CSL Computerized Speech Lab

Model 4300B Software version 5.X

Cheol Min Ahn M.D.

Department fo Otolaryngology, Kangbuk Samsung Hospital Samsung Medical Center, Seoul, Korea

Description of CSL

CSL, Model 4300B is a highly flexible audio processing package designed to provide a wide variety of speech analysis operations for both new and sophisticated users.

Operations include 1) Data acquisition
2) File management
3) Graphics
4) Numerical display
5) Audio output
6) Signal editing
7) A variety of analysis functions

External module include 1) Input control
2) Output control
3) Jacks

Software include 1) Wide range of speech display manipulation
2) Editing
3) Analysis

System Features

Has 1) Dual-channel speech acquisition
2) Disk storage
3) Retrieval and playback with high(50KHz per channel) sampling rates
4) Options can extend the input to 4 channel and DAT(Digital Audio Tape) direct interface.

Speech editing include 1) Mixing
2) Subtracting
3) Digital filtering
4) Warping(Playback at different rates without affecting pitch)
5) Adding
6) Splicing
7) Down sampling

Analysis inclued 1) Waveform
2) Energy
3) FFT spectrums
4) LPC filter response
5) Pitch
6) Formant histories
7) Spectrograms

All analyses include both graphic and numeric analysis(Statistical, log)

Phonetic transcription feature for producing complete IPA standardized character sets which are time-linked to waveform and can be stored in a time-linked format with the sampled speech singal.

Program Option

DAT Interface and Four Channel Input Direct-to-Disk
Programmer's Kit
DADiSP Interface
Delayed Auditory Feedback
Synthesis
Multi-Dimensional Voice Program
Voice Range Profile
Sona-Match
Real-Time Spectrogram
Real-Time Pitch Extraction
Phonetic Database
Palatometer Database
IPA Transcription Tutorial

Ease of Use

To make standard operations readily accessed by way of a mouse and pull-down menus.

Commands may be entered in one of three ways :

1) Selections in the pull-down menus
2) User-defined key commands
3) Keyboard commands

Further flexibility of operation is achieved by configuring CSL to run through a series of command files, or macros, which combine many commands into one instruction.

The command files included with the package upon delivery set the program to "default" opeation when CSL is first executed.

By editng these command files, or by typing in a new series of commands, through the use of a standard editor, CSL can be customized to perform tasks to suit the user's specific needs. Also, a learn mode allows the user to create, within CSL, new series of commands.

Entering the CSL Program

1) Make sure that the CSL is properly installed.

2) Turn on the host computer system, monitor, and external CSL module.

The CSL external module must be turned on for the CSL program to load.

3) Using DOS commands or a DOS utility such as Norton Commander, move to the disk where the CSL program is stored.

Once you are positioned at the correct screen prompt, you are ready to start the CSL program.

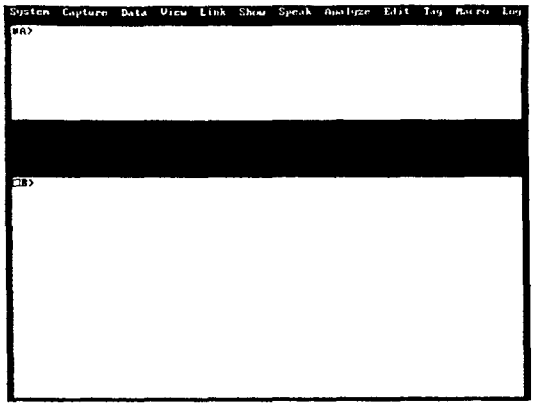
4) Type CSL after the DOS prompt, using the keyboard.

eg. C : \CSL50>>CSL

Once CSL is initiated, a VGA screen will appear.

View Screens

As you will note when you first enter the CSL program, a menu line, the Main Menu, appears across the top of the screen and the screen is divided



into two sections or "view screens". The smaller top view screen is labeled with the ID letter"A〉" and the bottom view screen, the larger of two, is given the ID letter "B〉".

Changing View Screens Via the Mouse

A view screen is indicated as being active by the color of the box in front of the ID letter in the top left-hand corner. If the box is black, the view screen is active. In the default view screen format provided with the program, the top view screen labeled "A〉" is the active view screen. A view screen must be activated in order to perform any of CSL's operations. You will also notice the small left-pointing arrow appearing in the center of the bottom view screen. This is the mouse cursor. Only one view screen can be active at a time.

To change the active view screen, proceed as follows ;

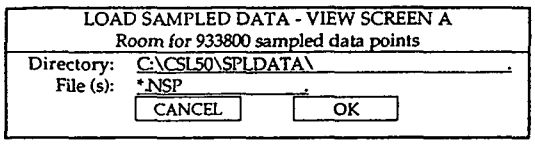
1) Move the mouse cursor to any visible part of the desired inactive view screen and press the LEFT mouse button.

This causes the previously active view screen to become inactive and activates the selected view screen. The LEFT mouse button may also be used to activate a data cursor within the view screen if that view screen contains data. Pressing the RIGHT mouse button in the inactive view screen will cause that view to come active without activating the data cursor.

Loading and Displaying Data
Loading and Sampled Data File

1. Select Data on the Main Menu

2. Select "Load Signal".



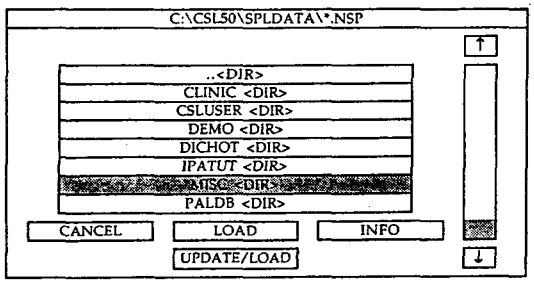
3. This display box informs you that the directory is currently set to load a file from a subdirectory under C : \CSL50\SPLDATA\. In addition, the file format extension the program is looking for is .NSP.

Select the OK box or press the ENTER key.

The resultant display box lists the directories and files located at C : \CSL50\SPLDATA\.

When CSL is first delivered, there are only subdirectories located at this directory.

Therefore, to select a file, you will need to select the appropriate subdirectory in order to access a data file.



The commands below the subdirectory and file listing are as follows :

CANCEL : Cancels the previous selection. Therefore, if selected at this point, the dialog box for loading data will appear.

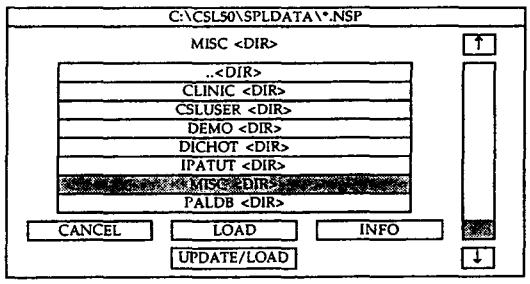
LOAD : Loads the selected subdirectory or file.

INFO : Provides information about the file selected. This command is only relevant for files and not subdirectories.

UPDATE/LOAD : Changes the load and save pointer to the current location. Therefore, you can select a subdirectory and then UPDATE/LOAD to speed up subsequent loading or saving of files to the desired subdirectory.

If the directory named in the box is not the directory where your sampled data resides, you may change this by selecting the appropriate directory, If.. 〈DIR〉 is selected, the dialog box will show all of the files and directories under C : \CSL50\.

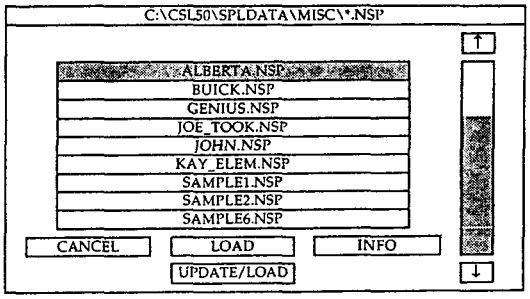
4. Using the mouse, highlight the subdirectory MISC. Press the LEFT mouse button to indicate your selection. Once selected, you will note that MISC 〈DIR〉 will appear above the menu listings.



5. Select LOAD to see the files stored in the subdirectory MISC.

A new dialog box will appear with a list of files available within this subdirectory.

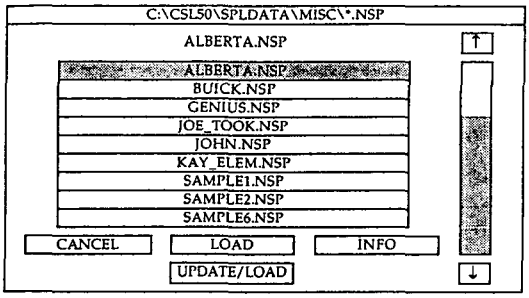
The INFO command, if selected, can provide information about a highlighted file.



You may change the default directory path by using the pull-down command "Set Waveform Directory〈Alt−F5〉" under DATA on the Main Menu or by selecting a new directory under LOAD file and selecting UPDATE/LOAD to keep the selected diretory as the new default directory path.

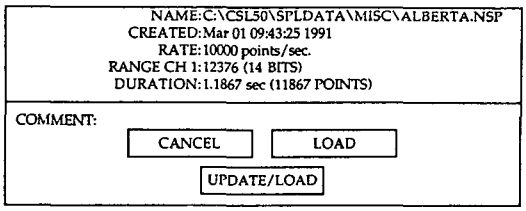
6. The File Directory box will now be displayed in the center of the screen. Using the mouse, select the ALBERTA.NSP sampled data file.

Again your choice will be highlighted and the filename will appear at the top of the filename list underneath the directory line.



7. To see the header information on the file you have selected, select the INFO box. An information box will appear on top of the file directory with information. You could also select LOAD to bypass the file information and load the file directly. UPDATE/LOAD updates the directory path as entered for subsequent loads.

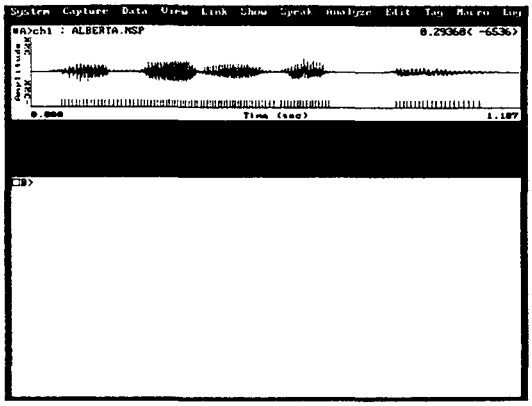
8. Once you have read the information, select the LOAD box to load the ALBERTA.NSP file.



The sampled data will appear in the active view screen as a graphics waveform. This will be followed by the name of the sampled data file. You will notice the time readout on the top right corner of the view screen. Immediately following the time readout and enclosed in angle brackets is a report of the current amplitude value. These two values are linked to movement of the data cursor.

9. To activate the data cursor, press the LEFT mouse button in the active view screen.

The data cursor appears as a vertical line on top of the waveform. As mentioned, the data cursor is tied to the mouse cursor and you may obtain time and amplitude readings as you move the cursor over the waveform.



10. To hear the information, first ensure that the data cursor is disabled by pressing either the RIGHT or LEFT mouse button. Then, select Speak on the Main Menu.

11. The pull-down menu will appear and you may choose "All Data 〈F3〉" to hear the information. Press any key to stop speaking.

12. You can also use the defined keys to access the speak command. Press the (F3) key to speak all data and press any key to stop speaking.

Creating a Spectrogram

Before you perform any analysis, you must have an EMPTY view screen in which to place the analysis results.

1. To activate this view screen, select view screen "B>" and press the RIGHT mouse button. You will notice that the small box in the top left-hand corner of view screen "B>" has now become black.

2. Next, select Analyze on the Main Menu and then "Spectrogram...". Note the three periods(...) that follow the "Spectrogram..." item. Whenever these occur, they indicate that a submenu follows the selection of that item, from which a more detailed selection is to be made.

3. Select "Spectrogram All Data". The FFT-based spectrogram will begin to draw across the view screen.

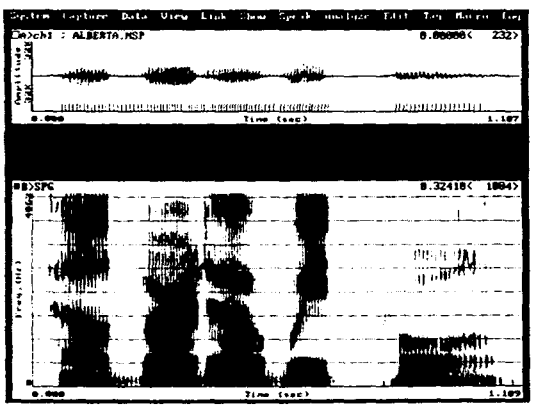
4. When the spectrogram has finished drawing, a view screen title "SPG" will appear to the right of the ID letter. With the mouse in view screen "B>", press the LEFT mouse button to activate the data cursor and convert the mouse from arrow mode to cursor mode. Note the time and ⟨frequency⟩ readout of cursor position in the upper right corner of the screen.

5. To link cursor movements in view screen "B>" to cursor movement in view screen "A>", press the mouse button once to change the mouse back to arrow mode. Then, use the mouse arrow to select Link on the Main Menu and then "Link Cursor to View A".

6. Move the cursor back to view screen "A>" by pressing the mouse anywhere in view screen "A>".

7. Move the cursor through waveform and spectrogram, which are now linked, to an area of interest. Press the LEFT mouse button again to place your first mark in the data.

8. Move the cursor to the end of the area of interest and place another mark. Now, select Speak on the Man Menu and then "Marked Section⟨F4>". You will hear the portion of the signal which was marked on the spectrogram analyzed on view screen"B>".



Placing Impulse Markers on the Waveform

The CSL software includes a program to mark each glottal pulse with a marker which will appear on the waveform display as vertical striations.

This markers are used in pitch tracking displays and in the pitch-synchronous operation of warping or formant tracking.

1. Activate view screen "A>" by pressing the mouse anywhere in that window.

2. Select Analyze on the Main Menu, then "Impulse Markers..." and then "Determine Impulse Markers All Data".

Impulse markers can be stored with a file so that regeneration of impulse markers is not required.

Overlaying a Formant Track and Other Analysis on the Spectrogram

A spectrogram and a time history formant display are compatible data types. That is, both display the analysis results in the dimensions of time and frequency. Thus, it is possible to compare the spectrogram and the time history formant display by superimposing the formant display on top of the spectrogram. Other displays, such as the waveform, are not compatible, because the vertical axis of a waveform represents amplitude. Note that compatibility between these two displays is only obtained if the time domain axis of both analyses are also the same value. You must first compute the spectrogram, then overlay the time history formant information. You can overlay pitch and energy traces if the time axes are identical. Note that the y−axis will always display the last overlaid trace.

1. Activate view screen "B>" by pressing the mouse anywhere in that view screen.

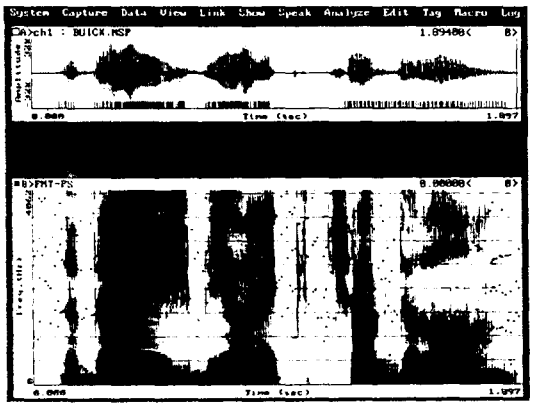
2. Select View on the Main Menu and then "Set Clear Before Display". When "Set Clear Before Display" is NO, you can overlay analysis. If "Set Clear Before Display" is YES, you will not be able to overlay analysis. Select NO and then OK. Turn off the menus by selecting view screen "B>".

3. Select Analyze on the Main Menu.

4. Select "LPC Formant History..." and then "Formants All Data". The formants will now start to draw over the spectrogram and will show as a highlighted tracing, or a sereis of dotted lines, overlaying the formants of the spectrogram. Because impulse markers were determined previously, a pitch-synchronous formant extraction was generated which pro-

duces one sereis of values for each glottal pulse.

When the trace is finished, the SPG title will be replaced by an FMT-PS title next to the view screen ID letter, indicating the kind of analysis(Formant Analysis-Pitch Synchronous) last performed in that view screen.



5. To overlay a pitch trace, activate view "B>". Select View on the Main Menu, then "Set Pen Color", and then GREEN. Next, select Analyze on the Main Menu, then "Pitch Extraction..." and then "Pitch All Data". A green pitch trace is calculated and overlaid on the spectrogram. Note that the y-axis displays the frequency axis for pitch. You can, if you wish, again change colors and ovelay an energy trace by selecting View on the Main Menu, then "Set Pen Color", and then BLUE. Next, select Analyze on the Main Menu and then select "Energy Calculation..." and "Energy All Data".

Marking Data and the Speak Options

1. Select the "A>" view screen and press the LEFT mouse button to activate both the view screen and the data cursor. Slide the vertical data cursor along the waveform to an area of interest.

2. Press the LEFT mouse button to place a mark in the data at the strart of the area of interest. Note that the vertical mark appears to extend down below the baseline in the view screen and the mouse cursor reappears.

3. Move the mouse cursor along the waveform to the end of the area of interest and press the LEFT mouse button twice, once to acrivate the data cursor and again to place the second mark in the data.

4. Press the LEFT mouse button again to reactivate the waveform cursor, then move it to a location between the two marks.

5. Press the LEFT mouse button again to reactivate the mouse cursor, then select Speak on the Main Menu. Press any key to stop speaking.

6. Select "Marked Section 〈F4〉" from the submenu to listen to the area you marked. You can also try the other Speak options noting what sections of the data are spoken with each selection.

7. To experiment with the defined keys, press the(F 4) key to speak the marked data and any key to stop speaking.

Additional View Screens and Analyses

Making a New View Screen

1. Select the "B>" view screen by pressing either the LEFT or RIGHT mouse button. The "B>" view screen is now active.

2. Select View on the Main Menu.

3. Select "Open New Active View" option. You will see that a highlighted outline appears around the perimeter of the "B>" view.

4. To adjust the size of this outline, move the mouse to change the position of the lower right corner of the frame. The outline should move towards the center of the computer screen. Then, press the RIGHT mouse button and select the size of the view screen by moving the mouse.

5. Pressing RIGHT mosuse button again will fix the size of the frame and the view frame location will now be "attached" to the mouse cursor. This allow the location to be changed by dragging the outline across the screen to the desired location.

6. By pressing the RIGHT mouse button, you can make further adjustments to the size of the outline. The location may also be changed simply by moving the mouse.

7. When you have achieved the correct size and position, fix your choice by prssing the LEFT mouse button. The frame will now become an active win-

dow : the white background color of the view screen will be filled in, the upper left corner will display the ID letter "C>", and the black active status box will be displayed. The view screen is now ready to receive data. The view cannot be resized or positioned once the LEFT mouse button has been pressed.

8. The view screen creation operation may be canceled at any time prior to pressing the LEFT mouse button by pressing both RIGHT and LEFT mouse button simultaneously or, on a three button mouse, by pressing the MIDDLE button. When the view creation operation is canceled, the outline that was displayed disappears and the previously active view screen is reactivated.

9. If you made a mistake in size or positioning the view and you have already pressed the LEFT mouse button, you can delete the view and start the process over at Step 2. To delete an active view, select View on the Main Menu and then "Delete Active View".

FFT Power Spectrum and LPC Filter Response

1. Place the time cursor on the waveform and select a voiced segment for analysis. Position the cursor in the middle of the voiced segment.

2. Select view screen "C>" by pressing the LEFT or RIGHT mouse button on any portion of the view screen. If the view screen is obscured by other view screens, you can retrieve it by selecting "Activate Previous View" under View on the Main Menu.

3. To perform the analyses, select Analyze on the Main Menu, then "FFT Power Spectrum..." and then "Power Spectrum at Cursor".

The FFT-based power spectrum will be drawn across view screen "C>" and the title"FFT" will appear in the top left corner next to the ID letter. Also, note that a frequency and gain readout appears at the top right-hand corner of the view screen.

The readout is linked to the data cursor which is activated by pressing the LEFT mouse button in view screen "C>".

To get the numerical listing of the analysis results, proceed as follows :

4. Select Show on the Main Menu.

5. Then select "Numerical Results". A box titled "FFT POWER SPECTRUM' will appear in the center of the screen with information containing frequency in Hertz(Hz) and gain in dB for each "bin" of the FFT analysis. To the far right of the box is a vertical bar which will allow you to scroll through the length of the analysis.

6. To get a hardcopy printout of the results, first ensure that your printer is properly connected and turned on. Then, select the PRINT option.

7. If you wish to store the results for future reference, select the FILE option from the "Numerical Results" box. After FILE is selected, you will see a prompt requesting a name for your analysis data. File naming conforms to DOS rules, expecting a name of up to eight characters and an extension of three characters. For record keeping purposes, an extension of .FFT is suggested. After typing in the filename, press the ENTER key or select OK.

8. You may exit the file-saving routine at any time by selecting CANCEL.

9. After you have saved or printed your results you may exit from the "Numerical Results" box of the FFT analysis by selecting OK.

Expanding a Portion of the Spectrum

1. After the FFT results are displayed, activate the FFT spectrum window by pressing the mouse button.

2. Position two markers on the screen to bracket the portion of the display you wish to enlarge.

3. Select Show on the Main Menu and then "Marked Secton". The FFT results will be redisplayed to the selected portion of the frequency range marked.

4. To prepare for overlaying an LPC filter response, return to showing all of the data. To do this, select Show on the Main Menu and then "All Data".

Overlay Power Spectrum and Filter Response

The power spctrum and LPC-based filter response are compatible with one another. So, for further comparison, you may place an LPC filter response over

the power spectrum. Unlike the spectrogram and the time history formant analysis, these may be overlaid in any order.

1. Before performing any overlays, ensure that the "Set Clear Before Display" option is turned to NO. To do this, select View on the Main Menu.

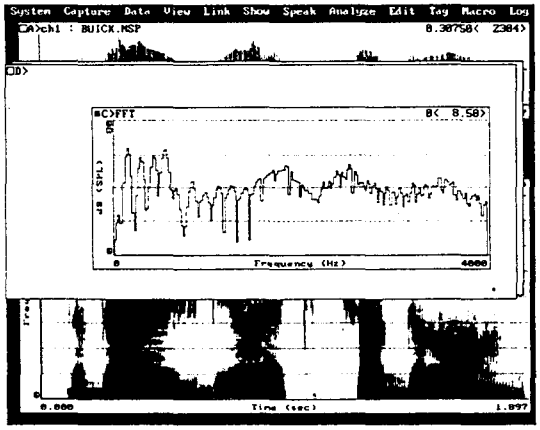
2. Select "Set Clear Before Display" and then NO.

3. The comparison will be further enhanced if you make the LPC filter response a dirrerent color from the power spectrum. To do this, move the cursor to View on the Main Menu and then "Set Pen Color ". You will have a choice of four colors. Select one, then OK.

4. Once you have selected the new color, select Aanlyze on the Main Menu, then "LPC Frequency Response...", and then "LPC Frequency Response at Cursor".

5. You may also obtain numerical results of the LPC filter response by selecting Show on the Main Menu and then "Numerical Results".

6. Once you have selected this option, you can choose numeric results of the frequency response or the formant information.



Data Capture and Saving

1. Check that the CSL external module has been properly connected to your computer.

2. Connect a suitable microphone to the CH1 input microphone jack.

3. Turning the speaker of during microphone recording avoids feedback problems. To turn the speker off, turn the volume control counterclockwise to stop, or select Capture on the Main Menu and then "Set Monitor Input ON/OFF". The default position is set to OFF but you may wish to turn it back ON if you are inputting data from a tape player.

4. To start your own data capture and save routines, select Capture on the Main Menu.

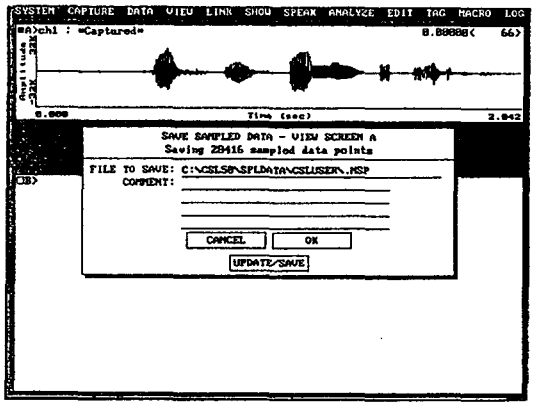
5. Then select "Capture Channel 1 〈F1〉". If the screen is not empty, a dialog box will appear asking you if you wish to proceed with data capturing. Select OK using the mouse button or press the ENTER key.

6. Adjust input level by phonation into the microphone and watching the green, yellow and red LED lights on the front panel of the CSL external module. Use the LEVEL adjustment control to adjust the input level to have the yellow light occasionally flicker by avoid bringing the level up to where the red light is flickering. The red light indicates that there is an overload.

7. Select OK to start data capture.

8. To stop data capture, press any key. The waveform for the captured data will appear in the active view. It is redrawn after data capture is completed to show the captured signal in the window. The CSL captures the last inputted data.

9. To save your captured data, select Data on the Main Menu. Now select "Save Signal, All Data".



10. The information box confirms the number of data points to be saved in the file. You will be prompted for a filename from the "File to Save : " line.

Check to ensure that the name of the directory is where you wish the saved sampled data to reside. You may also change the name of the directory at this point.

11. Once the name of the data directory is correct, enter the name of the file in standard DOS format. The filename can be up to eight characters long. The "Comment" prompt saves information for the file header.

12. To get to the comment line, press the down arrow key or the tab key.

13. Once this information is entered to your satisfaction, select OK to complete the saving routine.

Using the Command Line

The pull-down menus access specific commands and selected parameters available from CSL's command set.

All of the commands can also be accessed using the command line capability.

The advantage of the pull-down menu access is that you do not need to understand the command library or look-up parameter settings.

The advantage of the command line access is that you have more flexibility in fine-tuning your commands.

1. Select the "A>" view screen. Position the data cursor to a point on the waveform of interest.

2. Activate the "B>" view screen by typing :

〈space bar〉 USE B 〈enter〉

(Where 〈space bar〉 is one press of the space bar, USE B is the command, and 〈enter〉 is the ENTER key.)

You will note that on the upper left of the screen, a command line is displayed. As you type the above command, the characters will appear on this command line. The USE B, which you just typed in, performed the same function as if you had placed the cursor arrow on the B screen and pressed the RIGHT mouse button.

3. Now select Analyze on the Main Menu and then "Spectrogram...". Next, select "Spectrogram All Data". When the spectrogram has finished drawing a view screen title, "SPG" will appear to the right of the ID letter.

4. You can now purge the active view screen "B>" by typing :

〈space bar〉 PURGE 〈enter〉

In the above example, the command PURGE performed the same function as the pull-down command View on the Main Menu called "Purge Active View 〈F2〉".

5. There are two types of commands ; SET commands which adjust parameters for subsequent commands, and commands which execute an action. We will set the spectrogram parameter to an FFT point size of 75 points(220 Hertz filter bandwidth).

〈space bar〉 SET SPG.LENGTH 75 〈enter〉

Because a SET command only resets a program parameter, there will be no obvious action taken or display change. The parameter change will be realize when the relevant command, in this case SPG is implemented.

6. Use the command line to execute a spectrogram with a specific time axis :

〈space bar〉 SPG A = =+.3 〈enter〉

A spectrogram of a portion of the signal represented in view screen "A>" will now be generated on the "B>" view screen. The starting point for the analysis is the cursor, which is indicated by the = character, and the endpoint of the analysis is 0.300 after the cursor.

The general form for this command is 〈command name〉〈source〉〈range〉

7. To review the last command, press the backspace key. The last command sequence will be displayed. The ability to recall this command may be useful for re-execution or editing.

The approximately 150 commands and SET commands used in CSL are documented.

Using Macro Commands

A macro command capability allows you to string together many separate commands to execute at once.

This is especially useful when the same set of com-

mands is to be repeated.

You can create your own macros as required. Your created macros can be named and accessed using the pull-down menus. You can also add the command directly to the Main Menu.

There are three wayts to access commands or macros, which are a series of commands.

First, you can use the pull-down menus

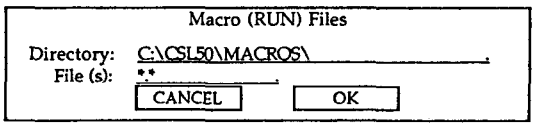
Second, you can use the command line to type in a command

Third, you can use the define key capability to access a command or macro command.

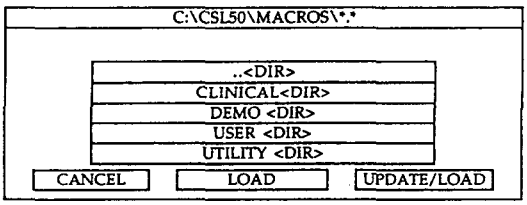
By using the pull-down menus

1. Usign the mouse, select Macro on the Main Menu.

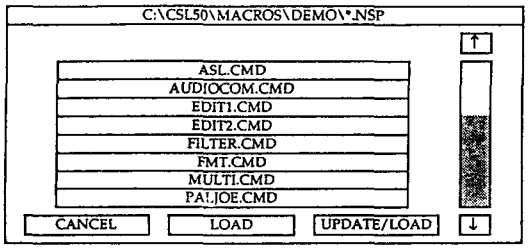
2. Select "Run a Macro".



3. Press the ENTER key or select OK. A list of the subdirectories is presented. Select the subdirectory DEMO〈DIR〉 and then LOAD to view the macro files stored under this subdirectory.



4. A list of the availabe macros will be presented for this subdirectory. You can now select any macro to run.



5. Select a macro as you would select a data file and select LOAD to run the selected macro. For example, select FMT. CMD appears above the list of macros. Then, select LOAD to load and run the macro.

By using the command line

1. Use the command line to execute a macro which illustrated the effect of phone line filtering on speech acoustics and perception.

〈space bar〉 RUN : \CSL50\MACROS\DEMO\PHONE.CMD

(Where RUN is the command to load a previously defined and stored macro command and PHONE. CMD is the name of the command stored in the subdirectory \CSL50\MACROS\DEMO.)

2. Press the Ctrl and "A" key simultaneously to execute a macro which will play speech files altered by ASL.

Macros Provided

The CLINICAL and DEMO subdirectories are the most useful macros to explore. You will also note that a group of macros under the path C : \CSL50\MACROS\CLINICAL\ are focused on clinical application.

These macros are located in the subdirectory C : \CSL50\MACROS\DEMO. Select each one to explore these capabilities and to guide you, by example, in designing your own macros.

Using the Defined Keys

1. Press the (F3) key to listen to the stored signal.

2. Mark a segment in view screen "A>" with the cursors.

3. Press the (F4) key to listen to the marked segment.

4. Press the Alt and (F9) keys simultaneously on your keyboard. This has been defined to delete all views and then create four new views. The size and aspect ratio of these views are well suited for waveform editing.

F1 : Capture one channel

F2 : Purge active view screen

Macro Name	Explanation
ASL. CMD	Plays files that were altered by optional ASL program. Provides examples for speech manipulations which can be implemented.
AUDIOCOM. CMD	Plays four voice samples. It illustrates how the CSL can be used as a powerful perceptual evaluation tool by juxtapositioning voice samples.
EDITL. CMD	A very long macro with a narrative that will demonstrate the CSL's cutting and splicing, warping, and playing capabilities.
EDIT2. CMD	This long macro will show the digital filtering capabilities of the CSL. Includes a narrative.
FILTER. CMD	Creates five views, loads a file, and then implements a band-reject digital filter to alter the signal. The pre- and post-filtered signal are spectrographically analyzed and spoken.
FMT. CMD	Creates six views, loads a signal from memory, performs a series of analysis, and speaks the signal.
MULTI. CMD	Analyzes a multiple channel recording.
PALJOE. CMD	A six view analysis of the classic acoustic phonetic phrase "Joe took father's shoebench out". All views are linked so that you can move the cursor and energy, spectrogram with formant extraction overlay, linguapalatal see pitch, contact, IPA transcription and waveform. Note TAGS(red triangles) on waveform.
PALKAY. CMD	Shows five views of the words "Kay Elemetrics Corp. ! ! . Note the Palatometer display in the lower left corner. This is displaying linguapalatal contact during speech. It was acquired by Kay's Palatometer. CSL can read Palatometer files.
PHONE. CMD	Demonstrates filtering a stored signal with a filter approximating the filtering of the phone line.
SAMPLING. CMD	Plays speech signals sampled at various sampling rates to demonstrate the perceptual impact of changing sampling rates.
SIG GEN. CMD	Provides examples of the CSL's filter generating capabilities.
SPG. CMD	Creates two views, loads a speech signal, and displays a traditional DC, 8kHz wideband spectrogram.
SPGFOFMT. CMD	Uses three views to load a file and generate a wideband spectrogram with pitch analysis.

F3 : Speak all

F4 : Speak marked

F5 : Load user file

F6 : Save a file

F7 : Voicing Macro(While this program is still operational, the Multi-Dimensional Voice Program has replaced this program and is run outside of CSL software, but uses CSL hardware.)

F8 : Transfer from 5500(refers to DSP Sona-Graph, Model 5500)

F9 : Clear all screens

F10 : Load user setup

Using the Help Menu

1. Using the mouse, select System on the Main Menu.

2. Then, select "General Help".

3. All of CSL's commands are listed in alphabetical order. To find out about the command APPEND, for example, select APPEND, then select HELP.

4. A brief description of the command will appear and the top line will indicate the proper syntax for using the command.

5. If desired, the command can be directly executed from the HELP menu by selecting EXECUTE.

6. Information about command parameters can be found under System on the Main Menu and then "Command Parameter Help".