TEXAS INSTRUMENTS

WINSDS

User's Guide

2000

Linear Products

SPSU010A

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Preface

Read This First

About This Manual

This user's guide describes installation instructions, reference information, and troubleshooting for the Windows Interface Speech Development Station (WINSDS).

How to Use This Manual

This document contains the following chapters:

Chapter 1 **Introduction to WINSDS**
This chapter describes WINSDS features, SDS5000 compatibility, WINSDS user interface, toolbar, status bar, and scale bar. It also describes the management of the various windows, selecting a mouse, and keyboard commands.

Chapter 2 **Hardware and Software Requirements for WINSDS**
This chapter describes the hardware and software requirements of the WINSDS system.

Chapter 3 **Installing WINSDS**
This chapter describes the hardware installation, software installation, and the audio connections of WINSDS.

Chapter 4 **Starting WINSDS**
This chapter describes starting WINSDS, creating a new application, setups, opening an existing application, and word setup.

Chapter 5 **Inputting, Playing, and Viewing Signals**
This chapter describes playing a signal, importing a WINSDS or SDS5000 word, the recording process, and viewing signals.

Chapter 6 **Editing A Document**
This chapter describes the various commands needed to edit a document.

Chapter 7 **List**
This chapter describes creating a list, opening an existing list, list commands, viewing a list, reading a list, and finishing a list.

Chapter 8 **Saving and Printing Your Work**
This chapter describes saving and printing your work, quitting WINSDS, and deleting unwanted files.

Chapter 9 **ROMSDS**
This chapter describes ROMSDS, how ROMSDS works, ROM data organization, data representation and coding, and starting ROMSDS. This chapter also includes a sample assembly file.

Chapter 10 **Sound Editor**
This chapter describes features of, starting, and running the sound editor. A function description of all the sound editor commands is also given.

Chapter 11 **Trouble Shooting**
This chapter gives hints for solving various problems when installing and running WINSDS.

Appendix A **LDS Analysis**
This appendix gives a brief description of linear predictive coding (LPC) and how WINSDS uses LDS.

Trademarks

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Chapter 1

Introduction to WINSDS

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1.1 Background

Welcome to the Texas Instruments Windows Interface Speech Development Station (WINSDS). WINSDS represents a revised and expanded version of the SDS5000, specifically designed to speed up the process of large vocabulary development. It is an inexpensive, user-friendly tool that is powerful enough for the nonspeech expert to produce high-quality linear predictive coding (LPC) and modified code-excited linear prediction (MELP) speech and sounds after working on the station for a short time.

1.2 New Features

The Windows-based WINSDS is a successor to the SDS5000 speech development station designed to produce synthesized vocabulary. It is read-compatible with the files generated by the SDS5000. Like the SDS5000 station, the WINSDS station runs on an IBM-PC or compatible. The following are newly implemented functions on WINSDS:

- Start-Up
  - Full start-up process (program manager icon, file execute, and parameter passing)
  - Multiple programs
  - Task alternation
  - SDS software runs without an analog development board
  - Start-up options
  - Database management tools (search folder for label, access to MSWord from another folder)
  - On-line board initialization
  - On-line configuration parameters
  - Application setup parameters
  - User-defined analysis parameters
  - New analysis parameters (e.g., new pitch parameters)
  - Modification of analysis parameters (e.g., at the application level: hamming window, voiced pre-emphasis, etc.)
  - Mouse- and keyboard-oriented interface
  - Quick screen display

- Window Displays
  - Window selection and tiling
  - Dual-channel capability (edit 2 channels simultaneously)
  - Simultaneous signal display
  - View word access table (words in the application)
  - View current channels (signal display)
  - Edit list capabilities
  - View compiled lists in database
- Play
  - Play pad
  - Play: Selection, word, all, frame
  - Stop play of synthetic speech
  - Play selected word(s) in a list
  - Automatic word labeling (apply scenario)
- Edit
  - Read/edit/add/delete word window
  - Comment zone for each word label
  - Frame modifications: Mark frame for future reference, split frame, concatenate split frame, repeat frame, skip frame
  - Binary files
  - Format editing
  - Create various word versions
  - Print signal display, numerical modifications, etc.
- View
  - View word and application status

- Setup
  - Hardware configuration
  - Application/word setups
  - Recording/audio setups
  - Adjust memory allocation
  - Colors
- Help
  - On-line Help

1.3 SDS5000 Compatibility

- File
  - File loading/saving/editing functions
  - Compatibility with SDS5000 files (read-only)
  - Signal editing (read a word, read a list)
  - Signal selection with mouse (frame, selection of frames, word, list of words, zoom selection, etc.)
- View
  - View application status
  - Zoom in/out (X-axis/Y-axis) and select/zoom
- Record
  - Unlimited signal input duration
  - Record a word/phrase/word-by-word and LPC analysis
  - On-/off-line Analysis
  - Play coded and uncoded synthetic speech (speed selection, all/word/selection/frame play)
  - Play a list (original or synthetic speech) with optional silence zones
  - Reset (initialize) signal window

- Edit
  - Cut/copy/paste word or frame selection
  - Split and concatenate words
  - Insert silent frame
- Modify
  - Measure/modify/recalculate pitch (step-by-step)
  - Pitch interpolation
  - Modify voiced or unvoiced frames
  - Pitch and energy slope alteration
  - Single parameter/word parameter modification
  - Variable application/word compression rates
- Options
  - Adjust input level display with maximum-level and saturation-level indicators
  - Adjust input/output gain
  - Flexible numerical editing (K_i editing)

1.4 WINSDS User Interface

The user interface of the WINSDS station was designed using Microsoft Visual Basic™ under Windows 3.1x™ and Windows 95™. The user interface is designed to conform as closely as possible to Microsoft MSDN™ User Interface guidelines and IBM™ Design rules for User Interface.

Screen Zones

The WINSDS interface features a main MDI window containing all other objects: a title bar, menu bar with drop-down menus, toolbar for quick menu item selection, a display zone with all windowing features, and a status bar at the bottom of the screen.

Mouse- and Keyboard-Driven Actions

Most actions can be performed using the mouse to select menus and option buttons. The keyboard can speed up operations for the experienced user. Keyboard commands are given on the menus for most (but not all) commands.

1.5 The Toolbar, Status Bar, and Scale Bar

1.5.1 Toolbar

The Toolbar is a permanent display at the top of the main WINSDS window. It gives the date and time and light-icons for record and play operations. These operations and the following icons can speed up operations:

1.5.1.1 Edit


Read a word in Channel 1: The Select Word appears as topmost window


Read a list in Channel 1: A prompt for the list number appears


Display the Edit Label and Comment as topmost window


Display Edit Lists window


Mark frame for future reference


Display Measure Pitch Modal window


Display numerical modifications

1.5.1.2 Record


Record one word


Stop Recording or stop current Play function


Repeat last Play or Start Playing All Original


Display Play Pad as topmost window

1.5.1.3 View


Display Application Status window

 Zoom in on X-axis

 Zoom out on X-axis

 Zoom in on Y-axis

 Zoom out on Y-axis

 Replace signal (default)

 Add a signal

 Select parameter in multiparameter display

1.5.1.4 Help

 Help

1.5.2 Status Bar

The Status Bar is a permanent display at the bottom of the WINSDS Main window. It contains the following information on the current word and current frame:

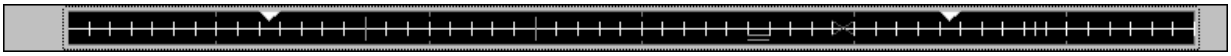
- Word label
- Vs is the word version
- Frame Nb is the current frame number at the cursor position
- F0 is the current frame fundamental frequency in Hz
  - F0 is calculated as F0 = (16 × FREQ)/T0 with
  - T0 is the calculated pitch for the frame in (1/16 of a sample) units
  - FREQ is the sampling frequency
  - UV is displayed if the frame is unvoiced.
- T0 is the current frame's displayed pitch as samples

- A0 is the current frame's displayed energy
- Fr.Reps. is the number of times the current frame is repeated during compressed speech
- FSI is the current frame split indicator
- Wrd.Thr. is the current word default compression threshold
- Fr.Thr. is the current frame default compression threshold

1.5.3 Scale Bar

The Scale bar (located below the Signal window) is used to identify word boundaries in a List (Concatenation) as well as the frame boundaries in each word. A word boundary is indicated by a vertical green line along the Scale bar, while a frame boundary is indicated by a vertical white line. The distance between two frame lines represents frame duration:

Figure 1–1. Scale Bar



The Scale bar also displays the following additional frame commands:

 Repeat frame

 Split frame

 Skip frame

 Mark frame for future reference

1.6 Windows

1.6.1 Manipulating Windows and Icons

- Manipulating Windows using the WINDOW Menu:
  - Minimize (Shrink to Icon): Minimizes or shrinks a selected window to an icon.
  - Maximum Form: Maximizes all windows.
  - Cascade: Cascades windows that are not in icon form.
  - Default (normal size): Resets a selected window to normal size.
- Manipulating Icons using the WINDOW Menu:
  - Icons on Background: Removes icons from the screen. You may also double-click on each icon.
  - Icons on Foreground: Displays all hidden icons.

WINSDS is a multiwindow application that enables the user to view or manipulate data displayed in each window. Every window appears in the Main MDI window, the area between the Toolbar at the top and the Status Bar at the bottom of the screen. WINSDS uses the following types of windows:

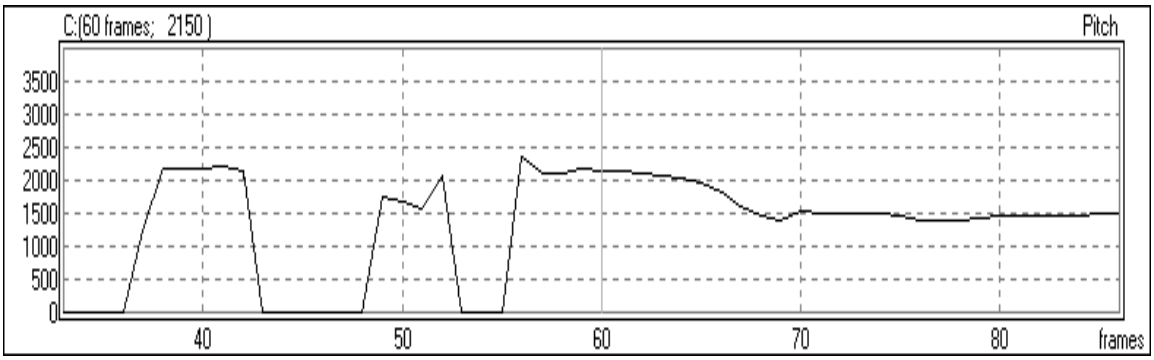
- Signal windows
- Status windows
- Modal windows
- List windows
- Topmost windows

1.6.2 Signal Windows

Signal windows display a word or a sequence of words called a List. Signal windows display the original signal and analysis results. Each window contains three displays:

- ❑ Sound waveform of the original signal
- ❑ Ruler separating the signal into a series of temporal frames
- ❑ Pitch and energy contours [or other specified parameter(s)] resulting from analysis

Figure 1–2. Signal Window



The name of the type of curve (e.g., Pitch, Energy) appears in the upper right corner of each display. The X-axis scale is measured in frames starting with Frame 1. The frame number and the curve value at the cursor position on the Y-axis appear in the upper left corner of the window.

Note:

Two sets of windows can be displayed simultaneously for the dual-channel MSP50C30. Pitch and Energy windows can be changed to display selected K-parameters from the LPC analysis of each signal.

Signal windows can be minimized (displaying the entire signal) or maximized (one screen pixel displaying each frame sample). Zooming in and zooming out are possible on Signal windows (See Section 5.4, *Viewing Signals*).

1.6.3 Status Windows

There are four types of status displays:

- Application Status window

Displays general information about the application of the SDS board and analysis setup information (e.g., Method, Chip, Coding table). Most parameters can be altered by clicking on the desired option for each parameter.

- Word Status window

Displays information about the word at the current cursor position:

- Channel speech signal duration
- Clipboard buffer duration (i.e., memory remaining)
- Original/synthetic/compressed duration of last play
- Original/synthetic number of frames

- Word Status table

Displays the status of all words in the application:

- Unrecorded words
- Unanalyzed words
- Uncoded words
- Unused words
- Words used in (optional) current list file

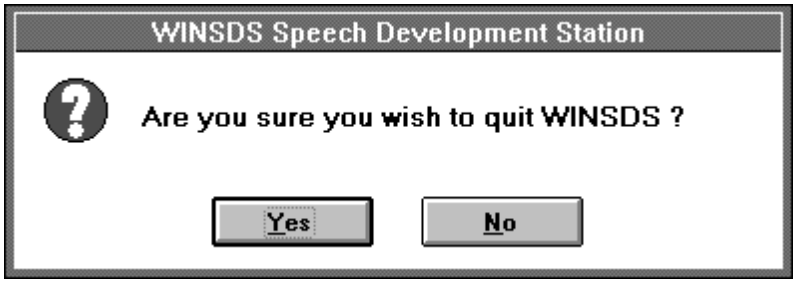
- Status Bar

Displays information about the current word and current frame, (see Section 1.5.2, *Status Bar*).

1.6.4 Modal Windows

Modal windows are prompts for information. They cannot be closed until the requested information has been input.

Figure 1–3. Modal Window



1.6.5 List Windows

There are two types of List Windows:

- List Window: Shows the current list file containing a set of numbered word concatenations or Sentences called Lists for an application.
- Object List Window: Shows the Object List in the database. An Object List consists of the compiled lists (of the current List File) for one or two channels. For two channels, a Sentence appears as a collection of formatted labels (rather than signals). The display format is the same as for the list window: Two channels contain the current lists, one per channel, (For more information, see Chapter 7, *Lists*).

1.6.6 Topmost Windows

Topmost windows are windows displayed permanently in front of all other windows. They are used for multiple actions or interaction between two or more windows.

- Select a Word window: This window appears with various titles depending on the action to be taken. The Select a Word window appears when you click on the word and then on OK. Here, the window acts like a normal window, disappearing while an action is being performed. However, if you double-click on the word, the topmost window remains visible while the action is performed.

The Select a Word window is used in the following cases:

- Read a Word: Words are displayed in a list with associated version (1, 2, etc.) and signal numbers (01, 02, etc.) Clicking on a word causes the signal, pitch and energy curves to be displayed.
- Analyze a Word
- Delete a Word
- Add a Word: Displays the signal of a new word in addition to the currently displayed signal.
- Edit Label: Displays Edit Label window used to label a word and write an optional comment.
- Play Pad can be used as a time-saver for Play operations in place of using the menus.

1.6.7 Managing Windows

- Reset Signals: Used to reset or clear the Signal windows so that they are empty.
- Tile Forms Horizontal: Horizontally tiles (arranges) forms that are not in icon form.
- Tile Forms Vertical: Vertically tiles (arranges) forms that are not in icon form, (See Figure 5–12. Signal Drop-Down List Box).
- Close Form: Closes the current window. You can also double-click on the upper edge of the window to close the form.

1.7 Selecting with the Mouse

- Menus and Options: Click on the selected menu, submenu, item, or option (e.g., OK).
- Word Selection: A word may be selected by double-clicking on the word signal.
- Selection: This feature is useful in playing Selections (parts of the displayed signal). A Selection is made by holding down the left mouse button and dragging the cursor. When the mouse button is released, Selection stops. If desired, a Selection can be dragged horizontally using the left mouse button. A Selection may be canceled by slightly moving the cursor while holding down the left mouse button, or by pressing DELETE. A Selection can be shortened or lengthened by pressing SHIFT and using the → and ← keys. Unselect also cancels the previous Selection. To Unselect, move the cursor slightly, but do not make a Selection.
- Zoom: A portion of the signal display can be magnified or viewed more closely (Zoom In). First, select the part of the signal you wish to view. Then, use PAGE DOWN or click on the Zoom icon to Zoom In on the X-axis.
- Cursor: The cursor is moved either by clicking on the signal display with the left or right mouse button held down or by using the →/← keys.

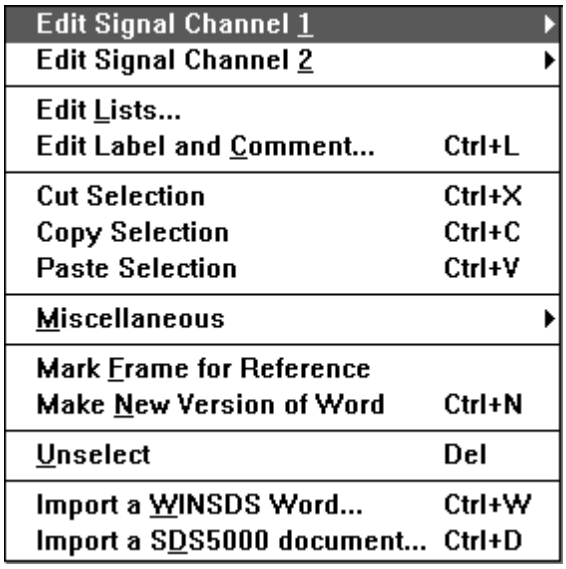
1.8 Keyboard Commands

1.8.1 Working with Menus and Options

Each menu and submenu option in WINSDS may be accessed by keystrokes, usually a combination of ALT plus a letter (A, B, C, etc.). For example, to access the File Menu, use the underlined letter as the access letter [e.g., a combination of ALT + F (from FILE)].

In some cases, items or functions may be accessed directly by using a function key or combination of keys. For instance, F12 displays the Word Access Table, while CONTROL + I inserts a Silent Frame. Keyboard commands are displayed in the menus, as shown in Figure 1–4.

Figure 1–4. Edit Menu



1.8.2 Moving the Cursor

As stated previously, the cursor is moved to the right or left along the displayed signal by using the right and left arrow keys, (→, ←). Using SHIFT with the arrow keys moves the cursor *quickly* to the left or right. The cursor can be moved to the beginning of the signal display by pressing HOME, and to the end of the display by pressing END. The right and left arrow keys can also be used to move to a command in a Menu or List box. Then, press ↵ (or ENTER) to select the item.

- Word-by-Word Cursor Moves: The up and down arrows (↑, ↓) cause the cursor to jump from word to word.
- Selection: Make or adjust the size of a selection with the right and left arrow keys (→, ←) while holding down SHIFT.
- Unselect: To Unselect, press DEL.
- Scroll: When the cursor reaches the left or right edge of the screen, the display scrolls along the signal so that hidden portions appear.
- Zoom: The PG DN key Zooms In (magnifies) the signal display along the X-axis, while PG UP Zooms Out along the X-axis. Likewise, + Zooms In along the Y-axis, while - Zooms Out along the Y-axis. The INSERT key centers the Y-axis on the current cursor position.
- Controls Selection: Move between Controls using TAB.
- Windows Selection: Press CONTROL + TAB simultaneously to move between WINSDS and other Windows programs.
- Topmost Window Selection: Use F2 to view the topmost window. To switch back to the current window, press F2 again. If several topmost windows are displayed simultaneously, pressing F2 displays each topmost window before switching back to the current window.

Chapter 2

Hardware and Software Requirements

This chapter is intended to help you to install and run WINSDS software. Please read the instructions carefully, and make sure the following minimum hardware and software requirements are met.

Topic **Page**

2.1	**Description of the WINSDS Package**	**2-2**
2.2	**Hardware and Software**	**2-2**

2.1 Description of the WINSDS Package

The WINSDS package consists of the following hardware and software:

- ❑ Hardware: DSP board for word analysis and synthesis.
- ❑ Software: Three programs for vocabulary generation are included:
  - ■ WINSDS software, running under WINDOWS 3.1x or WINDOWS95
  - ■ ROMSDS software for synthesizer-chip vocabulary generation
  - ■ Sound Editor program to analyze signals and create sound effects

2.2 Hardware and Software

WINSDS requires the following minimum hardware and software:

- ❑ PC 486 SX 25 or Pentium (Use of a PC 386 results in very slow display times.)
- ❑ 251-MB Hard Disk Drivespace (2 MB for the program, 20 MB for virtual memory and applications)
- ❑ 8-MB RAM for WFW 3.11 (Less than 8 MB results in the generation of errors.)
- ❑ 16-MB RAM (Less than 8 MB results in the generation of errors.)
- ❑ 14″ VGA color monitor
- ❑ 800 x 640 display (Smaller displays result in screen data loss.)
- ❑ 3-1/2″ floppy (1.44-MB) drive
- ❑ Compatible Microsoft Mouse with Mouse interface
- ❑ DOS version 6.0 or higher
- ❑ MS Windows version 3.1 (or more recent) or Windows95
- ❑ WINSDS synthesizer board (The board must be present to operate WINSDS software fully. However, partial operation is possible without the synthesizer board.)
- ❑ WINSDS Setup diskettes

Chapter 3

Installing WINSDS

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3.1	Hardware Installation	3-2
3.2	Software Installation	3-3
3.3	Audio Connections	3-4

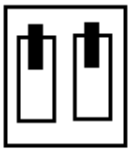
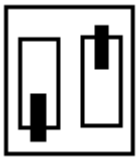
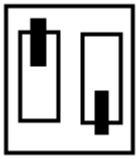
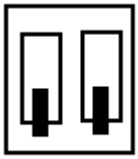
3.1 Hardware Installation

The default address for the WINSDS board is 300h. To change this address, execute the following instructions.

The WINSDS board is seen by the PC as four consecutive 16-bit registers in the I/O address area. These registers allow the PC to communicate with the TMS 320C31 chip and to control the synthesis modules directly.

The base addresses of these registers can be selected by changing the position of the SWI configuration switches located near the PC board connector (see Figure 3–1).

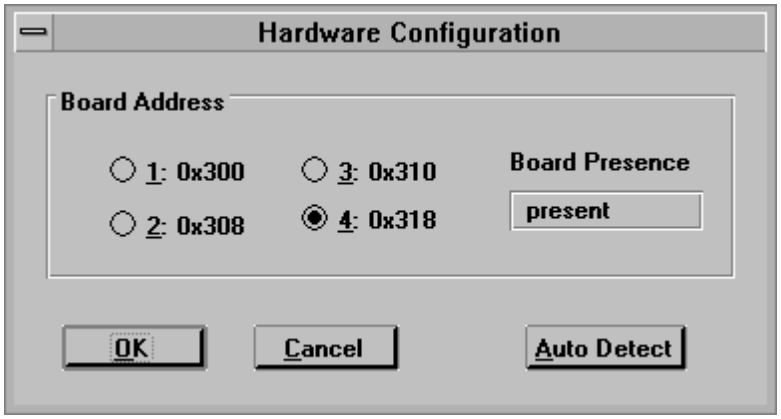
Figure 3–1. Base Address Registers

Base Address	Address Range	S1 configuration
300h	300h – 307h	
308h	308h – 30Fh	
310h	310h – 317h	
318h	318h – 31Fh	

3.1.1 Check I/O Address in WINSDS

The WINSDS attempts to locate the WINSDS board at the default location. If no board is detected at the currently used address, WINSDS displays an error message and Hardware Configuration Setup window (See Figure 3–2). The user may try to find the board at another location or use the Auto Detect button for a Plug-n-Play board search.

Figure 3–2. Hardware Configuration Window



3.2 Software Installation

To install the WINSDS software, first get into Windows 3.1 Program Manager, Windows95 My Computer, or Windows Explorer. Then insert the WINSDS Set-up Disk 1 in drive A. Go to the File Menu, click on *Run*, and type in the following command on the Command Line:

```
A:\SETUP (Press ENTER)
```

The Setup program then asks for a directory for the WINSDS program. The default is C:\WINSDS. You may replace the default choice and select your own drive and subdirectory. The Setup program then transfers and decompresses the files required to run WINSDS to the designated directory. Follow the directions on the screen. You are then prompted for additional information concerning the board address. The default choice is 300h (see Figure 3–1 to match your address to your board). When you see the WINSDS message, *Please insert WINSDS Setup Disk 2*, remove Disk 1 from drive A, insert Disk 2, and click on OK.

The Setup program creates a new group of programs in WINDOWS Program Manager or Explorer called WINSDS. Eject Setup Disk 2 from drive A, and

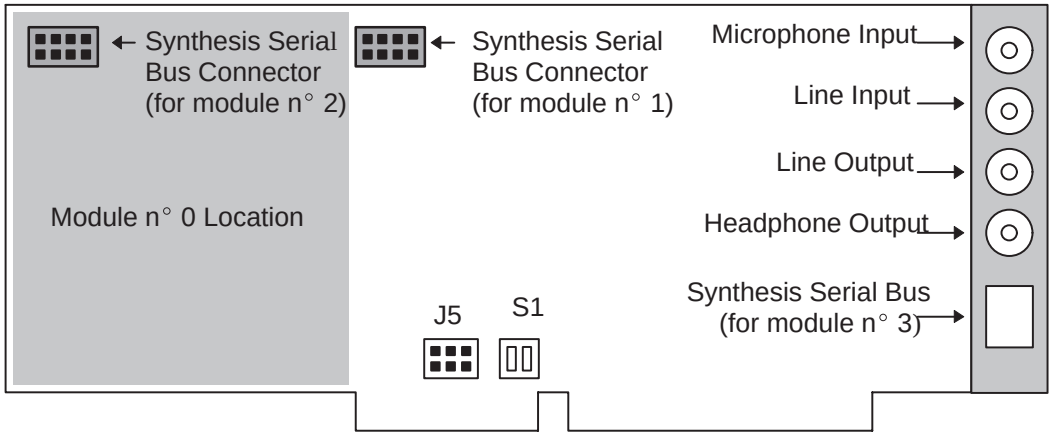
WINSDS installation is complete. If you have problems installing WINSDS, see Chapter 11: *Troubleshooting* for help.

3.3 Audio Connections

3.3.1 Hardware

After the WINSDS board has been installed, you should see four jacks on the back of the computer case. If you are facing the back of the computer case, the first jack on the left is Phones Output, the second is Line Output, the third is Line Input, and the fourth or right-most is Microphone Input (see Figure 3–3).

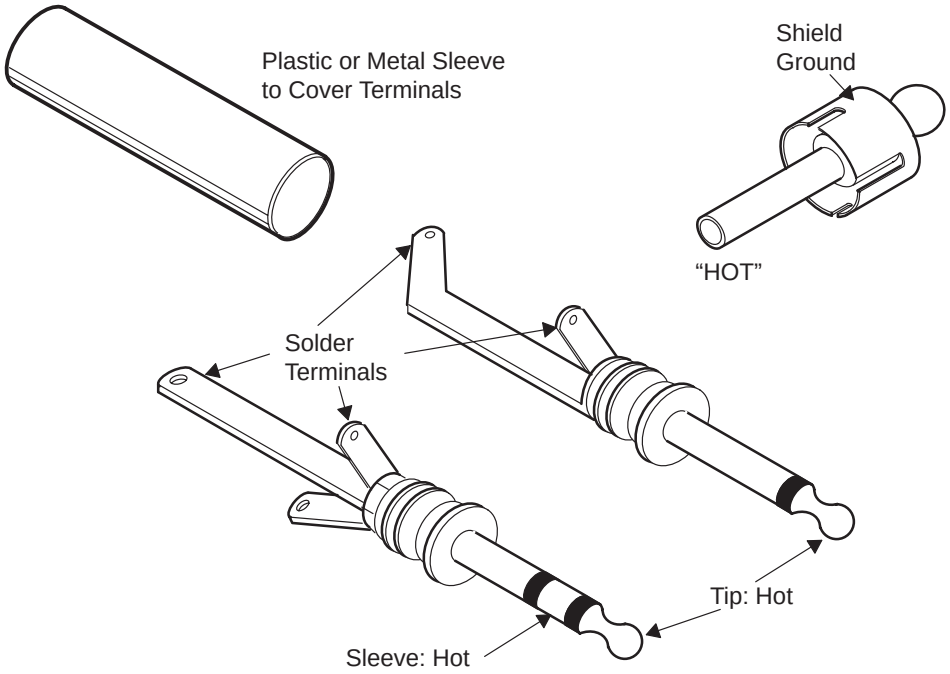
Figure 3–3. WINSDS Motherboard



Note:

No cables are included with the WINSDS; they must be purchased separately. You need to have the following connectors: A male RCA plug at one end of the cable and a female telephone plug at the other end.

Figure 3–4. Male Telephone (left) and RCA (right) Plugs



3.3.2 WINSDS Input/Output Settings

Output Settings

Go to the Setup Menu, and click on Audio Setup. Then click on either Select Phones Output or Select Line Output, depending on your output jack connection.

Input Settings

Go to the Setup Menu, and click on Recording Setup. Then click on either Select Line Input or Select Microphone Input depending on your input jack connection.

Chapter 4

Starting WINSDS

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4.2 Creating a New Application ---------- 4-5
4.3 Setups ---------- 4-7
4.4 Application Setup ---------- 4-8
4.5 Opening an Existing Application ---------- 4-11
4.6 Word Setup ---------- 4-12

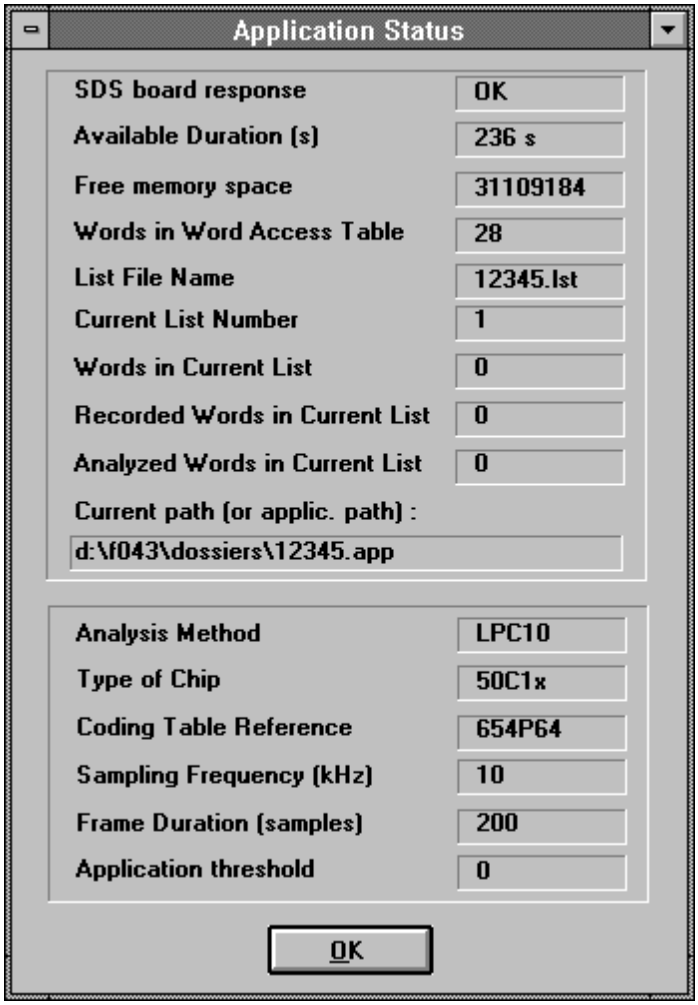
4.1 Start-Up

To start WINSDS, go to Windows Program Manager and click on the WINSDS icon 

in the WINSDS window. As WINSDS is loading, the Texas Instruments logo appears on the screen. A Welcome to WINSDS message appears on the screen, followed by a WINSDS Manager message, WINSDS memory reservation. An Application Status box flashes on the screen, then changes into an icon in the lower left corner of the screen.

You may want to check the SDS board response to make sure that your WINSDS board is working. The Application Status box can be viewed by clicking on the Application Status icon  or by going to the View Menu, clicking on View Status, and then selecting View Application Status.

Figure 4–1. Application Status Box



You may also want to check the amount of memory available by looking at Available Duration (s).

Note:

1) The Application Status box does *not* appear the first time you start up WINSDS.

2) When WINSDS is started, a prompt may ask you if you would like to Edit a List. The message occurs if there is a check before Invite to edit list at start-up in the Start-up submenu of the Options Menu of the Setup Menu. If you do not want the message to appear, click on the item, and the check mark disappears. The next time WINSDS starts, the message will not appear.

   Likewise, if the Record Light icon  on the Toolbar flashes red upon start-up, then the Invite to record at start-up option in the Start-up submenu of the Options Menu of the Setup Menu is checked. If you do not want to begin recording automatically upon start-up, click on the command, Invite to record at start-up. The check mark disappears, and the next time WINSDS is started, recording does not begin automatically.

3) Upon start-up, a message may appear, Do you want to open current application [*filename*]? This occurs if an application was saved at the end of the previous work session. (See the following text for information on applications; also Section 8.1; *Saving Your Work*.) If you do want to get into the previous application, click on Yes. If you do *not* want to get into the previous application, click on No. Then you may create a new application or open an existing application (See Sections 4.2 and 4.5 for details).

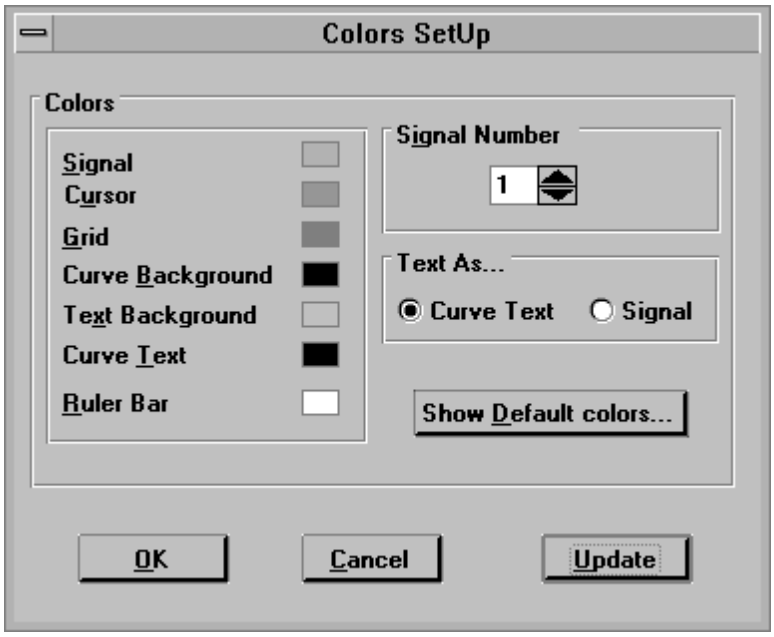
4.1.1 Change Memory Settings

Before you create a new application or open an application, go to the Setup Menu, Options submenu, and click on Change WINSDS memory settings. It is important to allocate enough memory for WINSDS to run correctly. A low amount of memory results in erratic errors.

4.1.2 Colors Setup

Before creating or opening an application, you may want to change the display colors for your WINSDS workstation. Go to the Setup Menu and click on Colors. A Colors Setup window appears as shown in Figure 4–2.

Figure 4–2. Colors Setup Window



The Colors Setup window allows you to choose colors for displays including the Signal, Cursor, Grid, Curve (e.g., Signal Display area) and Text Backgrounds, Curve (e.g., Signal Display area) Text, and Ruler Bar. You may also change the color of a chosen Signal Number. Click on a color box for a given display (e.g., Signal, Cursor) and a Color box appears. Choose a color from Basic Colors, Custom Colors, or Define Custom Colors options. Click on Update, Cancel, or OK.

4.2 Creating a New Application

4.2.1 Parameter Settings

To create a new application, go to the File Menu and click on New Application. A New Application Setup window appears displaying five parameters as shown in Figure 4–3.

Note:

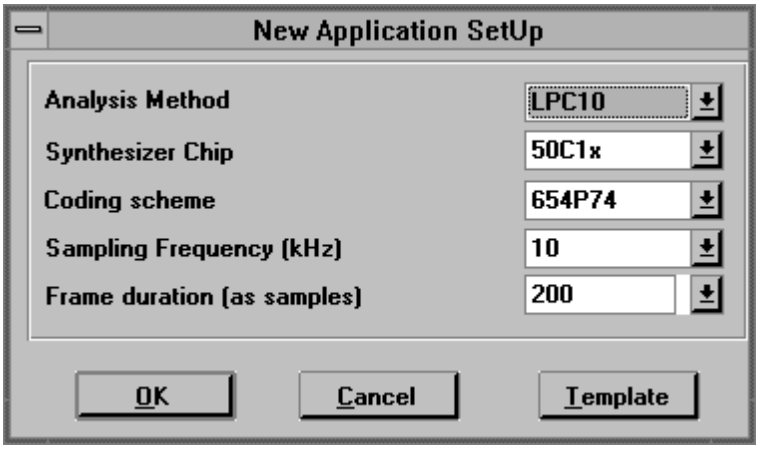
These parameters are defined at the Application or Word level, and are assigned default values depending on the type of chip and decoding table used. Application-level values apply when no other values are defined at the Word level. Application-level values are stored in a Parameter Description file, while Word-level values are stored in a Word Access file.

- Analysis Method [METHOD]: You may choose LPC10, LPC12, or MELP. The default method is LPC10.
- Synthesizer Chip [CHIP]: This mandatory parameter determines the type of synthesizer chip. It sends chip-related, non-modifiable parameters (or default values) to the synthesizer board. Choose the type of chip you plan to use for synthesis (MSP50C1x or MSP50C3x). The default is MSP50C1x. (MELP and dual-channel analysis require MSP50C3x.)
- Coding Scheme [TABLE]: Select a coding table (654P74 is the default). Only the standard coding scheme is currently available for MELP.
- Sample Frequency [FREQ]: Select 8 kHz or 10 kHz. A sampling rate of 8 kHz is usually good for low-pitched male voices, while 10 kHz is good for higher-pitched female, child, and character voices.

> **Note:**
>
> A *Frame* is the period of time characterized by a fixed number of samples. A *sample* (or *point*) is the smallest quantity of digitized sound represented by a fixed level and determined by the Sampling rate, e. g., 8 kHz or 10 kHz.)

- Frame Duration [NFRAME]: For LPC analysis, select a Frame duration (in Samples) from 40–200. You may also type in a user-defined value within that range. Default value = 200. For MELP analysis, there are two choices: 201 and 150. Default value = 201.
- Frame Duration*:* indicates the number of samples between the new LPC parameter computations. The shorter the *frame duration*, the more precisely the speech is coded, and the higher the data rate is. A frame duration of 100 is shorter than a frame duration of 200.

Figure 4–3. New Application Setup Box



When you have finished selecting parameters, click on OK. WINSDS Application Setup calculates and generates a new database for your Application and initializes the Analog Board (if present).

4.2.2 Template

Clicking on the Template button in the New Application Setup window opens the Select WINSDS Application window. Select an Application with the parameter settings that you would like your New Application to copy. The values for sampling frequency, frame duration, chip and coding table are taken from the template Application and given as current values for the New Application.

Note:

For New Application, the settings are default settings. To return to the default settings after selecting a template, use the Cancel button and redo the command.

View Status in the View Menu allows you to View Application Status (or View Word Status) at any time during a work session. An Application Status window shows the analysis parameters for the Application and other information relevant to the Application. Change parameter values by clicking on a value for other choices or by typing in a new value (see Figure 4–1).

4.3 Setups

WINSDS has several precustomized Setup files that work well for most users. However, you may want to modify a parameter or parameters for a particular application. For example, you may want a sampling rate of 8 kHz instead of 10 kHz, etc.

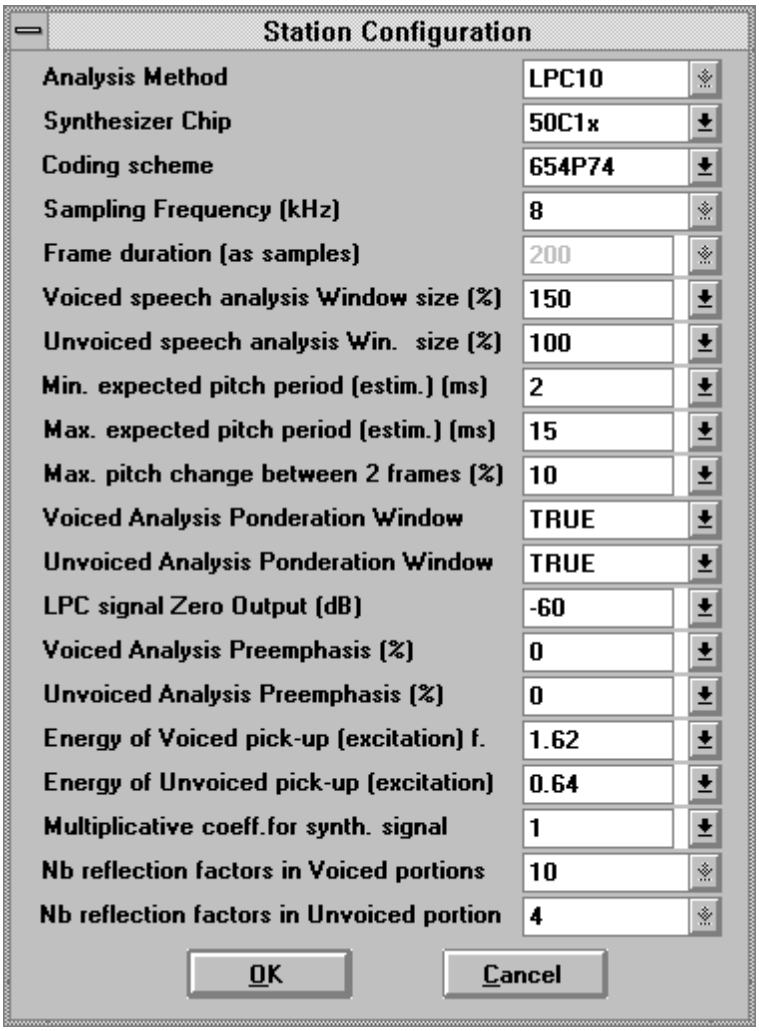
- Application Setup: The Application Setup allows you to set or view station parameters. You can change the defaults provided by the analysis method for a given Application. Changes are stored at the Application level.
- Recording Setup: You can choose from Line or Microphone Input and adjust Input Gain or Recording parameters. If a Recording parameter is changed, it is saved with the Application when the Application is saved.
- Audio Setup: Choose Line Output or Phones Output, and adjust Output Gain levels to 0 dB.

Each of these Setups is discussed in detail in the appropriate section (i.e., Section 4.4, *Application Setup*; Section 5.3, *Recording Process*; and Section 5.1, *Playing a Signal*).

4.4 Application Setup

The Application Setup command in the Setup Menu displays a Station Configuration window containing information about WINSDS parameter settings as shown in Figure 4–4. Defaults are provided by the Analysis Method (LPC10, LPC12, or MELP). Settings for most Analysis Parameters can be changed by selecting or typing in other values. Settings for the first five parameters, however, cannot be altered. These parameters are described in Section 4.2, *Creating a New Application*.

Figure 4–4. Station Configuration Window



Each of the WINSDS parameter settings displayed in the Station Configuration window is discussed in the following text. Parameter labels are

listed in square brackets. (Please note that the first five parameters listed in the Station Configuration window are discussed in Section 4.2, *Creating a New Application*.)

Alterable Analysis Parameters:

- Voiced Speech Analysis Window Size (%) [LPCV]: This parameter is expressed as a percentage of the frame duration. The LPCV% value is calculated as percent of the number of samples divided by 100; the result cannot exceed 400. That is, the range of permissible values is 100–300% of the number of samples. The minimum value is 100%. The maximum LPCV% value is 300% *or* the value that corresponds to 400 samples. Default = 150%.

- Unvoiced Speech Analysis Window Size (%) [LPCU]: Like [LPCV], this parameter is expressed as a percentage of the frame duration. The LPCU% value is calculated as percent of the number of samples divided by 100; the result cannot exceed 400. That is, the range of permissible values is 100–300% of the number of samples. The minimum value is 100%. The maximum LPCU% value is 300% *or* the value that corresponds to 400 samples. Default = 100%.

- Minimum expected Pitch period (estim.) (ms) [T0MIN]: This parameter should be adjusted to the pitch of the voice to be analyzed. Low values should be used for special effects where great precision of measurement is not the main goal. [T0MIN] is expressed in milliseconds (ms). Acceptable values range from 1.00 ms to the [T0MAX] value (see the following test). Default = 1.

- Maximum expected Pitch period (est.) (ms) [T0MAX]: The [T0MAX] parameter should be adjusted to the pitch of the voice to be analyzed. *High* values work best for *low-pitched* voices, while *low* values work best for *high-pitched* voices. [T0MAX] is expressed in milliseconds (ms). The following are acceptable values:

  8 kHz sampling frequency: 1.00 = 18.75 ms

  10 kHz sampling frequency: 1.00 = 15.00 ms

- Maximum expected Pitch change between 2 frames (%) [T0VAR]: Represents the maximum expected pitch change between two frames during precise evaluation operations. It is expressed as a percentage of the pitch duration. Values range from 0 –100%, with default values of 10% and 50%. This parameter is fundamental to pitch computation, and it is used for Calculate Pitch and for Calculate Pitch Step-by-step commands (see Section 6.4, *Modify Commands*). Default = 10%.

- Voiced Analysis Ponderation (Hamming) window [HAMV]: Flag indicating if a Hamming window weighting must be applied to LPC analysis of Voiced Frames. Typical value = TRUE.
- Unvoiced Analysis Ponderation (Hamming) window [HAMU]: Flag indicating if a Hamming window weighting must be applied to LPC analysis of Unvoiced Frames. Typical value = TRUE.
- LPC signal Zero Output (dB) [LPCLEV]: Acceptable values range from –60 dB to –20 dB. Default value = –60 dB.
- Voiced Analysis Pre-emphasis factor [EMPHV]: Represents a high-frequency pre-emphasis factor for Voiced Frames. This parameter is expressed as a percentage, with acceptable values ranging from 0–100%. Default value = 0.
- Unvoiced Analysis Pre-emphasis factor [EMPHU]: Represents a high-frequency pre-emphasis factor for Unvoiced Frames. This parameter is expressed as a percentage, with acceptable values ranging from 0 –100%. Default value = 0.
- Energy of Voiced pick-up (excitation) function [KEXIV]: The multiplicative coefficient to be applied to the Voiced excitation function. This parameter represents the Energy of the pick-up function, which in turn, represents the signal generated by the vocal folds exciting the vocal tract. Acceptable values range from 0 – 7.99. Low values are used for higher voiced excitation, and high values are used for lower voiced excitation. Default value is 1.62.
- Energy of Unvoiced pick-up (excitation) function [KEXIU]: The multiplicative coefficient to be applied to the Unvoiced excitation function. This parameter represents the Energy of pick-up function, which in turn, represents the noise generator for Unvoiced sounds exciting the vocal tract. Acceptable values range from 0 – 7.99. *Low* values are used for *higher* Unvoiced excitation, and *high* values are used for *lower* Unvoiced excitation. Default value is 0.64.
- Multiplicative coefficient for synthesized signal [KSIG0]: Acceptable values range from 0.5 – 1.0. Typical value = 1.0.
- Nb (Number) reflection factors in Voiced portions [NKIV]: Number of reflection coefficients (K-parameters) applied to Voiced Frames. Default value is 10 for LPC10 and 12 for LPC12 and MELP.
- Nb (Number) reflection factors in Unvoiced portions [NKIU]: Number of reflection coefficients (K-parameters) applied to Unvoiced Frames. Default value is 4 for LPC10 and 6 for LPC12.

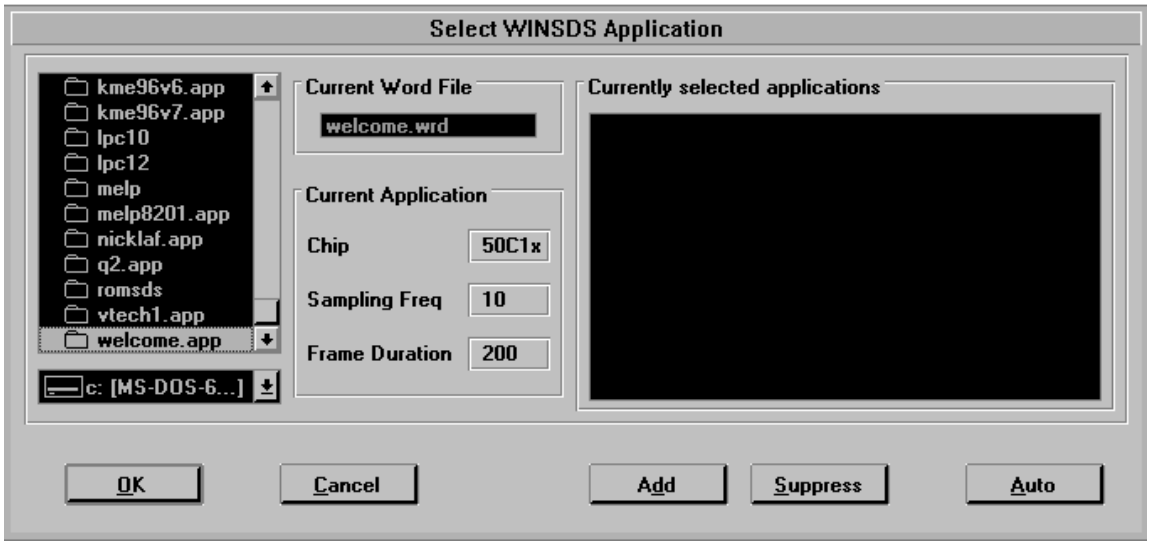
4.5 Opening an Existing Application

To open a previously saved application, click on Open Application in the File Menu. A window containing a directory of stored applications appears. Click on the disk drive containing the application that you wish to use.

Select the correct application by double-clicking on the Path Directory in the left window. For additional help in locating your application, you may double-click on a root directory and then on Auto. This function searches for applications in every subdirectory of the root directory. The cursor becomes an hourglass icon, and results appear in the right-hand window. You may stop the process at any time by clicking on Cancel.

Select an Application by clicking once on the name of the application in the Results window, or by double-clicking on the application name in the Path Directory in the left-hand window. When the Current Word File (filename.*wrd*) corresponding to the selected application appears in green in the middle window, click on OK to confirm your selection (see Figure 4–5).

Figure 4–5. Select WINSDS Application Box



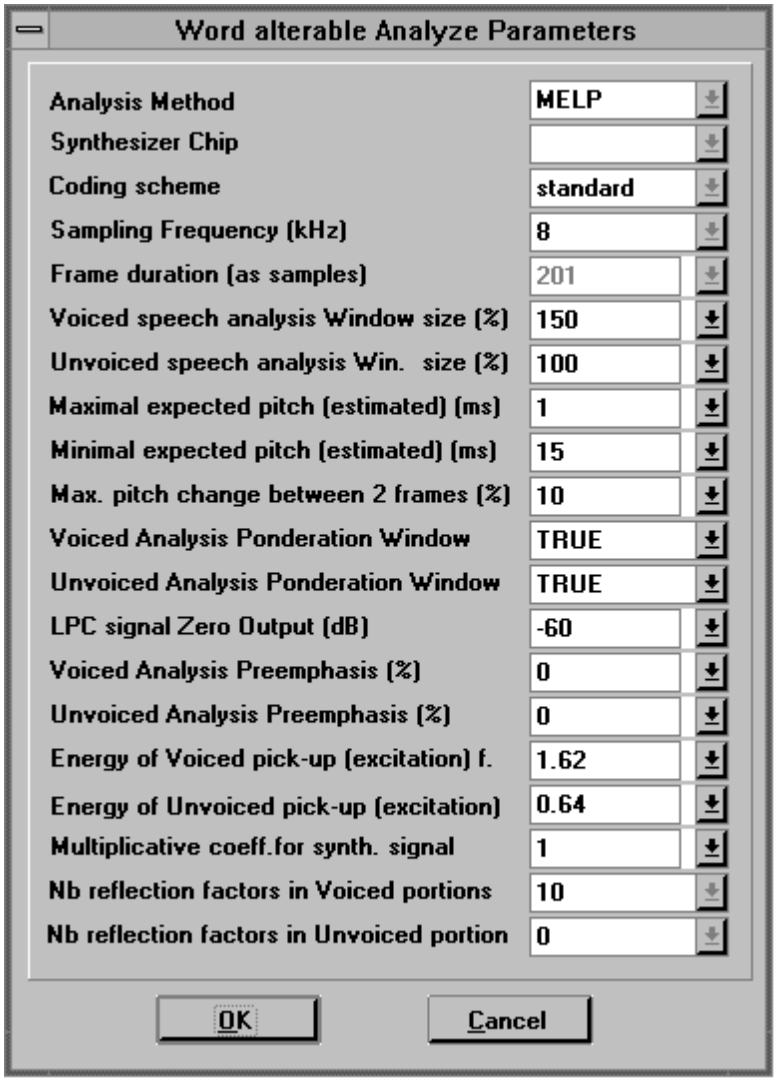
4.6 Word Setup

Once an application has been opened and a word has been displayed using the Read a Word command in the File Menu (or the Read-a-Word icon  on the Toolbar), the Word Setup command in the Setup Menu can be used to show parameters that can be altered for reanalysis of the word. The Word Setup window (Word Alterable Analyze Parameters window) is shown in Figure 4–6.

Note:

The parameters are the same as those obtained using the Application Setup command in the Setup Menu. The parameter values can be changed by clicking on the value to be modified and then either by choosing a value provided in the drop-down menu or by typing in the desired value within the range specified.

Figure 4–6. Word Alterable Analyze Parameters Window



Chapter 5

Inputting, Playing, and Viewing Signals

Once an application is created or opened, you can:

- ❑ Play words in an open application
- ❑ Import words to a new or open application
- ❑ Record new signals to a new or open application

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5.1 Playing a Signal

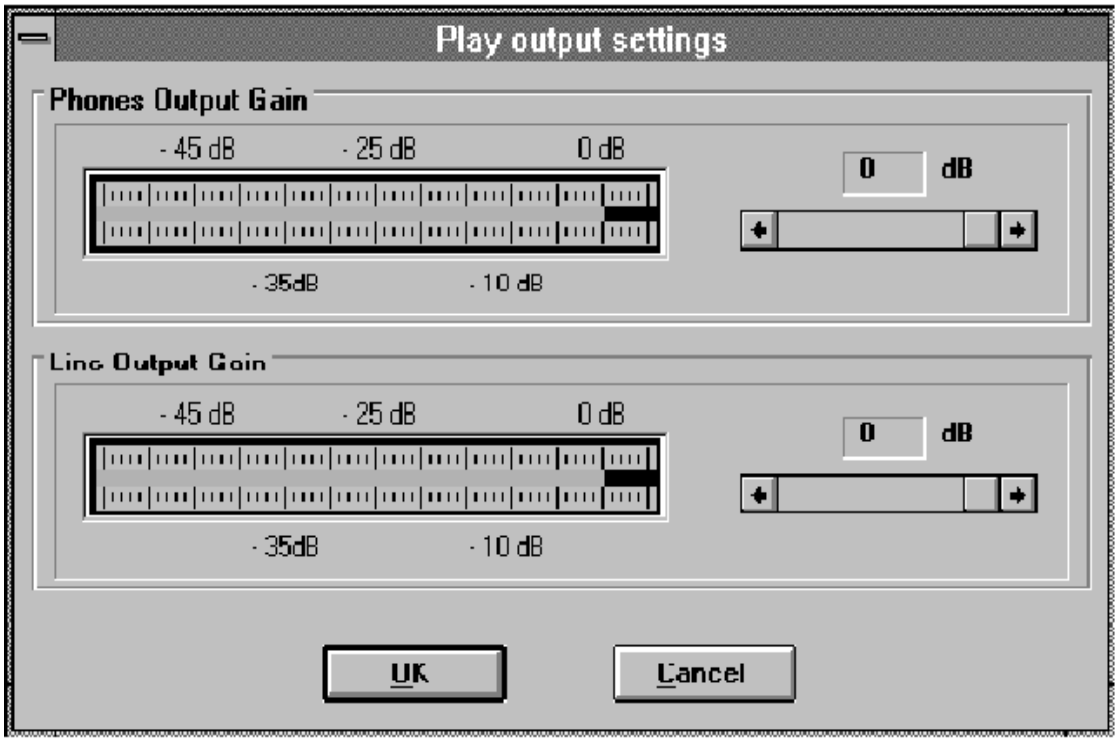
5.1.1 Select Output

Go to the Setup Menu, click on Audio Setup, and then choose either Select Phones Output if you want to hear the signal through headphones or Select Line Output if you want to hear the signal through a speaker.

5.1.2 Adjust Output Levels

Before trying to listen to a signal, go to the Setup Menu and click on Audio Setup. In the submenu, click on Adjust Output Settings, and a Play Output Settings window displays Phones Output Gain and Line Output Gain meters, which range from –45 dB to 0 dB. Use the scroll bars to adjust each output gain level.

Figure 5–1. Play Output Settings Window



5.1.3 Play

Next, be sure that the signal is displayed on the screen. (If there is no signal, go to the Edit Menu and select Read a Word, or click on the Read a Word icon on the Toolbar  , or select Read a Word on the Word Database box). Next, go to the Play Menu or use the Play Pad (by clicking on Slow Play and Play Pad in the Play Menu, or by clicking on the Play Pad icon  , or on the Play icon  on the Toolbar.

Play Options:

- Play Original Signal: Plays the Original sound wave with no synthesis.
- Play Uncoded Synthetic: Plays the Uncoded Synthetic sound resulting from LPC analysis, which is usually better quality than Coded Synthetic speech.
- Play Coded Synthetic: Plays the Coded Synthetic sound.
- Play Compressed Synthetic: Plays synthetic speech to which a user-defined compression rate has been applied.

For each *Play option*, you can listen to the:

- Entire Signal by choosing Play Channel (All)
- Word by choosing Play Word
- Selection by choosing Play Selection
- Single Frame by choosing Play Current Frame

There are two options only available for Synthetic Speech:

- Slow Play: Use the Play Pad from Slow Play and Play Pad in the Play Menu to make the speech rate faster or slower. Sliding the button along the *slow-fast* scroll bar changes the rate of speech as a percentage (25% = *fastest rate,* 100% = *original rate*, and 400% = *slowest rate*), which appears to the right of the scroll bar.

Figure 5–2. Play Pad

- Play a Single Frame: Causes the frame to be repeated continuously. A Play Single Frame window allows you to choose to listen to the Next Frame or Previous Frame by clicking on the desired option. The cursor position changes automatically to the selected frame. Click on Cancel to stop Play Single Frame.

Figure 5–3. Play Single Frame Window

You may also listen to the sound to the left or right of the cursor. These choices are listed in a submenu for each Play Option and on the Play Pad.

5.1.4 Stop Play

To *stop* Synthesis, click on one of the following options:

- ❑ Stop icon  on the Play Pad or on the Main Menu Toolbar
- ❑ Stop Play (F6) in the Play Menu

5.1.5 Repeat Play

To *repeat* the last played sequence, click on one of the following:

- ❑ Play icon  on the Main Menu Toolbar
- ❑ Repeat Play command in the Play Menu

5.1.6 Play Split Aux Frame Toggle (CONTROL + A)

When a frame is split into two parts, this command replaces the first part of the frame with the second part of the frame. The word is played with the second part of the frame.

5.1.7 Play Both Channels (CONTROL + B)

This feature works when an application is initialized for the 3x chip. Click Play Both Channels in the Play Menu or use the keyboard command (CONTROL + B) to listen to a word displayed on Channel 1 and a word displayed on Channel 2 simultaneously.

5.2 Importing a WINSDS or a SDS5000 Word

To import a WINSDS word, press CONTROL + W. To import a SDS5000 word, press CONTROL + D. Words and their associated signals may be imported from either WINSDS or the SDS5000. A *word* is defined as the basic unit of the WINSDS station. A word has a label, a comment zone, and at least three associated signal files:

- Original Signal (Wordname.sig)
- LPC Analysis Results (Wordname.prm)
- Coded and Compressed Bitstreams (Wordname.bin)

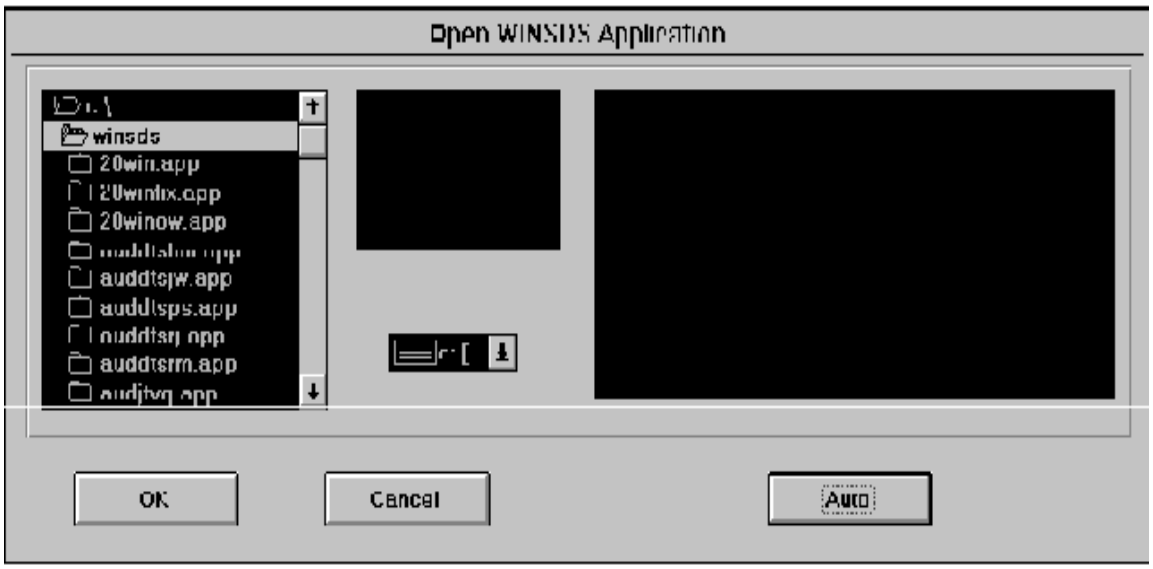
Note:

A given word may have several versions of LPC analysis results and coded bitstreams.

5.2.1 To Import Words From SDS5000 or WINSDS Files

Go to the Edit Menu and click on Import an SDS5000 Document or Import a WINSDS Word. A window with a directory of applications/documents appears as in Figure 5–4:

Figure 5–4. Open WINSDS Application Window



Note:

You may return to the directory at any time during a work session to scan directories of stored applications and documents by clicking on View Directory in the View Menu.

If you know the Application Name: Select the disk drive containing your application. Then, scroll through the list in the left-hand window until you see the application (or its subdirectory). Double-click on your application, and the name of the word access file appears in green in the middle window. Click on OK.

If you don't know the Application Name: Select the disk drive (e. g., C:, D:) where you think it is located. Then select the correct path by double-clicking on the root directory and Auto. This function searches for your application in every subdirectory of the root directory. The cursor becomes an hourglass icon, and results appear in the right-hand window. You may stop the process at any time by clicking on Cancel.

When the application is found, select it by clicking once on its name in the Results window, or by double-clicking on the application name in the directory in the left-hand window. When the word access file (filename.*wrd*) corresponding to the selected application appears in green in the middle window, click on OK to confirm your selection or double-click on the word name.

A Select Word box opens. To select, highlight the word(s) you wish to import or click on Select All to import all words in the application. Use the Read a Word option to display the signals for a given word; then play the displayed signal.

5.3 Recording Process

If you usually record at start-up of the WINSDS, and you want to begin recording automatically, go to the Options submenu of the Setup Menu. Click on Startup and then on Invite to record at startup. A check mark appears in front of the command, and the next time WINSDS is started, the Record icon begins flashing red, indicating that the recording process has started automatically. However, *if you do not want to record automatically at startup*, make sure that no check mark appears in front of Invite to record at start-up.

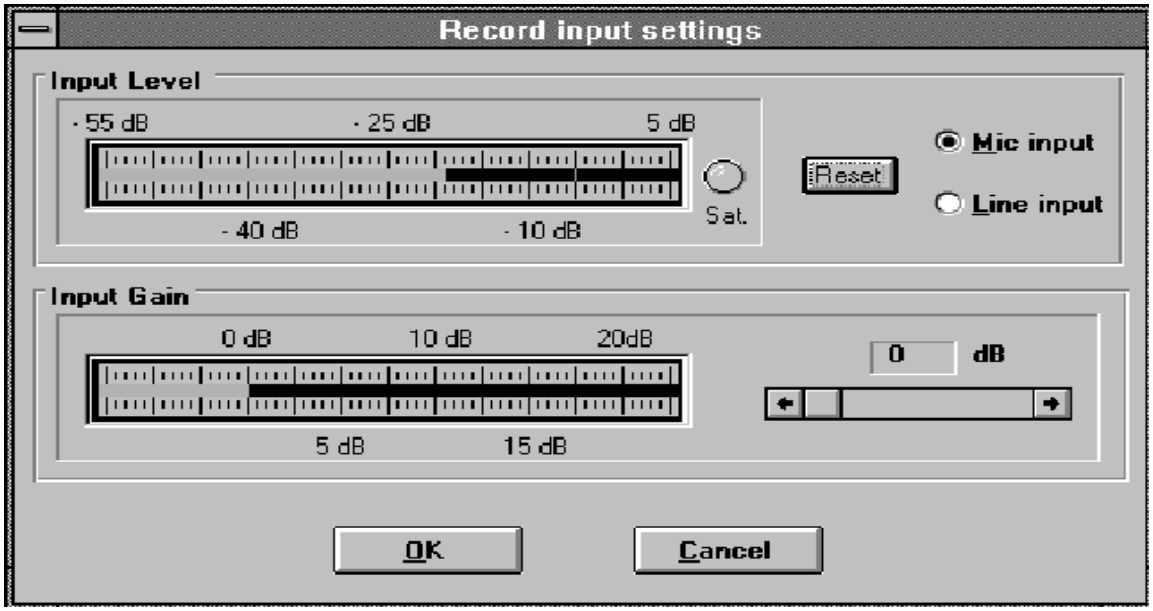
5.3.1 Select Input

In the Setup Menu, click on Recording Setup and then on Select Line Input if you are recording from an audio-tape or CD. Click on Select Micro Input if you are recording from a microphone.

5.3.2 Adjust Input Gain

Go to the Setup Menu, click on Recording Setup, and then on Adjust Input Gain level. The Record Input Settings window appears. To adjust input level, reset the maximum level indicator by clicking on Reset. Input the signal. If the input level is too high, the Saturation light turns red. Click on Reset to reset the maximum input level indicator. Make any necessary adjustments in the input gain level by using the scroll bar.

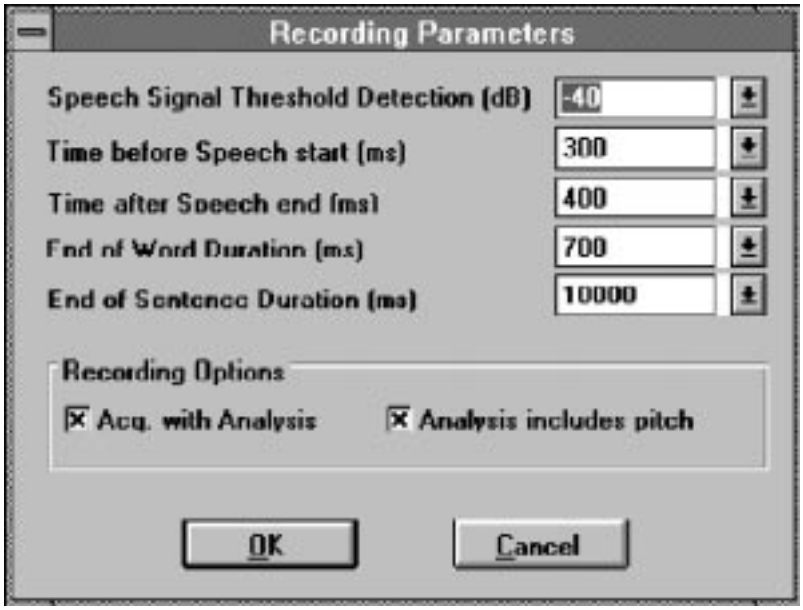
Figure 5–5. Record Input Settings Window



5.3.3 Recording Parameters

Keep in mind that the [ENDWRD] parameter *must always* be ≥ [BFRSIG] + [AFRSIG].

Figure 5–6. Recording Parameters Window



Recording Parameters

- Speech Signal Threshold Detection (dB) [SIGLEV]: WINSDS only records speech if the energy level of a signal is greater than the SIGLEV value. Acceptable values range from –60 to –20 dB. Default value = –60 dB.
- End of Sentence Duration (ms) [ENDSEN]: Duration of silence required for the recording process to stop. That is, WINSDS stops recording silence if it detects silence longer than the ENDSEN value. Acceptable values range from 0 – 30 s. Default value = 10,000 ms.
- Once a signal has been recorded, WINSDS automatically edits the signal to delete excess silence at the beginning and end of the signal:
  - Time before Speech start (ms) [BFRSIG]: Maximum signal duration allowed as lead time before the beginning of a word is detected. Acceptable values range from 0 – 800 ms. Default value = 300 ms.
  - Time after Speech end (ms) [AFRSIG]: Maximum signal duration allowed as lag time after the end of a word is detected. Acceptable values range from 0 – 800 ms. Default value = 400 ms.

- End of Word Duration (ms) [ENDWRD]: When recording in Word-by-Word mode, WINSDS automatically detects word boundaries. End of Word Duration is the duration of silence required for a word boundary to be detected. Acceptable values range from 0 s – 30 s. Default value = 700 ms.

Recording Options

- ❑ Acquisition with Analysis: If checked, the recording process includes LPC parameter analysis. If you record a signal and R but no A appears in the Read a Word box, check if this option has been selected; if not, select it.
- ❑ Analysis includes Pitch: If checked while recording or with off-line analysis, pitch calculation is included in LPC analysis. This feature should be checked.

5.3.4 Recording A Signal

Go to the Record Menu and choose from four Record modes:

- ❑ Record One Word
- ❑ Record in Word-by-Word Mode
- ❑ Record in Phrase Mode
- ❑ Record Words with Playback

Record One Word: The basic recording mode. LPC and pitch analyses are done simultaneously. To record a new word, click on the Record icon  or on Record One Word in the Record Menu.

A red-light icon on the Toolbar  begins to flash to signal when recording begins. When the speaker begins to talk, the red-light icon stops flashing and remains solid red during recording. If saturation occurs during recording, the red-light icon flickers. It shuts off (turns to gray) when recording ends.

To erase the displayed signal from the screen, go to the Window Menu and click on Reset Signals and then on OK to Confirm signal window reset on channel. However, a displayed signal does not have to be erased from the screen in order to read another Document.

Record Word-by-Word Mode: This mode automatically puts breaks between words, i.e., where silence is detected.

Record in Phrase (or Sentence) Mode: This mode causes the whole signal to be recorded without breaks until a sufficiently long silence is detected.

Record Words with Playback Mode: This mode works like Record Word-by-Word, but after each word has been pronounced by the speaker, it is played back so that the user can check the sound quality. F6

Note:

In this mode, the recording process must be stopped manually by clicking on the Stop icon on the Toolbar or on the Stop Play command [F6] in the Play Menu.

Stopping The Recording Process: It is possible to stop the recording process at any time by using one of the following options:

- Click on Stop Play (F6) in the Play Menu.
- Click on the Stop button on the Toolbar or Play Pad.
- Wait for the End of Sentence Duration message indicating that [ENDSEN] has applied. (See Setup: Recording Setup: Recording Parameters for more details.)

5.3.5 Labeling and Analyzing Signals

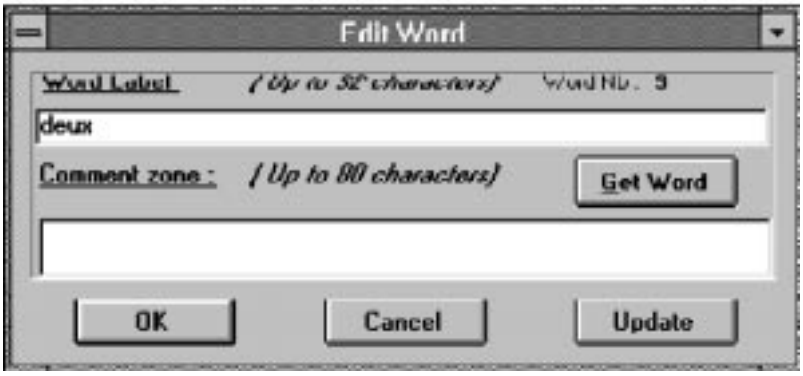
- Edit Label and Comment
- Apply Scenario
- Analyze Word
- Analyze Selection
- View Word Status

Labeling A Word: When LPC and pitch analyses are completed, the signal and LPC parameters appear on the screen. As shown previously, you can label the recorded word by clicking on the Label Word icon on the Toolbar, or click on Edit Label and Comment in the Edit Menu. An Edit Word window appears with space for a 32 character word label and an 80 character comment. (See Figure 5–7.)

Naming a word with the label of a previously recorded word is not permitted. You can make changes to the label or comment at any time. To confirm the word label, click on Update or OK in the Edit Word Label window. Update leaves the Edit Word Label on the screen as a topmost window in front of all other windows in order to accelerate the labeling process. The Edit Word Label window can also be minimized.

Apply Scenario Command: Apply Scenario automatically labels words recorded using Record Word by Word. Word labels come from a previously created list. (See Chapter 7,*Lists*, for more information.)

Figure 5–7. Edit Word Label Window



Analyze Word: Re-analyzes a word chosen from a list. The Word List can be used to re-analyze several words at a time. The Word Status Table shows the status of the words in the application.

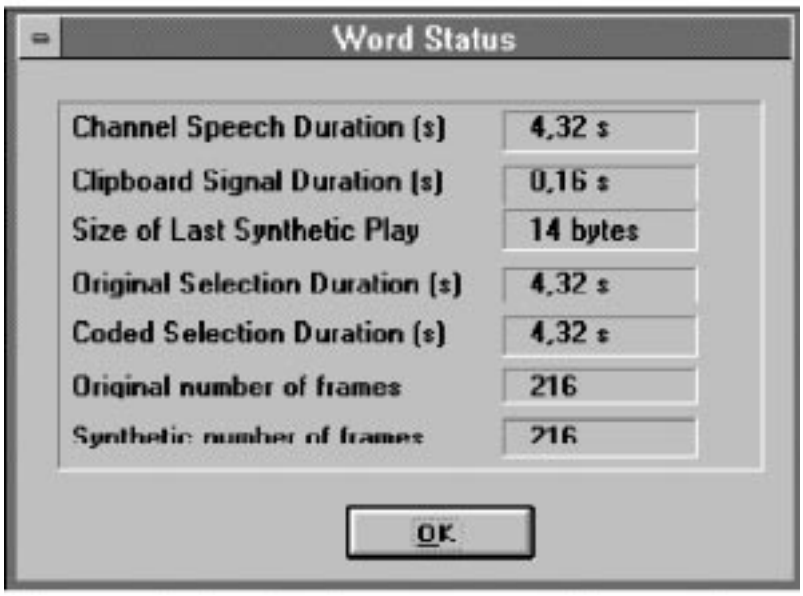
Note:

MELP analysis is not automatic for Words imported from another application. They must be re-analyzed.

Analyze Selection: Re-analyzes a selection highlighted on the signal display.

The View Word Status box in View Status of the View Menu displays a window containing information regarding the status of a specific word as shown in Figure 5–8. This information is useful during the Compression process.

Figure 5–8. Word Status Window



View Database Word Table: This feature sorts words in the application into subsets according to the option(s) selected in the lower part of the window:

- ❑ Unrecorded
- ❑ Unanalyzed
- ❑ Uncoded
- ❑ All Words
- ❑ Sorted
- ❑ Strict Condition

Information may be displayed either by word number (01, 02, etc.) or by label and version. All Words displays all words in the application. The Strict Condition causes the various options (listed previously) to be exclusive of one another. For example, if Unrecorded is checked, but Unanalyzed and Uncoded are not checked, in the Strict Condition all words are displayed that are unrecorded (no Original sound samples) but have LPC analysis parameters and binary coded files. Not checking the Strict Condition option results in all unrecorded words being displayed.

In the View Database Word Table, words in the application appear in one list, and the current status of the words appears in a second list as:

R: Recorded

A: Analyzed

S: There is a binary file saved on disk for the Word.

If the two lists are not in synch, they can be synchronized by clicking on an item in one of the lists.

Figure 5–9. View Database Word Table

5.4 Viewing Signals

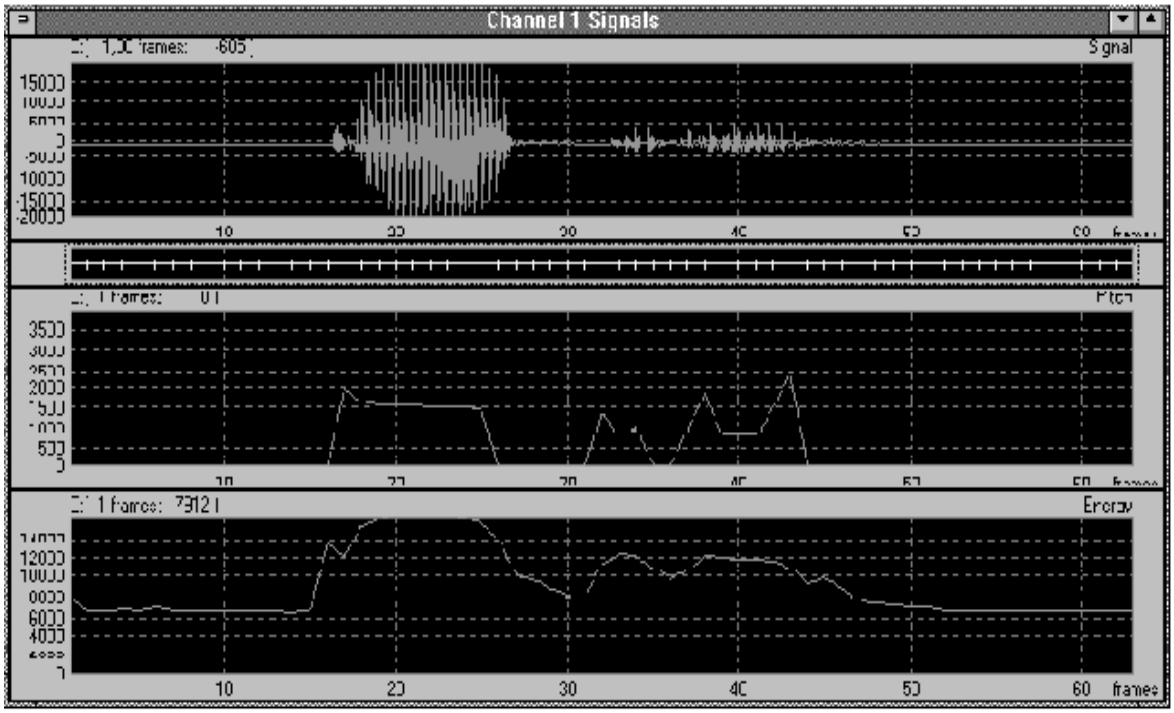
To view a signal, go to the Edit Menu, click on Edit Signal Channel 1 or Edit Signal Channel 2, and then on Read a Word in the submenu. You can also view a signal by clicking on the Read a Word icon  on the Toolbar.

Clicking on the Read a Word icon causes the Read a Word window to appear. Double-click to highlight the word you want to display. If you want to display more than one word, use the Add a Word command. To clear the display, use the Reset Signals/Clipboard command in the Window Menu.

As shown in Figure 5–10, three windows appear, displaying the:

- Signal
- Pitch Contour
- Energy Contour

Figure 5–10. View Signal



5.4.1 View Signal

This command displays the Original signal in the Channel 1 or Channel 2 window along with two other analysis parameters. Defaults are Pitch and Energy.

5.4.2 View Pitch

This command acts as a toggle checkbox. As mentioned previously, the Original signal is displayed in the Channel 1 or Channel 2 window along with two other analysis parameters. Defaults are Pitch and Energy. When other parameters are viewed, they first replace Energy, then Pitch. Use this command to display the pitch curve again.

5.4.3 View Energy

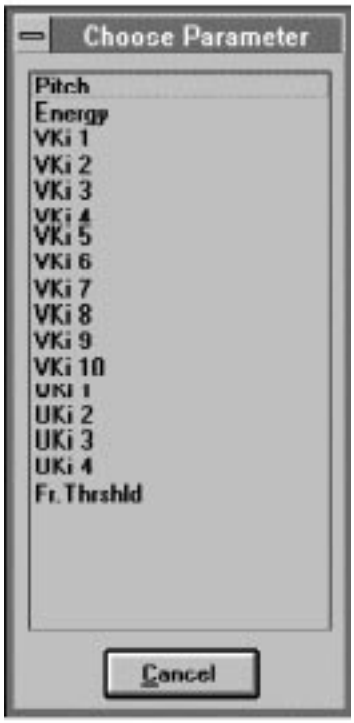
Like View Pitch, this command acts as a toggle checkbox. The Original Signal is displayed in the Channel 1 or Channel 2 window along with two other analysis parameters. Defaults are Pitch and Energy. When other parameters are viewed, they first replace Energy, then Pitch. Use this command to display the energy curve again.

5.4.4 View Other Parameters

This command displays other analysis parameters besides Pitch and Energy as shown in Figure 5–11. Frame Threshold is considered a parameter like the others and can be displayed as a signal.

For LPC10 analysis, the parameters are listed in the Choose Parameter box. There are 10 voiced K_i parameters, 4 unvoiced K_i parameters, and 1 specific parameter: Frame Threshold for LPC10.

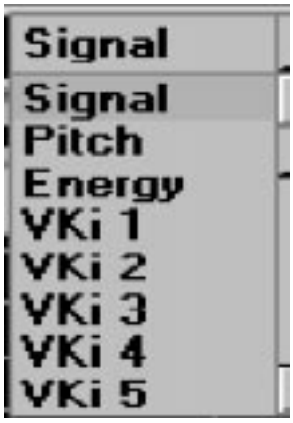
Figure 5–11. Choose Parameter Box



Note:

The drag and drop mouse operation may be used to drop and replace a parameter in a parameter display. Select the parameter from the drop-down-list box on the Toolbar shown in Figure 5–12. Drag the parameter to the desired display and drop it. Be sure that the left-most icon on the Parameter Toolbar is selected for View Parameter.

Figure 5–12. Signal Drop-Down List Box



5.4.5 Add Parameter

This command is used to add a parameter for a multiple signal display. Select one of the 2 parameter display areas by clicking on one of them or on the title region. The selected curve is outlined by a thin border. Select the Add Signal Channel command for the desired channel. WINSDS asks you to choose a parameter. The selected parameter is added to any previously displayed parameter curves in the display. The limit is 16 parameters per display.

Note:

The drag and drop mouse operation may be used to drop and replace a parameter in a parameter display. Select the parameter from the drop-down-box on the Toolbar (See Figure 5–12). Drag the parameter to the desired display and drop it. Be sure that the middle icon on the Parameter Toolbar is selected for Add Parameter.

5.4.6 Select Parameter

This command in the View Menu is used to select a parameter in a multi-signal display. This is useful to determine the Y-axis value of a parameter at the current cursor position. Note that the current parameter color becomes the text color in multiple signal display. (For more information, see the section on the Colors option of the Setup Menu.)

To use this command, first select one of the parameter displays (Pitch or Energy) by clicking on it or on the title bar. The selected display is outlined by a thin border. Select the Select Signal Channel command for the desired channel. WINSDS asks you to choose a parameter. The selected parameter becomes the current parameter in the curve.

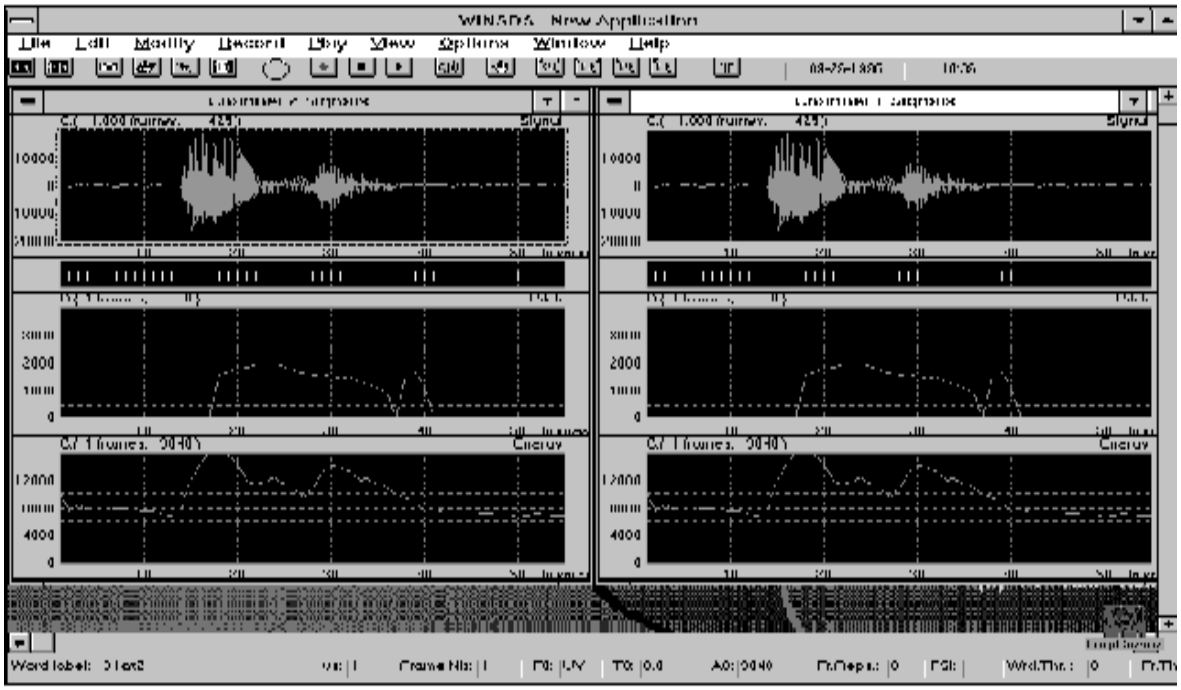
Note:

A parameter may be selected as the current parameter directly from the Toolbar. Select a parameter display area (i.e., Pitch or Energy) by clicking on it or on the Title bar. The selected display area is outlined by a thin border. Select the parameter from the drop-down-list box on the Toolbar. (See Figure 5–12.) Be sure that the right-most icon in the Parameter Toolbar is selected for Select Current Parameter.

5.5 Viewing Options

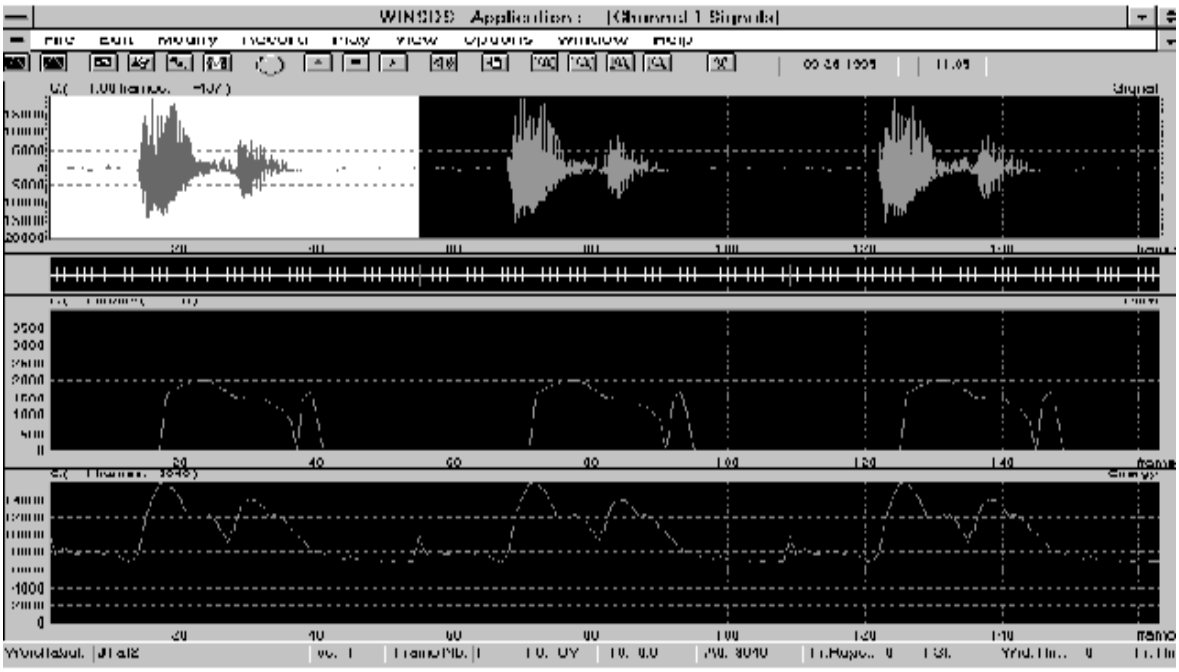
Dual-Channel Simultaneous Display: To display both channel signals as shown in Figure 5–13, go to the Edit Menu and click on Edit Signals. Next, tile (arrange) both signal windows side-by-side by clicking on Tile Forms Vertical in the Window Menu.

Figure 5–13. Dual-Channel Display



Word Selection: When more than one word is displayed, one of the words may be selected (highlighted) by double-clicking on the word signal as shown in Figure 5–14:

Figure 5–14. Selecting a Word

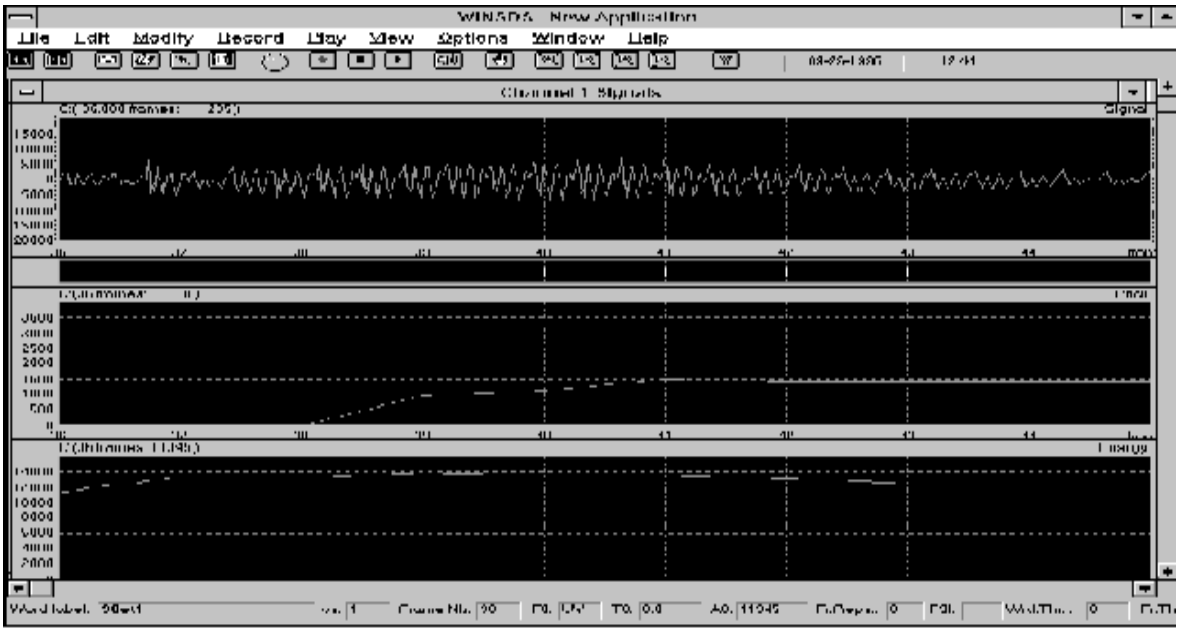


Cursor: The cursor is moved either by clicking on the display or by using the right and left arrow keys ([←][→]). Use the up and down arrow keys ([↑][↓]) to move the cursor from word to word.

Scrolling: Scroll to the right or left of the current screen by moving the cursor to the right or left border of the screen.

Zooming: You can zoom in or zoom out on the x-axis or y-axis when viewing signals by using the mouse to select a portion of the signal. Zoom In/Zoom In Y Axis magnifies that portion of the signal display in stages so that it can be viewed more closely. You can click on the appropriate Zoom-In icon on the Toolbar   . Zoom Out/Zoom Out Y-Axis returns the signal back to its original size in steps. You can also click on the appropriate Zoom-Out icon   on the Toolbar. If you prefer, click on Zoom In or Zoom Out commands in the View Menu.

Figure 5–15. Zoom



Chapter 6

Editing a Document

Topic Page

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6.1 Select/Unselect

Selecting Part Of A Signal: Using the mouse, select the part of the signal you wish to cut or copy and paste by pressing the (right) mouse button and dragging the cursor across it. Release mouse button to end selection. You can also click on Select in the Edit Menu or use DELETE. The selected part is highlighted. To change the selected part of the signal, hold down SHIFT and move the cursor to the new endpoints. (See Figure 5–10 for Selection display.)

Unselect DELETE: To Unselect a previously selected part of the signal, click on Unselect in the Edit Menu or press DELETE.

6.2 Cut, Copy, and Paste Selection

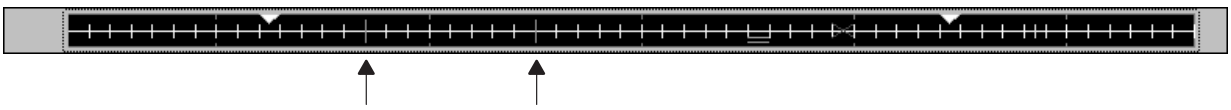
6.2.1 Cut and Copy

These commands allow you to delete, transfer, or duplicate a set of *Frames* in a word. If the selected part of the signal includes a given word, then the word is viewed by WINSDS as a set of frames in the word. The set of frames can be cut or copied to a clipboard. If a given word occurs more than once in a list, the Cut command acts on all occurrences of the word.

If the selected part of a signal extends across the signals for two words in a list, the selection extends to all words included in the selection. This is equivalent to manipulating the Object List (see Chapter 7, *Lists*). List words may be locally transferred or copied.

- Cut Selection: To delete a selected portion of the signal, press CONTROL + X, or go to the Edit Menu and click on Cut Selection.
- Split Current Word: The Split Current Word command is another way to cut out part of a signal. Position the cursor where you want to make a cut. Either go to the Edit Menu, click on Miscellaneous, and then on Split Current Word in the submenu, or press F3. The cut shows up as a vertical green line on the Scale bar underneath the signal display window as shown in Figure 6–1.

Figure 6–1. Split Current Word

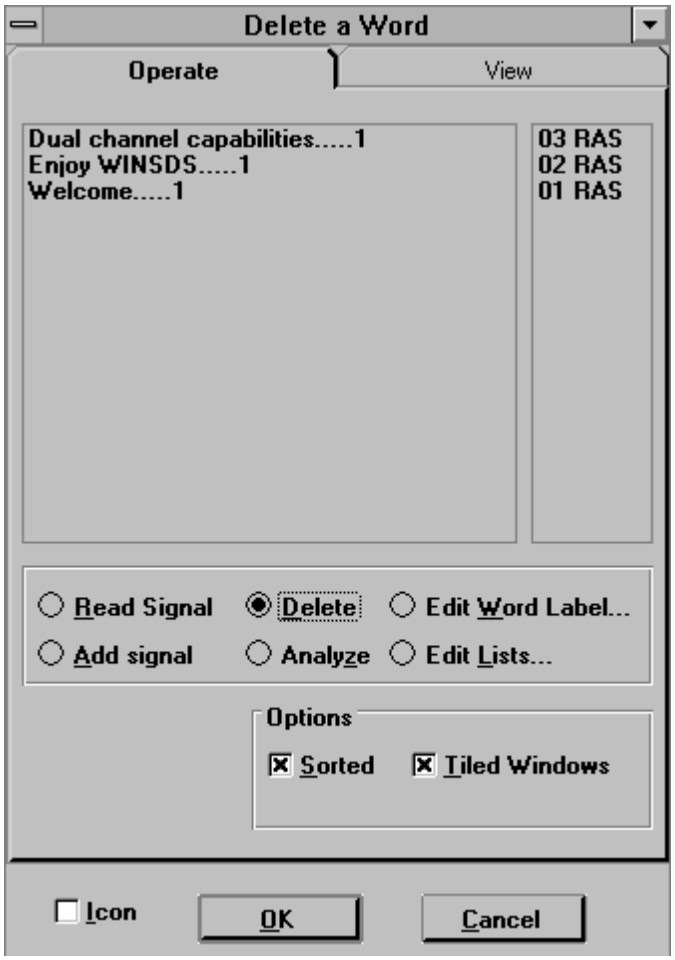


- Label Word: Label each new word using Edit Label and Comment command in the Edit Menu or click on the Edit Label icon  on the

Toolbar. The name of the word in which the cursor is currently positioned appears in the lower left corner of the screen (see Section 5.3.5, *Labeling and Analyzing Signals*, and Section 6.4, *Modify Commands*, for more information).

- Delete Word: There are two ways to delete a word: (1) Click on Delete Word under Miscellaneous in the Edit Menu or use the ALT + BACK SPACE keyboard command; (2) Click on the Delete Word option in the View Database Word Table window or use the SHIFT + DELETE keyboard command. A list of words appears. Highlight a word to delete it, and click on OK, and on Yes to confirm your intention to delete the word. Repeat the process for each word to be deleted (see Section 6.3, *Miscellaneous Edit Commands*).

Figure 6–2. Delete a Word

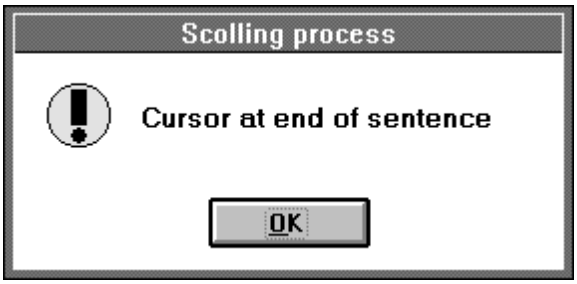


6.2.2 Paste Selection

Place the cursor where you want to paste a selection and press CONTROL + V. The pasted frames are inserted at the cursor position.

- To Paste Frames to the End of a Word: Select the signal for a word. In the Edit Menu, click on Edit Signal Channel 1 (or 2) and then on Read a Word in the submenu. Position the cursor at the end of the signal, and click the mouse or press →. A message appears to signify End of Sentence. Click on OK and immediately paste. The pasted frames appear after the last frame of the word.

Figure 6–3. Paste Frames



6.3 Miscellaneous Edit Commands

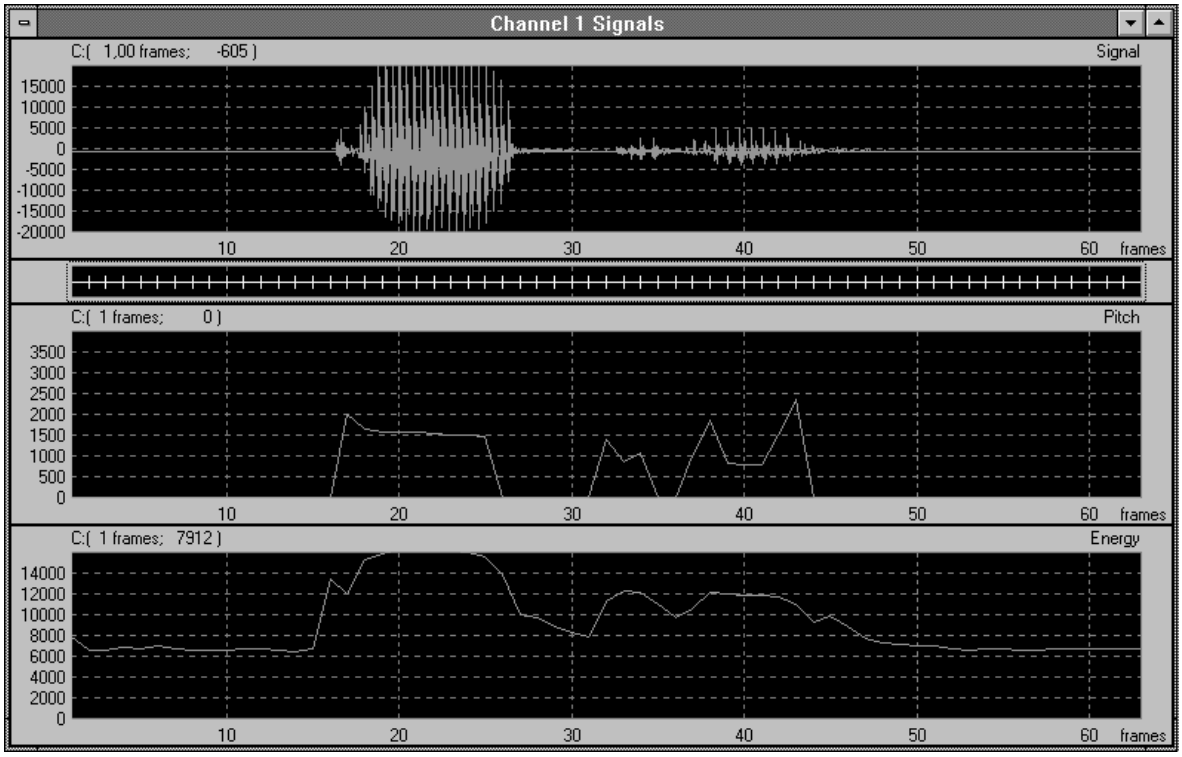
The following commands appear in the Miscellaneous submenu of the Edit Menu.

6.3.1 Transformation Commands

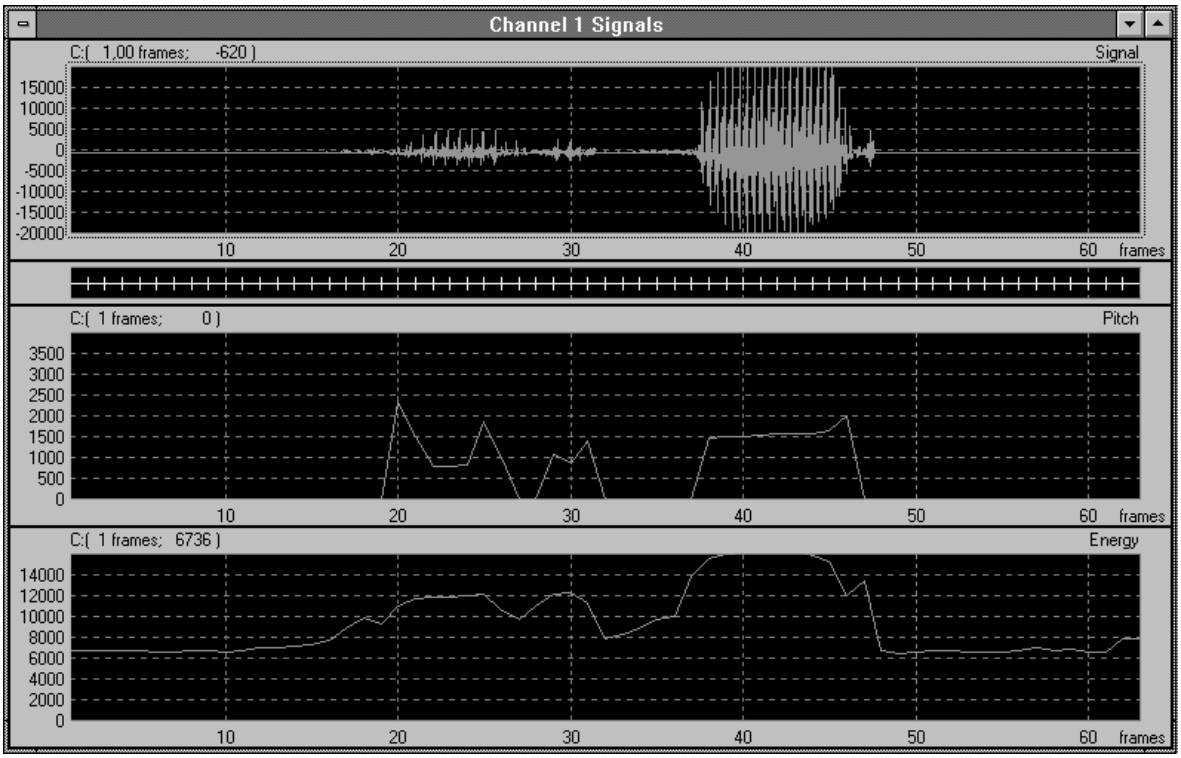
- Delete Word SHIFT + DELETE: Deletes the word at the current cursor position. Highlight the word you wish to delete from the Delete Word window and click on OK to confirm deletion of the word.
- Insert a Silent Frame CONTROL + I: Inserts a silent frame at the current cursor position.
- Exchange Words CONTROL + E: Replaces one word with another. Place the cursor on the word you wish to replace. Next, select the word to appear in its place, by selecting it either in the signal display or in the Read a Word window. Then click on Exchange Words.
- Mirror Word CONTROL + O: Reverses the word at the current cursor position. The word then appears and play backwards.

Figure 6–4. Mirroring

Before Mirroring:



After Mirroring:

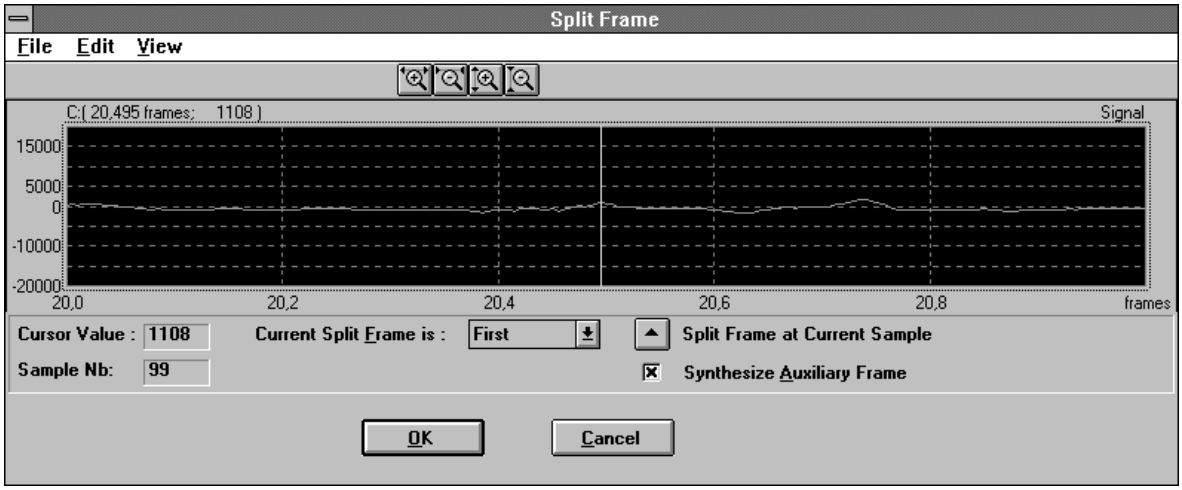


- Replace Parameter CONTROL + P: Gives a list of parameters to choose from (Pitch, Energy, and K-parameters) to replace a parameter in a selection. First, copy a word frame selection to the Clipboard and drag the Selection Zone to the Replacement Zone. Then click on Replace Parameter.

6.3.2 Split Commands

- Split Current Word F3 : Splits a word in two at the current cursor position.
- Split Current Frame CONTROL + F: Splits a frame at the current cursor position.

Figure 6–5. Split Current Frame



- Split-show First Frame Toggle CONTROL + T: Displays the parameters for the first or second split frame.
- Concatenate Adjacent Words (F4): Place cursor on the green cut line between the two words and click on Concatenate Adjacent Words under Miscellaneous in the Edit Menu, or simply press F4. Rename the word, if you wish, using Edit Label and Comment in the Edit Menu or the Edit Label icon on the Toolbar.
- Concatenate Split Frame CONTROL + G: Rejoins a previously split frame

6.3.3 Frame Commands

- Repeat Current Frame CONTROL + R: Repeats the frame at the current cursor position. Click on the Repeat Current Frame command in the Miscellaneous submenu of the Edit Menu or use the short-cut CONTROL + R keyboard command. In the box that appears, type in the number of times that you want the frame to be repeated. Two horizontal green lines appear on the frame in the Scale bar: .
- Skip Current Frame (toggle) CONTROL + K: Skips the current frame during synthesis. . Click on the Skip Current Frame command in the Miscellaneous submenu of the Edit Menu or use the short-cut CONTROL + K command. Clicking on a skipped frame undoes the Skip process.

- Mark Frame for Reference: Marks a frame for future reference. Use the Miscellaneous submenu command of the Edit Menu, or the specific icon  to mark or unmark the current frame. The marked frame appears in the Scale bar as the symbol  .

6.4 Modify Commands

The commands in the Modify Menu are used to edit parameters. After making modifications, you can choose to either Cancel Corrections or Make Corrections Permanent by clicking on these options in the Modify Menu. The following subgroups of commands are found in the Modify Menu:

- Pitch Commands
- Energy Commands
- Modify Edit Parameters Commands
- Compression Thresholds Commands
- Formant Editing Command

Some Modify commands, including Calculate Pitch Step-by-Step and Alter Pitch or Energy Curve Slopes, involve the notion of Clusters. A *Cluster* is a selection created by moving the cursor from left-to-right (left-origin) or from right-to-left (right origin).

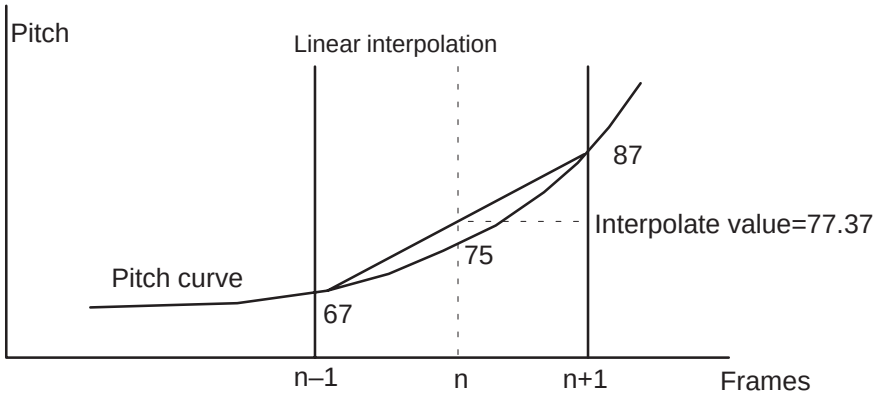
6.4.1 Pitch Commands

Group 1:

- Alter Frame Pitch Value: Changes the value of the current frame (where the cursor is positioned) to a user-defined value. If the frame has a value of zero, it is Unvoiced.

- Interpolate Pitch CONTROL + Y: Computes the pitch value of the current frame or selected frames as a linear interpolation between the value of the previous frame and the value of the following frame. For example, if the pitch value of the current frame is 75, the previous frame is 67, and the following frame is 87, then the interpolated pitch value is 77:

Figure 6–6. Interpolate Pitch

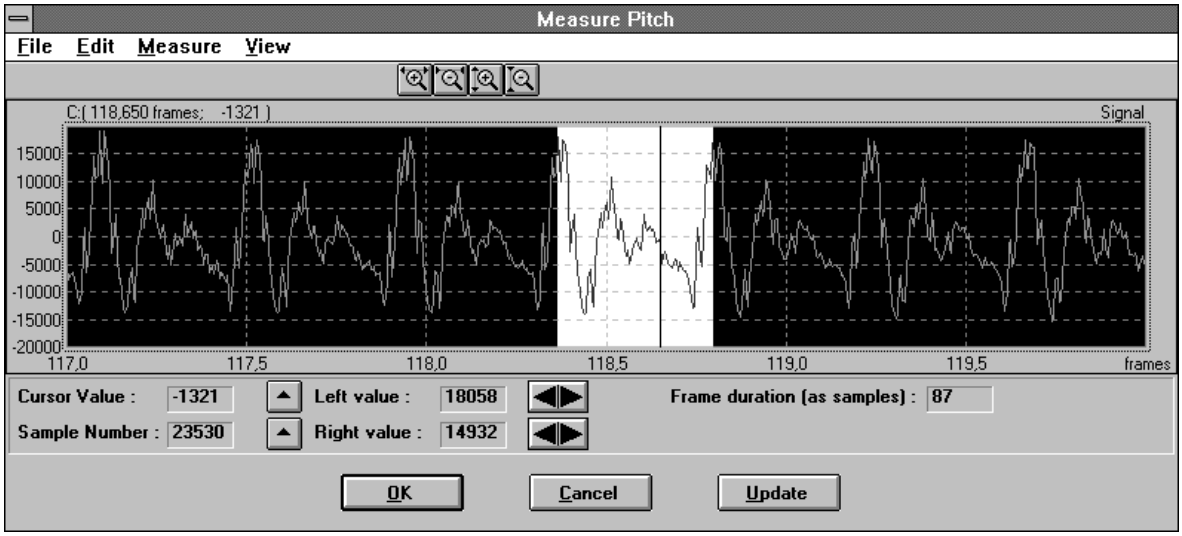


- Divide Frame Pitch by Two: Cuts the pitch value of the current frame in half.
- Multiply Frame Pitch by Two: Doubles the pitch value of the current frame.

Group 2:

- Measure Pitch Value: Measures the pitch value of the current frame. When you place the cursor on the frame where pitch is to be measured, or click on the Measure Pitch icon  on the Toolbar, a Measure Pitch window appears:

Figure 6–7. Measure Pitch Window



Select a zone between two consecutive peak values. Use the buttons  to fine-tune the selection. Clicking on the  button causes the maximum values to be calculated automatically. You can also click on Calculate Pitch in the Measure Menu at the top of the Measure Pitch window to calculate maximum pitch values.

To transfer measurement, click on OK or Update, or go to the Measure Menu at the top of the Measure Pitch window, and click on Transfer Measurement.

Note:

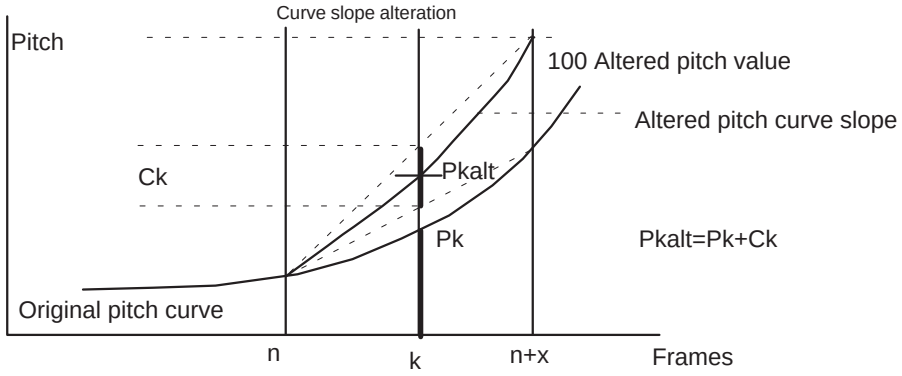
If the Selection Zone spans two different frames or is located in a different frame than the cursor, a message appears asking for confirmation. Several frames may be adjusted consecutively without exiting the Measure Pitch window. Use the cursor or arrow keypad to scroll through the signal.

- Calculate Pitch: Automatically recomputes the pitch value of a given voiced frame. The current pitch value is re-evaluated in terms of the pitch values of adjacent frames. The maximum expected pitch change for this calculation is a user-defined variable (T0VAR), given as a percentage. (See Application Setup command in Chapter 4.)

- Calculate Pitch Step-by-Step: Automatically recomputes the pitch values around the corrected one in a selected cluster of frames. The estimated pitch value is that of the frame preceding the Selected Cluster. As shown previously, the starting frame for recomputation is the user-defined variable (T0VAR), given as a percentage. (See Application Setup in Chapter 4.)

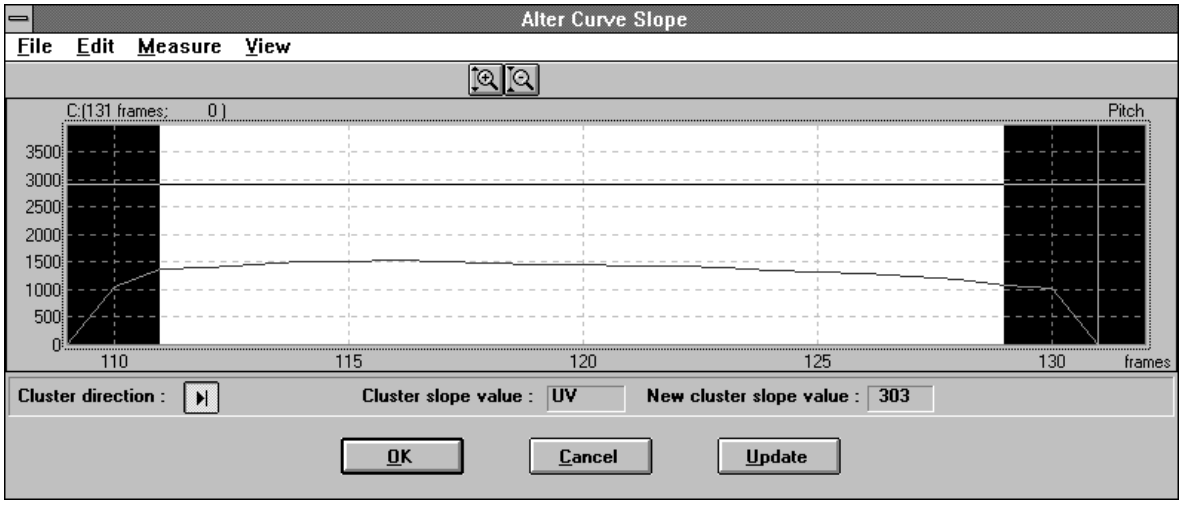
- Alter Pitch Curve Slope CONTROL + U: Changes the pitch values of a selected cluster of frames to alter the intonation (melody) of a signal. The pitch of a given frame is altered by adding a value percentage (Ck) to the pitch value (Pk) of each voiced frame in a cluster. The value percentage is calculated as a percentage of the difference between the altered pitch value and the pitch value of the current frame. In Figure 6–8, the alteration of pitch at rank k (Pkalt) is the sum of the old pitch value (Pk) and the corrector (Ck), whose value is the difference between two linear interpolations.

Figure 6–8. Alter Pitch Curve Slope: Value Percentage



Click on Modify Pitch in the Pitch submenu of the Modify Menu, and the Alter Curve Slope window appears:

Figure 6–9. Alter Curve Slope Window



Select a zone for curve slope alteration. The orientation of the cluster (left-to-right or right-to-left) is indicated by an arrow in the lower left part of the window (see Figure 6–9). To change the orientation from left to right, click the cursor at the right edge of the selection zone, which represents the new curve slope.

Select a new value for the curve slope using the horizontal cursor on the display, either by clicking the mouse or using ⓘ and ⓘ. To transfer measurement, click on Update or OK, or click on Transfer Measurement in the Measurement Menu at the top of the Alter Curve Slope window.

- Set Unvoiced Cluster CONTROL + Q: Unvoices voiced frames in a selection.
- Set Voiced Cluster CONTROL + J: Voices unvoiced frames in a selection. A computed pitch value is given to each frame. These values can be overridden by using Measure Pitch and Calculate Pitch in the Pitch sub-menu of the Modify Menu to compute pitch values.

Note:

If no pitch value was assigned to a set of frames during LPC analysis, the frames cannot be voiced and remains unvoiced. However, the Alter Frame Pitch Value command (see previous text) can be used to introduce pitch to a previously unvoiced frame.

6.4.2 Energy Commands

- Alter Energy Curve Slope CONTROL + M: Changes the Energy values of a cluster of frames to alter the loudness of a word. This command works like Alter Pitch Curve Slope. (See Figure 6–9 and Alter Pitch Curve Slope text for details.)
- Set Energy to Zero: Resets the Energy level of frames in a selected cluster. You are prompted to enter an Energy Threshold. Frames with energy levels lower than threshold are reset to zero. The corresponding reflection parameter (A0) for the Frames is also reset. A0 is a logarithmic representation of the normalized excitation energy (G): $A0 = 16 \times \log2(G)$.

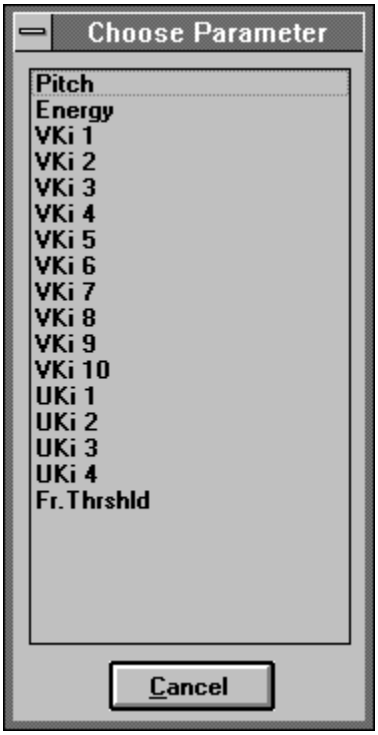
6.4.3 Modify Edit Parameters Commands

- Alter Word Parameter by CONTROL + L: Alters the value of a specified parameter within a selection by a certain percentage value. A positive value increases the parameter (e. g., Energy, Pitch) value, while a negative value decreases it. Alteration values range from –99% to +99%.
- Change Parameter Value SHIFT + CONTROL + F3: Changes the value of a single parameter for the frames in a selection. A Choose Parameter box prompts you to click once on the parameter to be replaced. Values are in units appropriate for the parameter chosen (e.g., for Pitch, units are Hz).

Note:

If you choose an *undisplayed* parameter, there is no visual cue.

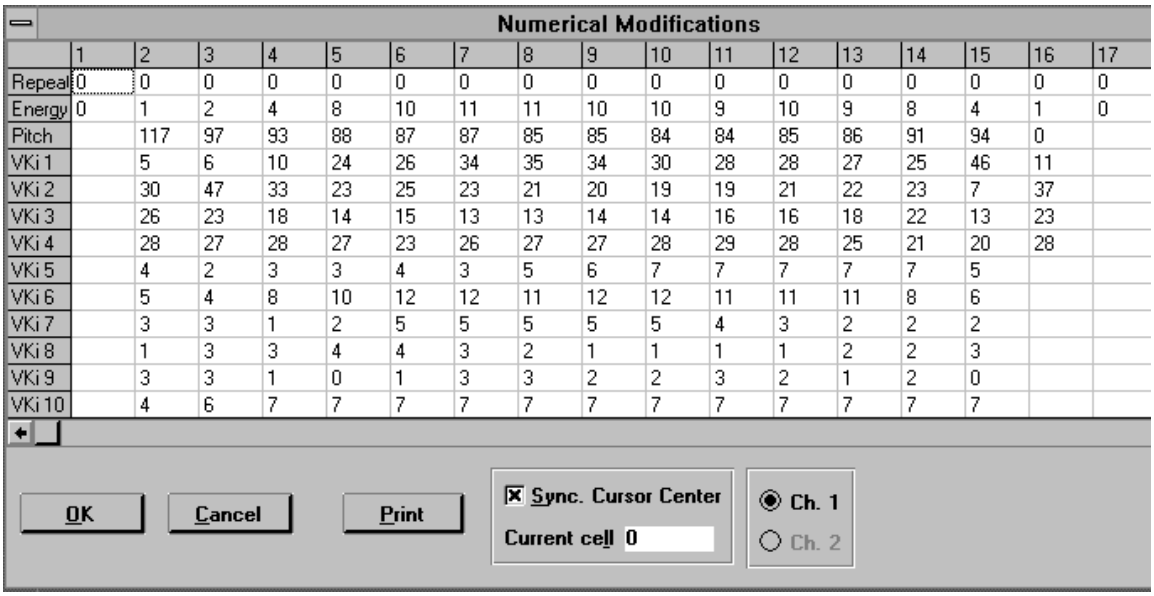
Figure 6–10. Choose Parameter Box



6.4.4 Numerical Modifications CONTROL + H

Displays a Numerical Modifications window of a two-dimensional table of a set of frames centered around the current frame. Each column represents a frame with the parameters of Energy (*A0*), Pitch (*F0*), and the reflection parameters (K_i):

Figure 6–11. Numerical Modifications Window



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Repeat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy	0	1	2	4	8	10	11	11	10	10	9	10	9	8	4	1	0
Pitch		117	97	93	88	87	87	85	85	84	84	85	86	91	94	0	
VKi 1		5	6	10	24	26	34	35	34	30	28	28	27	25	46	11	
VKi 2		30	47	33	23	25	23	21	20	19	19	21	22	23	7	37	
VKi 3		26	23	18	14	15	13	13	14	14	16	16	18	22	13	23	
VKi 4		28	27	28	27	23	26	27	27	28	29	28	25	21	20	28	
VKi 5		4	2	3	3	4	3	5	6	7	7	7	7	7	5		
VKi 6		5	4	8	10	12	12	11	12	12	11	11	11	8	6		
VKi 7		3	3	1	2	5	5	5	5	5	4	3	2	2	2		
VKi 8		1	3	3	4	4	3	2	1	1	1	1	2	2	3		
VKi 9		3	3	1	0	1	3	3	2	2	3	2	1	2	0		
VKi 10		4	6	7	7	7	7	7	7	7	7	7	7	7	7		

The value of every parameter in each frame can be altered. Clicking on the value to be changed highlights it. Type in the new value. Clicking on Synch. Cursor Center (below the table in the Numerical Modifications window) synchronizes a selected value with the current cursor in the Signal or Parameter window, so that moving the cursor in the Signal window automatically re-centers the frames in the Numerical Modifications window.

As with the SDS5000, you can select a zone before Numerical Modifications in order to center a set of frames. If no selection is made, 21 frames are centered around the current cursor position.

To play the signal while the Numerical Modifications window is displayed, use the following play keyboard commands:

	Original	Synthetic	Coded	Compressed
Play All	F5	Shift + F5	Ctrl + F5	Shift + Ctrl + F5
Stop Play	F6	Shift + F6	Ctrl + F6	Shift + Ctrl +F6
Play Word	F7	Shift + F7	Ctrl + F7	Shift +Ctrl +F7
Play Selection	F8	Shift + F8	Ctrl + F8	Shift + Ctrl + F8
Play Left	F11	Shift + F11	Ctrl + F11	Shift + Ctrl +F11
Play Right	F12	Shift + F12	Ctrl + F12	Shift + Ctrl + F12

You can also use the Play commands at the top of the Numerical Modifications table: All, Word, Left, Right, Selection, Frame, and Stop.

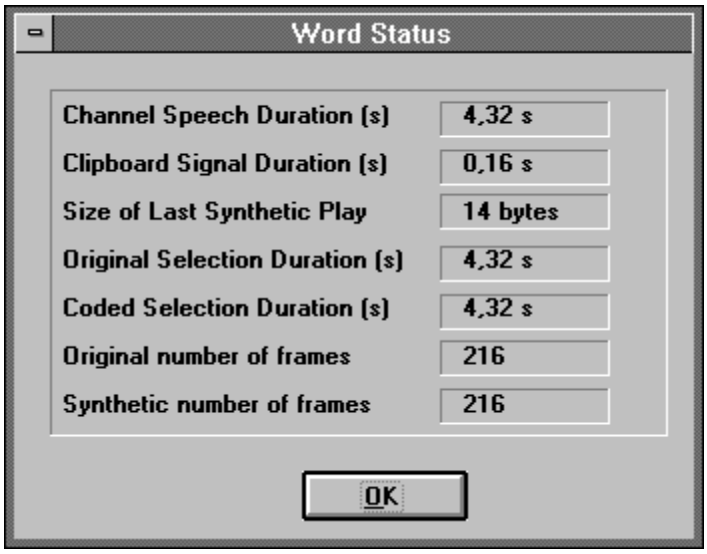
Use the four Modify menu commands at the top of the Numerical Modifications table to edit frames within the table:

- Set Unvoiced Cluster CONTROL + Q
- Set Voiced Cluster CONTROL + J
- Set Energy to Zero CONTROL + Z
- Restore Energy Levels CONTROL + M

6.4.5 Compression Thresholds Commands:

The View Word Status box in the View Status submenu of the View Menu displays a window containing information regarding the status of a specific word as shown in Figure 6–12. This information is useful in the compression process.

Figure 6–12. Word Status Window



Compression Thresholds commands allow you to adjust the threshold level for compressed speech. An average low-level threshold is automatically defined for the application. WINSDS compares adjacent frames to determine how similar they are in pitch, energy, and K-parameters. This is done by computing a Cepstrum (a Fourier transform of the power spectrum) for each frame and finding the distance (difference) between the two Cepstra. If the distance is small, then the frames are similar. Any set of frames whose Cepstral distance

is lower than the defined threshold is replaced by one average frame and the appropriate bit repeat factor. Any change in the compression rate is shown in the Word Status display. The changes are saved in the Word Access table or in the binary code file.

To Select a *Word* for compression rate change, double-click on the word, or position the cursor on the word (with no other words selected). To select a *zone*, drag the cursor across the zone pressing the left mouse button. Selecting the parameter [Fr.Thrshld] of View Other Parameters in the View Menu displays Compression Thresholds as well as other edit parameters.

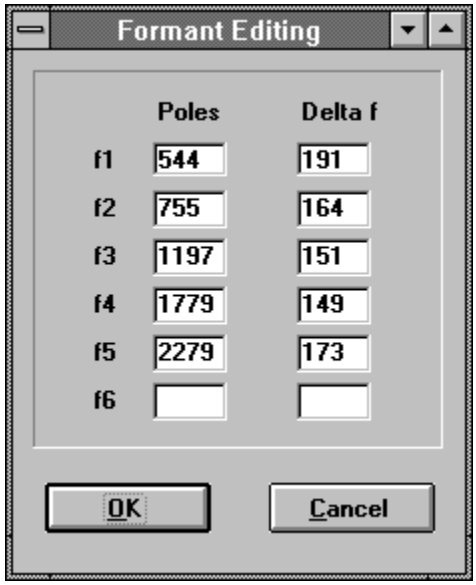
- Application Repeat Threshold: Application threshold change resets any other current threshold settings.
- Word Repeat Threshold: Alters the bit repeat threshold for the current word. A prompt appears for a compression threshold to be applied to the entire selection of frames of a word. The default compression rate is the application bit repeat threshold set in the application folder description file.
- Selection Repeat Threshold CONTROL + S: Alters the bit repeat threshold on a selection of frames extending across words. A prompt appears for the compression threshold for the entire selection. As previously shown, the default compression rate is the application bit repeat threshold set in the application folder description file. To listen to the modified compressed speech, click on Play Synthetic Word with Compression in the Play Menu or on the Play Pad, or use the Play Compressed Speech keyboard commands (see previous description).

6.4.6 Formant Editing Command:

Formant Editing is an optional editing feature. Formants are resonances in the spectrum of a sound that are shaped by the vocal tract. Poles are resonances in the LPC filter that are derived from the K-parameters; they are approximations of formants. There is not always a one-to-one correspondence between formant resonances and pole resonances.

The *Formant Editing* command extracts formant or pole frequencies and bandwidths for the current frame, and displays them in the Formant Editing window as shown in Figure 6–13:

Figure 6–13. Formant Editing Window



The Poles column refers to the frequency of the pole resonances. The Delta f column refers to the bandwidth of that resonance.

You may change the displayed formant values. Then, click on OK to convert new values to LPC information.

Chapter 7

Lists

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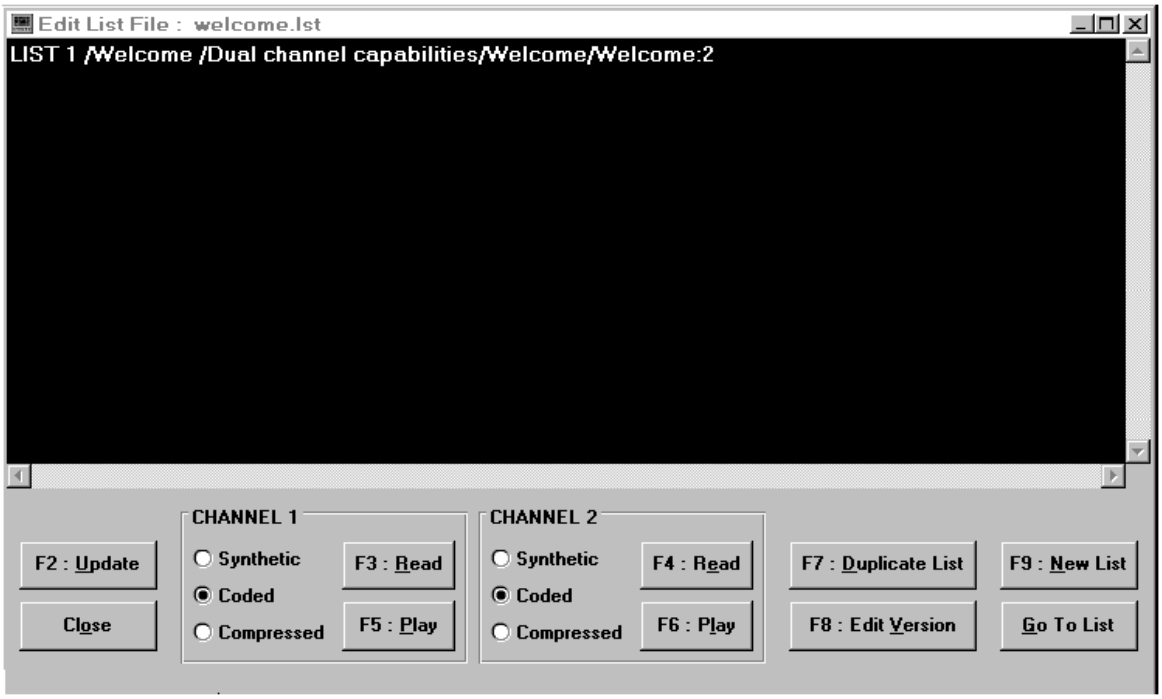
7.1 Creating a New List

A List or List File is another name for a Concatenation File, which consists of a list of concatenations or Words. Lists have many uses. For instance, a recording script can be typed directly into the WINSDS application as a List or Lists, a given Word can be tested in various contexts (i. e., concatenations or Lists), and sequences of numbers, letters, or words can be monitored for Pitch and Energy consistency.

To create a New List, go to the FILE Menu and click on New List File, or use the Edit Lists  icon on the Toolbar, or click on Edit Lists option in the View Database Word Table. An Edit List File window appears on the screen. Lists may be created and edited as described in the following sections.

Figure 7–1. Edit List File Window



Each List begins on a new line and has the following syntax:

LIST 1 /word1:1/word2:1/word3:1. . .

LIST 2 /word1:1/word4:1. . .

where each Word is followed by a colon and Word Version number. (Colon and Word Version number are optional for Words with only one version.)

Note:

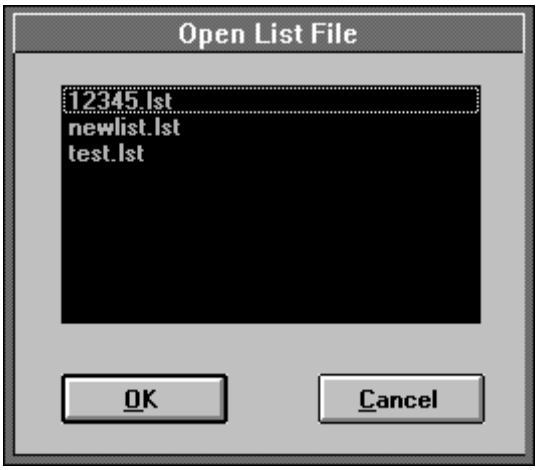
If a new List is created *before* recording the Words in the List, then Version 1 of the Word, which appears in the Word Status Table, represents only the Word *label* from the List. Version 2 of the Word is created when the signal is recorded.

7.2 Open an Existing List File

If you usually begin your work sessions by Editing a List, go to the SETUP Menu, Options submenu, and click on Startup, and then on Invite to Edit List at Startup. A check mark appears in front of this command, and the next time WINSDS is started, a message appears asking you if you want to edit a List. If you do *not* want this message to appear, click on the checked command and the check mark disappears. The message will *not* appear the next time WINSDS is started.

Many Lists may be created in a given Application. The Lists remain with the Application and cannot be transferred to other Applications. To open a previously created List, go to the FILE Menu and click on Open a List File. A box displays all List Files ([filename.lst]) created in the given Application. Click on the desired List File in the Open List File box, and then click on OK, or simply double-click on the selected file.

Figure 7–2. Open List File Box



Note:

If a List File is currently open, either in the background or as an icon, you must first close the current file using the Close List File command in the FILE Menu *before* opening another List File.

7.3 List Commands

7.3.1 Read a Word Window

One command used in creating Lists is in the Read a Word window:

EDIT LISTS: Clicking on the Edit Lists. . . command in the Read a Word window causes the window title to change to Get a Word for List. Double-clicking on each word in the order they are to appear in the List copies the words to the current List in the Edit List File window.

7.3.2 Edit List Command Buttons

There are Edit List command buttons under the Edit List work area:

F9: NEW LIST: At the beginning of a new line, prints the word, LIST, followed by an appropriate (consecutive) List number. Used when creating a new List or concatenation (e. g., sentence, string).

GO TO LIST: Positions the cursor on a previously created List.

F8: EDIT VERSION: Different versions of a Word with the same Label may appear in one or more Lists to represent slight intonation differences, alternate takes, parameter modifications, etc. The F8: Edit Version command allows the user to change a Version Marker at the end of the current Word after a colon (:). The default version is 1.

F7: DUPLICATE LIST: To determine how different versions of a Word sound in the same context, a given List can be copied using the F7: Duplicate List command, then the version of the Word can be changed using F8: Edit Version.

F2: UPDATE: Saves the List file. You are asked to type in a name for a new List in a Save Current List File As window

CLOSE: Closes the Edit List File window.

7.3.3 Playing Lists Using the Buttons in the Edit List File Window

Lists can be played on either Channel 1 or Channel 2 using the buttons in the Edit List File window under those headings.

CHANNEL 1

F3: READ: Displays the List in the Signal Display window on Channel 1. Choose Synthetic (Uncoded), Coded, or Compressed to hear.

F5: PLAY: Plays the Synthetic, Coded, or Compressed version of the List selected.

CHANNEL 2

F4: READ: Displays the List in the Signal Display window on Channel 2. Choose Synthetic (Uncoded), Coded, or Compressed to hear.

F6: PLAY: Plays the Synthetic, Coded, or Compressed version of the List selected.

The Edit List File window may be recalled at any time by clicking on Edit Lists in the EDIT Menu or on the Edit Lists icon on the Toolbar  .

7.4 Viewing a List

7.4.1 VIEW CHANNEL LIST 1

This command displays a window with a *formatted Object List* for Channel 1, which results from a List display or from Recording Word-by-Word. You may select the formatted Words and copy them to the Windows Clipboard using the

[Ctrl+Insert] keys. Create a new List in the Edit Lists window and paste the Words using the [Shift+Insert] keys.

Figure 7–3. View Object List Window

7.4.2 VIEW CHANNEL LIST 2

This command works the same as the VIEW CHANNEL LIST 1 command.

7.4.3 VIEW OBJECT LIST

This command displays an *Object List*. A box prompts you to type in the number of the Object List that you want to view.

7.5 Read a List

Click on Read a List under Edit Signal 1 or Edit Signal 2 in the EDIT Menu to read a compiled Object List as a signal. Or, click on one of the left-most Signal icons on the Toolbar: Read a List

 or Read a Word  .

The Scale bar is used to position Word boundaries in a List (concatenation) as well as the Frame boundaries in each Word. A Word boundary is indicated by a long vertical green line, while a Frame boundary is indicated by a short vertical white line on the Scale bar. The distance between two Frame lines represents the Frame duration.

Figure 7–4. Word Boundaries on Scale Bar

Note:

If more than 200 frames are displayed on the screen, then only word boundaries appear.

7.6 Finishing Lists

7.6.1 Close List File

This command closes the current List File.

Note:

When a List File is closed, the current Object Lists in the database is no longer be accessible. A List may *not* be read as a signal (Read a List) until a new List File is opened.

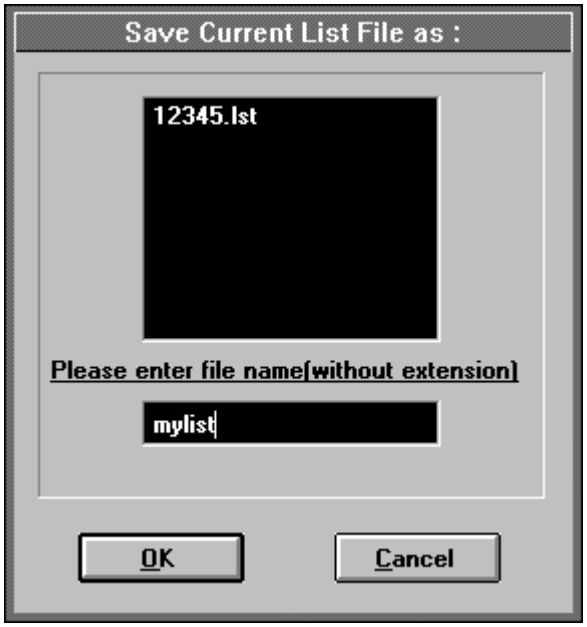
7.6.2 Saving A List

To Save your List, use one of the following commands:

Save List File saves the current List File in the current Application.

Save List File As: Used either when a new List File is created or to archive a List File by duplicating it. The Save Current List File As window is displayed:

Figure 7–5. Save Current List File as Window



The upper part of the Save Current List File window displays the current List Files in the Application. In the lower part, enter a file name (maximum of 8 characters with no extension) for the List to be saved. Then click on OK.

Chapter 8

Saving and Printing Your Work

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8.2 Printing Your Work ---------- 8-4
8.3 Quit [Exit WINSDS] ---------- 8-7
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8.1 Saving Your Work

8.1.1 Save Your Work in an Application Folder

Save Application: If you are editing a previously saved application, click on this command to save your editing changes to that application. The following messages appear: Saving WINSDS Context and Saving Word Access File. If you try to save an application that was not saved previously, the Save Application as. . . window appears (see Figure 8–1).

Save Application As: If you want to save a new application or a previously saved application that you have edited, click on Save Application as in the File Menu. The Save WINSDS Application As. . . window appears.

Figure 8–1. Save Application as. . . Window

In the center of the window, a small box lists the drive you are using. To save an application to a different drive, select the appropriate drive in the drop down menu. The left window displays the relevant path information. The right window displays the contents of the applications in the left window. (When a new application is being created, the right window is blank.)

There are also two text boxes. In the top text box, you can type the name of the new subdirectory if you wish to create one for your application. Then click on the Create subdirectory button below the text box, and the subdirectory name appears in the left window.

Use the bottom text box to create a new WINSDS application in the selected root directory. Select the root directory in the left window by double-clicking on the desired subdirectory. Then type in the application name in the lower right text box. Remember to limit the application name to a maximum of 8 characters *with no extension*. Next, click the Create Application button under the text box, or use the ALT + A keys. Save the new application by clicking on OK or use the ENTER (↵) or ALT + O keys.

Close Application: Clicking on this command in the File Menu saves your work and quit WINSDS. At the next start-up, however, no message appears asking if you want to edit the same application.

8.1.2 Saving Your Current List(s)

Save List File: Saves the current list file in the current application.

Save List File As: Used either when a new list file is created or to archive a list file by duplicating it. The Save Current List File as window is displayed:

Figure 8–2. Save Current List File as: Window

The upper part of the Save Current List File window displays the current list files in the application. In the lower text box, enter a file name (maximum of 8 *lowercase* characters with no extension) for the list to be saved. Then click on OK.

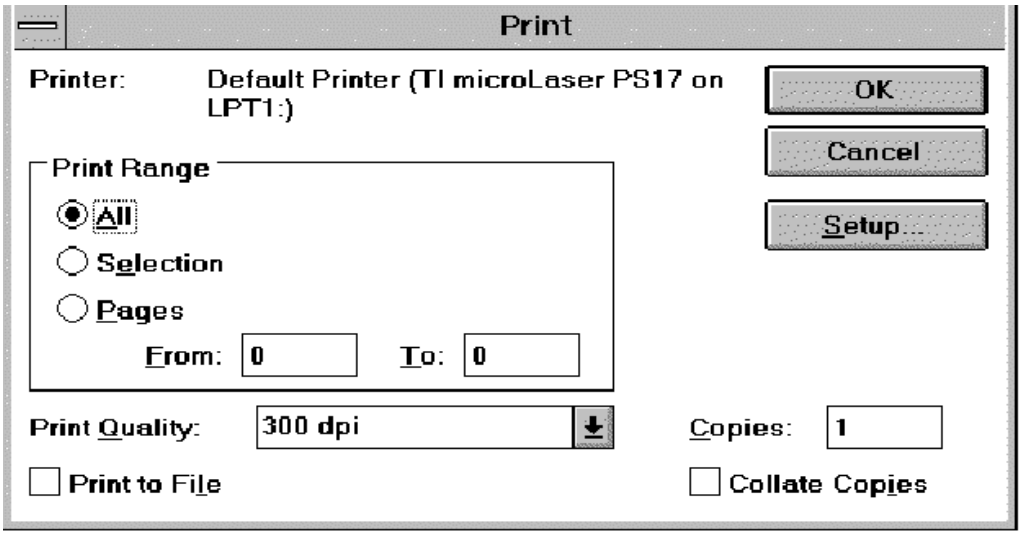
Close List File: This command closes the current list file. Note that the current object lists in the database is longer be accessible. A list may not be read as a signal until a new list file is opened.

8.2 Printing Your Work

8.2.1 Printer Configuration

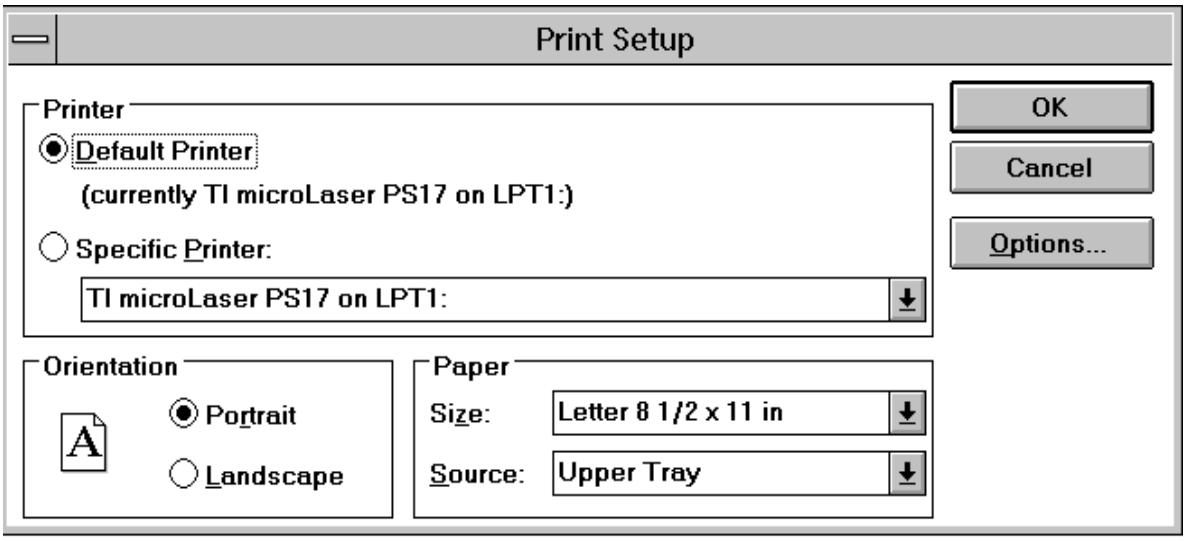
Printer Configuration: Clicking on Print in the File Menu and then Printer Configuration causes a Print window to appear:

Figure 8–3. Print Window



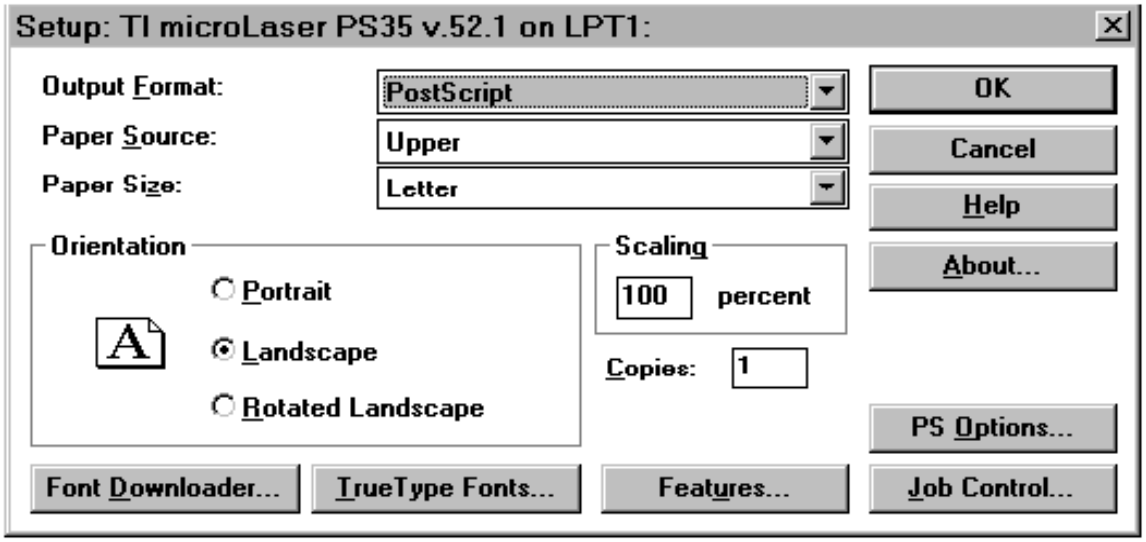
The buttons in the Print window are OK, Cancel, and Setup. Clicking on the Setup button in the Print window causes a Print Setup window to appear. You can select the printer and configure printer settings, e. g., vertical (portrait) or horizontal (landscape) orientation, paper size, and paper feed for the printer. To print a form (screen) select the horizontal orientation.

Figure 8–4. Printer Configuration Window



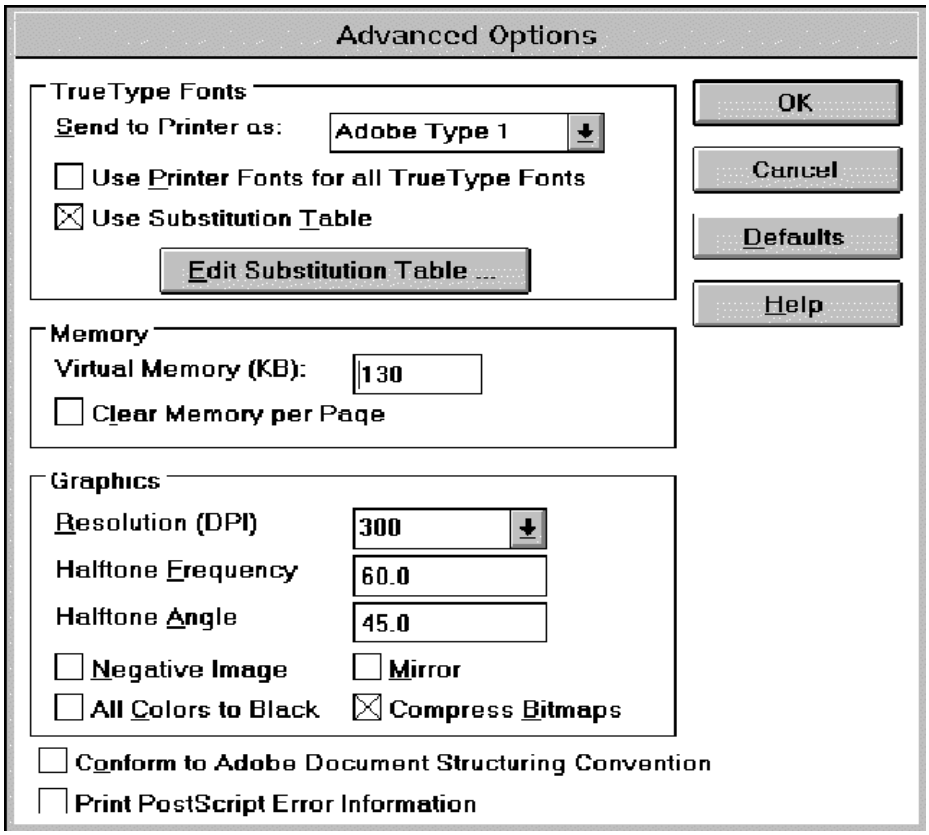
Clicking on Options opens an Options window:

Figure 8–5. Options Window



Clicking on the Advanced button opens an Advanced Options window:

Figure 8–6. Advanced Options Window



8.2.2 Print Form Or List(s)

Go to the Print submenu and select the type of item(s) you wish to print:

Print Form CONTROL + P: When printing a single form (or screen), first choose the Landscape Setup in the window that appears for Printer Configuration. Then click on Print Form in the Print submenu of the File Menu. The form is printed automatically.

Note:

Print Form prints the *modal window* currently displayed.

Print List: When you click on Print List, a message appears asking you for the number of the list you wish to print. Before a List File containing the desired

list can be printed, it must be compiled. In other words, only used lists (or Object Lists in the database) can be printed. (See Chapter 7, *Lists*, for more information on compiling a list.)

Print All Lists: This command automatically prints all Object Lists in the database associated with the current compiled List File.

8.2.3 Print Numerical Modifications (CONTROL + P)

To print the coded data displayed in the Numerical Modifications window, click on the Print button. Values for all frames of the word are printed as text. For European A4 paper, frames of coded data are printed by groups of 26 frames (portrait mode) or 39 frames (landscape mode). For US letter paper, the number of frames per group is 24 and the number of groups per page is 6.

Note:

For US letter paper, the last 4 lines of the sixth group of data on page 1 run over to the second page, and the seventh data group begins on page 3.

8.3 Quit [Exit WINSDS]

To exit a WINSDS Application, go to the File Menu and click on Quit [Exit WINSDS]. You are asked to confirm the command and save your work. (At the next start-up, you are asked if you want to reopen the previous application.) Double-clicking on the left corner button of the main WINSDS window is equivalent to clicking on Exit WINSDS.

8.4 Deleting Unwanted Files

In order to delete unwanted applications or list files, press ALT + TAB to go to Windows\File Manager. Highlight the files that you wish to delete and click on Delete in the File Menu or press the DEL. Confirm the deletion by clicking on OK.

Chapter 9

ROMSDS

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9.1 Purpose of ROMSDS

The ROMSDS program generates ROMs or EPROMs containing coded speech obtained from the WINSDS speech development station. In WINSDS, speech is cut into words, which are stored in application folders. ROMSDS software allows you to select the desired words from the application folders and store them in ROM in the desired order. ROMSDS also allows you to choose a synthesis program, which may be added to ROM storage.

9.2 How ROMSDS Works

ROMSDS software runs on a PC and provides a way to generate vocabulary data for synthesizer chips.

9.2.1 Making a .RSD Setup File

The Make (.RSD) Setup File command produces a .VOC file in standard text that can be edited from the current application vocabulary and the current object lists. The .VOC file, which is used in ROMSDS, contains all the words and valid lists for the current application, as well as Silence Zones associated with List Words.

When the vocabulary in your application is saved in final form, go to the File Menu and click on Make (.RSD) Setup File. A message verifies that a file has been created. Next, the .VOC file is input to ROMSDS (see subsection 9.2.3).

9.2.2 (.RSD) Setup File

A setup (.RSD) file, which is created automatically, includes setup and generation parameters. The .VOC file is then merged into the setup file with a .RSD extension.

9.2.3 ROMSDS

Clicking on ROMSDS in the File Menu inputs the .RSD file to ROMSDS. A ROM output file is created automatically, which includes the synthesis program, decoding table, and vocabulary. Silent Words are automatically generated. The ROM output file can be generated either in binary format or assembly format (for the 50CXX assembler).

9.2.4 Print

The vocabulary and setup parameters are printed in a ROMSDS.TXT file:

Figure 9–1. ROMSDS.TXT File

```
ROMSDS for WINSDS Version 1.2 Copyright TEXAS INSTRUMENTS 1995

 rom output file name:      d:\f104\winsds\welcome.app\wel-
come.rom
 rom file format            assembly
 rom data size              8bits
 rom base location          #0000
 rom physical_size          16 K
 rom fill code              #FF

 vocabulary location        #0001
 vocabulary format

 address format             16bits
 first_word_index           #0000

 word table location        #0001
 number of words location   #0001
 number of_words format     8bits

 list data_format           8bits
 list terminate code        #00
 list table location        #0001
 number of list location    #0001
 number of list format      8bits
 list access table location #0001

 energy number of bits      4
 stop code                  #0F
 silent code                #00

 no program

VOCABULARY read from d:\f104\winsds\welcome.app\ with 3 words
   0 ″Welcome:1″
             at #0000 size #00FB ( 251)  file 00000001.BIN
   1 ″Enjoy WINSDS:1″
             at #00FB size #036D ( 877)  file 00000002.BIN
   2 ″Dual channel capabilities:1″
             at #0468 size #074E (1870)  file 00000003.BIN

LIST table build (size 4 elements) with 1 lists

NO SILENT generated

Assembly code file generation in progress
  Writing number of words ...
  Writing number of lists ...
  Writing word access table ...
  Writing list access table ...
  Writing list table ...
  Writing vocabulary ...
  Writing silent words ...

End of assembly code file generation
```

ROMSDS for WINSDS Version 1.1 Copyright Texas Instruments 1995 rom output file name:

```
c:\winsds\romsds.app\romsds.ROM
```

9.3 ROM Data Organization

The following features are stored in ROM:

Word Data is in a bit-stream format, which represents the coded and compressed vocabulary. This list is the only feature necessary to synthesize coded speech. Each word is assigned a unique number.

Word Access Table is in the form of an address chain at the beginning of the bit-stream representation of a word, with each address pointing to the word data. This table is optional and indexed by word number.

Concatenation Table (similar to Lists): This table contains the concatenations used in the ROM-based application. Each word is defined by a number. Each concatenation is equivalent to a list (or sentence). At the end of the concatenation is a user-defined List Termination Code. This table is optional.

Access Table to concatenations is in the form of an address chain, with each address pointing to the beginning of each concatenation. This table is optional.

Synthesizer Program (for the chip synthesizer) and associated Decoding Table: These are optional and may be stored in ROM independently.

Number of Words (optional)

Number of Lists (optional)

Note:

The minimum requirement for ROM generation is the *Word Data*. That is, the only data needed directly by the ROMSDS software for ROM generation is the *Setup (.RSD) file*. You can edit this text file outside the ROMSDS application as long as the format complies with the file syntax rules. This file can be generated automatically by WINSDS for word and concatenation descriptions using the Make (.RSD) Setup File command in the File Menu.

9.4 Data Representation and Coding

9.4.1 Addressing Modes

The ROM may be addressed in several modes using the following parameters:

9.4.1.1 The ROM Data Format

This is the format of the minimum addressable data. It may be 8 or 16 bits. Addresses in ROM increment by 1 between two successive data elements.

Data may be Reflected: The data may be stored in *Normal mode* (i.e., bit-by-bit in memory), or it may be stored in *Reflected mode*, in which the bit order of each minimum addressable data element is reversed. The following items may be reflected:

- ❑ Vocabulary Data
- ❑ Number of Words Item
- ❑ List Data
- ❑ Number of Lists Item

Data may be Swapped: In the ROM, values occupying more than one minimum addressable element are stored in more than one element with LSB (Less Significant Byte) first, and MSB (More Significant Byte) last. In the output ROM file, these elements can be swapped (i.e., MSB first, LSB last).

9.4.1.2 The Addressing Format

The manner in which data is addressed depends on the quantity of data to be addressed and on the hardware.

- ❑ 16-bit Addresses may address up to 64k bytes of memory space
- ❑ 24-bit and 32-bit addresses access over 250k memory. The choice between these two modes depends on the hardware.
- ❑ Addresses may be Reflected: Reverses the bit order of each minimum addressable data element defining the address.
- ❑ Addresses may be Swapped: If the addressing format is larger than the ROM data format, the addressable elements composing the address may be reversed. For example, if the ROM addressable format is 8 bits and the address format is 16 bits, in Swap Mode, the high-order byte of the address is first, and the low-order byte second. If the target address is $100C, then in unswapped mode, the first byte of the address contains $0C and the second byte $10.

Figure 9–2. Addresses may be Swapped

	UNSWAPPED			SWAPPED		
Unreflected	m	7	0	15	8	m = memory position
	m + 1	15	8	15	8	m + 1
Reflected	m	0	7	8	15	m
	m + 1	8	15	0	7	m + 1

Figure 9–3. Address/Data Representations in Swapped and Unswapped Modes

Address Size		ROM Data Size = 8 bits			ROM Data Size = 16 bits		
16 bits	Unswapped	m	7	0	m	15	0
		m + 1	15	8			
	Swapped	m + 1	15	8	Ignore		
		m	7	0			
24 bits	Unswapped	m	7	0			
		m + 1	15	8			
		m + 2	23	16	Illegal		
	Swapped	m + 2	23	16			
		m + 1	15	8			
		m	7	0			
32 bits	Unswapped	m	7	0			
		m + 1	15	8			
		m + 2	23	16	m	15	0
		m + 3	31	24	m +1	31	16
	Swapped	m + 3	31	24	m +1	31	16
		m + 2	23	16	m	15	0
		m + 1	15	8			
		m	7	0			

9.4.2 SETUP FILE STRUCTURE

The source file for ROM generation is called the *Setup file* with the default file extension of .RSD. This file can be generated automatically using the concatenations (lists) of a WINSDS application. This file is stored in the application folder.

Note:

If this file is generated by the user, independent of WINSDS software, it is the user's responsibility to comply with the syntax of this file format. In addition, it is recommended for organizational purposes to put this file in the appropriate Application folder.

This .RSD text file consists of three sections:

- Setup Section defines the setup parameters, giving the location of the various programs or tables in use and the format for addresses and data.
- Word Section defines the words selected from the application.
- List Section (optional) defines optional Lists or concatenations used for ROM generation.

Note:

Each file line is limited to 250 characters. Comments, preceded by a semicolon (;), may be inserted anywhere. (Anything on the line following the semicolon is ignored. ROMSDS knows only a few keywords that are *not* key-sensitive.)

9.4.3 Setup Section

The Setup section starts with the keyword: %Setup. Because it is important to organize the order of data in the synthesizer chip and to provide access for the data features generated in the ROM, you are given the option to modify parameters. That is, you can select or adjust the ROM Setup file. Each parameter is followed by an abbreviation in brackets, which is used to set each parameter in the Setup file. Only one parameter per line is permitted.

Note:

If a default value is taken for a given parameter, the parameter should not appear in the Setup file, or it should appear as a comment (preceded by a semicolon). Hexadecimal values are accepted in the following formats: $FF, #FF, >FF.

The following parameters define the format and addresses of the data fields defined in the ROM:

ROM Output File [ROM_OUTPUT_FILE]

This is the Binary or Assembly file resulting from ROM generation, which occurs in the current directory. If this parameter is missing, ROM generation will *not* take place. The file is specified as *filename*.ext.

ROM File Format [ROM_FILE_FORMAT]

Specifies whether the ROM Output File is a Binary file or an Assembly 50CXX file. Keywords for this parameter are Binary and Assembly.

Note:

In binary format, be sure that *filename.syn* shows the correct path for the coding table.

ROM Data Size [ROM_DATA_SIZE]

Defines the ROM data format, which is the format of the minimum addressable data. Accepted values are 8 bits or 16 BITS. Addresses in ROM increment by 1 between two successive data elements. Default is 8 bits.

ROM Base Location [ROM_BASE_LOCATION]

Start address of ROM. Default is 0. Ignored in Assembly mode.

ROM Physical Size [ROM_PHYSICAL_SIZE]

Defines the total size of the Output Binary File (i.e., the ROM image) in number of Kbytes or KWords from 1 to 256 with a step size of 1). Any value is accepted. Ignored in Assembly format/mode. Default is 16 (Kbytes or KWords depending on ROM data size).

ROM Fill Code [ROM_FILL_CODE]

In Binary mode, it allows you to fill unused portions of ROM. Default value is $FFFF. Not used in Assembly mode.

Reflected Data Format [REFLECTED_DATA]

Reverses high-order and low-order bits in data. Accepted values are on or off. Default value is off.

Swapped Data Format [SWAPPED_DATA]

Swaps bytes in data. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

Vocabulary Location [VOCABULARY_LOCATION]

Defines the physical address of the vocabulary data in decimal or hexadecimal. If the parameter value is –1, the vocabulary will not be generated. This is ignored in Assembly mode.

Address Size [ADDRESS_SIZE]

Defines the address format (in bits). Accepted values are 16 bits, 24 bits, or 32 bits. Default value is 16 bits.

Reflected Address Format [REFLECTED_ADDRESS]

Reverses high-order and low-order bits of the addressable data elements of an address. Accepted values are on or off. Default value is off.

Swap Address Format [SWAPPED_ADDRESS]

Reverses high-order and low-order addressable data elements of an address. This can only occur if the size of the address is larger than the ROM data size. Otherwise, this parameter is ignored, even if it is defined. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

Word Access Table Location [WORD_TABLE_LOCATION]

If required, defines the Word Access Table location (i.e., physical address). Decimal or hexadecimal values are accepted. This table is optional. If the parameter value is –1, this table is not generated (i.e., default value).

Number of Words Location [NUMBER_OF_WORDS_LOCATION]

If required, defines the physical address where the Number of Words is indicated. Decimal or hexadecimal values are accepted. This value is optional. If the parameter value is –1, this parameter is not generated (i.e., default value). The parameter is declared by an EQU statement in Assembly format.

Number of Words Size [NUMBER_OF_WORDS_SIZE]

Defines the format to describe the Number of Words. Accepted values are 8 bits or 16 bits. Default value is 8 bits.

Reflected Number of Words [REFLECTED_NUMBER_OF_WORDS]

Determines if the Number of Words parameter is *Reflected*. Accepted values are on or off. Default value is off.

Swapped Number of Words [SWAPPED_NUMBER_OF_WORDS]

Determines if the Number of Words parameter is *Swapped*. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

First Word Index [FIRST_WORD_INDEX]

Defines the number of the first Word (e. g., 0 or 1). Default value is 0.

List Table Location [LIST_TABLE_LOCATION]

Defines the physical address of the List (Sentence) Table. Decimal or hexadecimal values are accepted. This table is optional. If the parameter value is –1, this table is not generated.

List Data Size [LIST_DATA_SIZE]

Defines the size of each List data element in bits. Accepted values are 8 bits and 16 bits. Default is 8 bits.

Reflected List Data [REFLECTED_LIST_DATA]

Determines if the List data is *Reflected*. Accepted values are on or off. Default value is off.

Swapped List Data [SWAPPED_LIST_DATA]

Determines if the List data is *Swapped*. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

List Termination Code Data [LIST_TERMINATE_CODE]

Defines the numerical value of Concatenation separators. Decimal or hexadecimal values are accepted. Default value is “0.”

Number of Lists Location [NUMBER_OF_LIST_LOCATION]

If required, defines the physical address where the Number of Sentences is located. Decimal or hexadecimal values are accepted. This value is op-

tional. If the parameter value is –1, this table is not generated (i.e., default value). In Assembly format, defined by EQU statement.

Number of Lists Size [NUMBER_OF_LIST_SIZE]

Defines the format to describe the Number of Lists. Accepted values are 8 bits or 16 bits. Default value is 8 bits.

Reflected Number of Lists [REFLECTED_NUMBER_OF_LIST]

Determines if the Number of Lists parameter is *Reflected*. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

Swapped Number of Lists [SWAPPED_NUMBER_OF_LIST]

Determines if the Number of Lists parameter is *Swapped*. Accepted values are on or off. Default value is off. Ignored in Assembly mode.

Concatenations Access Table Location

[LIST_ACCESS_TABLE_LOCATION]

If required, defines the physical address of the Lists (Sentences) Access Table. Decimal or hexadecimal values are accepted. This value is optional. If the parameter value is –1, this table is not generated (i.e., default value).

Energy Bits [ENERGY_BITS]

Defines the number of bits for energy coding. Default value is 4. This and the next two parameters are used to generate *silence*.

Stop Code [STOP_CODE]

Defines the Stop Code for vocabulary (coded as energy). Default value is $0F.

Silent Code [SILENT_CODE]

Defines the code for a Frame of Silence used by the Automatic Silence Generator. Default value is 0.

Synthesis Program File [PROGRAM_FILE]

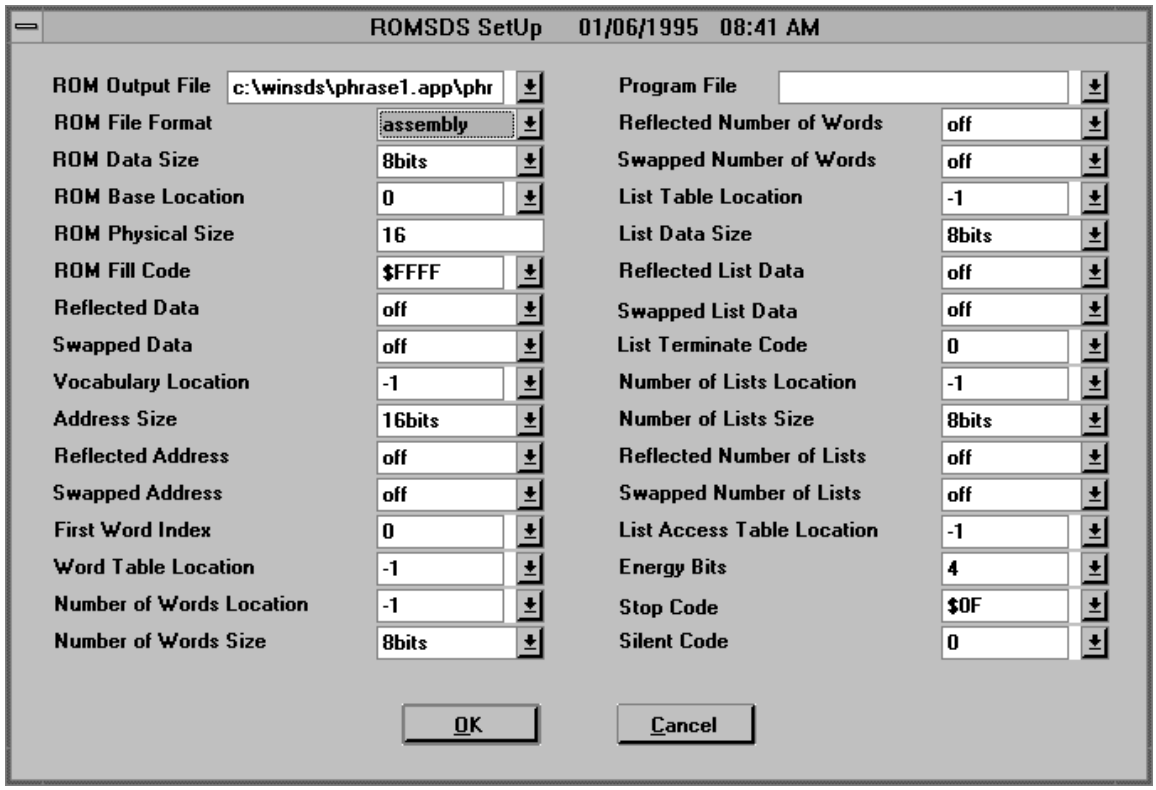
This parameter contains the *path and name of the synthesis program* to be inserted in the ROM. This file also includes the *decoding table* for the

synthesizer chip. This parameter is optional. Default is empty. This occurs if the parameter is not present in the Setup file. In Assembly format, the parameter is defined in a Copy statement.

Note:

You must define the Vocabulary and Lists locations as a function of the *total* number of phrases and the *mean* number of words per phrase.

Figure 9–4. Example of a ROMSDS Setup File



9.4.4 WORD SECTION

Each time a new word is defined, ROMSDS attaches an internal number to it. These internal numbers increment steadily by 1 from 1, and they are displayed in the vocabulary listing. The internal numbers must be used to define sentences. This section is defined by the keyword:

```
%VOCABULARY
```

%Vocabulary is followed by a complete path and filename definition for the chosen Application folder. Numbers start at 1 and are incremented by 1.

Figure 9–5. Word Section

```
%VOCABULARY          "c:\winsds\apps\goat.app\goat.WRD"
goat kid2:1          ; word 1
GOAT 10–19:1         ; word3
```

9.4.5 LIST SECTION

This section is defined by the keyword: %List, which is followed by a list of Word internal numbers separated by slashes ("/"). A line may append to the next one if it is too long to fit on the physical line. The end of a list is marked with double slashes ("//").

Figure 9–6. List Section

```
%LIST
;
goat kid2/GOAT 10–19,20/GOAT 10–19//
```

9.5 Example of an Assembly File

ROMSDS produces an Assembly file in which data is generated. Each line of the file ends in a semicolon (;) followed by offset information.

Figure 9–7. Assembly (.ROM) File

```
*Partial file generated by ROMSDS V1.2
```

```
* Number of words in vocabulary
NWORD EQU     1
* Number of lists
NLIST EQU    1
* Application program
       COPY    test.syn
* Word access table
WORDT   EQU     $               * start of word table
       DATA    VOC+#0000       * word   1 ”(_un_):1”
* Lists access table
LISTT   EQU     $               * start of list access
table
       DATA    LISTE+#0000     * list   1
* Lists content
LISTE   EQU     $               * start of list table
* list 1 ;#0000
       DATA    #0001,#0007,#0003,#00FF
       DATA    #0002,#0008,#0001,#0007,#0003,#00FF
* Vocabulary
VOC     EQU     $               * start of vocabulary
* word   1 ”(_un_):1”
       BYTE    #00,#00,#00,#00,#00,#00,#00,#08  ; #0000
       BYTE    #68,#FD,#12,#4C,#B6,#B7,#B2,#18  ; #0008
       BYTE    #46,#F4,#50,#ED,#B5,#2C,#C6,#69  ; #0010
       BYTE    #2D,#75,#FB,#A0,#87,#72,#59,#2B  ; #0018
       BYTE    #DD,#3E,#99,#2D,#96,#D6,#4A,#77  ; #0020
       BYTE    #AC,#6A,#4B,#84,#D5,#D2,#1F,#BB  ; #0028
       BYTE    #3C,#62,#1A,#A5,#F4,#E7,#29,#8F  ; #0030
       BYTE    #BA,#46,#29,#FD,#B1,#A9,#23,#E1  ; #0038
       BYTE    #56,#4B,#7F,#5E,#EA,#4A,#6A,#D5  ; #0040
       BYTE    #32,#9C,#A7,#3C,#92,#52,#B6,#0C  ; #0048
       BYTE    #E7,#AD,#8E,#86,#54,#2D,#FD,#F9  ; #0050
       BYTE    #C8,#A3,#29,#55,#4A,#7F,#DE,#F2  ; #0058
       BYTE    #5A,#4A,#A4,#D2,#9D,#8F,#3C,#16  ; #0060
       BYTE    #12,#AB,#F4,#E7,#23,#AE,#B8,#44  ; #0068
       BYTE    #2E,#ED,#79,#89,#23,#2E,#91,#4B  ; #0070
       BYTE    #7D,#9E,#F2,#88,#99,#A3,#52,#1E  ; #0078
       BYTE    #87,#3C,#6E,#66,#25,#14,#FB,#C4  ; #0080
       BYTE    #0E,#8B,#59,#4D,#D9,#56,#D9,#E3  ; #0088
       BYTE    #62,#E6,#52,#B6,#35,#66,#06,#6B  ; #0090
       BYTE    #F8,#94,#6C,#71,#E8,#C9,#12,#CE  ; #0098
       BYTE    #C5,#B3,#36,#AA,#31,#97,#53,#E1  ; #00A0
       BYTE    #21,#DA,#68,#88,#D5,#58,#30,#2B  ; #00A8
       BYTE    #5E,#0B,#8A,#75,#14,#9D,#A2,#13  ; #00B0
       BYTE    #42,#18,#1D,#00,#00,#00,#00,#00  ; #00B8
       BYTE    #00,#00,#00,#E0,#01
       BYTE    #00,#00,#C0,#03
. . .
* silent duration 3
       BYTE    #00,#80,#0F
* silent duration 3
       BYTE    #00,#00,#00,#C0,#07
       END
```

9.6 ROMSDS Program Start-Up

The ROMSDS software generates the contents of chip memory using information in the Setup File. The ROMSDS program is called up at the DOS level. The current setup parameters and vocabulary are taken from the Setup File and the current application. Options such as Listing Output and No PROM Generation are also found in the Setup File. A different Setup File may be called up using the line command input: >ROMSDS *setupfile*.RSD *(Return)*. For example:

```
>C:\WINSDS\ROMSDS\ROMSDS  C:\WINSDS\APPS\GOAT.APP\GOAT.RSD
```

This command automatically generates the ROM Output File. The ROMSDS software generates the ROM file used to burn the ROM and may contain the synthesis program for the *chip*, the *decoding table*, the *speech data*, and the *addressing scheme*. The address of each concatenation (list) may be found in ROM, while the address of each word may be found in the optional Word Access Table.

During processing, ROMSDS reports execution progress on-screen. If an error occurs, ROMSDS displays relevant information and stops. Reports can be redirected to an output file with the redirection ([>]) key. For example:

```
>C:\WINSDS\ROMSDS\ROMSDS
C:\WINSDS\APPS\GOAT.APP\GOAT.RSD

C:\WINSDS\APPS\GOAT.APP\GOAT.LST
```

Note:

The extension .RSD is not necessary; it is the default extension for the ROMSDS Set file.

Chapter 10

Sound Editor

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10.1 Introduction

Sound Editor is a Windows application that allows you to create and edit sound waves for the WINSDS. You can:

- Edit and process speech signals from a WINSDS Application
- Generate sound samples and *wave samples* in WINDOWS Multimedia WAVE format or in SampleVision SMP format

Sound Editor is a multiwindow program that lets you work with different windows containing sound waves and LPC parameters from different WINSDS Applications.

Table 10–1. Edit Features

Feature	Definition
Copy	Copies a selection of sound samples from an active Signal window to the Clipboard for later use.
Cut	Removes a selection of sound-samples from an active Signal window by copying them onto the Clipboard. From the Clipboard, the selection can be pasted onto other waveforms.
Paste	Inserts the sound samples from the Clipboard at the current cursor position or replaces any selected waveform in an active window.
Horizontal Mirror	Inverts the time axis of a selection of sound samples in an active window.
Vertical Mirror	Inverts the signal polarity of a selection of sound samples in an active Signal window.
Adjust Envelope	Changes the envelope of a selection of sound samples in an active Signal window according to user-defined values. The pattern is multiplied by the sound-sample selection.
Amplify	Increases the amplitudes of a selection of sound samples in an active Signal window.
Mix	Adds, subtracts, or multiplies sound samples from the Clipboard to a selection of sound samples in an active Signal window.
Zoom In	Expands the view of a Selection of sound samples in an active Signal window to the full width of the window.
Zoom Out	Redisplays the sound samples from the active Signal window before the last Zoom In action.

Using the signal generator functions of Sound Editor, you can generate the following types of signals.

Table 10–2. Signal Generator Functions of Sound Editor

Feature	Definition
Sine waves	Amplitude, frequency, and duration can be adjusted.
Saw waves	Amplitude, frequency, and duration can be adjusted.
Square waves	Amplitude, frequency, and duration can be adjusted.
Gaussian distributed white noise	Power and duration can be adjusted.
Uniformly distributed white noise	Power and duration can be adjusted.
Arbitrary waves drawn by the user	Amplitude, frequency, and duration can be adjusted, with phase continuity.

Sound Editor also provides digital signal processing (DSP) functions.

Table 10–3. Sound Editor DSP Functions

Feature	Definition
Spectrogram display	Represents the sound wave of a Signal window in the time-frequency domain by computing and displaying its spectrogram.
LPC analysis	Extracts Linear Predictive Coding (LPC) parameters and Pitch of a sound wave in a Signal window. These parameters, which are displayed in the form of an LPC spectrogram, can be modified.
Signal filtering	Filters the sound wave of a signal window with a user-specified filter.
Envelope shaping	Extracts and replaces the sound wave envelope in a given Signal window with that of a sound wave from a different window.

Sound Editor allows you to play sound waves and synthetic sounds using LPC synthesis.

10.2 Features of Sound Editor

Sound Editor is a multiwindow application program that enables the user to manipulate data displayed in each window. There are three types of windows:

- Signal windows
- Spectrogram windows
- LPC windows

10.2.1 Signal Window

A Signal window displays the sound waveform (i.e., the temporal representation of a sound). Each displayed sound waveform is given a title, shown on the Title bar of the Signal window. The title is in the form:

`Signal` *`x`*`: filename`

where *x* is a number representing the *Context Identifier* (see section 10.2.4). The *filename* is the name of the file associated with the displayed sound waveform (with a default extension name .SIG) if it exists, or Untitled, if there is no file associated with it. If sound samples in the Signal window are modified, an asterisk (*) is appended to the filename, indicating that modification occurred.

In the upper right corner of the Signal window, information about the sound waveform is displayed, e. g., the label, version number in the WINSDS Application database, and sampling rate. For example, information for a sound waveform opened from a WINSDS Application, which is the *second version* of the Word labeled as *ONE*, sampled at 10 kHz, would be:

```
Label: 'ONE' Ver: 2 Fs: 10kHz
```

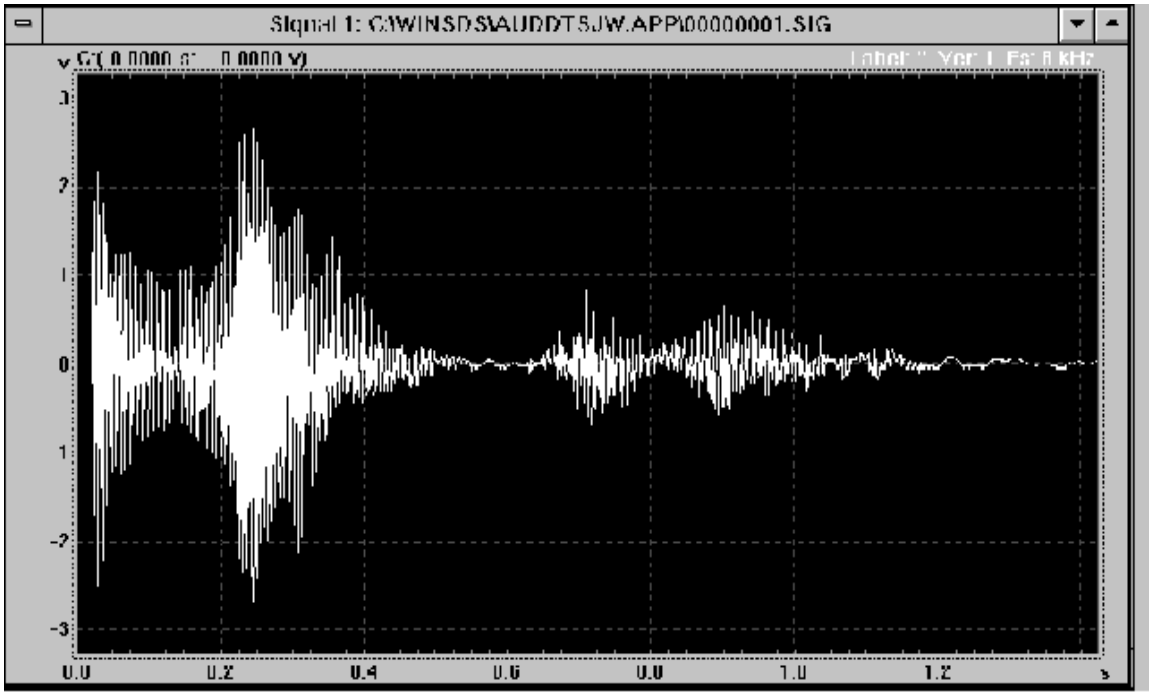
In the upper left corner of the Signal window, data for the current cursor position is given:

`C: (`*`x`*`, `*`y`*`)`

where *C* stands for the *current cursor*, *x* for the *time instant* of the current cursor position, and *y* for *amplitude* of the displayed sound waveform at the current cursor position.

In the sound display area of the Signal window, *red* dashed lines give the *time* along the horizontal axis and *amplitude* along the vertical axis. The *green* lines at the top and bottom of the display area indicate Frame boundaries of the displayed sound waveform. If the duration of the displayed sound waveform is too long, Frame markers are not displayed. The Frames of a displayed sound waveform are used for LPC analysis. The displayed sound waveform in a Signal window can be edited and saved to a disk file.

Figure 10–1. Signal Window



10.2.2 Spectrogram Window

A Spectrogram window displays a *sound spectrogram* (i.e., a time-frequency representation of a sound). Each sound spectrogram is displayed along with a title in the Title bar, which has the form:

```
Spectrogram x: filename
```

where *x* is a numeric *Context identifier* (see the following). *Filename* represents the filename associated with the sound waveform displayed in the Signal window from which the spectrogram was derived.

A Spectrogram window is divided into two subwindows, a Spectrogram subwindow above and a Cross-Sectional View subwindow below. In the *upper right*-hand corner of the Spectrogram subwindow, is the *analysis bandwidth* for the displayed sound spectrogram. The analysis bandwidth is adjustable. In the *upper left*-hand corner of the Spectrogram subwindow is data on the sound spectrogram at the current cursor position, which takes the form:

```
C: (x)
```

where *C* stands for the *current cursor*, and *x* represents the *time instant* of the current cursor position. In the spectrogram display area of the Spectrogram

subwindow, *red* dashed lines give the *time* along the horizontal axis and *amplitude* along the vertical axis.

The Cross-sectional View subwindow displays *frequency* information for the Spectrogram subwindow at the current cursor position. The display is refreshed each time the cursor position in the Spectrogram subwindow changes. In the *upper left*-hand corner of the Sectional View subwindow is data for the current cursor position in that window, which takes the form:

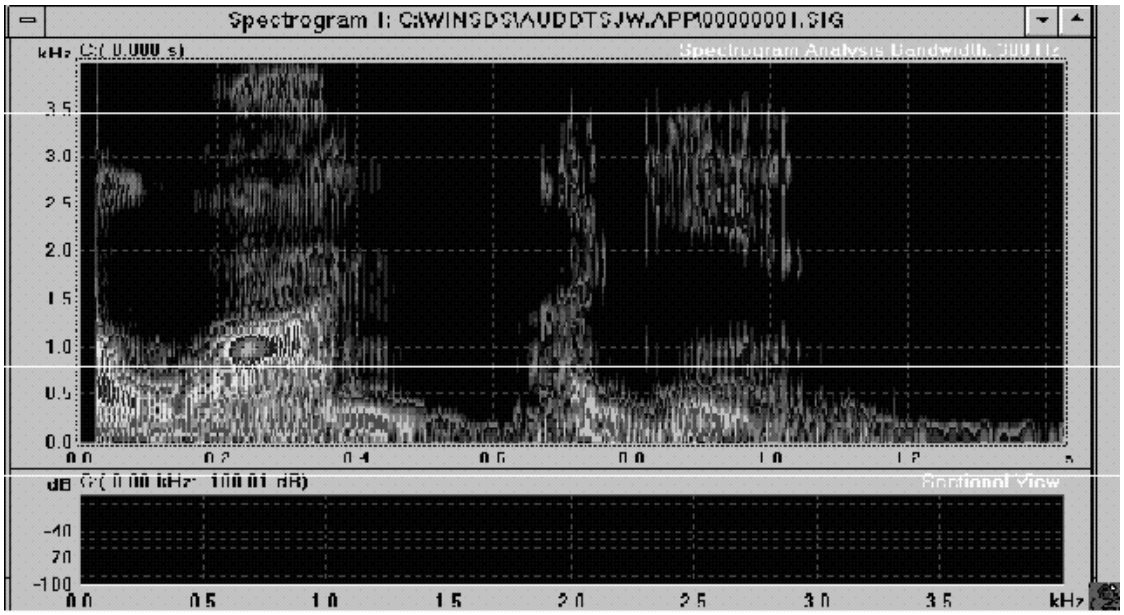
```
C: (x, y)
```

where *C* stands for the *current cursor*, *x* for the *frequency* value at the current cursor position, and *y* for the *spectral power* value at the current cursor position. In the display area of the Sectional View subwindow, *red* dashed lines give the *frequency* along the horizontal axis and *power spectrum magnitude* along the vertical axis.

Note:

The sound spectrogram displayed in a Spectrogram window cannot be edited or saved to a disk file.

Figure 10–2. Spectrogram Window



10.2.3 LPC Window

An LPC window displays all LPC parameters (except Pitch) extracted from an LPC spectrogram of a sound waveform. Each LPC spectrogram is given a title, which is shown in the Title bar of the LPC window. The title is in the form:

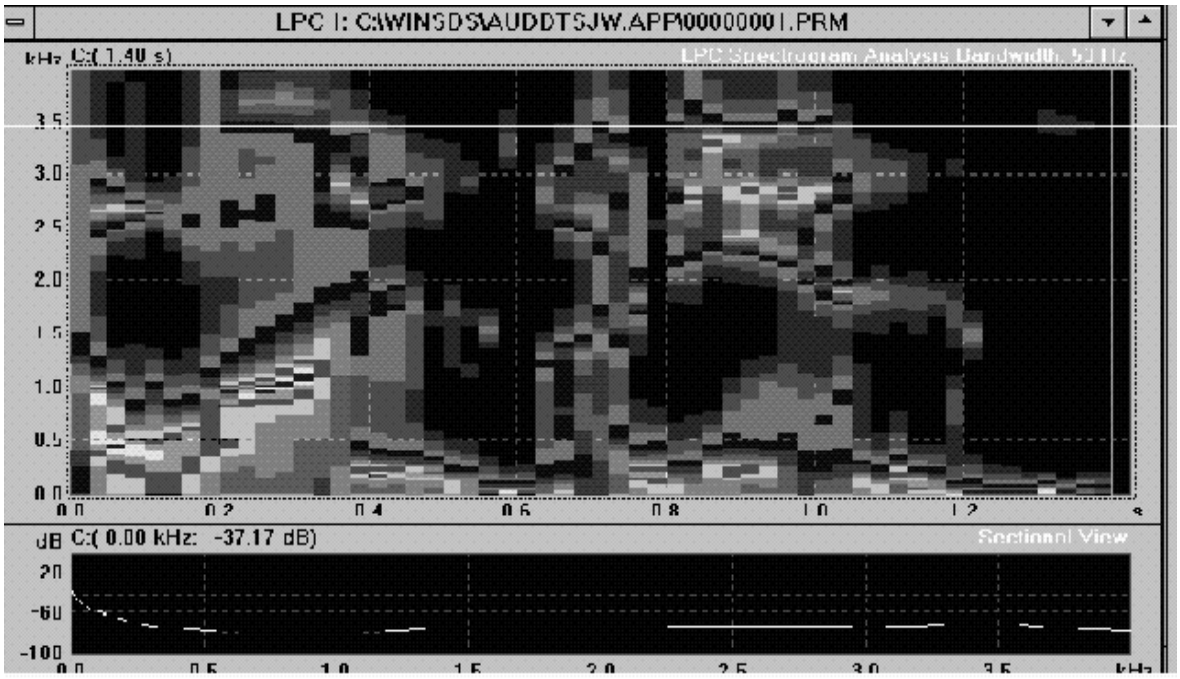
```
LPC x: filename
```

where *x* is a numeric *Context identifier* (see the following). *Filename* represents the filename associated with the sound waveform displayed in the Signal window from which the LPC spectrogram was derived (but with a default extension .PRM). The LPC window is similar to the Spectrogram window. (See Section 10.2.2. for details on Spectrogram windows.)

Note:

The LPC spectrogram in an LPC window *cannot be edited*, but it *can be saved* to a disk file. LPC parameters (and Pitch) are saved, but *not* the LPC spectrogram.)

Figure 10–3. LPC Window



10.2.4 Context

Context includes a Signal window, Spectrogram window, and an LPC window for a signal. It is possible to work with multiple Contexts. A Context is identified by a unique number displayed on the Title bars of the Signal, Spectrogram, and LPC windows within the same Context. Each time you open a sound sample file, import a sound file, or generate a sound, a new Context is created automatically. When a file is saved, both the sound samples in the Signal window and the LPC parameters in the LPC window are saved.

Cursors in the three windows of a Context can be locked, so that when the cursor in one window is moved, the cursors in the other windows move simultaneously. For example, when the cursor in a Signal window is moved, the cursors in the Spectrogram subwindow of the Spectrogram window, and the LPC spectrogram subwindow of the LPC window also move. Likewise, when the cursor in the Sectional View subwindow of the Spectrogram window is moved, the cursor in the Sectional View subwindow of the LPC window moves simultaneously.

10.2.5 Working With The Mouse

You can manipulate data displayed in a window by using the mouse to move the cursor and select or unselect a set of data.

- *To move the cursor to a new position* — Click the mouse at the new position, or click on the cursor and drag it to the position.
- *To Make a Selection* — Press the *left* button on the mouse at the starting position of the data set and drag it to the end position. This action highlights the Selection.
- *To Select all the displayed data* — Double-click the mouse anywhere in the window.
- *To Unselect a set of data* — Click the mouse anywhere in the window.

10.2.6 Working With The Keyboard

You can also manipulate data displayed in a window by using keystrokes to move the cursor and zoom in and out on the horizontal or vertical axis.

- *To Move the cursor to a new position* — Use → or ← to move the cursor sample-by-sample to the right or left. Holding the arrow keys down moves the cursor more rapidly. The combinations CONTROL + → and CONTROL + ← move the cursor 20 samples at a time to the right or left.

The HOME and END keys position the cursor at the first and last sound samples displayed. The combinations CONTROL + HOME and CONTROL + END position the cursor at the first and last samples *of the sound waveform*.

- *Increasing the Zoom* — Press + to increase the Zoom on the *horizontal* axis (i.e., to reduce the number of samples displayed on either side of the cursor by a factor of two).

Press * to increase the Zoom on the *vertical* axis (i.e., to decrease the dynamic display by a factor of two).

Note:

These commands do *not* work if the number of samples displayed is less than 1/16 of the total number of samples in the sound waveform.

- *Decreasing the Zoom*: Press - to decrease the Zoom on the *horizontal* axis (i.e., to double the number of samples displayed on either side of the cursor).

Note:

This command will *not* work if the total number of samples in the sound waveform is already displayed.

- Press / to decrease the Zoom on the *vertical* axis (i.e., to double the dynamic display).
- *To Move the displayed Vertical Zoom*: Press ↑ or ↓ to move the displayed vertical Zoom in *small* steps or PAGE UP or PAGE DOWN to move in *large* steps.
- *To Center the displayed Vertical Zoom*: Press INSERT to center the displayed vertical Zoom on the sound-sample value at the current cursor position. This command is useful after you have pressed / several times so that the display has disappeared because it is outside the display area.
- *To Remove Zoom*: Press DEL to remove the Zoom on the *horizontal* axis. Press SHIFT + DEL to remove the Zoom on the *vertical* axis. Press CONTROL + DEL to remove the Zoom from *both* the horizontal and vertical axes.

10.3 Sound Editor Package and Installation

10.3.1 Sound Editor Package

Sound Editor is part of the WINSDS board and software package. Table 10–4 lists the software package files.

Table 10–4. Software Package Files

Feature	Definition
SNDEDIT.EXE	Sound Editor Windows Executable Code file
SNDEDIT.HLP	Sound Editor on-line Help file
CURVEFIL.VBX	Sound Editor Signal Window Management module
SPECGRAM.VBX	Sound Editor Spectrogram Window Management module
FADER.VBX	Sound Editor Data Dialog Control module
SNDDRIVR.DLL	Sound Editor Basic Functions module
WAVECONV.DLL	Sound Editor Support module for Wave format sound files
SDSDRIVR.DLL	WINSDS Board Driver
BA_TMS.A0	WINSDS Board Driver
CMDIALOG.VBX	VB Support module
THREED.VBX	VB Support module
VBRUN300.DLL	VB Support module

10.3.2 Sound Editor Installation

Sound Editor is installed automatically during WINSDS installation.

10.4 Starting Sound Editor

To get into Sound Editor, go to the WINSDS File Menu and click on Sound Editor. This command exits WINSDS and transfers control to Sound Editor. The current Application name is also transmitted to Sound Editor.

You can also launch Sound Editor by clicking on its icon 

in WINDOWS Program Manager.

10.5 File Menu

The File Menu offers several commands for opening and displaying an existing WINSDS Application Signal file, closing and saving a window, or converting an existing sound-sample file from another format into the WINSDS sample format.

10.5.1 Open CONTROL + O

The Open command in the File Menu opens an existing WINSDS Application Signal file. An Open dialog box asks for the name of the WINSDS Application Signal file to be opened. If the filename entered is not a valid filename, a message appears. If the filename entered is valid, Sound Editor opens the file and creates a new Signal window to display the file.

If an LPC parameter file (of the opened WINSDS Application Signal file) exists, it is displayed in the LPC window of the newly created Context. LPC Analysis Setup parameters, including sampling rate, LPC analysis method, number of samples per Frame, as well as the Word label and version number, are loaded into Sound Editor for work on the newly created Context.

Sound Editor maintains a list at the bottom of the File Menu, of names of the four most recently opened files. Clicking on one of the filenames in the list opens the corresponding WINSDS Application Signal file.

10.5.2 Close CONTROL + W

The Close command in the File Menu closes the current active window, i. e., a Signal window, an LPC window, or a Spectrogram window. If the data displayed in the window have been modified since the last Save, Sound Editor displays a message asking if the data should be saved before closing the window.

10.5.3 Save / Save (As) CONTROL + S / CONTROL + A

The SAVE command in the File Menu can only be used to save data displayed in a Signal window or an LPC window. A spectrogram *cannot* be saved. The Save command saves the data displayed in the current active window (a Signal or LPC window) to the WINSDS Application from which the Signal file was opened or to the file on which the last Save action was performed. If the Signal window or LPC window of the same Context are both open, then they are both saved. If the data displayed in the LPC window have not been updated since the last modifications were made to the Signal window, Sound Editor asks if an Update should be performed before saving.

Since the WINSDS Application database maintains several versions of Signal files with the same Word label, data from Signal and LPC windows are saved to a new version of the label. Thus, filenames for the data displayed in the windows are changed to new filenames, and the version number changes to the last version of the label.

If the data displayed in the window is *not* associated with a disk file (i.e., Untitled), the Save command acts as Save As. The Save As command saves the data displayed in the current active window (Signal or LPC window) to a different WINSDS Application. If the Signal and LPC windows of the same Context are both open, they are both saved. If the data displayed in the LPC window has not been updated since the last modifications were made to the Signal window, Sound Editor asks if an Update should be performed before saving.

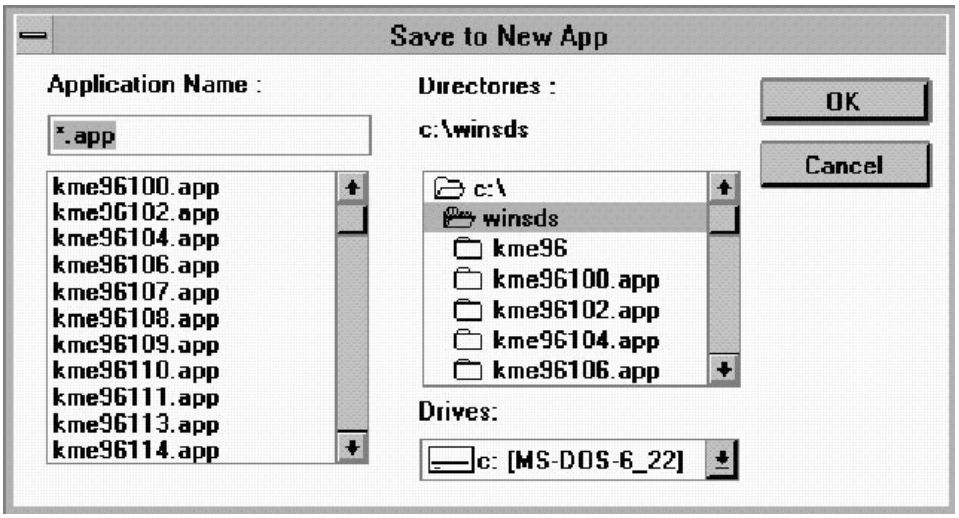
Clicking on Save As in the File Menu causes a Save As dialog box to appear. Type in a valid WINSDS Application filename to which the displayed data are to be saved. A Valid WINSDS Application means that the existing WINSDS Application's sampling rate, LPC analysis method, speech synthesizer chip, transcoding table, and number of samples per Frame for LPC analysis are all the same as those of the data displayed in the window to be saved. If a valid WINSDS Application is found, Sound Editor suggests a filename for saving the displayed data. Then a prompt to enter a Word label appears.

Since the WINSDS Application database maintains several versions of Signal files with the same Word label, data from Signal and LPC windows are saved to a new version of the label. Thus, filenames for the data displayed in the windows are changed to new filenames, and the version number changes to the last version of the label.

10.5.4 Save to (New) Application CONTROL + P

Choosing the Save to (New) Application command in the File Menu causes a Save to New App window to appear as shown in Figure 10–4. To create a new application, select the directory location where you want to put your New Application. Then type the name of the Application. Application settings for a New Application in Sound Editor are found in the Options Menu: (1) Parameter settings in the LPC Settings submenu, and (2) Sampling rate in the Sample Rate submenu.

Figure 10–4. Save to New Application Window



10.5.5 Import WAVE

The Import WAVE command in the File Menu opens a sound-sample file in Microsoft WAVE format. The sound wave files, with the Microsoft PCM and ADPCM format and the sampling rates shown in the following list, are converted to Sound Editor sound-sample file format with either an 8 kHz or 10 kHz sampling rate, selected from the Options Menu:

- 48 kHz
- 44.1 kHz
- 22.5 kHz
- 11.25 kHz

If the sound-sample file in WAVE format contains stereo sound samples, prompts appear asking whether you want to import *only the left* channel, *only the right* channel, or a *mix of both* channels (scaled down by a factor of two).

Note:

Since Import Wave uses a sampling rate conversion filter, which runs on the WINSDS board, this command will *not* work if the DSP board is not present.

10.5.6 Import SMP

The Import SMP command opens a sound-sample file in SampleVision's® SMP format. The sound wave files, with sampling rates ranging from 51.2 kHz

to 8 kHz or 10 kHz, are converted into Sound Editor sound-sample file format with either an 8 kHz or 10 kHz sampling rate, which is selected using the Sample Rate command in the Options Menu (see the following).

Note:

Since Import SMP uses a sampling rate conversion filter, which runs on the WINSDS board, this command will *not* work if the DSP board is not present.

The converted sound waveform is displayed in the new Signal window of an automatically created context with no filename (i.e., Untitled). The LPC parameters, previously set up using the LPC Settings command in the Options Menu (see the following), are copied to the new Context. The WINSDS Application in which the imported sound wave is to be saved should have the same LPC settings and sampling rate as the sound waveform in the Signal window.

10.5.7 Convert WINSDS

The Convert WINSDS command opens a WINSDS Application Signal file with either an 8 kHz or 10 kHz sampling rate. A message appears, asking if you want to convert the file into the Sound Editor sound-sample file format with a different sampling rate (changing 8 kHz to 10 kHz or vice versa) regardless of the sampling rate selected using Sample Rate in the Options Menu (see the following).

If you click on Yes, the file is converted and displayed in the new Signal window of an automatically created Context with no filename (i. e., Untitled). The LPC parameters of the WINSDS Application are copied to the new Context. The sampling rate of the converted sound-sample file is the new sampling rate. The WINSDS Application should have the same LPC settings and sampling rate as the sound waveform in the Signal window. The corresponding LPC parameter file of the WINSDS Application Signal file is not opened, since the Pitch parameter is *not* analyzed with the new sampling rate.

If you click on No, the WINSDS Application Signal file is opened, preserving its original sampling rate. In this case, Convert WINSDS acts just like the Open command.

Note:

Since Convert WINSDS uses a sampling rate conversion filter, which runs on the WINSDS board, this command will *not* work if the DSP board is not present.

10.5.8 Import Raw File

The Import Raw File command imports a pre-recorded raw 16-bit sound file to Sound Editor. Before importing the raw sound file, select the sampling rate for the imported file using the Sample Rate submenu in the Options Menu.

10.5.9 Exit

The Exit command ends Sound Editor and returns to WINDOWS. Before exiting, the sampling rate, LPC settings, Auto Fade settings, and Spectrogram settings (set via the Options Menu), are saved to a file named SNEDIT.INI in the WINDOWS directory. The next time Sound Editor is started, these settings are reloaded.

10.6 Edit Menu

10.6.1 Cut, Copy, Paste, And Undo

The Edit Menu offers several commands for editing or Zooming In or Out when viewing sound samples displayed in a Signal window. Zoom commands are also available for LPC and Spectrogram windows, as well as for the Clipboard window (see the Show Clipboard command in the Window Menu).

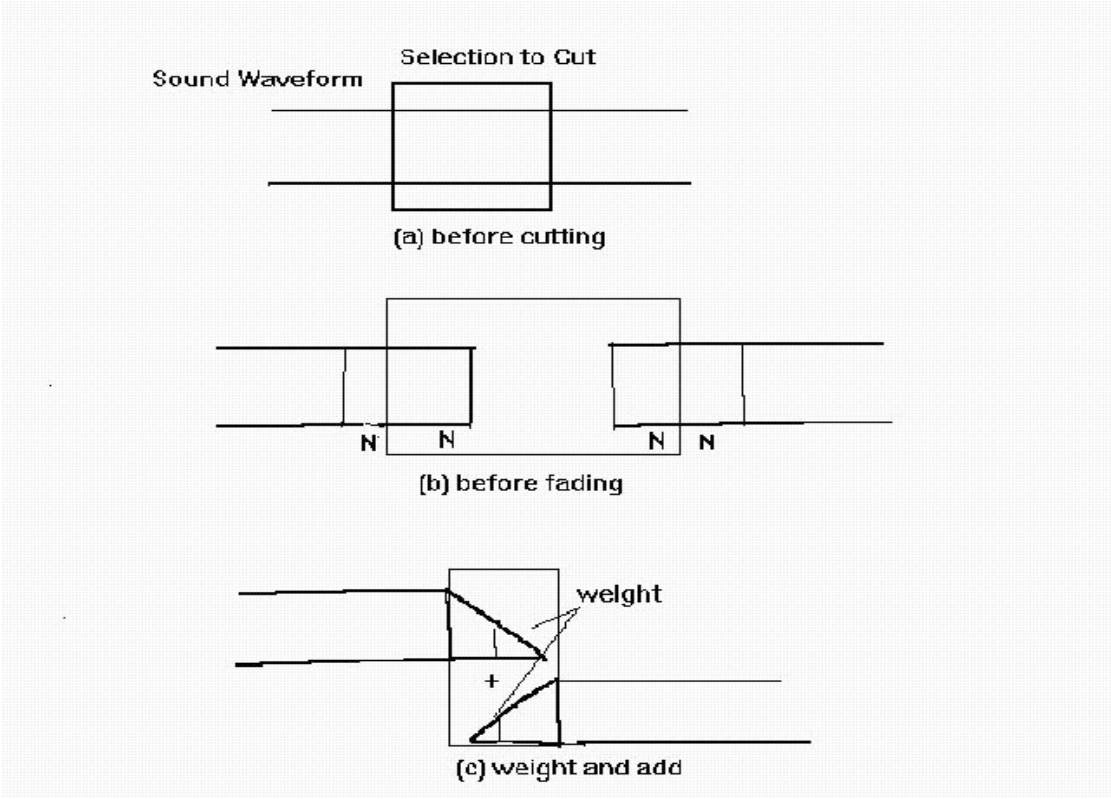
Cut CONTROL + X

The Cut command in the Edit Menu copies a selection of sound samples from an active Signal window to the Clipboard for use later, and the Selection is deleted from the Signal window. If automatic Cross Fading (set via the Auto Fade command in the Options Menu) is required, a number of samples before and after the selection are also copied to the Clipboard for future Cross Fading.

Note:

The extra samples that were copied will not appear on the Clipboard display. The two ends of the remaining signal after the selection has been deleted are cross faded.

Figure 10–5. Cross Fading



After the Selection of sound samples has been copied to the Clipboard (as in Figure 10.5a), N samples before and after each Selection boundary are preserved (as in Figure 10.5b). Then the two sections of 2N samples are Cross Faded through linear interpolation (as in Figure 10.5c). In this way, the remaining sound waveform preserves its phase continuity. The N is defined by the Fade Duration parameter set using the Auto Fade command in the Options Menu. Follow the same procedures to apply Cross Fading to other Edit commands.

Copy CONTROL + C

The Copy command in the Edit Menu copies a Selection of sound samples from an active Signal window to the Clipboard for use later. If automatic Cross Fading (set via the Auto Fade command in the Options Menu) is required, a number of samples before and after the Selection are also copied to the Clipboard for future Cross Fading.

Note:

The extra samples that were copied will not appear on the Clipboard display.

Paste CONTROL + V

The Paste command in the Edit Menu copies sound samples to the Clipboard and inserts them at the current cursor position in an active Signal window if no sound samples are selected in the window. If there is a Selection of sound samples in the window, the Paste command replaces the current sound samples of the current active Signal window. If automatic Cross Fading is required (set by using the Auto Fade command in the Options Menu), both ends of the Pasted sound samples are Cross Faded with the ends of the sound samples in the Signal window. If the sampling rate of the remaining sound samples in the Clipboard is different from that of the current active Signal window, a message appears asking if you want to continue.

Undo CONTROL + Z

The Undo command in the Edit Menu cancels the last editing action on the sound samples displayed in a Signal window. Sound Editor preserves a trace of the last editing action performed for each Signal window, so that it can be canceled.

10.6.2 Mirror

Horizontal Mirror

The Horizontal Mirror command in the Edit Menu inverts the *time* axis of Selected sound samples in the current active Signal window. If automatic Cross Fading is required (set by using Auto Fade in the Options Menu), both ends of the inverted sound samples are Cross Faded with the ends of the remaining sound samples in the Signal window.

Vertical Mirror

The Vertical Mirror command in the Edit Menu inverts the polarities of Selected sound samples for the current active Signal window. If automatic Cross Fading is required (set by using Auto Fade in the Options Menu), both ends of the inverted sound samples are Cross Faded with the ends of the remaining sound samples in the Signal window.

10.6.3 Adjust Envelope

The Adjust Envelope command in the Edit Menu applies user-defined adjustments to the envelope for Selected sound samples in the current active

Signal window. If automatic Cross Fading is required (set by using Auto Fade in the Options Menu), both ends of the adjusted sound samples are Cross Faded with the ends of the remaining sound samples in the Signal window.

Clicking on this command opens a dialog box for you to draw an envelope pattern to be applied to the Selection. The vertical axis of the drawing area represents the *normalized amplitude* of the drawn envelope pattern. The horizontal axis represents the *time instants* of the Selected sound samples, which are indicated by the number of samples of the Selection. By default, the envelope pattern is initialized as a flat pattern with an amplitude value of 1.0, which means that no new envelope pattern is to be applied. Then, the mouse can be used to drag the initial pattern curve to the desired pattern. Clicking on OK in the dialog box applies the drawn pattern to the Selection. Clicking on Cancel cancels the Adjust Envelope command.

10.6.4 Amplify

The Amplify command in the Edit Menu applies a user-defined *gain* to the Selected sound samples of the current active Signal window. If automatic Cross Fading is required (set by using Auto Fade in the Options Menu), both ends of the amplified sound samples are Cross Faded with the ends of the remaining sound samples in the Signal window.

Clicking on this command opens a dialog box for you to enter a *gain value in decibels (dB)* for amplification. Sound Editor sets minimum and maximum values for the gain to be entered. A minimum gain of –90 dB, in practice, attenuates the Selected sound samples to silence. In order to prevent eventual arithmetic overflow of the amplified sound samples, the maximum gain value is determined by Sound Editor as a function of the current maximum amplitude of the Selected sound samples. Clicking on OK in the dialog box applies the entered gain to the Selection. Clicking on Cancel cancels the Amplify command.

10.6.5 Mixing

The Mixing option of the Edit Menu offers three commands:

- Add
- Subtract
- Multiply

Using these commands, sound samples from the Clipboard can be added to, subtracted from, or multiplied by Selected sound samples in the current active Signal window. If the *duration* of the sound samples from the Clipboard and

the Selected sound samples in the Signal window are not the same, the duration of the resulting mixed samples takes on the value of the *shorter* duration. If automatic Cross Fading is required (set by using Auto Fade in the Options Menu), both ends of the mixed sound samples are Cross Faded with the ends of the remaining sound samples in the Signal window. If the sampling rate of the sound samples from the Clipboard are different from that of the active Signal window, a message appears asking whether you want to continue or cancel the Mixing command.

10.6.6 Zoom

Zoom In CONTROL + I

The Zoom In command in the Edit Menu expands a Selection of sound samples in the current active Signal window to the full width of the window. There is a maximum of 20 levels for Zoom In. Each time you click on this command, Zoom level is increased by one.

Zoom Out CONTROL + F

The Zoom Out command in the Edit Menu redisplays the sound samples of the current active Signal window as they were before the last Zoom In. Each time you click on this command, Zoom level is decreased by one.

10.7 Generator Menu

The Generator menu provides commands for generating the following types of waveforms, for which *amplitude*, *frequency*, and *duration* can be altered. (*Phase continuity* is also possible for user-defined Arbitrary waveforms.)

- Sine Waves
- Saw Waves
- Square Waves
- User-defined Arbitrary Waves

Commands are also provided to generate *Gaussian and Uniformly distributed white noise,* for which *power* and *duration* can be altered.

10.7.1 Sound Wave Commands

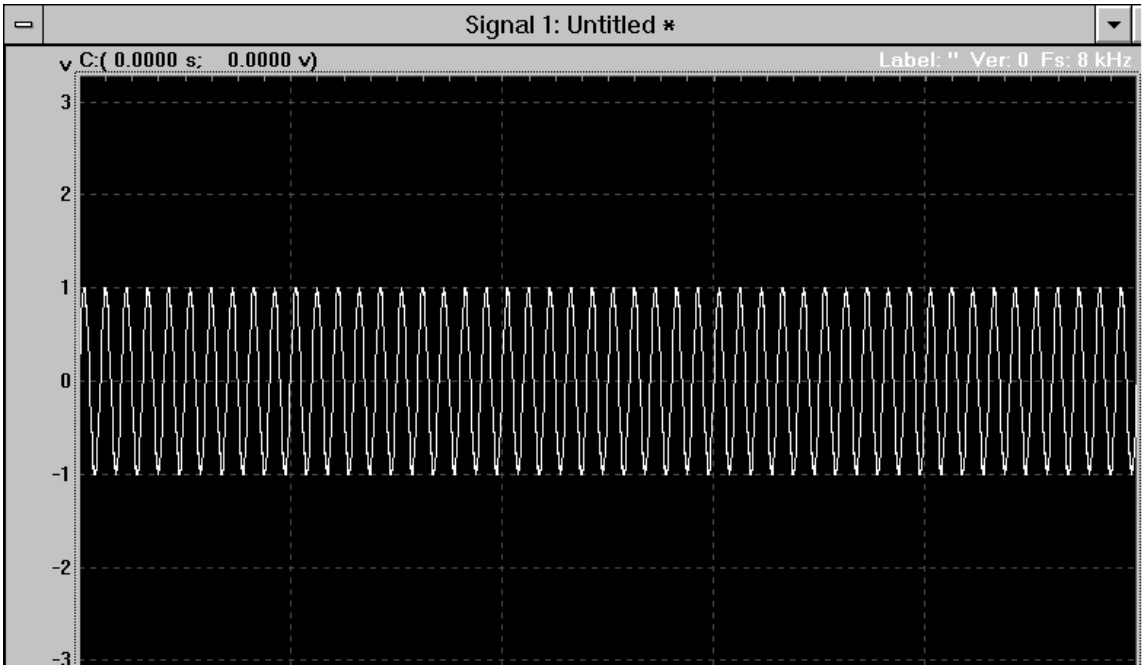
Sine Wave

The Sine Wave command in the Generator menu generates a *sine* waveform at the current sampling rate (set using the Sample Rate command in the

OPTIONS Menu). Sound Editor creates a new Context for the generated sound waveform, displays it in the Signal window of the new Context, and labels it as Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the OPTIONS Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *frequency*, *amplitude* and *duration* values. Minimum and maximum values for the parameters are preset by Sound Editor. Clicking on OK in the dialog box applies the values entered to the signal generation. Clicking on Cancel cancels the Sine Wave command.

Figure 10–6. Sine Wave (50 Hz)



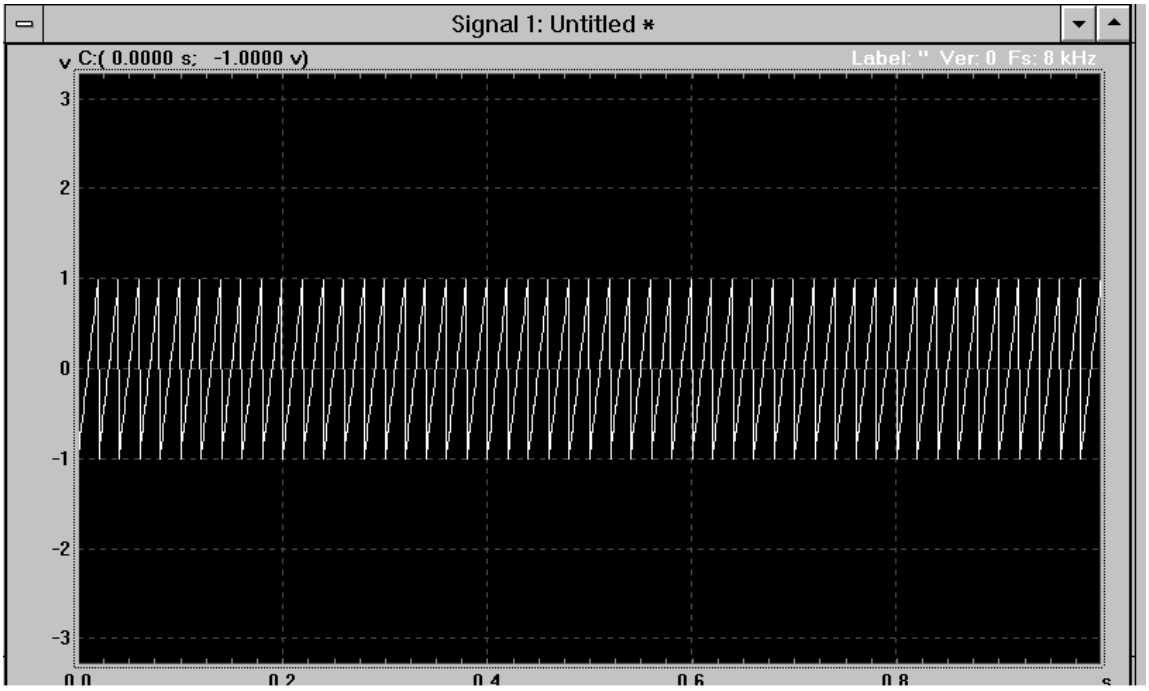
Saw Wave

The Saw Wave command in the Generator menu generates a saw waveform at the current sampling rate (set using the Sample Rate command in the OPTIONS Menu). Sound Editor creates a new Context for the generated sound waveform, displays it in the Signal window of the new Context, and labels it Untitled until a new label is assigned. The sampling rate and LPC

parameters, set previously using the LPC Settings command in the OPTIONS Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *frequency*, *amplitude* and *duration* values. Minimum and maximum values for the parameters are pre-set by Sound Editor. Clicking on OK in the dialog box applies the values entered to the signal generation. Clicking on Cancel cancels the Saw Wave command.

Figure 10–7. Saw Wave (50 Hz)

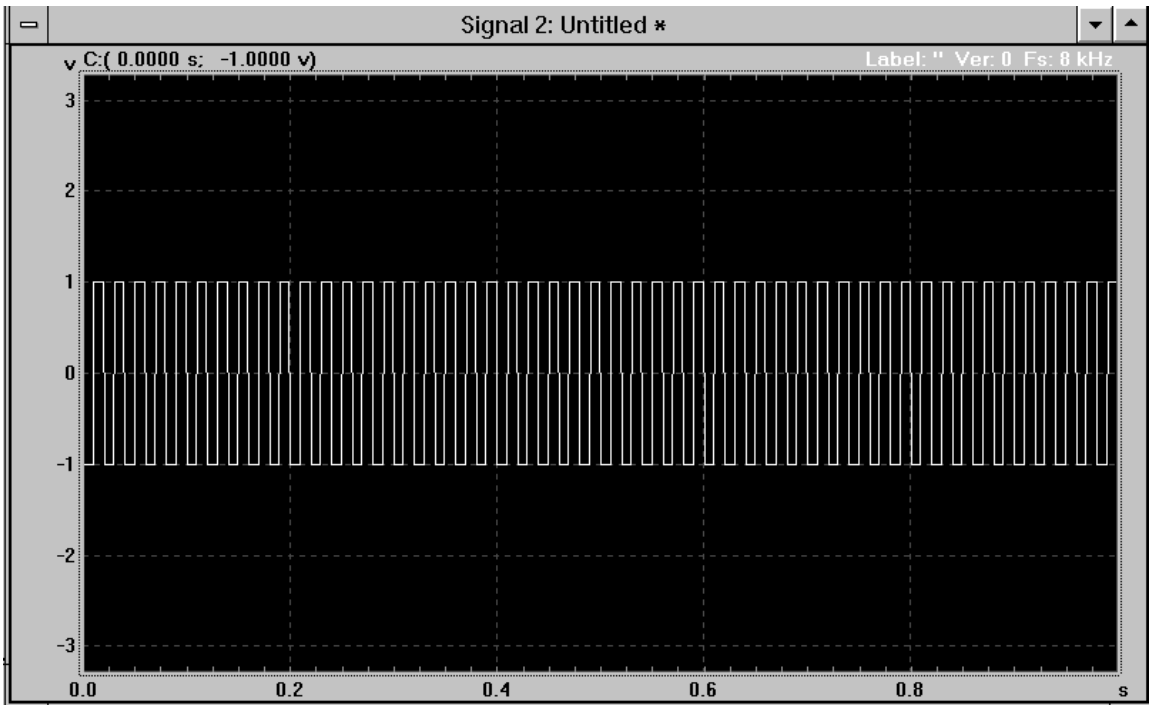


Square Wave

The Square Wave command in the Generator menu generates a *centered square waveform* at the current sampling rate (set using the Sample Rate command in the OPTIONS Menu). Sound Editor creates a new Context for the generated sound waveform, displays it in the Signal window of the new Context, and labels it Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the OPTIONS Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *frequency*, *amplitude* and *duration* values. Minimum and maximum values for the parameters are preset by Sound Editor. Clicking on OK in the dialog box applies the values entered to the signal generation. Clicking on Cancel cancels the Square Wave command.

Figure 10–8. Square Wave (50 Hz)



Draw [Arbitrary Wave]

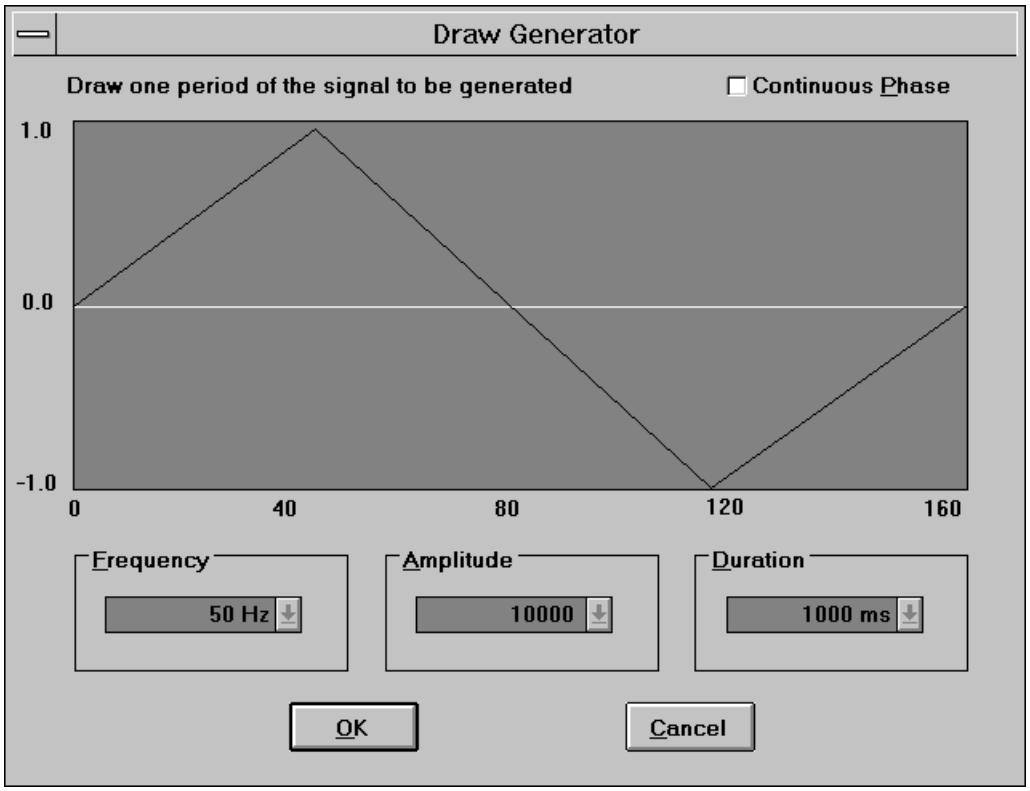
The Draw command in the Generator menu generates *a user-defined arbitrary* waveform at the current sampling rate (set using the Sample Rate command in the OPTIONS Menu). Sound Editor creates a new Context for the generated sound waveform, displays it in the Signal window of the new Context, and labels it Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the OPTIONS Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *frequency*, *amplitude* and *duration* values. Minimum and maximum values for the

parameters are preset by Sound Editor. Then you are prompted to draw one period of the signal to be generated. The *vertical* axis of the drawing area represents the *normalized amplitude* of the drawn signal period. The *horizontal* axis represents the *time instants* of the drawn signal samples, which are indicated by the number of samples in the signal period. The number of samples per signal period is determined by the signal frequency entered. The higher the signal frequency is, the fewer the number of samples per period. By default, the signal amplitudes to be generated are initialized to zero, which generates silence.

Use the mouse to drag the initial signal curve to the desired signal period waveform. If the Continuous Phase box in the dialog box is checked, the first and last samples of the drawn signal period have the same amplitude, ensuring *phase continuity* in the generation of all required signal periods. Clicking on OK in the dialog box applies the entered values to the signal generation. Clicking on Cancel cancels the Draw command.

Figure 10–9. Draw [Arbitrary Wave] (50 Hz)



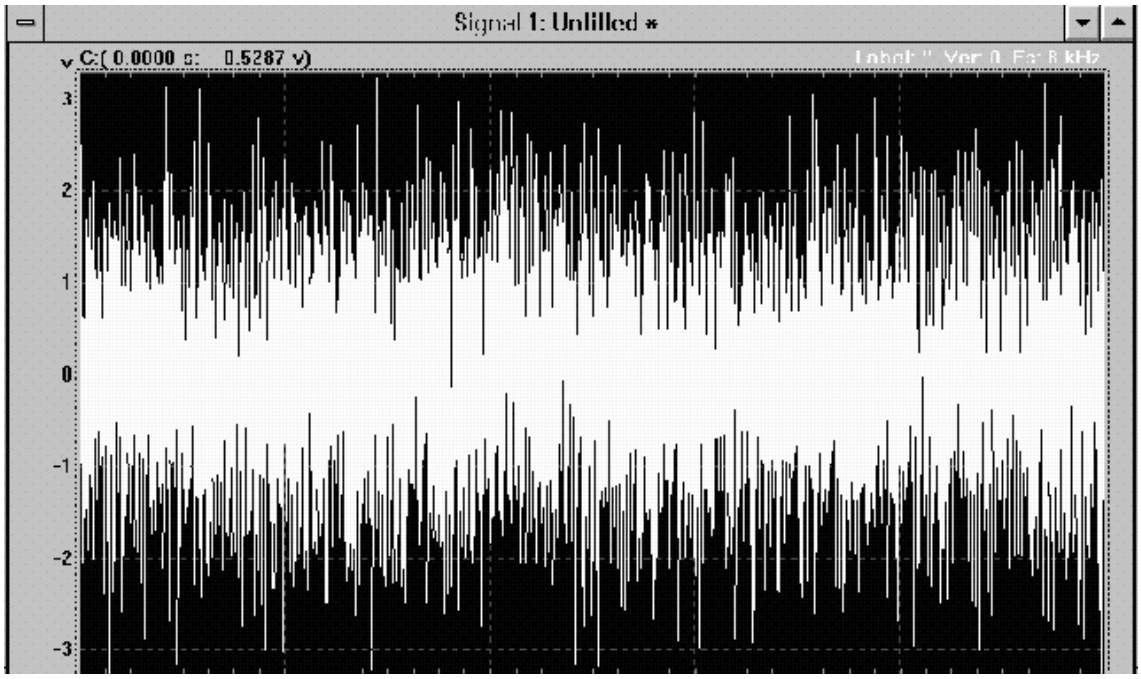
10.7.2 Noise Commands

Gaussian Noise

The Gaussian Noise command in the Generator menu generates a Gaussian law distributed white noise waveform. Sound Editor creates a new Context for the generated sound waveform, displays it in the Signal window of the new Context, and labels it Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the Options Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *power* and *duration* values. Minimum and maximum values for the parameters are pre-set by Sound Editor. Clicking on OK in the dialog box applies the entered values to the signal generation. Clicking on Cancel cancels the Gaussian Noise command.

Figure 10–10. Gaussian Noise (1 Hz)

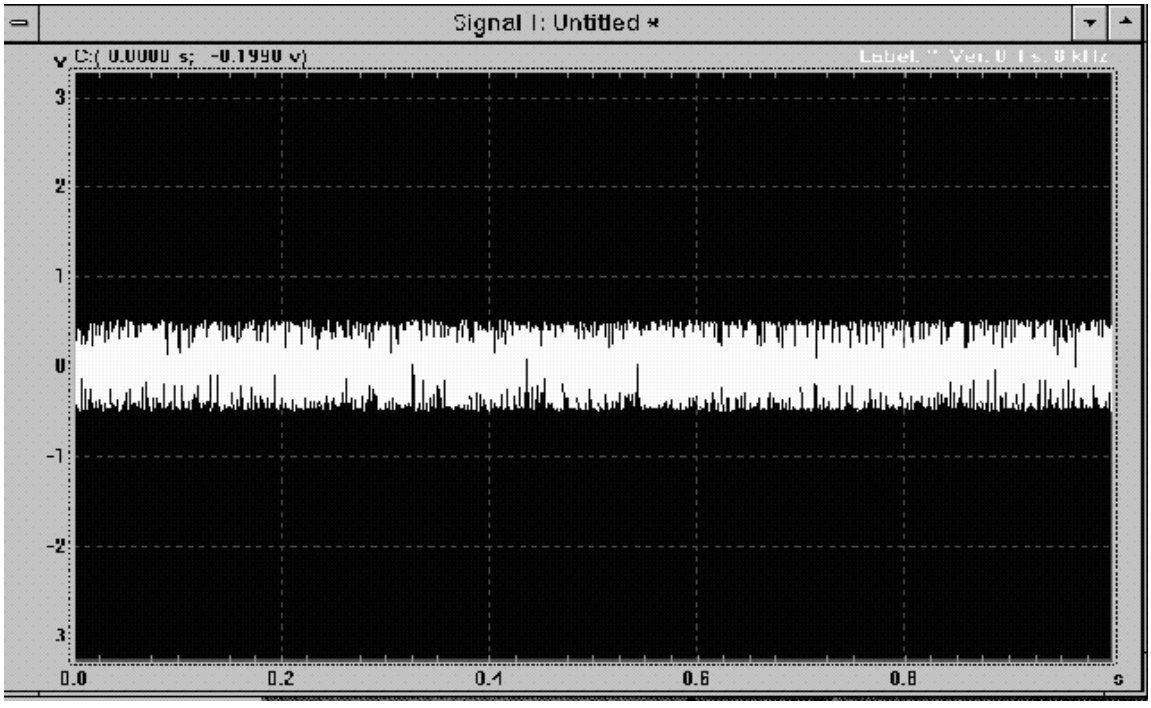


Uniform Noise

The Uniform Noise command in the Generator menu generates a uniformly distributed white noise waveform. Sound Editor creates a new context for the generated sound waveform, displays it in the Signal window of the new context, and labels it as Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the Options Menu (see the following), are copied to the new context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to enter *power* and *duration* values. Minimum and maximum values for the parameters are pre-set by Sound Editor. Clicking on OK in the dialog box applies the entered values to the signal generation. Clicking on Cancel cancels the Uniform Noise command.

Figure 10–11. Uniform Noise



10.8 Processing Menu

The Processing Menu contains several commands for the digital signal processing of sound samples in the current active Signal window:

- Compute and display the spectrogram
- Extract and display the LPC and Pitch parameters
- Filtering
- Envelope Shaping

10.8.1 Spectrogram

The Spectrogram command in the Processing Menu computes the *spectrogram* (*time-frequency* representation) of the sound samples in the current active Signal window (see Figure 10–2). The computed spectrogram is displayed in the Spectrogram window of the context of the current active Signal window.

If the Spectrogram window is not already displayed, it will appear automatically. If the Spectrogram window is already displayed, then the spectrogram is recomputed and redisplayed in the same window (since the sound samples in the current Signal window have been modified since the last spectrogram computation). If the sound samples in the current Signal display window have *not* been modified since the last spectrogram computation, then the Spectrogram window simply redisplays the previously computed spectrogram.

The computed spectrogram is displayed in 16 colors, which represent the power spectrum intensities of the sound spectra. These colors are listed in the following according to increasing power spectrum intensities:

- Black (low-power spectrum intensity)
- Red
- Green
- Brown
- Blue
- Magenta
- Cyan
- Gray
- White
- Light Red
- Light Green
- Light Cyan
- Light Blue
- Yellow
- Bright White (high-power spectrum intensity)

The *spectrogram analysis bandwidth* can be adjusted from 78 Hz to 800 Hz by using the Spectrogram Options command in the Options Menu. This enables you to do either a narrow- (e.g., 45 Hz) or wide-band (e.g., 300 Hz) spectral analysis. Each time a spectrogram is computed, the settings, which were set using Spectrogram Options in the Options Menu, are used for computation and display. Spectrogram Options also allows you to specify low and high *clip* levels for the spectrogram display. These clip levels clip out the lower and higher power spectral intensities of the computed spectra for a better visual display of the spectrogram.

Note:

If the WINSDS DSP board is present, Sound Editor performs the spectral analysis on the DSP board. If the DSP board is *not* present, it performs the analysis on the PC.

10.8.2 LPC Analysis

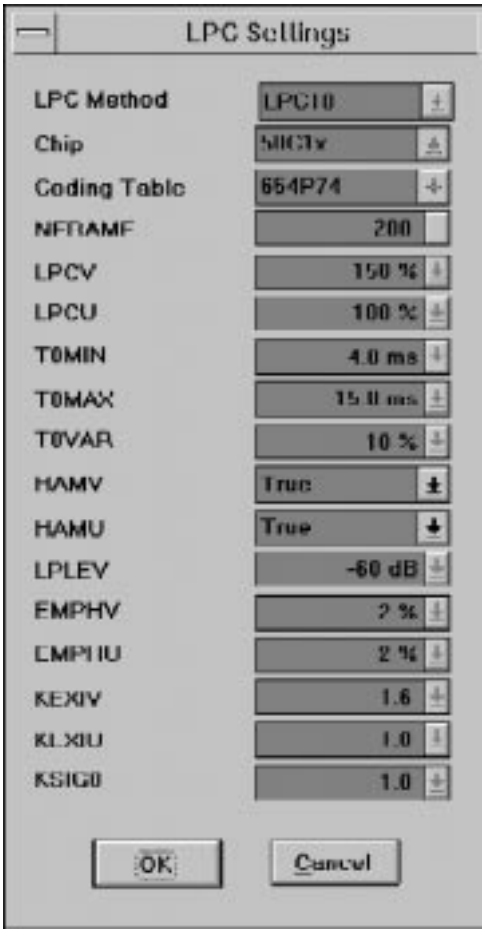
The LPC Analysis command in the Processing Menu extracts LPC parameters (the Linear Predictive Coding model of a sound) and Pitch (for speech signals). The extracted LPC parameters are displayed in the LPC window of the context of the current active Signal window in the form of an LPC spectrogram. (Pitch is *not* displayed.)

If the LPC window is *not* already displayed, it appears automatically. If the LPC window is already displayed, then the LPC parameters are re-computed and re-displayed in the same window provided that the sound samples in the current Signal window have been modified since the last computation of LPC parameters. The LPC window is simply redisplayed if the sound samples in the current Signal window have *not* been modified since the last LPC computation.

The LPC spectrogram is displayed in 16 colors as in the Spectrogram window (see section 10.8.1). Spectrogram options also allows you to specify low and high *clip* levels for the spectrogram display. These clip levels clip out the lower and higher power spectral intensities of the computed LPC spectra in order to obtain a better visual display of the LPC spectrogram.

Each time an LPC analysis is performed, the LPC analysis settings stored with the context are displayed. This allows you to modify some of the settings for the analysis to be performed. (However, settings related to the WINSDS Application setup, i.e., analysis method, coding table, synthesizer chip, and samples per Frame, *cannot* be changed.)

Figure 10–12. LPC Settings



The *LPC spectrogram bandwidth* is not affected by Analysis Bandwidth under Spectrogram Options in the Options Menu. It is determined by the *Voiced LPC analysis window size* parameter (LPCV) of the LPC settings of the Context.

Note:

Since LPC Analysis uses the LPC analysis routines, which run on the WINSDS board, this command does *not* work if the DSP board is not present.

10.8.3 Filtering

The Filtering command in the Processing Menu filters the sound waveform displayed in the current active Signal window. Sound Editor creates a new

Context for the filtered sound waveform, displays it in the Signal window of the new context, and labels it Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the Options Menu (see the following), are copied to the new Context. The WINSDS Application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

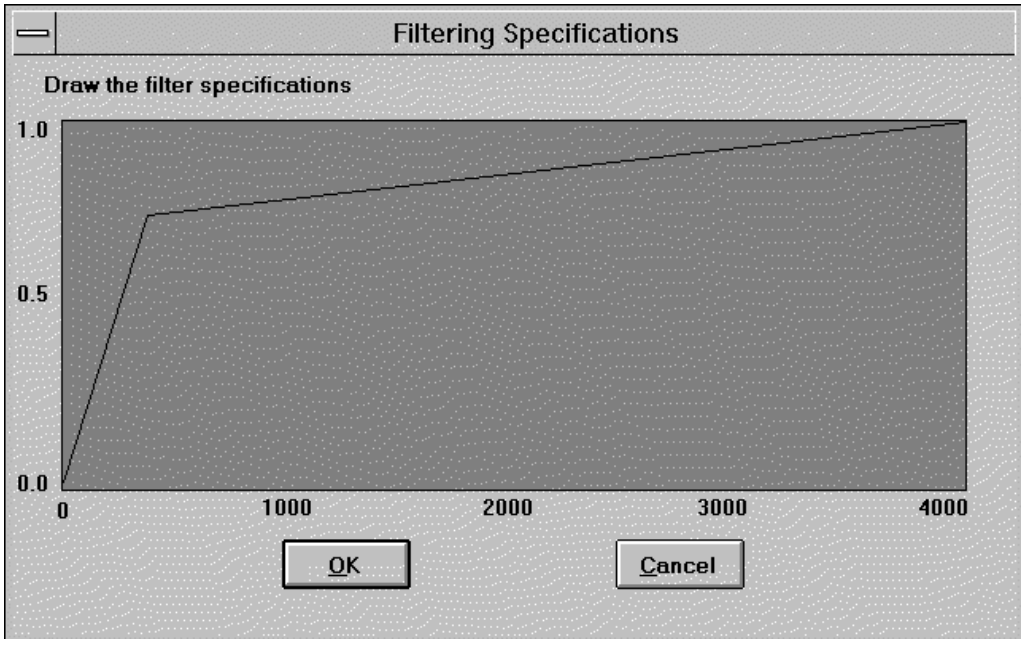
Clicking on this command opens a dialog box for you to draw the filtering specifications. The *vertical* axis of the drawing area represents the *normalized gain of the FFT filter*. The *horizontal* axis represents the *frequency scale*, which is shown as frequency values in Hz, and is determined by the sampling rate of the context of the current active Signal window. By default, the filter frequency components are initialized to 1.0, which results in a pass-all filter. Use the mouse to drag the initial filter curve to the desired filter form.

Clicking on OK in the dialog box applies the specified filter to the current active Signal window. Clicking on Cancel cancels the Filtering command.

Note:

Filtering is performed on the DSP board, if present. If the DSP board is *not* present, filtering is performed on the PC.

Figure 10–13. Filtering Window

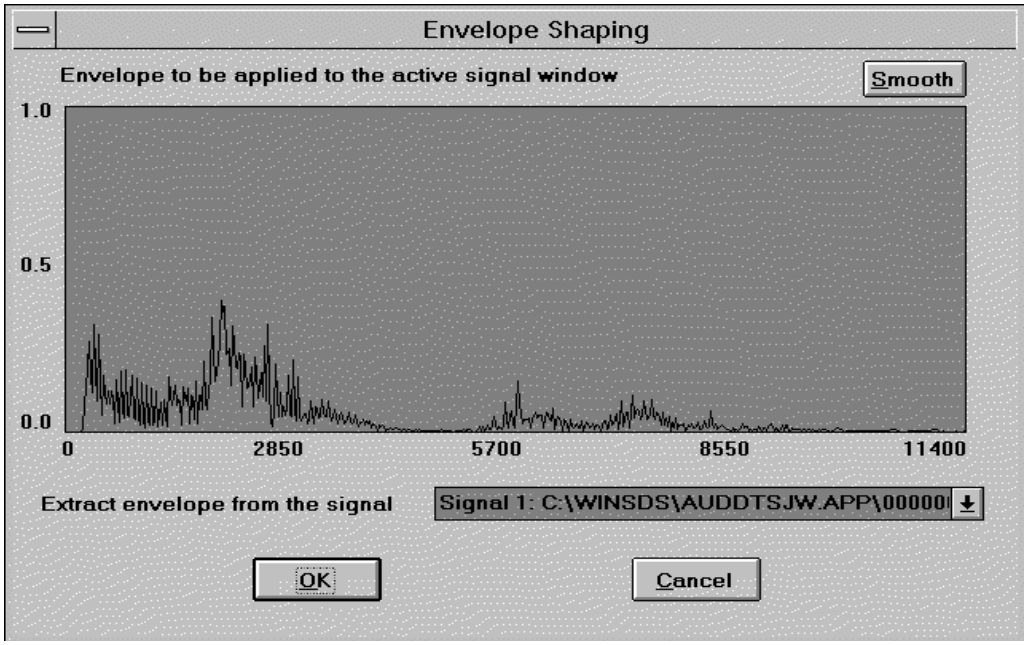


10.8.4 Envelope Shaping

The Envelope Shaping command replaces the entire envelope of the sound waveform displayed in the current active Signal window with a user-defined envelope. Sound Editor creates a new Context for the envelope-shaped sound waveform, displays it in the Signal window of the new Context, and labels it Untitled until a new label is assigned. The sampling rate and LPC parameters, set previously using the LPC Settings command in the Options Menu (see the following), are copied to the new Context. The WINSDS application to which the generated sound wave is to be saved must have the same LPC settings and sampling rate as the generated waveform.

Clicking on this command opens a dialog box for you to draw a new envelope pattern. The *vertical* axis of the drawing area represents the *normalized amplitude* of the drawn envelope pattern. The *horizontal* axis represents the *time instants* of the drawn envelope samples, determined by the number of samples in the current active Signal window.

Figure 10–14. Envelope Shaping Window



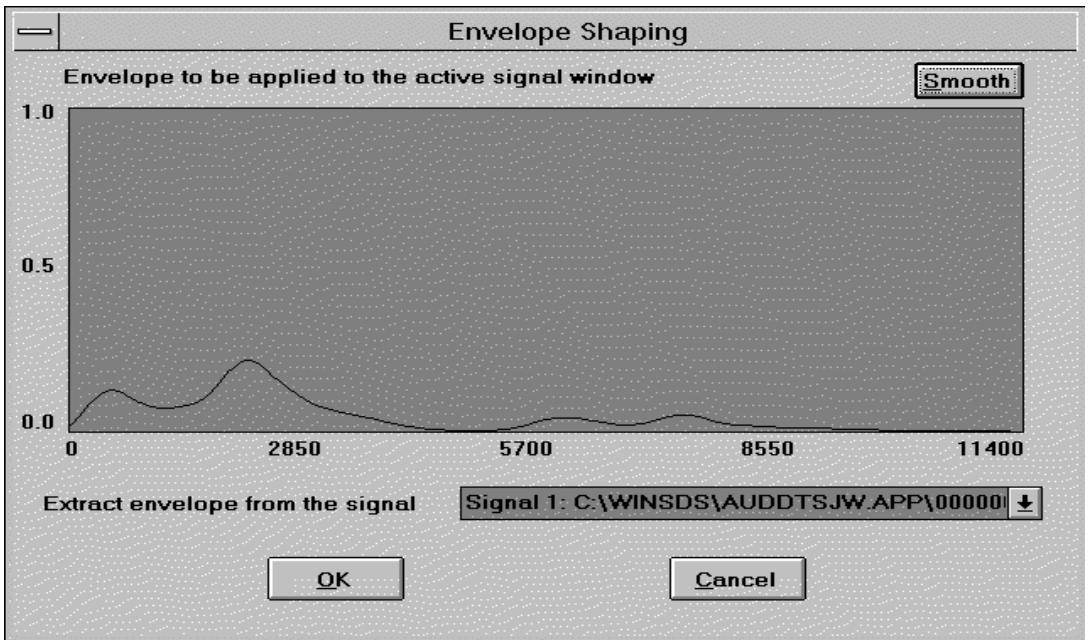
The envelope displayed in the drawing area is down-sampled with respect to the signal envelope of the sound samples displayed is the current active Signal window. A dialog box appears in which the titles of all Signal windows displayed by Sound Editor are listed. This allows you to extract the envelope of each displayed Signal window. When the title of a Signal window is selected

from the list, its envelope is automatically extracted and displayed in the drawing area.

By default, the envelope of the current active signal window is extracted and displayed in the drawing area. Use the mouse to drag the initial envelope pattern to the desired envelope pattern. The Smooth option performs *smoothing* of the currently displayed envelope pattern in the drawing area by applying a moving average window to the envelope pattern. When you click on the Smooth option, a dialog box appears, asking you to enter the *smoothing window length* N, which defines the number of points of the moving average window centered on an envelope pattern sample to be smoothed as 2N + 1.

Clicking on OK in the Envelope Smoothing dialog box applies the smoothing procedure using the user-defined smoothing window length, and then closes the dialog box. That is, clicking on OK replaces the initial envelope pattern in the current active Signal window with the user-defined envelope pattern. Clicking on Cancel cancels the Smoothing command.

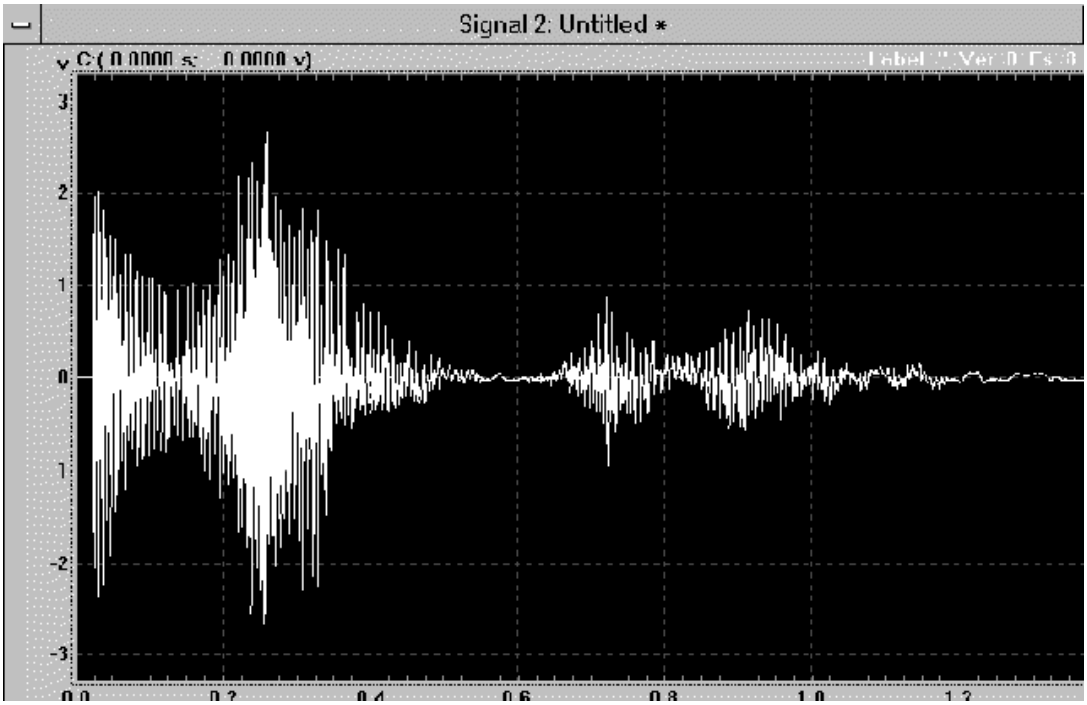
Figure 10–15. Smoothed Envelope



Note:

Envelope shaping is performed on the DSP board, if present. If the DSP board is *not* present, envelope shaping is performed on the PC.

Figure 10–16. User-defined Envelope Pattern



10.9 Playback Menu

The Playback Menu contains the following commands for playing the sound samples in the current active Signal window:

- Play Entire
- Play Selection
- Play Left
- Play Right

10.9.1 Play Entire F5

The Play Entire command in the Playback Menu plays all sound samples displayed in the current active Signal window. If the Signal window is Zoomed, then only the Zoomed sound samples are played.

Note:

Since Play Entire uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.9.2 Play Selection F6

The Play Selection command in the Playback Menu enables you to play a Selection of sound samples displayed in the current active Signal window.

Note:

Since Play Selection uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.9.3 Play Left F7

The Play Left command in the Playback Menu plays sound samples displayed in the current active Signal window starting with the first sample to the *left* of the current cursor position.

Note:

Since Play Left uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.9.4 Play Right F8

The Play Right command in the Playback Menu plays sound samples displayed in the current active Signal window starting with the first sample to the *right* of the current cursor position.

Note:

Since Play Right uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.10 Synthesis Menu

The Synthesis Menu contains the following commands for playing *synthetic* sound samples from the current active LPC window:

- ❏ Synth Entire
- ❏ Synth Selection
- ❏ Synth Left
- ❏ Synth Right

10.10.1 Synth Entire SHIFT + F5

The Synth Entire command in the Synthesis Menu plays all Frames displayed in the current active LPC window. If the user has zoomed in on the LPC window, only the zoomed frames are played.

Note:

Since Synth Entire uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.10.2 Synth Selection SHIFT + F6

The Synth Selection command in the Synthesis Menu plays a selection of LPC frames displayed in the current active LPC window.

Note:

Since Synth Selection uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.10.3 Synth Left SHIFT + F7

The Synth Left command in the Synthesis Menu plays the LPC frames displayed in the current active LPC window, starting with the first frame to the *left* of the current cursor position.

Note:

Since Synth Left uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.10.4 Synth Right SHIFT + F8

The Synth Right command in the Synthesis Menu plays the LPC frames displayed in the current active LPC window, starting with the first frame to the *right* of the current cursor position.

Note:

Since Synth Right uses the WINSDS board for Playback, this command will *not* work if the DSP board is not present.

10.11 Options Menu

The Options Menu contains several commands for setting up Sound Editor's working parameters:

- ❑ Sample Rate
- ❑ LPC Settings
- ❑ Lock Cursors
- ❑ Auto Fading
- ❑ Spectrogram Options

10.11.1 Sample Rate

The Sample Rate command in the Options Menu sets Sound Editor's working sampling rate to 8 kHz or 10 kHz. Choice of sampling rate alters the sound waveform's sampling rate as it is imported from WAVE or SMP® format or generated by Sound Editor.

Note:

This command does not affect the sampling rate of a signal in an open or converted WINSDS application.

10.11.2 LPC Settings

The LPC Settings command in the Options Menu sets up Sound Editor's working LPC settings. The system LPC settings affect only the LPC settings of sound waveforms subsequently imported from WAVE and SMP® formats and those subsequently generated by Sound Editor.

Note:

This command does not affect the LPC settings of a signal in an open or converted WINSDS application.

Clicking on this command opens a dialog box for you to modify LPC settings. These settings should match those of the WINSDS application from which the word was taken. (See Section 4.4, Application Setup for details regarding parameter settings.)

LPC Parameter	Parameter Description
LPC Method	LPC analysis method (LPC 10 or LPC 12)
Chip	Speech synthesizer chip used for synthesis
Coding Table	Transcoding table used for synthesis
NFRAME	Number of samples per Frame
LPCV	Number of samples in the Voiced LPC analysis window
LPCU	Number of samples in the Unvoiced LPC analysis window
T0MIN	Minimum Pitch period in milliseconds (ms)
T0MAX	Maximum Pitch period in milliseconds (ms)
T0VAR	Minimum percentage of variation allowed per Pitch period for Pitch re-evaluation
HAMV	Flag for Voiced analysis Hamming window
HAMU	Flag for Unvoiced analysis Hamming window
LPCLEV	Threshold in decibels (dB) for zeroing LPC parameters during LPC analysis
EMPHV	Voiced analysis pre-emphasis coefficient
EMPHU	Unvoiced analysis pre-emphasis coefficient
KEXIV	Weighting factor for Voiced speech synthesis excitation energy
KEXIU	Weighting factor for Unvoiced speech synthesis excitation energy
KSIG0	Weighting factor for Global speech synthesis excitation energy

Clicking on OK in the dialog box validates changes made to the settings. Clicking on Cancel cancels changes made to the settings.

Note:

The WINSDS Application in which the generated sound wave is to be saved should have the same LPC settings and sampling rate as the sound waveform in the Signal window.

Upon exiting from Sound Editor, the LPC settings are saved to a file named SNEDIT.INI in the WINDOWS directory. The next time Sound Editor starts up, these settings are reloaded.

10.11.3 Lock Cursors (Toggle)

The Lock Cursors command locks the cursors of the Signal window, the LPC window, and the Spectrogram window within a single Context. When the locked cursor is moved in one window, cursors in the other windows move simultaneously. For example, when you move the cursor in the Signal window, the cursors in the Spectrogram window and the Spectrogram subwindow moves, as does the cursors in the LPC window and the LPC spectrogram subwindow.

Cursors in windows of different Contexts can be locked separately. Each time the command is activated, the cursors are locked in all three windows within the same Context of the current active window without affecting the cursors in windows in other Contexts.

“Lock Cursors is a toggle command, so that if the cursors of the current active window Context are not already locked, they become locked, and the command display is checked.

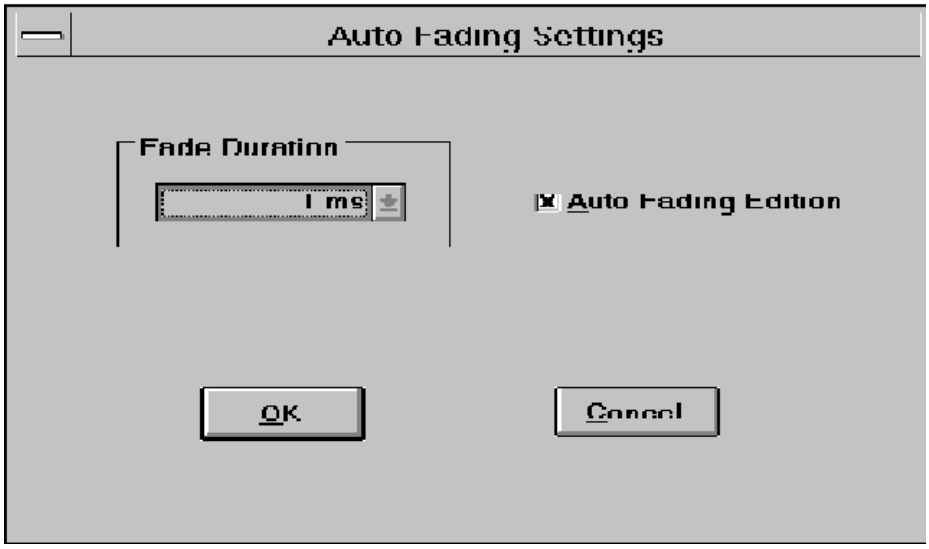
10.11.4 Auto Fading

The Auto Fading command in the Options Menu sets automatic Cross Fading options for the editing commands in the Edit Menu.

Clicking on Auto Fading opens a dialog box with the following options. Checking the Auto Fading Edit box in the dialog box applies Auto Fading automatically when using editing commands from the Edit Menu. The Fade Duration parameter determines the duration of the signal used for Cross Fading.

Clicking on OK in the dialog box validates changes made to the settings. Clicking on Cancel cancels changes to Auto Fading settings.

Figure 10–17. Auto Fading Window



10.11.5 Spectrogram Options

The Spectrogram Options command in the Options Menu sets the Bandwidth parameter and display settings (low clip level or high clip level) for spectrogram computation by the Spectrogram command in the Processing Menu.

Clicking on Spectrogram Options opens a dialog box with options to select. The spectrogram analysis Bandwidth parameter can be adjusted from 78 Hz to 800 Hz, which permits either a narrow- or wide-band spectral analysis. The Low Clip Level and High Clip Level parameters are used for spectrogram and LPC spectrogram displays. These levels clip out the lower and higher power-spectrum intensities of the computed spectra in order to obtain a better visual display of the spectrogram. Clicking on OK in the dialog box validates modifications to the settings. Clicking on Cancel cancels the modifications.

10.12 Window Menu

The Window Menu contains several commands used to manipulate the working windows in Sound Editor:

- Cascade
- Tile
- Show Clipboard

10.12.1 Cascade CONTROL + K

The Cascade command in the Window Menu *cascades* the displayed windows.

10.12.2 Tile CONTROL + T

The Tile command in the Window Menu tiles the displayed windows (i.e., arranges the windows like tiles).

10.12.3 Show Clipboard CONTROL + B

The Show Clipboard command in the Window Menu displays sound samples currently in the Clipboard along with the sampling rate. The Clipboard display window is similar to a Signal window, but it does not display frame markers, and Edit commands cannot be used. Only Zoom functions are possible.

10.12.4 Displayed Windows List

Sound Editor maintains a list of the currently displayed windows. Click on the desired window title to activate a window in the list.

10.13 Help Menu

The Help Menu contains several commands for on-line help:

- Contents
- Search for Help On
- About Sound Editor

10.13.1 Contents

The Contents command in the Help Menu displays a table of contents for on-line Help information.

10.13.2 Search For Help On

The Search For Help On command in the Help Menu provides quick access to help on a selected topic.

10.13.3 About Sound Editor

The About Sound Editor command in the Help Menu provides information about copyright and version of Sound Editor, as well as on the WINSDS board present and PC status.

Chapter 11

Troubleshooting

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11.1 Help Menu

If you are having trouble with a WINSDS command, go to the Help Menu. Use the Summary command for an overview of topics covered, and/or Search for Help on. . . for information on a specific topic. The About WINSDS command provides information about the WINSDS copyright, version, board and PC status.

11.2 Debugging WINSDS

Debug options are located in the Options submenu of the Setup Menu under Miscellaneous. Each option is described in the following:

11.2.1 Examine Cursor

This command is used to examine cursor actions in support (troubleshooting) operations. The command lists all commands from the current work session.

11.2.2 Debug

The following three Debug commands can be used when problems arise. They are found in the Debug submenu of Miscellaneous under Options in the Setup Menu.

- Event Tracking Window Toggle: Keeps track of mouse events, e. g., moving mouse up/down or clicking, and displays them in a window on the screen.
- Disk Trace File Toggle: Keeps track of WINSDS messages that appear on the screen and writes them to WINTRACE.TMP in the WINSDS directory in DOS.
- Database Trace File Toggle: Keeps track of all data management functions called within WINSDS and writes them to WINTRACE.TMP in the WINSDS directory in DOS.
- Extended Trace File Toggle: Used with Disk Trace File Toggle or Database Trace File Toggle to add more information to WINTRACE.TMP in the WINSDS directory in DOS.

11.3 Problems Installing WINSDS

A message, COMMDLG.DLL is in use appears, and then installation aborts.

COMMDLG.DLL is already installed in Sound Editor. Click on Ignore.

Messages indicate that files are missing, e.g., COMPOBJ.DLL, OLE2.DLL, STORAGE.DLL.

Reinstall the complete Windows package; then reinstall WINSDS.

11.4 Problems Starting WINSDS

After initial Setup, errors occur while running WINSDS.

Try to reinstall WINSDS using the default directory (C: \WINSDS). If that does not solve the problem, check memory allocation for WINSDS and Windows. Call the TI-Speech Applications Group for technical support.

WINSDS halts execution for a short time and then resumes. The hard disk drive seems busy.

If you have several other Windows applications running at the same time, try to close them. Then verify that you have enough Virtual Memory allocated and that your system has a minimum of 8 MB of RAM if running WINSDS under WFW 3.11 or 16 MB of RAM if running WINSDS under Windows95 ™.

Note:

When low on memory, the Windows Memory Manager tries to recompact scattered memory, and this process may result in a pause in execution once in a while.

A fatal error occurs during execution.

Reset PC. If that doesn't work, call the TI-Speech Applications Group for technical support.

When WINSDS is started, a prompt asks if you would like to Edit a List.

The message occurs if there is a check before Invite to edit list at start-up in the Start-up submenu of the Setup Menu. If you do *not* want the message to

appear, click on the item, and the check mark disappears. The next time WINSDS starts, the message will not appear.

The record light icon  on the Toolbar flashes red upon start-up.

The Invite to record at start-up option in the Start-up submenu of the Options Menu is checked. If you do not want to begin recording automatically upon start-up, click on the command, Invite to record at start-up. The check mark disappears and the next time WINSDS is started, recording will not begin automatically.

11.5 Problems Recording and Playing a Signal

Displays occur very slowly, especially signal displays and cursor movements.

Make sure you are using a 486 DX-33 or 486 DX2-66 PC (*not* a 386 PC). Check memory allocation in WINSDS, Windows, and DOS.

An Overflow Message appears while you are attempting to display a signal, and you return to Windows.

Extend Virtual Memory in Windows Control Panel, and verify that your system has a minimum of 8 MB of RAM for WFW 3.11 or 16 MB for Windows95™.

LPC Quality is noisy when you play the recorded signal or the imported file.

❑ Check the following settings in the Station Configuration table in Application Setup in the Setup Menu:

Coding Scheme	654P74
Maximum expected Pitch	1 or 2
Minimum expected Pitch	15 or 18.5
Voiced analysis Pre-emphasis	0
Unvoiced analysis Pre-emphasis	0
Energy of Voiced pick-up (excitation)	1.62
Energy of Unvoiced pick-up (excitation)	0.64

❑ Re-analyze the signal by clicking on Analyze Word in the Record Menu.

- ❑ Select the entire signal in Signal window. Go to the Modify Menu, Energy submenu, and click on Set Energy to Zero. When a box appears asking you for a value, type in 8000 and click on OK.

The signal does not play when the Numerical Modifications window is displayed.

Use the appropriate function keys to listen to the different Play Modes. (See section 6.4.4 for function key combinations for Play.)

WINSDS does not record (especially in a new application).

Go to the Recording Setup in the Setup Menu, and select Adjust Input Gain. Adjust the Input Gain if you have not yet done so. Click on OK. Try to record again.

11.6 Editing Problems

Cut Selection (Edit Menu) results in the deletion of the entire signal.

If your selection crosses a word boundary, words on both sides of the boundary (indicated by a vertical green line on the Scale bar under the Signal display) are highlighted and deleted. Or, you have tried to cut the first frame of the displayed signal. Try using Split Current Word (F3) and Delete Word commands in the Edit Menu instead.

11.7 Problems with Lists

Words from the list are not recorded or analyzed in the Word Status table.

If the word labels in the list do not match the word labels of recorded words, they show up as extra items in the Read a Word window.

11.8 ROMSDS Problems

ROMSDS.TXT has an error message at the end indicating that it did not run.

If you have deleted a word in the application using the Delete a Word command in the Miscellaneous submenu of the Modify Menu, have exited WINSDS, and then have run ROMSDS in a later session, you get an error message due to an incomplete Delete operation. Run Make (.RSD) Setup File and ROMSDS again.

In Windows95™ the ROMSDS.TXT file displayed after running ROMSDS may not the latest version of the text file. Run Make (.RSD) Setup File and then ROMSDS.

11.9 Problems with the 3x Chip

Using the 3x chip, when a Split Word is played, there is a loud click at the cut.

After changing the chip to 50C3x in the Setup Menu, wait 2-3 seconds.

11.10 MELP

Sound Editor doesn't work on MELP applications.

MELP functions have not been implemented on Sound Editor.

Table 11–1. DSP Module Error Codes and Messages

Error Code	Error Message
1	DSP: No error reported.
2	DSP: Time out during speech acquisition. Check board and cables.
3	DSP: Loss of synchronization during speech acquisition
4	DSP: The processor is busy.
5	DSP: THE DSP board cannot respond to the PC hosts' commands.
6	DSP: Time out during sending commands to board.
7	DSP: Time out during data block transfer from board.
8	DSP: Time out during data transfer from board.
9	DSP: Time out during data block transfer to board.
10	DSP: Time out during data transfer from board.
11	DSP: Time out during data transfer to board.
12	DSP: DSP board executable code file format
13	DSP: Bad DSP executable code file format
14	DSP: Bad DSP board executable code
15	DSP: Cannot load DSP board executable code file. Check board address.
16	DSP: Cannot find transcoding table size.
17	DSP: Bad transcoding table file
18	DSP: Cannot load transcoding table file.
19	DSP: Number of the parameters in the transcoding table in error
20	DSP: Cannot find synthesis program file.

Appendix A

LPC Analysis

Topic Page

A.1 LPC Analysis A-2

A.1 LPC Analysis

Linear Predictive Coding (LPC) is the most widely used method of expressing the transfer function of the filter representing the vocal tract. The basic theory is that an audio signal can be approximated by a linear combination of past outputs of a hypothetical filter with present inputs. In the case of speech signals, this filter is assumed to have the basic properties of the human vocal tract (i.e., a uniform, open tube). In LPC there are two sources of excitation: periodic impulse (*voiced*) and noise (*unvoiced*). Voiced excitation represents vocal-fold vibration in the human vocal tract associated with vowels and some consonants such as [r, l, w]. Unvoiced excitation represents friction noise associated with consonants such as [f, s, h], and transient noise associated with consonants such as [p, t, k].

Changes is the three-dimensional shape of the vocal tract over time are accounted for by dividing the tube into ten smaller segments of equal length with varying cross-sectional areas. The statistical method of least-squares is used to estimate a set of coefficients representing sound propagation at the boundaries between segments.

The input frequency is determined by extracting the pitch period from the original signal. An energy factor (or gain) is produced as a by-product of the analysis algorithm. Parameters, generated by the method described in the previous text, are valid for a finite time interval (5 ms to 20 ms).

A complete set of parameters is called an *analysis frame*. Within a given analysis frame, digital samples of the signal are generated at a rate of 8 or 10 kHz. Parameter values are updated several times within a frame by means of interpolation logic, which provides smooth transitions from one frame to the next.

Every 10 ms to 20 ms, LPC analysis updates the values of the following synthesis parameters:

- Set of reflection coefficients representing linear prediction
- Type of excitation (voiced or voiceless)
- Energy of the excitation
- Pitch period (or pitch frequency) of voiced signals

In order to determine the values of these parameters, it is necessary to analyze the speech signal to be synthesized. Analysis of the speech/sound signal to be synthesized may result in imprecision leading to a degradation of the synthesized signal (e. g., imprecise measurement of pitch period, choice of excitation type at transitions between some consonants and vowels). The analysis system used must allow for the correction of such errors. WINSDS and its precursors have been developed by Texas Instruments to meet this need.

WINSDS allows for speech/sound recording from an external source (microphone or line). It computes and codes linear prediction parameters and allows for their modification. WINSDS also allows for sound editing (cutting words, adding silence, inserting, deleting, etc.) Powerful ROM generation software creates complete EPROM data with words/sounds that have been previously recorded and coded.

Appendix B

Customer Information

This appendix includes example ordering forms.

Topic **Page**

B.1 New Product Release Forms (TSP50C0x/1x) B–2

B.1 New Product Release Forms (TSP50C0x/1x)

The new product release form is used to track and document all the steps involved in implementing a new speech code onto one of the parent speech devices. Blank forms are provided in subsections B.1.1 through B.1.8 (note that the addresses on these forms are subject to change). Copy the new product release forms (NPRF) provided or get one from your TI field sales office to initiate the implementation process. The next step is to complete Section 1. As seen on the blank forms, Section 1 allows you to choose the options pertinent to the parent device you wish to use. Section 1 also allows you to choose your own customer part number used for ordering your parts. If no customer part number is indicated, then TI defaults to the CSM1xxxxxx part number for ordering purposes. Completion of the company name, project name, and option fields is mandatory. Completion of all other fields in Section 1 is optional. After completion of Section 1, you must submit the NPRF (along with your speech code) to the speech products group via your local TI field sales office.

Once the speech products group receives the speech code and the NPRF, you have completed the initial steps involved in implementing this code onto production devices. Since all parent speech devices are mask programmable, the speech code must first be converted into a format that the speech products mask vendor can use to generate this new mask. This format is called a PG output. Once this PG output is generated, the original speech code is reconstructed from the PG output file and sent back to you for recheck. This recheck ensures that the PG output file was generated correctly. Along with the reconstructed speech code, the NPRF is also returned to you with Section 2 completed by TI. In this section, TI assigns your own CSMxxxxxx part number and, in the case of packaged devices, TI also proposes a symbol format to you. If you wish to deviate from the suggested symbol format, you must consult TI for requested changes.

After you verify the reconstructed speech code and accept the proposed symbol format, you are required to sign section 3 as authorization for TI to generate the mask, prototypes, and risk units in accordance with the pertinent purchase order. You then need to send or fax the NPRF to the speech products group via the local TI field sales office. TI should have the prototypes shipped to you approximately six weeks after receiving the NPRF with section 3 signed. Once you receive these prototypes, you need to verify the functionality of the prototypes, sign section 4, and send the NPRF (with section 4 signed) back to TI. At this point, you can start ordering production units.

B.1.1 New Product Release Form for TSP50C04

```
                          NEW PRODUCT RELEASE FORM
                                FOR TSP50C04

SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Output (check one):
          ___  2 pin push–pull (2D)
          ___  single pin single ended (1D) (not recommended)

Internal RC Oscillator (check one)
          ___  9.6  Mhz  (9.1Mhz – 10.1Mhz)
          ___  7.68 Mhz  (7.18Mhz – 8.18Mhz)
          ___       Mhz  ( +5% OR –5%)

Pulse width modulation (check one)
          ___  PW1
          ___  PW2

Package Type (check one):
          ___ N (16 Pin)
          ___ die
          ___ SOWB (20 Pin)
                 ___ Tube
                 ___ Reel
*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     ??? YMLLLLT      |  YM:   DATE CODE
                          |    <optional 13 char> |  T:    ASSY SITE
                          |    <optional 11 char> |  ???:  TI EIA NO. or
                          +----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     \T/ YMLLLLT      |  YM:   DATE CODE
                          |    <optional 10 char> |  T:    ASSY SITE
                          |    <optional  6 char> |  \T/:  TI LOGO
                          +----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

OR E–MAIL: code–rel@msp.sc.ti.com

B.1.2 New Product Release Form for TSP50C06

```
                          NEW PRODUCT RELEASE FORM
                               FOR TSP50C06

SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Output (check one):
          ___  2 pin push–pull (2D)
          ___  single pin single ended (1D) (not recommended)

Internal RC Oscillator (check one)
          ___  9.6  Mhz  (9.1Mhz – 10.1Mhz)
          ___  7.68 Mhz  (7.18Mhz – 8.18Mhz)
          ___       Mhz  ( +5% OR –5%)

Pulse width modulation (check one)
          ___  PW1
          ___  PW2

Package Type (check one):
          ___ N (16 Pin)
          ___ die
          ___ SOWB (20 Pin)
                 ___ Tube
                 ___ Reel
*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     ??? YMLLLLT      |  YM:   DATE CODE
                          |    <optional 13 char> |  T:    ASSY SITE
                          |    <optional 11 char> |  ???:  TI EIA NO. or
                          +----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     \T/ YMLLLLT      |  YM:   DATE CODE
                          |    <optional 10 char> |  T:    ASSY SITE
                          |    <optional  6 char> |  \T/:  TI LOGO
                          +----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

OR E–MAIL: code–rel@msp.sc.ti.com

B.1.3 New Product Release Form for TSP50C10A

```
                          NEW PRODUCT RELEASE FORM
                             FOR TSP50C10A

SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _______________
Technical Contact : _____________________________  Phone:(___) _______________
Customer Part Number:_____________________________

D/A Output (check one):
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D) (not recommended)
           ___  single pin double ended (1A)

Package Type (check one):
           ___ N (16 Pin)
           ___ die
           ___ SOWB (20 Pin)
                  ___ Tube
                  ___ Reel

*****************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _______________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                           +-----------------------+  LLLL: LOT TRACE CODE
                           |     ??? YMLLLLT       |  YM:   DATE CODE
                           |    <optional 13 char> |  T:    ASSY SITE
                           |    <optional 11 char> |  ???:  TI EIA NO. or
                           +-----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                           +-----------------------+  LLLL: LOT TRACE CODE
                           |     \T/ YMLLLLT       |  YM:   DATE CODE
                           |    <optional 10 char> |  T:    ASSY SITE
                           |    <optional  6 char> |  \T/:  TI LOGO
                           +-----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

B.1.4 New Product Release Form for TSP50C11A

```
                          NEW PRODUCT RELEASE FORM
                             FOR TSP50C11A

SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _______________
Technical Contact : _____________________________  Phone:(___) _______________
Customer Part Number:_____________________________

D/A Output (check one):
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D) (not recommended)
           ___  single pin double ended (1A)

Package Type (check one):
           ___ N (16 Pin)
           ___ die
           ___ SOWB (20 Pin)
                  ___ Tube
                  ___ Reel

*****************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _______________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                           +-----------------------+  LLLL: LOT TRACE CODE
                           |     ??? YMLLLLT       |  YM:   DATE CODE
                           |    <optional 13 char> |  T:    ASSY SITE
                           |    <optional 11 char> |  ???:  TI EIA NO. or
                           +-----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                           +-----------------------+  LLLL: LOT TRACE CODE
                           |     \T/ YMLLLLT       |  YM:   DATE CODE
                           |    <optional 10 char> |  T:    ASSY SITE
                           |    <optional  6 char> |  \T/:  TI LOGO
                           +-----------------------+
```

r**********

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

B.1.5 New Product Release Form for TSP50C12

```
                          NEW PRODUCT RELEASE FORM
                               FOR TSP50C12

SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Option:
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D)
           ___  single pin double ended (1A)

LCD Drive:
           ___ Type A, Fast
           ___ Type B, Slow

Oscillator:
           ___  RC (Resistor/Capacitor)
           ___  CR (Ceramic Resonator)

Pulse width modulation (check one):
           ___  PW1
           ___  PW2

*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

*******************************************************************************
SECTION 3.  AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS
     This section is to be completed by the customer and sent to TI after
     after the following data has been met:

        1) The customer has verified that the TI computer generated data
           matches the original data.

I hereby certify that the TI generated verification data has been checked and
found to be correct, and I authorize TI to generate masks, prototypes, and
risk units in accordance with purchase order in section 1 above.

By:_____________________________________    Title:_____________________
Date:_____________________

(FAX this form to 214–480–7301. Attn: Code Release Team)
```

```
*******************************************************************************
SECTION 4.  APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION
     This section is to be completed by the customer after prototype devices
     have been received and tested.

I hereby certify that the prototype devices have been received and tested and
found to be acceptable, and I authorize TI to start normal production in
accordance with purchase order #_____.

By:_____    Title:_____
Date:_____

*******************************************************************************

Return to:   Texas Instruments, Inc.
             Attn: Code Release Team
             P.O. Box 660199, M/S 8718
             Dallas, TX 75266–0199

OR Fax to:   (214)480–7301
             Attn: Code Release Team

Have Questions?:
CALL:        Code Release Team
             (214)480–4444

OR E–MAIL:   code–rel@msp.sc.ti.com
```

B.1.6 New Product Release Form for TSP50C13

```
                          NEW PRODUCT RELEASE FORM
                                FOR TSP50C13D
SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Output (check one):
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D) (not recommended)

Internal RC Oscillator (check one)
           ___  9.6  Mhz  (9.1Mhz – 10.1Mhz)
           ___  7.68 Mhz  (7.18Mhz – 8.18Mhz)
           ___       Mhz  ( +5% OR –5%)

Pulse width modulation (check one)
           ___  PW1
           ___  PW2
Package Type (check one):
           ___ N (16 Pin)
           ___ die
           ___ SOWB (20 Pin)
                 ___ Tube
                 ___ Reel
*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     ??? YMLLLLT      |  YM:   DATE CODE
                          |    <optional 13 char> |  T:    ASSY SITE
                          |    <optional 11 char> |  ???:  TI EIA NO. or
                          +----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     \T/ YMLLLLT      |  YM:   DATE CODE
                          |    <optional 10 char> |  T:    ASSY SITE
                          |    <optional  6 char> |  \T/:  TI LOGO
                          +----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

OR E–MAIL: code–rel@msp.sc.ti.com

B.1.7 New Product Release Form for TSP50C14

```
                          NEW PRODUCT RELEASE FORM
                                FOR TSP50C14D
SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Output (check one):
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D) (not recommended)

Internal RC Oscillator (check one)
           ___  9.6  Mhz  (9.1Mhz – 10.1Mhz)
           ___  7.68 Mhz  (7.18Mhz – 8.18Mhz)
           ___       Mhz  ( +5% OR –5%)

Pulse width modulation (check one)
           ___  PW1
           ___  PW2
Package Type (check one):
           ___ N (16 Pin)
           ___ die
           ___ SOWB (20 Pin)
                 ___ Tube
                 ___ Reel
*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     ??? YMLLLLT      |  YM:   DATE CODE
                          |    <optional 13 char> |  T:    ASSY SITE
                          |    <optional 11 char> |  ???:  TI EIA NO. or
                          +----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     \T/ YMLLLLT      |  YM:   DATE CODE
                          |    <optional 10 char> |  T:    ASSY SITE
                          |    <optional  6 char> |  \T/:  TI LOGO
                          +----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

Return to: Texas Instruments, Inc.
Attn: Code Release Team
P.O. Box 660199, M/S 8718
Dallas, TX 75266–0199

OR Fax to: (214)480–7301
Attn: Code Release Team

Have Questions?:
CALL: Code Release Team
(214)480–4444

OR E–MAIL: code–rel@msp.sc.ti.com

B.1.8 New Product Release Form for TSP50C19

```
                          NEW PRODUCT RELEASE FORM
                                FOR TSP50C19
SECTION 1.  OPTION SELECTION
     This section is to be completed by the customer and sent to TI along with
     the microprocessor code and speech data.

Company:_____________________________   Division:_____________________________
Project Name:________________________   Purchase Order #:____________________
Management Contact: _____________________________  Phone:(___) _____________
Technical Contact : _____________________________  Phone:(___) _____________
Customer Part Number:_____________________________

D/A Output (check one):
           ___  2 pin push–pull (2D)
           ___  single pin single ended (1D) (not recommended)

Internal RC Oscillator (check one)
           ___  9.6  Mhz  (9.1Mhz – 10.1Mhz)
           ___  7.68 Mhz  (7.18Mhz – 8.18Mhz)
           ___       Mhz  ( +5% OR –5%)
Pulse width modulation (check one)
           ___  PW1
           ___  PW2
Package Type (check one):
           ___ N (16 Pin)
           ___ die
           ___ SOWB (20 Pin)
                  ___ Tube
                  ___ Reel
*******************************************************************************
SECTION 2. ASSIGNMENT OF TI PRODUCTION PART NUMBER
     The TI Part Number is to be completed by TI.

TI Part Number: _____________

SECTION 2B. PACKAGE UNIT SYMBOLIZATION
     This section is to be completed by the customer.
     The first line of the symbolization is fixed. Except EIA#/Logo.
     The second and third lines are to be filled in by the customer.

Top Side Symbolization (16pin 'N')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     ??? YMLLLLT      |  YM:   DATE CODE
                          |    <optional 13 char> |  T:    ASSY SITE
                          |    <optional 11 char> |  ???:  TI EIA NO. or
                          +----------------------+           TI LOGO

For '16N' packages, the customer may choose between 980 or the TI LOGO on the
first line.

Top Side Symbolization (20pin 'SOWB')
                          +----------------------+  LLLL: LOT TRACE CODE
                          |     \T/ YMLLLLT      |  YM:   DATE CODE
                          |    <optional 10 char> |  T:    ASSY SITE
                          |    <optional  6 char> |  \T/:  TI LOGO
                          +----------------------+
```

****

SECTION 3. AUTHORIZATION TO GENERATE MASKS, PROTOTYPES, AND RISK UNITS

This section is to be completed by the customer and sent to TI after after the following data has been met:

1) The customer has verified that the TI computer generated data matches the original data.

2) The customer approves of the symbolization format in Section 2B. (Applies to packaged devices only)

I hereby certify that the TI generated verification data has been checked and found to be correct, and I authorize TI to generate masks, prototypes, and risk units in accordance with purchase order in section 1 above. In addition, in the instance that this is a packaged device, I also authorize TI to use the symbolization format illustrated in section 2B on all devices.

By:_____ Title:_____
Date:_____

(FAX this form to 214–480–7301. Attn: Code Release Team)

****

SECTION 4. APPROVAL OF PROTOTYPES AND AUTHORIZATION TO START PRODUCTION

This section is to be completed by the customer after prototype devices have been received and tested.

I hereby certify that the prototype devices have been received and tested and found to be acceptable, and I authorize TI to start normal production in accordance with purchase order #_____.

By:_____ Title:_____
Date:_____

****

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