.25

FILENAME: C13TT5

FIRST VOLT CK BLOCK=	4.55	FIRST FREQ CK BLOCK=	4.50
LAST VOLT CK BLOCK=	13.09	LAST FREQ CK BLOCK=	13.25
VOLT BLOCK LENGTH=	8.55	FREQ BLOCK LENGTH=	8.75

FREQUENCY

WORD =	T
G-LEVEL =	2
VARIANCE =	0.75
AVERAGE =	8.30

VOLTAGE

WORD =	T
G-LEVEL =	2
VARIANCE =	0.47
AVERAGE =	8.29

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.64
FREQ THRESHOLD= 2171

FILENAME: C09TT1

FIRST VOLT CK BLOCK=	4.95	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	12.41	LAST FREQ CK BLOCK=	12.50
VOLT BLOCK LENGTH=	7.45	FREQ BLOCK LENGTH=	7.50

FILENAME: C09TT2

FIRST VOLT CK BLOCK=	3.00	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	10.31	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	6.31	FREQ BLOCK LENGTH=	6.75

FILENAME: C09TT3

FIRST VOLT CK BLOCK=	3.82	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	11.00	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	7.18	FREQ BLOCK LENGTH=	6.75

FILENAME: C09TT4

FIRST VOLT CK BLOCK=	4.21	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	11.21	LAST FREQ CK BLOCK=	11.50
VOLT BLOCK LENGTH=	7.00	FREQ BLOCK LENGTH=	7.25

FILENAME: C09TT5

FIRST VOLT CK BLOCK=	5.59	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	11.46	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	5.87	FREQ BLOCK LENGTH=	6.25

FREQUENCY

WORD =	T
G-LEVEL =	3
VARIANCE =	1.25
AVERAGE =	6.90

VOLTAGE

WORD =	T
G-LEVEL =	3
VARIANCE =	1.58
AVERAGE =	6.80

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.64
FREQ THRESHOLD= 2133

FILENAME: C04112

FIRST VOLT CK BLOCK=	6.71	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	14.71	LAST FREQ CK BLOCK=	14.75
VOLT BLOCK LENGTH=	8.00	FREQ BLOCK LENGTH=	8.00

FILENAME: C04124

FIRST VOLT CK BLOCK=	7.91	FIRST FREQ CK BLOCK=	8.00
LAST VOLT CK BLOCK=	15.17	LAST FREQ CK BLOCK=	15.25
VOLT BLOCK LENGTH=	7.26	FREQ BLOCK LENGTH=	7.25

FILENAME: C04157

FIRST VOLT CK BLOCK=	4.98	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	12.12	LAST FREQ CK BLOCK=	12.25
VOLT BLOCK LENGTH=	7.15	FREQ BLOCK LENGTH=	7.25

FILENAME: C04216

FIRST VOLT CK BLOCK=	5.02	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	11.56	LAST FREQ CK BLOCK=	11.75
VOLT BLOCK LENGTH=	6.54	FREQ BLOCK LENGTH=	6.75

FILENAME: C04234

FIRST VOLT CK BLOCK=	2.26	FIRST FREQ CK BLOCK=	2.25
LAST VOLT CK BLOCK=	11.06	LAST FREQ CK BLOCK=	11.25
VOLT BLOCK LENGTH=	8.80	FREQ BLOCK LENGTH=	9.00

FREQUENCY

WORD =	T
G-LEVEL =	4
VARIANCE =	2.25
AVERAGE =	7.65

VOLTAGE

WORD =	T
G-LEVEL =	4
VARIANCE =	2.26
AVERAGE =	7.55

VOLTAGE THRESHOLD= 0.37
VOLTAGE CK LEVEL= 0.64
FREQ THRESHOLD= 2153

FILENAME: C08TT1

FIRST VOLT CK BLOCK=	3.30	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	9.90	LAST FREQ CK BLOCK=	10.00
VOLT BLOCK LENGTH=	6.60	FREQ BLOCK LENGTH=	7.25

FILENAME: C08TT2

FIRST VOLT CK BLOCK=	6.37	FIRST FREQ CK BLOCK=	6.50
LAST VOLT CK BLOCK=	14.32	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	7.96	FREQ BLOCK LENGTH=	7.50

FILENAME: C08TT3

FIRST VOLT CK BLOCK=	4.96	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	12.86	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	7.88	FREQ BLOCK LENGTH=	8.00

FILENAME: C08TT4

FIRST VOLT CK BLOCK=	2.20	FIRST FREQ CK BLOCK=	2.50
LAST VOLT CK BLOCK=	9.46	LAST FREQ CK BLOCK=	9.00
VOLT BLOCK LENGTH=	7.27	FREQ BLOCK LENGTH=	6.50

FILENAME: C08TT5

FIRST VOLT CK BLOCK=	4.46	FIRST FREQ CK BLOCK=	4.25
LAST VOLT CK BLOCK=	11.50	LAST FREQ CK BLOCK=	11.50
VOLT BLOCK LENGTH=	7.03	FREQ BLOCK LENGTH=	7.25

FREQUENCY

WORD =	T
G-LEVEL =	5
VARIANCE =	1.50
AVERAGE =	7.30

VOLTAGE

WORD =	T
G-LEVEL =	5
VARIANCE =	1.23
AVERAGE =	7.36

VOLTAGE THRESHOLD= 0.33
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2247

FILENAME: C03TS1

FIRST VOLT CK BLOCK=	2.45	FIRST FREQ CK BLOCK=	3.50
LAST VOLT CK BLOCK=	6.83	LAST FREQ CK BLOCK=	7.00
VOLT BLOCK LENGTH=	4.39	FREQ BLOCK LENGTH=	4.50

FILENAME: C03TS2

FIRST VOLT CK BLOCK=	3.97	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	8.14	LAST FREQ CK BLOCK=	8.25
VOLT BLOCK LENGTH=	4.18	FREQ BLOCK LENGTH=	4.25

FILENAME: C03TS3

FIRST VOLT CK BLOCK=	4.90	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	9.72	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	4.74	FREQ BLOCK LENGTH=	4.75

FILENAME: C03TS4

FIRST VOLT CK BLOCK=	2.92	FIRST FREQ CK BLOCK=	2.75
LAST VOLT CK BLOCK=	7.02	LAST FREQ CK BLOCK=	7.25
VOLT BLOCK LENGTH=	4.11	FREQ BLOCK LENGTH=	4.50

FILENAME: C03TS5

FIRST VOLT CK BLOCK=	14.95	FIRST FREQ CK BLOCK=	15.00
LAST VOLT CK BLOCK=	19.94	LAST FREQ CK BLOCK=	20.00
VOLT BLOCK LENGTH=	4.99	FREQ BLOCK LENGTH=	5.00

FREQUENCY

```
*******************************
*                             *
*      WORD =   S             *
*   G-LEVEL =   1             *
*  VARIANCE =   0.75          *
*   AVERAGE =   4.50          *
*                             *
*******************************
```

VOLTAGE

```
*******************************
*                             *
*      WORD =   S             *
*   G-LEVEL =   1             *
*  VARIANCE =   0.88          *
*   AVERAGE =   4.48          *
*                             *
*******************************
```

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.75
FREQ THRESHOLD= 2471

FILENAME: C13TS1

FIRST VOLT CK BLOCK=	4.85	FIRST FREQ CK BLOCK=	5.00
LAST VOLT CK BLOCK=	9.55	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	4.70	FREQ BLOCK LENGTH=	4.75

FILENAME: C13TS2

FIRST VOLT CK BLOCK=	5.00	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	9.20	LAST FREQ CK BLOCK=	9.25
VOLT BLOCK LENGTH=	5.40	FREQ BLOCK LENGTH=	5.25

FILENAME: C13TS3

FIRST VOLT CK BLOCK=	5.02	FIRST FREQ CK BLOCK=	5.25
LAST VOLT CK BLOCK=	10.27	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	5.25	FREQ BLOCK LENGTH=	5.25

FILENAME: C13TS4

FIRST VOLT CK BLOCK=	7.46	FIRST FREQ CK BLOCK=	7.50
LAST VOLT CK BLOCK=	12.93	LAST FREQ CK BLOCK=	13.00
VOLT BLOCK LENGTH=	5.47	FREQ BLOCK LENGTH=	5.50

FILENAME: C13TS5

FIRST VOLT CK BLOCK=	5.32	FIRST FREQ CK BLOCK=	5.50
LAST VOLT CK BLOCK=	10.33	LAST FREQ CK BLOCK=	10.50
VOLT BLOCK LENGTH=	5.01	FREQ BLOCK LENGTH=	5.00

FREQUENCY

WORD =	S
G-LEVEL =	2
VARIANCE =	0.75
AVERAGE =	5.15

VOLTAGE

WORD =	S
G-LEVEL =	2
VARIANCE =	0.77
AVERAGE =	5.17

VOLTAGE THRESHOLD=	0.43
VOLTAGE CK LEVEL=	0.75
FREQ THRESHOLD=	2233

FILENAME: C09TS1

FIRST VOLT CK BLOCK=	6.40	FIRST FREQ CK BLOCK=	6.75
LAST VOLT CK BLOCK=	11.34	LAST FREQ CK BLOCK=	11.00
VOLT BLOCK LENGTH=	4.94	FREQ BLOCK LENGTH=	4.25

FILENAME: C09TS2

FIRST VOLT CK BLOCK=	4.46	FIRST FREQ CK BLOCK=	4.75
LAST VOLT CK BLOCK=	9.37	LAST FREQ CK BLOCK=	9.75
VOLT BLOCK LENGTH=	4.90	FREQ BLOCK LENGTH=	5.00

FILENAME: C09TS3

FIRST VOLT CK BLOCK=	5.78	FIRST FREQ CK BLOCK=	5.75
LAST VOLT CK BLOCK=	13.69	LAST FREQ CK BLOCK=	14.00
VOLT BLOCK LENGTH=	7.91	FREQ BLOCK LENGTH=	8.25

FILENAME: C09TS4

FIRST VOLT CK BLOCK=	3.68	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	8.16	LAST FREQ CK BLOCK=	8.25
VOLT BLOCK LENGTH=	4.48	FREQ BLOCK LENGTH=	4.50

FILENAME: C09TS5

FIRST VOLT CK BLOCK=	3.57	FIRST FREQ CK BLOCK=	3.75
LAST VOLT CK BLOCK=	8.04	LAST FREQ CK BLOCK=	8.25
VOLT BLOCK LENGTH=	4.47	FREQ BLOCK LENGTH=	4.50

FREQUENCY

WORD =	S
G-LEVEL =	3
VARIANCE =	4.00
AVERAGE =	5.30

VOLTAGE

WORD =	S
G-LEVEL =	3
VARIANCE =	3.44
AVERAGE =	5.34

VOLTAGE THRESHOLD= 0.39
VOLTAGE CK LEVEL= 0.67
FREQ THRESHOLD= 2062

FILENAME: 004135

FIRST VOLT CK BLOCK=	3.01	FIRST FREQ CK BLOCK=	4.00
LAST VOLT CK BLOCK=	7.05	LAST FREQ CK BLOCK=	8.00
VOLT BLOCK LENGTH=	3.93	FREQ BLOCK LENGTH=	4.00

FILENAME: 004154

FIRST VOLT CK BLOCK=	10.10	FIRST FREQ CK BLOCK=	10.25
LAST VOLT CK BLOCK=	17.41	LAST FREQ CK BLOCK=	18.00
VOLT BLOCK LENGTH=	7.24	FREQ BLOCK LENGTH=	7.75

FILENAME: 004211

FIRST VOLT CK BLOCK=	8.53	FIRST FREQ CK BLOCK=	8.75
LAST VOLT CK BLOCK=	15.83	LAST FREQ CK BLOCK=	16.25
VOLT BLOCK LENGTH=	7.30	FREQ BLOCK LENGTH=	7.50

FILENAME: 004232

FIRST VOLT CK BLOCK=	8.85	FIRST FREQ CK BLOCK=	9.00
LAST VOLT CK BLOCK=	16.42	LAST FREQ CK BLOCK=	16.50
VOLT BLOCK LENGTH=	7.57	FREQ BLOCK LENGTH=	7.50

FILENAME: 004251

FIRST VOLT CK BLOCK=	9.09	FIRST FREQ CK BLOCK=	9.25
LAST VOLT CK BLOCK=	16.98	LAST FREQ CK BLOCK=	17.00
VOLT BLOCK LENGTH=	7.89	FREQ BLOCK LENGTH=	7.75

FREQUENCY

WORD =	S
G-LEVEL =	4
VARIANCE =	3.75
AVERAGE =	6.90

VOLTAGE

WORD =	S
G-LEVEL =	4
VARIANCE =	3.95
AVERAGE =	6.79

VOLTAGE THRESHOLD= 0.38
VOLTAGE CK LEVEL= 0.66
FREQ THRESHOLD= 2269

FILENAME: C08TS1

FIRST VOLT OK BLOCK=	2.00	FIRST FREQ OK BLOCK=	3.00
LAST VOLT OK BLOCK=	7.23	LAST FREQ OK BLOCK=	7.50
VOLT BLOCK LENGTH=	4.57	FREQ BLOCK LENGTH=	4.50

FILENAME: C08TS2

FIRST VOLT OK BLOCK=	7.57	FIRST FREQ OK BLOCK=	7.75
LAST VOLT OK BLOCK=	12.21	LAST FREQ OK BLOCK=	12.25
VOLT BLOCK LENGTH=	4.64	FREQ BLOCK LENGTH=	4.50

FILENAME: C08TS3

FIRST VOLT OK BLOCK=	5.90	FIRST FREQ OK BLOCK=	6.00
LAST VOLT OK BLOCK=	10.48	LAST FREQ OK BLOCK=	10.50
VOLT BLOCK LENGTH=	4.58	FREQ BLOCK LENGTH=	4.50

FILENAME: C08TS4

FIRST VOLT OK BLOCK=	9.00	FIRST FREQ OK BLOCK=	9.25
LAST VOLT OK BLOCK=	14.11	LAST FREQ OK BLOCK=	14.25
VOLT BLOCK LENGTH=	5.02	FREQ BLOCK LENGTH=	5.00

FILENAME: C08TS5

FIRST VOLT OK BLOCK=	5.14	FIRST FREQ OK BLOCK=	5.25
LAST VOLT OK BLOCK=	9.54	LAST FREQ OK BLOCK=	9.75
VOLT BLOCK LENGTH=	4.39	FREQ BLOCK LENGTH=	4.50

FREQUENCY

WORD =	S
G-LEVEL =	5
VARIANCE =	0.50
AVERAGE =	4.60

VOLTAGE

WORD =	S
G-LEVEL =	5
VARIANCE =	0.63
AVERAGE =	4.64

VOLTAGE THRESHOLD= 0.38
VOLTAGE OK LEVEL= 0.75
FREQ THRESHOLD= 2239

Vita

J. Calvin Hunter was born 13 November 1947 in Rock Hill, South Carolina. He graduated from West High School, Salt Lake City, Utah in 1966. He entered the Air Force in February 1967 where he served as an Aerospace Ground Equipment Technician for seven years. He received a scholarship under the Airman Education and Commissioning Program, and graduated from the University of Utah in 1976 with a Bachelor of Science degree in Electrical Engineering. He was subsequently assigned to Hill AFB, Utah as a Test Instrumentation Engineer/ Project Manager. In June 1980 he was assigned to the Air Force Institute of Technology as a graduate student in Avionics and Fire Control Systems.

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Speech Recognition, Gravity, G-Stress, Voice Decoding
Speech Analysis.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An algorithm to determine energy shift along the time axis was applied to digitized speech data, which had been recorded at six different gravity levels. The analog speech was recorded during centrifuge tests at the Air Force Medical Research Lab, Wright-Patterson AFB, Ohio. The data was then digitized, Fourier Transformed, high frequency preemphasized, channel compressed, and energy-normalized. The processed files were checked for time duration of each word in both the time and frequency domain. Large

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time-duration differences--up to 200 msecs--were recorded; but there was no statistical mapping pattern of distortion versus gravity level. Time distortion of the speech energy within a given gravity level was as significant as the distortion between gravity levels. The results indicate that no additional time warping considerations will need to be made, within the speech recognition algorithms, to compensate for gravity fluctuations.