IN CUBE OnLine Manual

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INTRODUCTION

Congratulations on selecting IN3 TM Voice Command!   (IN3 is pronounced "IN CUBE".)   You'll find IN3 Speech Recognition to be a powerful productivity tool which will help you manage WindowsTM and give you voice command input for all of your favorite applications.   If you're frustrated with cumbersome keyboard and mouse operations, you will really enjoy the convenience and speed of voice input.

IN3 is your third input device (keyboard and mouse are your first and second).   You will find voice is most efficient for many of the operations you frequently perform.   Allow yourself to naturally and spontaneously select the input method that is most convenient.   You will likely prefer voice input for window navigation as well as for command entry in applications like CAD, publishing, and data collection.

IN3 Users Guide

This documentation covers IN3 Voice Command for Windows.   It includes a "Quick Start" section which will help you install IN3 Voice Command.   A tutorial provides stepbystep instructions and explanations of IN3 Voice Command features.   Helpful tips for optimizing speech recognition performance are provided to assist new users.   "Principles of Operation" provides a technical overview of the system and its components to help you understand how IN3 Voice Command interacts with your audio board and the other parts of your system.   IN3 Voice Command includes Windows contextsensitive Help, which may be activated with the F1 key when an item is selected.

A complete Application Programming Interface (API) for use in designing fully voiceinteractive applications is available as a separate product.   This developer's tool contains a complete library of functions for use in fully integrating IN3 Voice Command with your application software.   Developer's documentation, supplied with the API, is complementary to this IN3 Voice Command documentation.

Command Corp. Inc. provides support and consultation via telephone and Email for IN3 Voice Command users and developers. Telephone hours are 8:30 AM to 5:30 PM Eastern time Monday through Friday. Email is answered within 24 hours Monday through Friday.

> Telephone: (404) 813-8030
> FAX: (404) 813-0113
>
> Email USENET: support@gacc.atl.ga.us

1.0   START-UP INFORMATION

EVEN IF YOU DON'T READ ANYTHING ELSE, PLEASE READ THIS SECTION.

Before installing IN3, make sure you can record and playback messages using your Windows-compatible audio system.   Optimizing the gain for IN3 is discussed later in this section.

Be sure to check the README file for release notes.

1.1   Installation

IN3 Voice Command runs on any IBM compatible 386, 486 or Pentium™ system with Windows™ 3.1.   IN3 Software requires approximately 2 Mb of disk space for all of its components.   To install IN3, start Windows, select File and Run.   Place the IN3 Setup disk in a floppy drive.   At the Run Prompt, type: A: setup <enter>.   If you are using other than the A drive, substitute the drive letter.

During installation, you will be prompted for the drive and path where you want IN3 Voice Command sample lexicons installed.   Follow the prompts and answer the questions as the install routine requests information.   The IN3 application and system files will be installed in your Windows program and system directories.

Setup will add the IN3 Voice Command Icon to the accessories program group.   IN3 is immediately available to use when installation is complete.

1.2   Microphones

IN3 Voice Command speech recognition technology creates a voice template for each command.   Then, in recognition mode, it compares and matches those templates to data coming from the microphone.   The comparison is performed continuously and in real time.   Templates created in a reasonably quiet environment with a strong voice signal will be wellmatched even in the presence of typical office noise.

Most microphones are designed for "close talking."   If you position the mike close and build your voice templates with a strong signal in a quiet environment, recognition performance will be virtually 100% accurate.   But if you move away from the mike, your voice signal will be progressively reduced and it may become too weak to create a distinctive voice template.

Command Corp. Inc. supplies deskmounted and headset microphones for optimum performance with speech recognition.   Some of these are designed for speaking distances of six to sixteen inches, and they perform very well in a normal office environment.

Contact Command Corp. Inc. at (404) 813-8030 for additional information.

1.3   Audio Boards

IN3 Voice Command runs with most 8 and 16 bit Windows compatible audio boards.   In selecting an audio board for use with IN3, choose a board that records and plays back audio that is relatively free of static and hum.   Also, choose a board which has efficient Windows drivers.   Many audio board manufacturers have updated Windows drivers for their boards.   Check with the manufacturer's support group or bulletin board and update your drivers to the latest available revisions.

1.4   Setting Audio Record Gain

IN3 Voice Command requests and receives digital data from your audio board in the same manner as if you were making a recording.   Since various audio boards have different sampling rates and sample size, IN3 automatically uses the best rate and sample size available from each board.

Sampling rate and size are selected by IN3 in the following order:

1. 8KHz   16 bit   (preferred)
2. 11KHz   16 bit
3. 8KHz   8 bit
4. 11KHz   8 bit   (least preferred)

If your record/playback tool permits adjustment of sampling rate and sample size, pick the most preferable rate and size available according to the listing above.

Use the record and playback tool provided with your audio board to make a test recording.   Then use the audio record gain adjustment or "mixer" supplied with your board to adjust the gain for optimum performance.

Speaking in a normal and relaxed voice, record a one or two second test message.   Play the message back and note whether the signal is clear and strong or weak and distorted.

Since microphone and audio board characteristics vary greatly, you may need to try several record gain settings to find the optimum value.   The best setting is the one which produces the strongest undistorted signal with the least hum, static or background noise.   If your record/playback tool provides a graphic representation of the recording, set your record gain so the loudest peaks created in your normal speaking voice just approach, but do not reach, the upper and lower limits of your waveform viewer.   If background noise or system noise is excessive at this gain setting, either reposition the microphone closer to your mouth or reduce the record gain setting, or do both.

Be sure to save the gain setting using the save utility included with your audio board.   This will insure that the record gain is set to the same value each time you start up.

When you have finished setting the record gain, exit from the record/playback application.   This will permit IN3 Voice Command to request and receive audio data from the board.

The microphones which are provided with audio boards can be used with IN3 Voice Command if you exercise a little care.   Testing indicates that optimum performance is achieved when voice templates are created in a quiet environment with the mike positioned close to the speaker's mouth.

1.5   Running The Demo

Double click on the IN3 Voice Command Icon.   The IN3 Status Window opens with the Demo lexicon of commands.

Select Edit and Build Templates.   Turn off radio, etc. and eliminate noise as much as possible during the process of creating voice templates.   Position the microphone as described above.   Then click on Begin and speak the commands in a normal voice as you are prompted.

In less than a minute you will have completed your templates for the demo lexicon and you will have voice control over some of the frequently used desktop functions.

2.0   IN₃ VOICE COMMAND TUTORIAL

2.1   StartUp

Set record gain as described in Section 1.4.

Launch IN3 by double clicking on the IN3 Icon.

IN3 displays the IN3 Status Window with the Demo lexicon already opened.   If you already created voice templates for the Demo, you need not create them again, but we suggest you review the following sections for additional information and tips on getting good performance.

2.2   Loading a Lexicon

From the IN3 Status Window select File then Open.   IN3 presents a dialogue box containing files. Starter lexicon files provided with the system are identified by .vcb suffix.   Select the demo.vcb lexicon and click on OK.   This will load the demo lexicon, which has already been created for you.   The demo commands appear in the Commands Loaded scroll list.

2.3   Building Templates

Select the Edit button, and then select the Build Templates option to create your voice templates for each command in the demo lexicon.   The Build Templates window is displayed.

When the Build Templates window opens, two mode selections appear.   IN3 will set these modes to the normally desired settings based on the status of the lexicon.   If IN3 fails to find a template for each command in the lexicon, the CREATE function will be highlighted indicating that some templates need to be built.   If IN3 senses that all commands have templates, the refine selection will be highlighted.   You can change this default selection by clicking on the desired option.

IN3 defaults to either ALL or SELECTED mode depending on whether it senses that some templates already exist or there are none.   In SELECTED mode, the system will prompt you to build templates only for those commands needing templates.   If you wish to replace some but not all existing command templates with new ones, highlight the commands in the Status Window before entering the Build Templates Window and then use Selected Mode.

Position your microphone, then in CREATE mode, click on Begin.   You will be prompted to repeat each command twice.   When you have spoken all commands twice, you will then be prompted to repeat each command one more time.   As each voice template is created, an asterisk appears to the left of each command in the status window.

Note also that the Begin button becomes a Pause/Resume button, for use if you are interrupted.

If during the process of building or refining templates, IN3 receives a weak signal, the build process will be suspended and a message "Audio Input Level Is Too Low" will appear.   Either reposition the microphone so it is closer to your mouth or speak more loudly in order to provide a stronger signal.

In order to optimize the template data, you are required to provide a somewhat stronger audio signal when you are Building or Refining templates.   When in recognition mode you will be able to speak more softly and you will still obtain very good performance.

If for any reason templates were not created during this initial process, any commands that remain without templates will be highlighted in the Commands Loaded scroll list.   The Status message at the

bottom of the Status Window will say, "Need to create templates."   Select Edit and Build Templates.   In the Templates window CREATE and SELECTED will be highlighted.   Click on Begin to complete the build templates process.   Note that not all templates need to be created in order to use some commands.

2.4   Testing Speech Recognition

Once templates have been created, you are ready to test recognition.   Do not Exit from the IN3 Status Window.   If you Exit the IN3 Status Window, IN3 Voice Command will shut down.   IN3 may be minimized to an icon which will not shut it down.

The Status Window contains a list of the commands in the lexicon for use as a reminder.   Notice that the Status line at the bottom of the window says Recognition is active.   As you test recognition by speaking commands, the Status line will indicate each command that is recognized.

The first command in the Status Window, _MICROPHONE, is your voice operated microphone switch. When IN3 loads a lexicon, the microphone is on and the lips in the upper right hand corner are red.   Say "Microphone" and the switch is turned off.   The lips change from red to black indicating the microphone is off.   Say "Microphone" again to turn the mike back on and the lips return to red.   A beep also sounds when the microphone switch is changed.   One beep indicates the switch has been turned off and two beeps signal it has been turned back on.

Test the commands to verify that Calendar, Clock, Command Shell, Calculator, etc. are working.   Then manipulate the windows by using the commands.

Voice template features are established by energy patterns rather than frequencies, so there is no need to speak in a monotone.   Test this aspect of the IN3 System performance by saying a few of the commands with different pitches.

IN3 is a continuous word spotting system.   It will recognize a command even though it is embedded in a continuous sentence.   To test this, say, "Give me the calendar please."   If you spoke naturally when you created the voice template for calendar, the system will recognize and execute calendar even though it is embedded in a sentence.

Now say, "File Manager," very rapidly and very slowly to see the extremely wide range of speeds at which the command will be recognized even though you probably did not change the speed when you created the voice template.

2.5   Tips on IN3 Recognition

New users sometimes try to "help" IN3 by speaking very distinctly when building templates and testing. As a result, the templates may work fine while testing but later in normal use when the user is relaxed and speaking softly, some commands may not be recognized.   So when building templates try to relax and speak normally.

If IN3 Voice Command tends to falsely recognize one or more commands, the template(s) probably contains noise.   To correct this, use the mouse to highlight the command in the IN3 Status Window. Select Edit, choose the Build Templates option, and create a new template.   For best results, do this at a quiet time and position the mike so it picks up a good strong signal.   You might also want to check audio quality by making a test recording as described in section 1.4.   Also, refer to Section 1.2 "Microphones" for more information on use of microphones.

If creating a new template does not correct the problem, your record gain may be set too high.   Try reducing the gain until the problem is solved.

2.6   Refining Templates

IN3 permits you to refine your templates.   Refining updates the data in your original templates and captures the natural variations in pronunciation which occur over a period of time.   After an initial startup period, no further template maintenance is normally required.

To refine templates, select the Edit button and then the Build Templates option.

The Build Templates window will appear with the mode settings REFINE and ALL highlighted.   Click on the Begin button and speak the commands as you are prompted.

When refining templates, IN3 Voice Command prompts you to speak each command only once.

2.7   Adding Commands to a Lexicon

To add a new command to the demo lexicon, select the Edit button from the IN3 Status Window and then select New Command.   The New Command Dialog box opens.

When this window appears, the cursor will be positioned in the Command name field.   Type the word you want to say: "Directory Wide" and press the Tab key on the keyboard.   Note: If you hit enter by mistake, you will return to the IN3 Status Window.   To complete the "Directory Wide" entry, select Edit and Update commands.   Then hit F1 for context sensitive help.   When you hit TAB, the cursor moves to the Keystroke field.   Type in "dir/w" for the DOS command.   In order to execute the DOS Command dir/w, an enter is required at the end of the keystroke sequence.   To add {enter} to the keystroke sequence, click the mouse pointer on the arrow next to the Other keys field.   Select enter from the list to add {enter} to the keystroke sequence.   Click on OK to complete the addition of "directory wide" to the demo lexicon.

If during the process of entering commands or key sequences you make an error, you can clear the information with backspace or delete.

For a more complex example, let's create a spoken command that will "restore" an application which has been minimized to an icon.   Again select Edit and New Command.   Type: Restore for the command name and then press the Tab key on your keyboard.   The pointer moves to the Keystroke field.   The keystrokes which will execute Restore are Alt {space} R.   Click the mouse on the "Alt" box, then select {space} from the other keys list.   Finally, type an R from the keyboard and click on OK.

2.8   Building a Template for a New Command

To create the voice template for this newly created command, select Edit, then Build Templates.   The Templates window appears with CREATE and SELECTED modes highlighted.

Select Begin and follow the prompts.

2.9   Testing the New Command

Test these new commands in a DOS Command Shell.   First, say "Command Shell."   IN3 will open a DOS Command Shell window.   Say "Directory Wide" and the command will be executed.   Say "Minimize" and then "Restore."   Now you have full voice control of your Windows Workstation.

2.10   Creating Voice Macros

IN3 Voice Command will create keyboard events for any sequence of up to 64 keystrokes for each recognized command.   You can string any number of commands together to create a macro and IN3 Voice Command will pass the string to the application.

2.11   Power User

Congratulations!   Having completed this tutorial, you now have the knowledge and experience with IN3 Voice Command to be a power user.   As you explore additional features, use the on line help F1 for detailed guidance with each operation.   Just use your imagination and set up IN3 Voice Command to handle the commands that are awkward or tedious to execute from keyboard or mouse.

Good Luck!

3.0   PRINCIPLES OF OPERATION

3.1   Windows Audio

IN3 Voice Command receives its audio data from the Windows audio wave device usually referred to as an audio board.   The microphone gain is set using the record gain control or mixer that is supplied with the audio board.

3.2   IN$_3$ Subsystem

IN3 Voice Command processes the audio data from the audio device into voice templates and then in recognition mode performs template matching.   When a template is matched, keyboard events are created and inserted into the key queue.   Template matching is performed continuously.

3.3   Lexicons

A lexicon is a set of voice commands consisting of three data files that are identified by the lexicon name with suffixes of .vcb, .tpl, and .sub.

*.vcb :   contains command name and keystroke information

*.tpl :   contains voice templates

*.sub :   contains command attributes

The standard IN3 Voice Command System will handle lexicons of up to 75 commands and all 75 commands may be active for recognition at the same time.

3.4   Commands

A command consists of keystrokes, a voice template, and an attribute. Up to 64 keystrokes can be generated upon recognition of a command.

The keystrokes are inserted into the key queue when the spoken command has been recognized.   IN3 handles any combination of keystrokes from the PC enhanced keyboard including shifted combinations. Full voice macro capability is provided.

The voice template is the stored data that is used to match a voice command, to incoming speech samples.

3.5   Performance
IN3 compares all of the voice templates which are active for   recognition to the data that is collected and processed from the audio device, and it does so in real time.   Generally, all 486 based PCs have enough processing power to perform IN3 recognition with at least 75 commands active for recognition while running userinteractive applications.   Response is immediate.

Depending on the speed, 386 based PCs will begin to exhibit a perceptible time delay in entering keystrokes when the number of active commands exceeds 50 or 60.

The audio device manufacturers supply device drivers which handle the transfer of digital data from the

audio board to memory via direct memory access "DMA."   The efficiency of these device drivers has a significant influence on IN3 performance.   Many board manufacturers have updated their Windows drivers so it is a good idea to obtain and use the latest available update.

3.6   Creating and Refining Voice Templates

Before a command can be recognized, a corresponding voice template must first be created.   A voice template represents energy associated with the way in which you pronounce the command.   Naturally there are variations in the way you say a command each time it is spoken.   The template refining process builds on the base voice template to create a refined template that represents your normal range of pronunciations.

3.7   Microphone Switch

A voiceoperated microphone switch is embedded in the IN3 Lexicon.   The IN3 command keystroke sequence $mike$ toggles the switch off and on.   In operation, the microphone may be toggled to ON or OFF by speaking the command, "microphone" while recognition is active.   Separate ON/OFF voice command switches can be implemented by adding spoken commands with the keystrokes $mikeon$ and $mikeoff$. The mike, mikeon, and mikeoff characters must be lower case.

The Lips shown in the Status Window and in the minimized icon change from red to black when the microphone switch is turned off.   When it is turned back on the lips return to red.

3.8   Keystroke Modes and Command Mode

IN3 Voice Command provides two types of control for manipulating the Windows interface and for entering commands or data to applications running under Windows.   These modes, known as Keystroke Mode and Command Mode, are described in detail below.

3.9   Keystroke Mode

In Keystroke Mode, IN3 enters keystroke information corresponding to data, menu accelerator keys, or key sequences for voice macros into the system key queue. The information entered to the key queue is in the form of key scan codes.   Keystroke Mode is the default mode for most voice macro commands.

Any combination of keys from the PC enhanced keyboard can be entered. In order for IN3 to recognize modifier keys among keystroke strings, the modifier keys, {Ctrl}, {Alt}, {Shift}, and the other Special keys such as {enter}, {tab}, etc. are placed in braces.   Function keys are also identified by braces. {F1}, {F2}, are examples. In building a lexicon, these keys may be typed on the "Keystrokes" line using braces or they may be selected using the mouse from the scroll list in the dialog box.

3.10   Command Mode

IN3 provides a powerful facility called Command Mode which provides window manipulation, job execution, and lexicon reloading.

Command mode is invoked when the first character in the command string is a '>' (greater than symbol) and the second character is anything else. If both the first and second characters are '>' symbols, the string is processed as a keystroke sequence with one of the '>' characters and Command Mode is not entered.   This technique, called doubling, allows keystroke sequences to begin with a '>'.   The '>' is significant only in character position one on.   Anywhere else in a keystroke sequence it is treated as a

simple character and nothing special is performed.

Command Mode processing begins with the character following the '>' in position 1.   A command and one parameter are parsed off.   The parameter may be a quoted string and if it contains embedded white space (space, tab, backspace, formfeed, etc) it must be enclosed in double quotes.   A double quote may be entered in a string by doubling.

The string matching is always performed in a case sensitive manner.   Strings which are not capitalized the same do not match.

Command Mode Commands must be entered in lower case.   An invalid command terminates command processing at that point.

3.11   IN3 Command Mode Commands

     class "Window Class"   Locate a window with a window class matching the "Window Class" parameter.   If a window can be located which is already open, it is raised to the top of the window stack and focus is transferred to it.   If an open window can not be located, but a window does exist which is iconified, the iconified window is opened and then processed as before.   If neither an open window or an iconified window can be located, the command fails.   The "class" command can only open a window with the "visible" attribute and cannot open a "hidden" window.   Class names can be difficult to determine but are often the same as the program name.

     echo "string"   Enters the string parameter into the system keyboard queue just the same as a simple keystroke sequence.   This is the ONLY function with allows nonascii characters to be embedded in the parameter string.
     exec "command string"   passes the parameter string to windows for execution.   This performs the same operation as the "run" function from the "progman" program manager.   The "exec" command succeeds if the program can be successfully started and fails otherwise.

     title "Window Title"   Performs the same function as the "class" command but on a window with a window title matching the "Window Title" parameter.

     open "filename"   passes the filename parameter to the IN3 user interface to be opened as a new lexicon.   The file name may be a complete drive and path or may be a simple lexicon to be found in the same directory as the current lexicon.   It is not necessary to supply and extension on the lexicon name. Command succeeds if recognition can be restarted with the new lexicon and fails otherwise.

Command Sequences:

Commands are executed sequentially until a command succeeds. Software developers will recognize this as equivalent to a logical "OR" operation which permits IN3 to handle compound commands.

Example 1:

>title "Cardfile (PHONELST.CRD)" exec "cardfile.exe phonelst.crd"

IN3 will first attempt to raise an existing window with the title "CardFile (phonelst)".   Failing that, it will attempt to execute the cardfile.exe command with a parameter for the "phonelst.crd" card file.

Example 2:

>title "WordPerfect myfile.wp5 (unmodified)" title "WordPerfect myfile.wp5"

IN3 will first attempt to raise a WordPerfect window with an unmodified document title.   If that fails, it will attempt to raise a window with the modified document.

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