Version Information

Polyphonic Edition
Version 3.1

Introduction

Have you ever been struck with a moment of bursting creativity, recorded a great new idea for a song or a hot new lick, but now can't remember what notes you played?   Are you a music teacher who needs an easier way to write down a practice sequence for your student?   Or, are you a music copyist who is looking for a simpler alternative to playing a recording of a song over and over to pick out the notes and write them down?

Electronic equipment and computer software has been available for over ten years to record music in the form of a MIDI file so it could later be automatically notated, played back using the sounds in your sound card or MIDI-enabled musical instruments, edited in a sequencer,   or used on Web pages to save space over wave files.   The catch is that the music has to be "played in" on a MIDI-enabled instrument, so you have to know how to play a song in order to record it.

A few products have been recently developed that will allow you to sing or play a non-MIDI instrument, determine the notes you played, and write them to a MIDI file.   We call this new field of computer technology "automatic music recognition".   The catch here, of course, is that these products can only recognize songs played monophonically -- one note at a time.   How many songs do you know that contain only one note at a time?

Attempts have been made over the years to create an automatic music recognition system that recognizes polyphonic music — music containing more than one note at a time, such as chords.   This has proved to be a daunting task, however.   If you wanted a recording of polyphonic music to be converted into a MIDI file, the fact remained that you had to succumb to the grueling task of picking out the notes yourself.

Until now.

IntelliScore music recognition system will listen to your music and help figure it out for you.   You simply copy the music into the computer from an audio CD, a tape recording, a record, an existing wave file, or whatever.   You do not need a MIDI-enabled instrument.   You do not need to know how to play the song.   After setting some parameters, IntelliScore will convert a wave file to a MIDI file, ready for cleanup through a sequencer.   Thereafter, you can play back the MIDI file on your own MIDI-enabled musical instruments or notated.   IntelliScore is for music performers, publishers, arrangers, and teachers who work with sheet music or MIDI files.

IntelliScore doubles your productivity, letting you spend more time making music and being creative and less time picking out notes.

Recognition

- Converts wave files to MIDI files with unlimited polyphony

- 95 instrument filters for wave files containing a single instrument

- Multiple instrument recognition mode

- Automatically detects key and chord names

- Automatically filters out noise and non-tuned percussion, such as applause, static, cymbal crashes, snare drum rolls, etc.

- Constrain To Key option

- Auto Gain option

- Transpose playback pitch

- Change playback Speed

- Boost/cut playback Volume

- Wave Threshold and MIDI Threshold

- Speaker buttons to help set recognition parameters

- Tempo Tracker feature ensures that timing information never strays off beat, even when the tempo varies

- Displays full Status information

Install

To install IntelliScore on your computer, perform the following steps:

1. Quit all other programs that may be running before installing IntelliScore.

2. Place the CD in your CD-ROM drive or disk 1 in the floppy drive.

3. Click on "Start | Run...".

1. Type **x:\setup.exe** in the text box and click on "OK" (where **x:** is the letter of the drive you are installing from).

1. Follow the instructions on the screen.

1. You will be asked to specify an installation folder.   You may select any folder you choose, but this User Guide assumes you chose **C:\Program Files\intelliScore Polyphonic**.

1. You will be asked to specify a folder for the program shortcuts.   You may select any folder you choose, but this User Guide assumes you chose **intelliScore Polyphonic**.

1. The setup program will begin copying files to your computer.   If newer versions are already on your computer, they will not be overwritten.

Uninstall

You should always use the IntelliScore uninstall utility should you desire to remove IntelliScore from your system. Additionally, if you want to move IntelliScore's files to a different folder or hard disk on your system, you should first use the uninstall utility to remove it, then run the install utility again to place the files to the new folder. To use the uninstall utility, perform the following steps:

1. Click on "Start | Settings | Control Panel".

2. Double-click on the "Add/Remove Programs" icon.

3. Under the "Install/Uninstall" tab, select "intelliScore Polyphonic".

4. Click on the "Add/Remove" button and follow the instructions on the screen.

1. No files will be removed that are being used by another Windows 95 or Windows NT program. If a file in the Windows system folder is not needed by any other program on your system, you will be prompted before deleting the file.

Start

To start the program, do one of the following:

- Click on "Start | Programs | intelliScore Polyphonic | intelliScore Polyphonic".

- In Windows Explorer, double-click on a project file.   These files have a **.ipr** extension.   When the program starts, it will automatically load the project you clicked.   The first time you do this a window will appear requesting you to indicate which program you want to run when filenames with that extension are clicked upon.   Type **IntelliScore Project** in the Description box.   Select **iSpmrs** from the list of programs and click the OK button.

Case Study

When you installed IntelliScore onto your system, you may have elected to install a set of sample files to the **Samples** sub-folder on your computer.   Included in this collection is a wave file representing a portion of the 2nd movement of Ludwig von Beethoven's 8th Piano Sonata in C Minor called Pathetique.   The wave file was recorded using the recommended settings described in the manual.   We will use this music as we use the New Project Wizard to give you practice at adjusting recognition parameters.   You can compare your work to the project and MIDI files we came up with.   Feel free to experiment, however.   That is the best way to learn how to use all the features of IntelliScore to their maximum potential.   To preserve the original files, back them up to a different folder or rename them, or else you will be prompted to replace them as you follow the case study.   You can also preserve and compare the results of your experiments using different filenames.   This case study assumes you are using the default settings in the Options window and that you installed IntelliScore at the default path of **C:\Program Files\IntelliScore Polyphonic**.

1.   Click the Blank Document Icon in the Tool Bar to start the New Project Wizard.

2.   Click the Next button to go past the introductory screen.

3.   You are asked where the wave file will be obtained from.   Choose the bottom option, as the wave file for this case study already exists.   Click the Next button to continue.

4.   You are asked to specify the wave file.   Click on the Open Folder button.   In the Open Wave File dialog box, change to the folder in which you installed IntelliScore.   Select the file **Samples\Pathetique Sonata.wav**.   You will receive a warning message that the wave file has a recording level of 59%, which is slightly below the optimum range.   For this case study, we will use the file anyway.   Click the OK to remove the message and the Next button to continue to the next step.

5.   Since the wave file contains a single type of instrument, a piano, choose the **Single** option and click Next to continue.

6.   Now select the instrument from the list box.   Choose **0 - Acoustic Grand Piano**.   You can click the speaker button to hear what the instrument sounds like through your sound card.   Click Next to continue.

7.   You are asked to enter the polyphony level.   This section of Pathetique Sonata only contains four notes at the same time, so type or use the spinner to enter   the value **4** and click Next to continue.

8.   It is time to tap in the tempo so IntelliScore knows where the beats fall.   Start the wave file playing by pressing the Play button.   Tap the <SPACE BAR> in time with the music until the wave file finishes playing.   If you tapped the same way we did, the tap count should finish at **31** with a tempo of **50** beats per minute.   The Tap Extender window appears.   Since we tapped the entire time span of the wave file, we do not need to extend the taps, so click the Cancel button to close the window.   Click Next to continue.

9.   For the Timing Resolution, accept the default value of **2**, since there are two notes per beat.   Click Next to continue.

10.   Accept the suggested MIDI filename of **C:\Program Files\IntelliScore Polyphonic\Samples\Pathetique Sonata.mid** and click Next to continue.

11.   Click the Finish button to close the New Project Wizard and start the recognizer.

12.   When it is finished, your MIDI editor will open with the generated MIDI file loaded.   Note that IntelliScore detected the names of the chords present in the wave file, but that the new chord names appear every four beats, whereas it sounds like the chords actually change every two beats in the wave file.   Play the MIDI file that IntelliScore has just created and listen to the range between the high notes and low notes being played.   Also listen to determine if the faster notes were detected.   You may also want to have the sequencer notate the MIDI file.   This MIDI file seems to cover the entire range of notes, including a couple notes that seem too low.   Note what a more appropriate lowest note would be.   Also note that IntelliScore determined that Pathetique Sonata is in the key of A-flat Major, which seems correct.   Now close the MIDI editor.

13.   The MIDI file turned out pretty well, but if you want to adjust it further, reopen the project editor.   In the Pitch Tab, you will see that IntelliScore detected a Pitch Range of **Db1** - **Bb4**.   The low note was too low, so try adjusting the range to **Eb1 - Bb4**.   In the Timing Tab, change the Beats Per Chord from **4** to **2**.   Now, click the OK button to

close the window and restart the recognizer with these optimized settings.

14.   When it is finished, your MIDI editor will open with the revised MIDI file loaded.   You may want to edit notes individually as desired in the editor.   Be sure to save the final touched-up version of your MIDI file.   You can also save your project settings if you desire.

Main Window
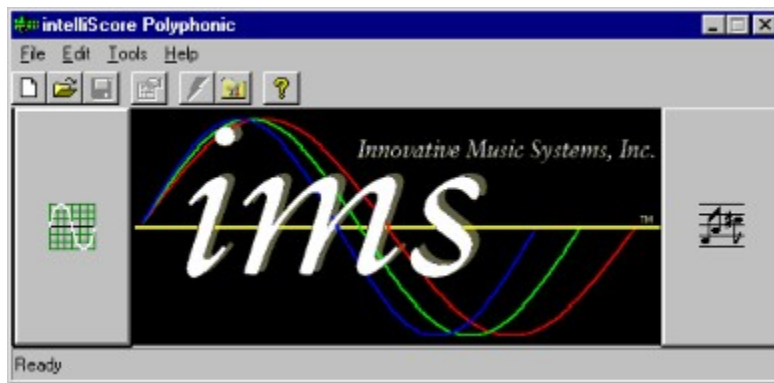
The Main Window provides access to all of IntelliScore's windows through a Menu Bar and Tool Bar and allows you to load and save projects.

- [Menu Bar](#)

- [Tool Bar](#)

- [Title Bar](#)

- [Status Bar](#)

- [Sine Wave Button](#)

- [Music Notes Button](#)

Help Menu (accelerator key: H)

Provides access to help and program information.

Item	Accelerator Key	Shortcut
IntelliScore Polyphonic Help	H	<F1>
Getting Started Guide…	G	
Visit Web Site…	V	
About IntelliScore Polyphonic	A	

IntelliScore Polyphonic Help Item, Help Menu

Opens the IntelliScore Polyphonic help file, which contains a comprehensive reference, recording guidelines, background information, and troubleshooting tips.

About IntelliScore Polyphonic Item, Help Menu

Displays version and legal information about IntelliScore Polyphonic.

Tool Bar

Contains buttons for quick access to some of the more frequently used functions in the Menu Bar.

Icon	**Equivalent Menu Item**
Blank Document	New Project…
Open Folder	Open Project...
Disk	Save Project
Document With Pointing Finger	Edit Project
Lightening Bolt	Recognize
Folder with Tools	Options…
Question Mark	IntelliScore Polyphonic Help

Pitch Tab, Project Editor (accelerator key: P)
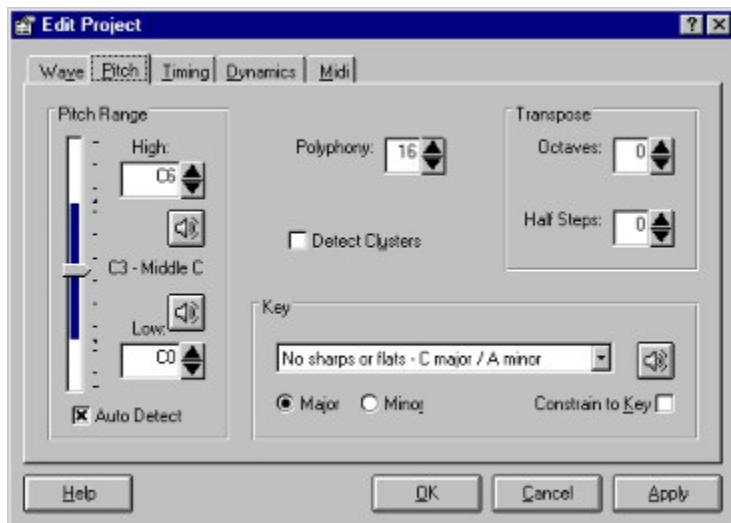
Contains controls to adjust the pitch range and key, as well as specify the polyphony level and transposition.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Polyphony		1	128	16
Low Note		C-2 (0)	<= High Note	C0 (24)
High Note		>= Low Note	*	C6 (96)
Auto Detect (Pitch Range)				checked
Key		7 flats	7 sharps	Auto Detect
Major/Minor	J - Major, R - Minor			Major
Constrain To Key	K			unchecked
Octave Transpose		-10	+10	0
Half Step Transpose		-11	+11	0
Detect Clusters	U			unchecked

*Depends on sample rate of wave file: 44100 Hz - G8 (127), 22050 Hz - E8 (124), 11025 Hz - E7 (112).

Polyphony, Pitch Tab
User Level: Basic, Advanced
*MIDI File Usage: Playback, Notate*

For best results, limit the polyphony setting to specify the most number of notes played at the same time in the wave file. For example, a solo voice would be **1**, but a barbershop quartet would be **4**, because it contains 4 voices. A guitar strumming chords would be **6**, because there are 6 strings on a guitar, each sounding a single note at a time.   The default value changes based on a single person playing the Wave Instrument you select.   When you change the Polyphony, the Auto Detect and Detect Cluster features are either enabled or disabled off depending upon the new setting.

Detect Clusters, Pitch Tab
User Level: Advanced
*MIDI File Usage: Playback, Notate*

The Detect Clusters control is visible if the Wave Instrument is set to **Multiple** and the Polyphony is greater than **1** (not monophonic).   (If the Wave Instrument is set to **Single**, cluster detection automatically is enabled.)   Check this box if your music contains adjacent notes that sound at the same time.   If the Constrain To Key feature is enabled, adjacent notes are notes that are next to each other in the key.   If the Constrain To Key option is disabled, adjacent notes would be separated by half-step intervals.   An example of the second case would be the first inversion of the C major 7 chord, containing the notes E - G - B - C.   The notes B and C are only a half-step apart, meaning the notes are right next to each other.   Enabling this feature significantly increases recognition time.   Since these clusters occur only infrequently in most music, it is usually best to leave this feature turned off.
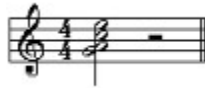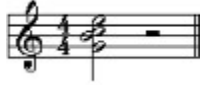
The first example contains a half-step interval between B and C, requiring the Detect Clusters feature.
The second example does not, and therefore would not benefit from the Detect Clusters feature.

Timing Tab, Project Editor (accelerator key: T)
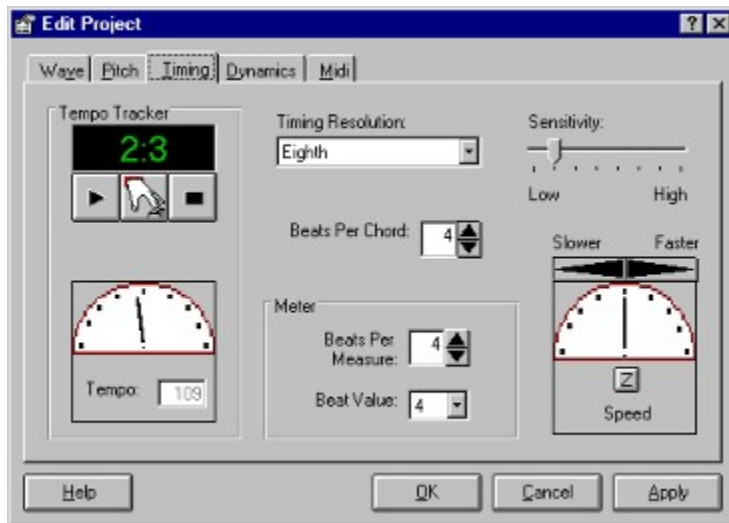
Contains settings that effect the tempo, speed, meter, and the duration of notes in the MIDI file.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Tempo Tracker		5 bpm	1080 bpm	120 bpm
Beats Per Measure		1	99	4
Beat Value		1	32	4
Notes Per Beat (Timing Resolution)		Whole note	1/128 note triplets	Eighth note
Beats Per Chord		1	99	4
Sensitivity		0	7	1
Speed		12.5%	800%	100%

Sensitivity, Timing Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

In some forms of music IntelliScore may have difficulty detecting the melody if the music contains a lot of percussion and quicker notes at the same time.   If the melody in the MIDI file is lacking after running the recognizer, try increasing the Sensitivity by moving the slider one notch to the right.   You should only increase the Sensitivity when necessary, because higher sensitivities result in greatly slowing down recognition.   Therefore it is best to start with the default setting and work from there.   The Sensitivity setting is not available when the Polyphony is set to **1** (monophonic).

Wave Instrument, Midi Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

Specify whether there is a single type of instrument or several different instruments in the wave file (not counting drums and percussion).   Wave files containing only a single type of instrument produce the best recognition results, because IntelliScore understands the characteristics of a great number of musical instruments.   For example, if the wave file includes one or more guitars, choose **Single**. However, if it includes a guitar and a piano, choose **Multiple**. If you set the wave instrument to **Single**, you should then select the instrument from the drop-down list box that most closely represents the instrument in the wave file (although sometimes you will get better results by selecting an instrument that is dissimilar to the instrument in the wave file).   The list box contains a subset of the General MIDI patch list.   To hear what the selected instrument sounds like through your sound card, click the Speaker button. Whenever you select a new wave instrument, the Patch will be set to the same instrument.   You will also be prompted to allow IntelliScore to automatically adjust the Pitch Range and Polyphony settings to the typical range of a single person playing the instrument you choose.

On-line Help

IntelliScore contains extensive on-line help at four levels:

- To access general help such as background information, select "Help | intelliScore Polyphonic Help" from the Menu Bar, click on the Question Mark Icon on the Tool Bar, or press <F1>.

- For a general explanation of the use and functionality of a window, click the Help button on that window.

- For an explanation of a particular control on a window, click on the "What's This" Question Mark icon at the upper right corner of the window if it is present, and then click on the control you want to know more about. Alternatively, you may click on the control you want to know more about, then press <F1>.

- When an error message appears, you can often get more information about the error by pressing the Help key or <F1> key before dismissing the message box.

General Problems

Problem
I created a project, but I can't start the recognizer.

Possible Solutions
• Select a Wave File.

Problem
The recognizer runs too slow or does not stop initializing.

Possible Solutions
• Lower the Time Range.
• Disable the Detect Clusters feature.
• Lower the Pitch Range.
• Lower the Timing Resolution.
• Reduce the Sensitivity
• Enable the Constrain To Key feature.
• See the instructions for the "Out of memory" error.
• Get a faster processor.

Problem
The MIDI file does not reflect the wave file accurately enough.

Possible Solutions
• Check the recording quality of your wave file, especially its volume, and re-record it if necessary.   See Recording Guidelines for more information.
• Recognition is best on wave files that are recorded at a good volume, are not too fast, and contain only a few instruments and minimal drums and percussion. For vocals, limit singing to using "aah" or "ooh."
• After trying the suggestions below for more specific problems, review the Project Editor section of the Parameter Reference chapter in this User Guide to learn how you can adjust various parameter settings to improve accuracy.   The most important settings are Wave Instrument, Polyphony, Pitch Range, and Timing Resolution.

Problem
Some sections of the MIDI file are more accurate than others.

Possible Solutions
• Recognize the wave file in several pieces, using a separate project specifically optimized for each piece.   This is particularly helpful if the music changes key, tempo, or rhythm.

Problem
The A#0 or B0 note keeps showing up in my MIDI file, but it should not be there.

Possible Solutions
• Your 60Hz AC power supply may be bleeding into your audio recording.   Be sure you are powering your computer through a surge suppresser that provides EMI filtering and re-record your wave file.

Problem
The quieter parts of my wave file are not reflected in the MIDI file.

Possible Solutions
• Increase the recording level and re-record your wave file.
• Use the Automatic Gain Control (AGC) feature of your sound card, if it has one, and re-record your wave file.

Problem
My wave editor or MIDI editor does not automatically load my file when I start it from IntelliScore or displays an error message.

Possible Solutions
• Your editor may not be compatible with this feature.   If so, you will need to load the file yourself after starting the editor.
• Use a different editor.
• You may not have the proper drivers or hardware installed.   Refer to your sound card documentation for help.

Problem
Where my wave file contains very high notes, strange erroneous notes show up in the MIDI file.

Possible Solutions
- Re-record your wave file through a high frequency cutoff filter, if you have one.   Set the cutoff frequency to half of the sample rate.
- Use the cutoff filter feature of your sound card, if it has one and re-record your wave file.   It may be automatic, in which case you do not need to set it.

Problem
I am having trouble recording a wave file, playing or transcribing a MIDI file, or installing my sound card.

Possible Solutions
- Be sure the volume is turned up high enough to hear and not muted.
- Refer to the manual that came with your wave editor, MIDI editor, or sound card.   We do not provide support for other vendors' products.
- If you need additional help, call the appropriate vendor's help desk.

Problem
When I play back the MIDI file that IntelliScore created, the instrument does not sound anything like the patch I selected in the Project Editor.

Possible Solutions
- You may have specified MIDI channel 10 in the Project Editor, which is reserved for percussion instruments.
- Your sound card may not be compatible with General MIDI.

Problem
I can't see any chord names when I view the MIDI file in my sequencer.

Possible Solutions
- IntelliScore writes chord names to the MIDI file as markers, however, sequencers display markers in different ways.   Some sequencers show the chord names above the notation, while others may list the markers by themselves in a window.   You may need to try another sequencer.

Problem
I'm having difficulty tapping the tempo starting on the very first beat.

Possible Solutions
- Start tapping on the first beat of the second measure.   When you finish tapping, the Tempo Extender window will appear, and IntelliScore will ask you if you want it to automatically extend your taps.   Tell it you want to extend your taps to the beginning.

Problem
I don't like using the Tempo Tracker.

Possible Solutions
- IntelliScore needs to know where the beats fall so that it can synchronize the timing in the MIDI file it generates.   If you record your instrument directly into IntelliScore using the built-in metronome, you do not need to use the Tempo Tracker.

Problem
IntelliScore seems to be inserting silence (rests) at the beginning of the MIDI file.

Possible Solutions
IntelliScore assumes that when using the Tempo tracker your first tap is on the first beat of a measure.   If you selected to automatically extend your tapping to the beginning of the wave file using the Tempo Extender, IntelliScore will add silence as necessary to align your first tap to the beginning of a measure when it is notated.   If you want to prevent intelliScore from inserting the silence, either be sure to tap on the first beat of a measure or do not elect to automatically extend your tapping to the beginning of the wave file.   The silence may be desirable if the first beat of the music does not coincide with the beginning of a measure.

Error Message:
Unable to run recognizer.

Possible Solutions:
- See instructions for the "Out of memory" error.

- The file iSpd.exe is not in the "C:\Program Files\intelliScore Polyphonic" folder or is corrupted.   Reinstall IntelliScore.

Automatic Music Recognition

A system that listens to music in waveform format and recognizes the notes being played, together with timing and dynamics information. IntelliScore Polyphonic is the world's most advanced polyphonic automatic music recognition system, that is, it can recognize more than one note being played at a time.

Monophonic

Music that only contains one note at a time.   Examples would include a person singing all by himself or playing an instrument that can only create one note at a time, such as a flute.   However, most music is polyphonic.   IntelliScore Polyphonic is the world's most advanced automatic music recognition system that can recognize polyphonic music.

Polyphonic

Music containing more than one note at a time, such as chords.   This would include most music played by a group of people such as a band or orchestra, or a single person playing an instrument that produces more than one note at a time, such as a guitar or piano.   Most music is polyphonic.   IntelliScore Polyphonic is the world's most advanced polyphonic music recognition system.

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Assumptions

This help file assumes you are already familiar with the Windows 9x interface, as well as any installed hardware and software such as sound cards and sequencers.   It assumes everything is properly installed, configured, and working properly.   The ability to read music is helpful, but not required.   Knowledge of recording terminology is also helpful. To obtain best results, read this guide in its entirety.

Typographical Conventions

This help file uses consistent visual cues and text formats so that you can interpret it accurately.

<KEY>   The name of a key on the computer keyboard to be used.   For example, <F4> means press the key labeled "F4."   It does not mean type **F** followed by **4**.

<KEY1+KEY2>   When two keys are joined by a "plus" sign, this means you should press both keys at the same time.   For example, <ALT+F4> means you should press the <ALT> key, and while holding it down, press the <F4> key, then release both keys.

bold   Characters printed in bold represent a value that should be typed exactly as it is shown or selected from a provided list.

italic   Words shown in italic are place holders for information you need to provide.   For example, if you are directed to type *filename*, enter the actual name for a file instead of the word "filename."

solid underline   Clicking on a solid underlined word or phrase will cause you to jump to a different topic relating to that word or phrase.

dotted underline   Clicking on a dotted underlined word or phrase will make additional information relating to that word or phrase appear in a pop-up window.   Click again to remove the pop-up window.

"quoted"   Items contained in quotes are names of items in the Menu Bar or Windows controls that are not described elsewhere.

"Label1 | Label2"   Labels separated by the pipe symbol specify how to navigate through the Menu Bar items to trigger a desired action.   For example, "File | Open" means click on the "File" label to open the File Menu, then click on the "Open" label.   This combination of actions opens a file.

This is a topic.

This is a pop-up window.

What's New

Version 3.1 contains the following enhancements:

- IntelliScore now runs properly under Asian versions of Windows

- More extensive error checking

- Several minor bug fixes

Version 3.0 contains the following enhancements:

- New Project Wizard that steps you through the process of preparing IntelliScore to generate midi files and is designed to help you achieve the most accurate recognition results in the shortest amount of time.   IntelliScore is now easier to use than ever.

- You can now record your music directly into IntelliScore.   You no longer need to create a wave file before using IntelliScore.

- IntelliScore automatically checks if your wave file was recorded at the optimum level.

- IntelliScore now includes 95 filters, each designed for a specific instrument.   If your wave file contains a single instrument, recognition accuracy is greatly improved.

- New Tap Extender automatically extends your tapping to the beginning of the wave file if you have difficulty beginning tapping on the first beat

Wave File Formats Supported

- Wave files can be recorded directly into IntelliScore, or an existing wave file can be specified

- Automatic verification of optimum recording level

- Sample rates: 11025 / 22050 / 44100 Hz

- Monaural or stereo

- 8-bit or 16-bit sampling resolution

- Handles wave files up to 2 billion bytes in length (However, we recommend recording a separate wave file for every section of a song, so that recognition parameters can be set differently for each section.)

- Standard PCM format (uncompressed only)

MIDI File Support

- Conforms to MIDI File Specification 1.0, format 0

- Pitch Range: 0 (C-2) to 127 (G8), where middle C = 60 (C3)

- Note On Velocity and Note Off Velocity: 1 - 127, 64 if disabled

- Detected chords written as markers

- Patch: 0 - 127 corresponding to General MIDI instrument names

- MIDI Channel: 1 - 16

- Notes Per Beat (Timing Resolution): Whole note to 128th note, including triplets

- Key Signature: All twelve major and minor keys

- Meter (Time Signature): 1/1 to 99/32

Performance

- Full 32-bit operation for best performance under Windows 95/98/Me and Windows NT/2000

- Optimized for fastest processing on Pentium II-class PCs

- Supports long filenames

How It Works

Suppose you were to listen to a music recording and enter it note by note into your sequencer.   For each note being played, you would need to determine its pitch, rhythm, and dynamics, which translate to which note is being played, when and how long the note is played, and how loud it is played.   IntelliScore must determine the same things.   The computer starts with a music recording in the form of a wave file.   If you visually examine such a wave file in your wave editor, it would be hard to conceive that we perceive that squiggly oscillating waveform as music.   Our ears perform the magic.   A snail-shaped organ in our inner ears contain many tiny hairs that vibrate in response to a waveform.   Which hairs vibrate determine the notes we hear.   Even if you are not musically trained sufficiently to name the notes being played, the fact is you perceive music as a set of notes, not as the oscillating waveform that initially enters your ear canal.

What may be rudimentary to us is often not so simple for computers, and music recognition is no exception.   Since computers cannot truly hear like we can, IntelliScore recognizes music by doing what computers do best - computations.   In fact, IntelliScore performs several million calculations to recognize a single piece of music.

It is important to note that a single wave file can be interpreted as several different combinations of notes.   To prove this point, try this challenge with your friends: Give each of your friends a duplicate recording of a song.   To make it as interesting as possible, be sure the song uses several different instruments including percussion.   Have each person independently figure out all notes being played and create a MIDI file from them.   They can take as much time and listen to the recording as many times as they want.   Now compare the MIDI files, and you will find that they are not the same!   The differences are most pronounced in passages of music containing instruments having a bright timbre.   Is the sound created by many muted instruments playing different notes or a few bright instruments?   Now have IntelliScore create a MIDI file from the recording.   IntelliScore will give you a solution that represents the "essence" of the music, that is, the prominent chords and melody lines but not necessarily some of the more subtle parts.   Its results may be different than what you would have come up with.   However, even if though you may clean up the MIDI files created by IntelliScore, you will be spared of many hours of tedious effort of notating the song from scratch.

Of course our ears are not the only organ that help us to hear.   The other is our brain.   This is where we determine what set of notes are being played based upon our understanding of what notes belong together, and then decide whether or not we like these patterns.   The study of these patterns is known as music theory.   IntelliScore uses music theory, among other things, to help it recognize music.

See also:

- <u>Notes About MIDI</u>

- <u>A Note About Accuracy and Speed</u>

Notes About MIDI

MIDI files, just like sheet music, cannot represent the full range of expression that exists in live music performed by humans.   This is the reason why several people can perform the same piece of sheet music, yet the resulting sound is different.   Even a MIDI file played by one computer might sound different than another because the sound generation hardware may be different.   Wave table sound cards utilize actual recordings of real instruments, whereas FM (frequency modulation) sound cards create synthesized sounds.   Additionally, many musicians know that the music emanating from a computer playing a MIDI file can sound flat because it lacks the small errors introduced by human performers.   A wave file is a digital recording similar to that on an audio CD, and captures all the nuances in a performance.   A MIDI file, by contrast, represents musical information symbolically as a series of notes, volume, duration, etc.   Therefore, a certain amount of information is lost when converting wave files to MIDI files.   This section describes how information is mapped between the two formats.

Each note is tracked from when it begins sounding until when it ends.   The volume of the note as when it rises above the Midi Threshold is considered the "note on velocity".   Similarly, the volume of the note when it subsequently falls below the Midi Threshold is recorded as the "note off velocity".   These two events may coincide with the attack and release of the note if the Midi Threshold is low enough.   The volume may fluctuate while the note is sounding, but these fluctuations are lost.   If the pitch of the note fluctuates, this information is also lost.   The exception to this rule is when the pitch change is extreme enough to be considered a different note.   In this case, the first note is considered to end and the new note begins.   The note off velocity of the first note and the note on velocity of the new note are recorded as the volume of the note when the pitch change to the new note occurred.

Because note on velocity and note off velocity can be programmed on synthesizers to effect sounds in different ways beside volume, the resulting sound may not be as expected.   Differing envelopes of musical instruments also affect the velocity values.   An envelope consists of the attack, decay, sustain, and release volumes.   When a note is struck, the volume increases from zero during the attack stage then decreases partially during the decay stage.   The volume remains steady or continues to fall at a slower rate while the note is sustained.   When the note is released, the volume returns to zero.   The sustain phase of a piano's envelope, for example, decreases constantly.   In this case a note with a short duration (sooner release) on a piano would have a higher note off velocity than the same note with a longer duration.   However, the same note on a flute would result in a higher note off velocity than a piano, since the volume during sustain phase of a flute is constant.

You should also know that the MIDI standard enforces certain elements of modern Western music theory.   Music is represented using a twelve-tone scale, for example.   Only major and minor scales are recognized, for another.   This limitation of MIDI may also affect how accurately wave files can be represented as MIDI files.

A Note About Accuracy and Speed

Several factors affect the accuracy of the IntelliScore's proprietary music recognition algorithm in addition to the limits imposed by MIDI.   Non-tuned sounds such as drums, cymbals, applause, and noise are not converted to MIDI. However, if you record the music yourself, recognition will be much improved if you leave percussion out of the recording.   The tone quality of different instruments affects recognition accuracy.   A bright instrument, such as a trumpet for instance, is not recognized as accurately as a flute, which produces a dull, steady tone.   As a result IntelliScore will recognize some forms of music quite accurately, while it may refuse to recognize others.

Music with longer notes tend to be recognized more accurately.   Accuracy can be improved by adjusting the recognition parameters rather than accepting their default values.   There is a trade-off, as greater accuracy usually results in lengthening the time that IntelliScore requires to recognize a piece of music.   The best way to reduce recognition time without compromising accuracy is to run IntelliScore on the fastest processor possible.

When evaluating how well IntelliScore recognizes a piece of music, it is important to judge what the MIDI file sounds like rather than what it looks like after being notated.   MIDI files do not contain enough information to specify exactly how it should be notated.   As a result, two different music notation software programs will interpret the exact same MIDI file differently, creating sheet music that is different in appearance.   In a similar fashion, published sheet music often represents a copyist's interpretation of a piece of music.

Minimum System Requirements

- Intel Pentium or higher (or compatible processor).   The key component affecting IntelliScore's recognition speed is the processor, so the faster, the better.   The processor has no affect upon recognition accuracy.

- Windows 95/98/Me with 16M of memory or Windows NT 4.0/2000 with 24M of memory

- Mouse or compatible pointing device

- CD-ROM drive to install the program or an Internet connection to download the program

- Windows compatible sound card, such as Sound Blaster, that supports recording of 8-bit wave files at 11025 Hz and plays MIDI files following the General MIDI standard

- Speakers or earphone

Optional

- Sequencer software to edit MIDI files

- Notation software to convert MIDI files to sheet music

- MIDI interface and MIDI instrument to play MIDI files

- CD-ROM drive for playing audio CDs containing music to be recognized by IntelliScore

- Surge suppresser with electromagnetic interference (EMI) filtering (recommended when recording from an external source)

Hard disk space (8M total)

- 6M for program and help files

- 2M for example files

- Additional space to store files you create

In addition, your hard disk will need space to store wave files.   This can be substantial depending on the number, length, and format of these files.   The table below will give you some idea of how much storage you would need for each minute of music depending on the recording parameters you use.   The first row shows the preferred settings. The wave file settings in the last row are equivalent to the digital recordings on an audio CD.

Sample Rate	Sampling Resolution	Number of Tracks	Size
11025	8 bit	monaural	661,500
11025	8 bit	stereo	1,323,000
11025	16 bit	monaural	1,323,000
11025	16 bit	stereo	2,646,000
22050	8 bit	monaural	1,323,000
22050	8 bit	stereo	2,646,000
22050	16 bit	monaural	2,646,000
22050	16 bit	stereo	5,292,000
44100	8 bit	monaural	2,646,000
44100	8 bit	stereo	5,292,000
44100	16 bit	monaural	5,292,000
44100	16 bit	stereo	10,584,000

Exit

To exit the program, do one of the following:

- Click on "File | Exit".

- Click on the X button at the top right hand corner of the window.

- Double click on the icon at the top left corner of the window.

- Click on the icon at the top left corner of the window and click on "Close."

- Press <ALT+F4> or <CTRL+F4>.

If you have made any unsaved changes to the recognition parameters, you will be asked if you wish to save them before exiting the program.

Getting Started

Before you begin, use the <u>Options</u> window to set up IntelliScore to work according to your preferences.   These preferences will pertain to all projects you work on until you change them.   Also be sure to review the <u>Recording Guidelines</u> section to learn how to record the best wave files.

To begin working with a project, you need to either create a new project or open an existing project.   To create a new project, click on the Blank Document icon.   This will open the <u>New Project Wizard</u>, which will ask you for information that will assist IntelliScore in generating an accurate MIDI file in the shortest amount of time.   Once you enter all of the requested information, the recognizer will run and the generated midi file will appear in your MIDI editor.   You can thereafter modify your settings in the <u>Project Editor</u> and run the recognizer again, if desired.   You can save the project settings for use later.

If you want to work with a project that you had previously saved, click on the Open Folder icon to select the project or select it from the list of recent projects in the File menu.   Once the project is open you can modify your settings in the <u>Project Editor</u> and run the recognizer, if desired.   You can also resave the project settings for use later.

If you need any assistance, the <u>online help system</u> contains a detailed reference to all the controls, error message explanations, a glossary, etc.

Record Wave File Window
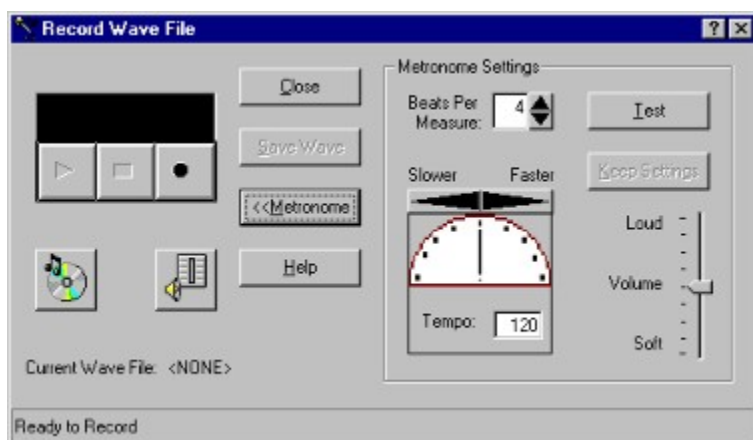
The Record Wave File window allows you to record wave files directly into IntelliScore.   This window appears when you click the Microphone button next to the Wave File Name text box in the Project Editor.

First you need to decide whether or not to use the metronome.   You should use the metronome whenever you will be playing your musical instrument or singing directly into the program.   Use of the metronome ensures that the generated MIDI file will be synchronized with the beats of the music and eliminates the necessity of tapping in the tempo using the Tempo Tracker.   However, if the music is prerecorded but not as a wave file, such as from a CD, you cannot use the metronome and will need to tap the tempo in later.

If you are using the metronome, display its settings by clicking the Metronome button. Indicate the Tempo (in beats per minute) and number of beats per measure to match the music you will be playing.   You can adjust the metronome volume by adjusting the slider.   To try out your settings by listening to the metronome, click the Test button. You can copy the metronome settings to the Project Editor by clicking the Keep Settings button.

Hook up your tape player, record player, mixer, or electronic musical instrument, as appropriate, to your sound card following the sound card manufacturer's instructions.   If you have more than one sound card hooked up to your computer, IntelliScore uses the one set at Start | Settings | Control Panel | Multimedia | Audio | Recording | Preferred device.   If you are recording from a CD, place the audio CD in your computer's CD drive then click the CD Player button to start your CD player program, and then locate the track and position on the CD of the music you are interested in recognizing.   Click the Volume Control button to display the mixer which you can use to adjust the recording levels.

When you are ready to begin recording, click the circle Record button.   If you are using the metronome, you will hear a one-measure lead-in before recording actually begins and you will see the current measure/beat displayed.   The metronome sound will be recorded along with your instrument, but it will not interfere with the recognition process.   If you are not using the metronome, recording will begin immediately and you will see the elapsed time displayed. Click the square Stop button when you have finished recording.   If your recording level was not optimum, you will see a warning message; in this case, you may want to adjust the levels and record it again.   You can press the triangular Play button to play back the recording you just made.

When you are satisfied with the wave file you recorded, save it by pressing the Save Wave button.   You will be prompted to enter a name for the wave file.   The name of the latest wave file you saved is displayed as the Current Wave File.   You may record a any number of wave files in this manner.   When you are finished, click the Close button.   The Record Wave File window will close, and the name of current wave file is displayed in the Wave File Name text box in the Project Editor.

See also: Recording Guidelines

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Recording Controls				
CD Player				
Volume Control				
Close	C			
Save Wave	S			

Metronome	M			
Help	H			
Beats Per Measure		1	99	4
Tempo		5 bpm	1080 bpm	120 bpm
Volume		1	127	64
Test	T			
Keep Settings	K			

Recording Controls, Record Wave File Window

When you are ready to begin recording, click the circle Record button.   If you are using the metronome, you will hear a one-measure lead-in before recording actually begins and you will see the current measure/beat displayed.   The metronome sound will be recorded along with your instrument, but it will not interfere with the recognition process.   If you are not using the metronome, recording will begin immediately and you will see the elapsed time displayed. Click the square Stop button when you have finished recording.   If your recording level was not optimum, you will see a warning message; in this case, you may want to adjust the levels and record it again.   You can press the triangular Play button to play back the recording you just made.

CD Player Button, Record Wave File Window

If you are recording from a CD, place the audio CD in your computer's CD drive then click the CD Player button to start your CD player program, and then locate the track and position on the CD of the music you are interested in recognizing.

Volume Control Button, Record Wave File Window

Click the Volume Control button to display the mixer which you can use to adjust the <u>recording levels</u>.

Close Button, Record Wave File Window

When you are finished recording your wave file or decide not to record one, click the Close button.   The Record Wave File window will close, and the name of last wave file you saved, if any, is displayed in the Wave File Name text box in the Project Editor.

Save Wave Button, Record Wave File Window

When you are satisfied with the wave file you recorded, save it by pressing the Save Wave button.   You will be prompted to enter a name for the wave file.   The name of the latest wave file you saved is displayed as the Current Wave File.

Metronome Button, Record Wave File Window

Before recording, you need to decide whether or not to use the metronome.   You should use the metronome whenever you will be playing your musical instrument or singing directly into the program.   Use of the metronome ensures that the generated MIDI file will be synchronized with the beats of the music and eliminates the necessity of tapping in the tempo using the Tempo Tracker.   However, if the music is prerecorded but not as a wave file, such as from a CD, you cannot use the metronome and will need to tap the tempo in later.

If you are using the metronome, display its settings by clicking the Metronome button. Indicate the Tempo (in beats per minute) and number of beats per measure to match the music you will be playing.   You can adjust the metronome volume by adjusting the slider.   To try out your settings by listening to the metronome, click the Test button. You can copy the metronome settings to the Project Editor by clicking the Keep Settings button.

Help Button, Record Wave File Window

Displays the general topic in the help file relating to the Record Wave File Window.

Beats Per Measure, Record Wave File Window

Set the beats per measure by typing in the value or using the spinner.   This adjusts the way the metronome sounds and is the same as the setting of the same name in the Project Editor.

Tempo, Record Wave File Window

Set the tempo in terms of beats per minute by typing in the value or using the spinner.   This adjusts the rate of the metronome and is the same as the setting of the same name in the Project Editor.

Volume, Record Wave File Window

Adjust the metronome volume by adjusting the slider.   To try out your settings by listening to the metronome, click the Test button. The metronome plays the woodblock sound on your sound card, so if you don't hear the metronome even when the volume is set to maximum, perhaps the MIDI playback volume is turned down.   In this case, click on the Volume Control button and adjust the MIDI playback volume.   You can copy the metronome settings to the Project Editor by clicking the Keep Settings button.

Test Button, Record Wave File Window

To try out your settings by listening to the metronome, click the Test button. While the metronome is playing, you can adjust the Beats Per Measure, Tempo, and Volume and immediately hear the results.

Keep Settings Button, Record Wave File Window

If you are satisfied with your metronome settings, you should click the Keep Settings button.   This will copy to Beats Per Measure and Tempo values to the Project Editor.   The Volume setting will be preserved for the next time you use the metronome.

Recording Guidelines

If you want IntelliScore to recognize a piece of music, it must first either exist as a wave file, or you can record it directly into IntelliScore.   To record a wave file, click the Microphone button next to the Wave File Name text box in the Project Editor.   This will open the Record Wave File window.   To select a preexisting wave file, click the Folder button next to the Wave File Name text box.

We feel it is necessary to caution you at this point about creating wave files from copyrighted material.   Usually it is unlawful to reproduce, store, or transmit copyrighted material in any form or by any means, including electronic, recording, or otherwise without the consent of the owner of the material.   While automatic music recognition is a new field that has not yet been tested in the courts, recording copyrighted material as wave files, as well as converting wave files to MIDI files, could constitute a violation.   If you use IntelliScore to process copyrighted material, you are violating the terms of your license agreement.

See also:

- Wave File Settings

- Recording Levels

- Use of Signal Processors

Wave File Settings

Various types of wave files are supported, but the following are the minimum requirements:

- Sample Rate: 11025 Hz

- Sampling Resolution: 8-bit

- Number of Tracks: Monaural

- Must be PCM format (uncompressed)

You could use higher sampling rates than 11025 Hz, but it would take longer for IntelliScore to recognize, not improve recognition quality very much, and take up a lot of additional storage space on your hard disk.   Probably the only time you would want to record with a higher sampling rate is so that IntelliScore could recognize very high frequencies (above the range on a piano).   Similarly, a sampling resolution of 16-bits occupies more hard disk storage than an 8-bit sample without providing a significant improvement in accuracy.   Stereo wave files do not provide any benefit over monaural files (except that Stereo Balance can be manually adjusted) since IntelliScore converts these to monaural anyway.

Recording Levels

Wave recording or selecting a wave file, recognition results are best if the wave file was recorded at a good level. The optimum level is as high as possible without clipping the signal.   Once you record or select a wave file, IntelliScore will notify you if the wave file's level is not in the optimum range of 50 to 99%.   If it is less than 50%, it may be too quiet.   If it is 100%, the signal is probably too loud so that it is distorted.   IntelliScore can still use the wave file if its level is out of optimal range, but you may achieve better results by adjusting the levels and record the wave file again.   If you are recording directly into IntelliScore, click the Volume Control button to open the audio mixer and adjust the levels.   The level stated in the warning message box will not be updated to reflect your changes until you record your music again.   For best quality, you should set the playback volume near maximum and adjust the record volume as necessary.   This approach minimizes the amount of noise in the wave file.

To adjust the recording level using the Windows Volume Control:
1.   Click on the Properties item under the Options menu.
2.   Select the Recording radio button, then click OK.
3.   Select the source of the music by checking the Source checkbox.
4.   Adjust the corresponding volume level using the slider.

Signal Processors

If you have any pieces of signal processing equipment, you can use them to improve the quality of the wave file you are recording.   Remember that the better the quality of the recording, the better IntelliScore is able to recognize it. We will assume you know how to use these devices and what they are used for.

- Limiters and Compressors

- Noise Gates

- Cutoff Filters

- Equalizers

Limiters and Compressors

You can use a limiter to increase the volume of your music without clipping part of the signal.   You can use a compressor in combination with a limiter to increase the volume of the quieter parts to match the louder parts, evening out the volume throughout.   IntelliScore is better able to recognize louder notes.   The Auto Gain parameter performs digital compression in case you don't have a compressor.   This parameter defaults to "on."   The disadvantage of using compression is that you lose the dynamics of the music.

Noise Gates

A noise gate can help eliminate background noise during the parts of the song that don't have any notes playing. This helps prevent IntelliScore from detecting notes where there aren't any. The Wave Threshold parameter acts as a digital noise gate.

Cutoff Filters

A high frequency cutoff filter can help prevent erroneous notes from appearing in your wave file where higher notes are present.   The cutoff frequency should be set to half of the sample rate as shown in the table below.   Many sound cards have an appropriate cutoff filter built in.

Sample Rate (Hz)	Cutoff Frequency (Hz)
11025	5012.5
22050	11025
44100	22050

Equalizers

You may use an equalizer to color the music to your liking, possibly to compensate for an uneven frequency response in the audio source or to apply special effects.   IntelliScore does not apply any of its own equalization.

Title Bar

The title bar, along the top of the Main Window, contains the name of the currently loaded project.

Status Bar

The status bar, along the bottom of the Main Window, indicates the overall status of the recognizer and other useful information.

Sine Wave Button, Main Window

This large button, on the left side of the Main Window, launches the wave editor defined in the Options Window.   If a wave filename appears in the button, it is automatically loaded when the wave editor starts, if your wave editor supports this feature.

Music Notes Button, Main Window

This large button, on the right side of the Main Window, launches the MIDI editor defined in the Options Window.   If a MIDI filename appears in the button, it is automatically loaded when the MIDI editor starts, if your MIDI editor supports this feature.

Menu Bar

Provides access to functions that manipulate projects, wave files, and MIDI files; customizes the way IntelliScore operates; runs the recognizer, and accesses help and program information.

- File Menu

- Edit Menu

- Tools Menu

- Help Menu

File Menu (accelerator key: F)

Provides access to functions that create, open, and save projects as well as end the program.

Item	Accelerator Key	Shortcut
New Project Wizard...	N	<CTRL+N>
Open Project...	O	<CTRL+O>
Save Project	S	<CTRL+S>
Save Project As...	A	<CTRL+A>
Exit	X	<CTRL+F4>
1 *project name*	1	
2 *project name*	2	
3 *project name*	3	
4 *project name*	4	

New Project Item, File Menu

Opens the New Project Wizard to assist you in creating a new project.   If unsaved changes have been made to the current project, IntelliScore asks if you want to save them first.

Open Project... Item, File Menu

Prompts you to select an existing project to open, reads the parameters of the project you select, displays the project name in the Title Bar, and opens the Project Editor.   If unsaved changes have been made to the current project, IntelliScore asks if you want to save them first.

Save Project Item, File Menu

Saves the current parameter settings, as modified in the Project Editor, using the current project name.   If there is no current project name, you will be prompted to enter one.   This item is disabled if there were no changes to your project since the last save.

Save Project As... Item, File Menu

Prompts you to type a new project name, then saves the current parameter settings, as modified in the Project Editor, using that project name.   If no project is currently loaded, IntelliScore suggests a name that is the same as the wave file you selected, except with an **.ipr** extension at the end.   The new project name is displayed in the Title Bar.   If the project name you enter already exists, you will be asked to confirm the save, since the old file will be overwritten. This item is disabled if there were no changes to your project since the last save.

Exit Item, File Menu

Ends the program.   If you have made any unsaved changes to the recognition parameters, you will be asked if you wish to save them before exiting the program.

Recent Projects List, File Menu

The latest four projects opened or saved are displayed, most recent file on top.   Click on one of these project filenames to open the selected project.   If the project you select has the same name as the project currently loaded, it is not reloaded.

Edit Menu (accelerator key: E)

Provides access to external programs that manipulate wave files and MIDI files and allows you to edit projects.

Item	Accelerator Key	Shortcut
Wave...	W	
Project...	R	<F4>
Midi…	M	

Wave… Item, Edit Menu

Launches the wave editor defined in the Options Window.   If the wave filename specified in the current parameter settings exists, it is automatically loaded when the wave editor starts, if your wave editor supports this feature.

Project... Item, Edit Menu

Opens the Project Editor, with which you can modify the settings in the currently open project.   These affect the way IntelliScore recognizes music.   This item is disabled if there is no currently open project; either open a project or create a new project first.

Midi… Item, Edit Menu

Launches the MIDI editor defined in the Options Window.   If the MIDI filename specified in the current parameter settings exists, it is automatically loaded when the MIDI editor starts, if your MIDI editor supports this feature.

Tools Menu (accelerator key: T)

Runs the recognizer and allows you to customize the way IntelliScore operates.

Item	Accelerator Key	Shortcut
Recognize	R	<F5>
Options...	O	

Recognize Item, Tools Menu

Starts the recognizer, which creates a MIDI file from the wave file you select based on the settings in the currently open project.   The must a project open with a wave file specified before you can start the recognizer.   If the name of the MIDI file to be created already exists, you will be prompted to confirm that you want the old file replaced.   If the wave file you specified does not exist, you will be notified, and the recognizer will stop.

Options... Item, Tools Menu

Opens the Options Window so you can adjust the way that the IntelliScore user interface operates.
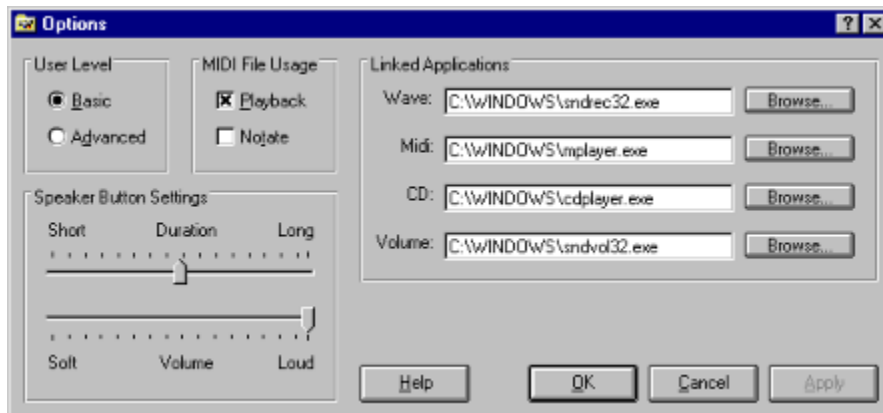
Getting Started Item, Help Menu

Opens the Getting Started topic in the help file.   This topic provides basic instructions ot get you started using Intelliscore.

Visit Web Site Item, Help Menu

Opens the Intelliscore web site within Internet Explorer.   Search this site to register your product or to obtain the latest upgrade and support information.

Options Window

You can customize various features of IntelliScore to work they way you want. You can specify what wave editor, MIDI editor, CD player, and recording volume control you want to use, your user level, how you intend to use the MIDI files IntelliScore creates, and the volume and duration of tones generated when you press a speaker button while setting recognition parameters. These settings will be preserved until you change them. To display the Options Window, select "Tools | Options..." or click on the Options button while in the Project Editor.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Wave Editor				sndrec32.exe
Wave Browse	R			
Midi Editor				mplayer.exe
Midi Browse	W			
CD Player				cdplayer.exe
CD Player Browse	S			
Volume Control				sndvol32.exe
Volume Control Browse	E			
User Level	B - Basic, D - Advanced			B
Playback	P			checked
Notate	T			checked
Speaker Button Duration		.25 seconds	1.25 seconds	.75 seconds
Speaker Button Velocity		1	127	127
Help	H			
OK	O			
Cancel	C			
Apply	A			

Linked Applications, Options Window

IntelliScore links to any programs you specify that record, play, and edit wave files or MIDI files so you can continue to use the editors you have come to know.   IntelliScore can also link to your favorite CD player for use when recording wave files from audio CD, and volume control for use in setting recording levels when you use IntelliScore to create wave files.   Upon installation of IntelliScore, these programs default to "Sound Recorder" (for wave files), "Media Player" (for MIDI files), "CD Player", and "Volume Control,"   which are supplied with Windows.   To replace these defaults with your own preferred programs, you only need to indicate where these programs are.   Either type the full path of the program in the appropriate box or click on the corresponding "Browse..." button to select one.

Speaker Button Settings, Options Window

Reference tones can be played to help you determine the appropriate pitch range, key, patch, and channel when setting recognition parameters.   They sound when a Speaker button is clicked in the Project Editor, as long as a sound card is installed in your system.   You can use the sliders to customize the duration and velocity of the reference tones.   If you have more than one MIDI device hooked up to your computer, IntelliScore uses the one set at Start | Settings | Control Panel | Multimedia | Midi | Midi Output.

User Level, Options Window

User Level affects what parameters are available to you when you edit projects.   If you are new to IntelliScore, you should always select **Basic**.   This will hide conversion parameters from you that are often difficult to set properly and are rarely used anyway.   Once you become familiar with these parameters and are obtaining successful results, or you just want to experiment, you can select **Advanced**.   This will show the simpler parameters along with the more esoteric ones.

MIDI File Usage, Options Window

Indicate how you intend to use the MIDI files to be created by IntelliScore.   If you want to play back the MIDI files, check the first box.   This will allow you to set parameters affecting how the MIDI file sounds when played back and does not require you to have any knowledge of music theory.   If you intend to notate the MIDI files, check the second box.   This will allow you to set parameters affecting how the sheet music will appear.   To set these parameters, you need to know how to read music.   If you would like to both play the MIDI files and notate them, check both boxes.

Help Button, Options Window

Displays the general topic in the help file relating to the Options Window.

OK Button, Options Window

Preserves any changes you have made and closes the Options window.

Cancel Button, Options Window

Discards any changes you made since the last time you clicked the Apply button.   The Options window is then closed.

Apply Button, Options Window

Preserves any changes you have made.

Project Editor

You can use the Project Editor to change the settings in a project after you create the project using the New Project Wizard.   A project specifies everything IntelliScore needs to recognize a piece of music, including what wave file you want converted, the name of the MIDI file that will be created, and all of the settings that influence the speed of the recognition process and the accuracy and contents of the resulting MIDI file.   To start the Project Editor, first either create a new project using the New Project Wizard or open an existing project, then click on "Edit | Project..." in the Menu Bar or the Document With Pointing Finger Icon in the Tool Bar.
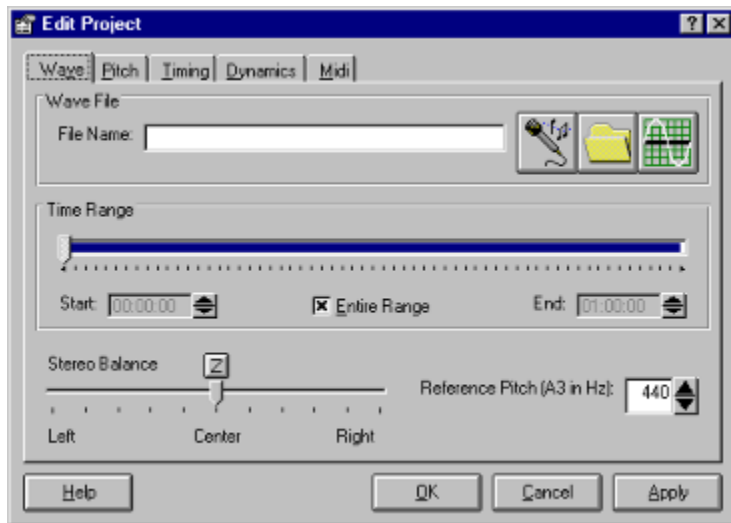
Tabs

- Wave

- Pitch

- Timing

- Dynamics

- Midi

Buttons

Caption	Accelerator Key
Help	H
OK	O
Cancel	C
Apply	A

Wave Tab, Project Editor (accelerator key: V)

Contains settings relating to the wave file you want recognized.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Wave File Name				None; required
Start Time		00:00:00	<= End Time	00:00:00
End Time		>= Start Time	length of wave file*	length of wave file*
Entire Range	E			checked
Stereo Balance		100% L, 0% R	0% L, 100% R	50% L, 50% R
Reference Pitch		435 Hz	445 Hz	440 Hz

    *If wave file does not exist or its format is unsupported, its length is considered to be 01:00:00.

Wave File Name, Wave Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

In the "File Name" box, type the full path and filename of the wave file you want recognized.   The wave file does not need to exist until you start the recognizer.   This information is required for all projects.   Rather than typing, you can click the button with the Folder icon to open a dialog window to help you find an existing wave file.   After selecting a wave file and closing the dialog, its name appears in the File Name box.   Clicking the button with the Sine Wave icon launches the wave editor specified in the Options Window, allowing you to hear the current wave file.   If the wave file you specified in the File Name box currently exists, it is automatically loaded when the wave editor starts, if your wave editor supports this feature.   Clicking the button with the Microphone icon opens the Record Wave File window, where you can record a new wave file directly into IntelliScore from a musical instrument, audio CD, etc.

See also:

- Record Wave File
- Recording Guidelines

Time Range, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

You can specify what part of the wave file you want recognized to speed up the recognition process.   The maximum range is determined by the length of the wave file when you specify the wave file or when the project is loaded, whichever occurs last.   If the wave file does not currently exist, the length defaults to one hour (**01:00:00**). You can use the slider to the set the desired range or type in the Start and End times.   To set the start time using the slider, drag the slider knob to the desired position.   The current start time is displayed in the Start box.   To set the end time, drag the slider knob to the desired position while pressing the <SHIFT> key.   The current end time is displayed in the End box.   The time range   is automatically adjusted if you use the Tempo Tracker to set the tempo.   If you manually change the Start Time, you should record the tempo again using the Tempo Tracker to maintain synchronization.

Start Time, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Type the desired starting point of the Time Range in the wave file you want recognized.   It must be in a *hh***:***mm***:***ss* format, where *hh* is hours, *mm* is minutes, and *ss* is seconds.   You may also adjust the time using the spinner control.   The displayed range on the Time Range slider is adjusted accordingly.   You cannot enter a time greater than the End time.   The Start Time is automatically adjusted if you use the Tempo Tracker to set the tempo.   If you manually change the Start Time, you should record the tempo again using the Tempo Tracker to maintain synchronization.

End Time, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Type the desired ending point of the Time Range in the wave file you want recognized.   It must be in a *hh*:*mm*:*ss* format, where *hh* is hours, *mm* is minutes, and *ss* is seconds.   You may also adjust the time using the spinner control.   The displayed range on the Time Range slider is adjusted accordingly.   You cannot enter a time less than the Start time or greater than the length of the wave file.   The End Time is automatically adjusted if you use the Tempo Tracker to set the tempo and indicate, when prompted, that you tapped the entire portion of the wave file.   If the wave file does not currently exist, the length defaults to one hour (**01:00:00**).

Entire Range, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Check this box as a quick way to set the time range to the maximum settings.   When checked, the Time Range slider is completely filled in, the Start time displays **00:00:00**, and the End time displays the current length of the wave file.   If the wave file does not currently exist, the length defaults to one hour (**01:00:00**). Since checking this box changes the Start Time, you should record the tempo again using the Tempo Tracker to maintain synchronization.

Stereo Balance, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

If the wave file was recorded in stereo, the left and right channels are combined to form a monaural recording during the recognition process.   At the center position, the two channels are mixed equally.   You can move the slider to the left or right to change this balance.   Click the "Z" button to return the balance to the exact center position.

Reference Pitch, Wave Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

You can use this setting to specify the tuning of the music in the wave file.   In most parts of the world, the standard frequency of an A3 note (the A above middle C) is 440 Hz.   This is the first note you hear when members of an orchestra are tuning their instruments.   If some notes in the created MIDI file waver between the correct note and the note next to it, try adjusting the Reference Pitch.   For example, if the correct note is a D and in the MIDI file it alternates between a D and D-flat, the recording is flat.   Set the Reference Pitch to a lower frequency value to compensate.   Likewise, if the MIDI file alternated between a D and a D-sharp, the recording is sharp.   Set the Reference Pitch to a higher frequency value to compensate.

Pitch Range, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

Normally, you should try to restrict the recognized pitch range to the smallest possible range that contains all notes present in the wave file, but not beyond.   This will improve both recognition speed and accuracy.   You can use the Auto Detect feature to help set this range.   You can in theory specify a pitch range from C-2 up to G8 (MIDI note numbers 0 through 127, if the sample rate of the wave file is 44100 Hz), assuming Middle C is C3 (MIDI note number 60), but we don't recommend it.   A larger range also requires more memory.   For comparison, a piano has a pitch range of A-1 to C7.   The default range changes based on a the range of the Wave Instrument you select.   Generally, a 4 octave range is sufficient.   Be especially careful not to set the Low note too high; if the created MIDI file contains many wrong notes, try lowering the Low note by an octave.   You can specify the pitch range by using the slider, or by typing the note value in the High and Low boxes.   To set the low note using the slider, drag the slider knob down to the desired value.   The value you select is displayed in the Low box.   To set the high note, drag the slider knob up to the desired value while pressing the <SHIFT> key.   The value you select is displayed in the High box.

The first example has a pitch range of E3 - G3.   The second example has a pitch range of E3 - E4.

High Note, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

Type the value of the highest note of the Pitch Range, or adjust it using the spinner control.   The displayed range in the Pitch Range slider will adjust accordingly.   To hear the note you selected, click on the Speaker button below the High box.

Low Note, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

Type the value of the lowest note of the Pitch Range, or adjust it using the spinner control.   The displayed range in the Pitch Range slider will adjust accordingly.   To hear the note you selected, click on the Speaker button above the Low box.

Auto Detect (Pitch Range), Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

The Auto Detect helps you set the High and Low note values.   After running the recognizer without clicking the **Stop** button while this feature is enabled, IntelliScore automatically detects the highest and lowest notes in the MIDI file within the range that was previously set.   It then adjusts the High and Low notes to match these values to be used the next time you run the recognizer.   The Auto Detect feature only reduces the range; it does not increase it. Therefore, if you determine that there are notes present in the wave file that were not in the MIDI file, you should increase this range.   Since the Auto Detect feature modifies the project, you be asked if you want to save the changes when you close it by opening another project, creating a new project, or exiting IntelliScore.

Key, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Notate

Use the drop-down list box to manually select the key of the music.   Click on the Speaker button to hear a triad representing the Key you specify.   If you do not know the key or the music changes key, leave this control set to the default of **Auto Detect**. This will allow IntelliScore to determine the predominant key and write it to the MIDI file when it performs music recognition.   After running the recognizer without clicking the **Stop** button, the Key and Major/Minor settings are automatically updated.   You will need to save the project to retain this information in the project.

The first section shows music as it would appear without an appropriate key signature.
The second section contains the correct key signature of D-flat major.

Major/Minor, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Notate
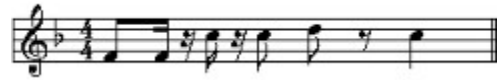
Check the appropriate radio button to indicate whether the music is in a Major or Minor key.   This in itself does not affect what notes are in the created MIDI file, only the key specification displayed when the file is notated.   This parameter cannot be adjusted if the Key is set to **Auto Detect**.   Click on the Speaker button to hear a triad representing the Key you specify.

Constrain To Key, Pitch Tab
User Level: Basic, Advanced
MIDI File Usage: Notate

Check this box to limit the notes in the created MIDI file to the notes in the Key you specify.   Any detected notes that are not in the key are filtered out.   Select this option when the music remains in key most of the time, as it will reduce the number of erroneous notes in the MIDI file.   If you use this option and too many notes are filtered out, try again without it.   This option cannot be selected if the Key is set to **Auto Detect**.

The first section did not use the Constrain To Key feature.
The second section used the Constrain To Key feature for the key shown (F major).

Transpose, Pitch Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Use this feature if you want to transpose chromatically the notes in the created MIDI file.   It does not affect the Key signature you specified in the MIDI file, if any.   Type the desired value in the "Octaves" box and "Half Steps" box, as applicable.   Alternatively, you can adjust the values using the appropriate spinner control(s).   For example, if you want to transpose the notes down 14 half-steps, enter **-1** in the "Octaves" box and **-2** in the "Half Steps" box, since an octave contains 12 half-steps.   If the wave file contains an A3, for example, this setting would be changed to G2 in the created MIDI file.   If the wave file contains an E3, it would be changed to a D2, and so on.

The first section is not transposed.   The second section is transposed down one half-step.

Tempo Tracker, Timing Tab
*User Level: Basic, Advanced*
MIDI File Usage: Playback, Notate

If you specified a wave file you want recognized and did not record the wave file using the metronome, you should use the Tempo Tracker to tell IntelliScore where the beats fall in the music.   If you already know the tempo and are running IntelliScore in Advanced Mode, you can type it in, but for best accuracy, record the tempo using the Tempo Tracker.   Close all unnecessary programs before using the Tempo Tracker.   Click the Play button (it contains the right arrow icon.)   The wave file will begin playing.   Click on the button to the right of the Play button or press the <SPACE BAR> in time with the music, starting with the first downbeat of the portion you want recognized.   (The downbeat is the first beat of the measure or bar.)   If you find it difficult to start tapping on the first beat, wait and being tapping on the first beat of the next measure; we'll adjust it later.   Tap at a steady rate as if you were tapping your foot or clapping your hands in time with the music.   You do not need to click at the same speed as the notes are being played; several notes can play in between each tap.   One rule of thumb that applies to most modern music is to listen to the rhythm.   The rhythm usually consists of a repeating pattern.   If you tap four times per pattern, you will notice that the loudest drum hit occurs on the third of every four beats.   As you tap you will notice a counter over the tapper buttons.   If you specified you intend to notate the midi file in the Options window, the counter is in the format *m:b*, where *m* is the current measure and *b* is the current beat within that measure.   If you specified you did not intend to notate the midi file, the counter simply increments with each tap.   You will also notice during tapping that the average tempo of your taps is displayed.   You can stop tapping when this value stabilizes, but for best accuracy, you should tap the entire portion of the song that you want recognized; this ensures synchronization is maintained even if the music changes tempo.   Only the tapped portion of the wave file will be recognized; clicking the Start and Stop buttons do not count as taps.   As a result you must tap at least twice.   If you wait more than about 65 seconds between any two taps, the tempo is too slow and you will receive an error.   When you are finished, press the Stop button (it contains the square icon) or wait for the wave file to finish playing.   If you miss a beat, just start over.   Once you finish tapping, the Tap Extender window will appear.   If you later select a different wave file or change the Start Time, you should record the tempo again to maintain synchronization.   Once you tap in the tempo, the tempo display is locked into your taps; you will not be able to type in another tempo value unless you create a new project, but you can tap the tempo again.

See also:

- Tap Extender

Tap Extender Window
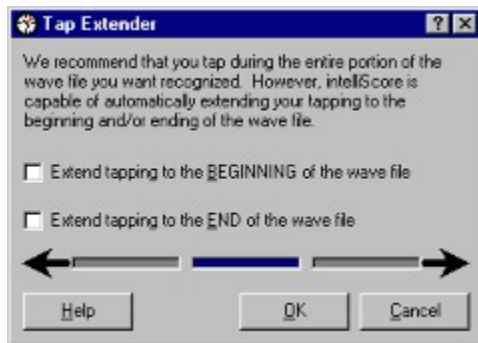
Provides options to automatically extend your taps.   This window appears after you tap in the tempo.   We recommend you tap the entire portion of the wave file you desire, beginning with the first beat of the first measure you want recognized.   This ensures that the midi file generated by IntelliScore retains perfect synchronization, even when the wave file changes tempo.   However, you can take advantage of the Tap Extender if the tempo remains constant, if you have trouble tapping at the first beat, or the music does not begin at the beginning of a measure.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Extend to Beginning	B			Unchecked
Extend to End	E			Unchecked
Help	H			
OK	O			
Cancel	C			

Extend to Beginning, Tap Extender Window

The Tap Extender window appears after you tap in the tempo.   You should try to begin tapping at the first beat of the first measure you want recognized.   However, the music may not start at the beginning of a measure, or you may have trouble tapping right on the first beat.   In these cases, check the Extend to Beginning checkbox.   This will automatically extend your tapping to the beginning of the wave file based on the average tempo of your tapping. This may result in the beginning of the generated midi file being silent so that the first beat you tapped lines up with the beginning of a measure.

Extend to End, Tap Extender Window

The Tap Extender window appears after you tap in the tempo.   We recommend you tap the entire portion of the wave file you want recognized.   This ensures that the midi file generated by IntelliScore retains perfect synchronization, even when the wave file changes tempo.   However, if the tempo remains constant, you can take advantage of the Tap Extender by only tapping a portion of the wave file and checking the Extend to Beginning checkbox.   This will automatically extend your tapping to the end of the wave file based on the average tempo of your tapping.

Help Button, Tap Extender Window

Displays the general topic in the help file relating to the Tap Extender Window.

OK Button, Tap Extender Window

The Tap Extender window appears after you tap in the tempo.   Clicking the OK button instantly performs tap extension according to your checkbox selections and closes the window.

Cancel Button, Tap Extender Window

The Tap Extender window appears after you tap in the tempo.   Clicking the Cancel button ignores your checkbox selections and closes the window without any automatic tap extension.

Meter, Timing Tab
User Level: Basic, Advanced
MIDI File Usage: Notate

Set the meter of the music you want displayed when it is represented in sheet music form.   The terms "meter" and "time signature" are interchangeable.   Type the number of beats per measure in the upper box or adjust it with the spinner control.   For the lower box, select a value from the drop-down list box that indicates what type of note has one beat.   A beat corresponds to one tap in the Tempo Tracker.   For example, if you want a quarter note to get one beat, select **4** from the list.   If you want an eighth note to get one beat, select **8**.

The first section shows music with the wrong meter of 4/4 applied.   The second section has the correct meter of 12/8 applied.
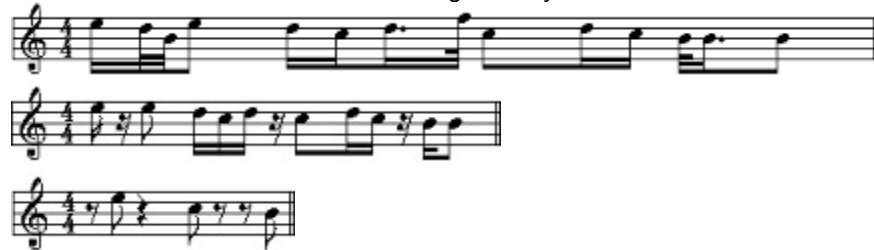
Notes Per Beat (Timing Resolution), Timing Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

If you have not indicated in the Options window that you intend to notate the MIDI file, select from the drop-down list the largest number of notes contained within the time span of one beat.   If the created MIDI file misses notes with a short duration, increase the notes per beat.   If the created MIDI file contains many erroneous notes with a short duration, reduce the notes per beat.   If you are converting with a swing beat, try using one of the triplet settings. These are the numbers that are not a power of two, such as **3**, **6**, and **12**.   Choose this setting carefully, as the best setting will probably be somewhere in the middle.   Be aware that setting the notes per beat to a high number significantly increases the duration of the recognition process.   The Notes Per Beat setting works with the pace of your taps using the Tempo Tracker to determine the average resolution over time used by the recognizer.   For example, if you tapped twice per second and set a resolution of **4** beats per note, this yields the same results as if your tapped once per second and set a resolution of **8** beats per note.   Both of these examples result in a resolution of 480 notes per minute.

If you have indicated in the Options window that you intend to notate the MIDI file, select from the drop-down list the shortest type of note that you want in the MIDI file.   If the created MIDI file misses the notes with a shorter duration, choose a shorter note from the list.   (The note types are arranged in the list from the longest duration at the top to the shortest at the bottom.)   If the created MIDI file contains many erroneous notes with a short duration, select a longer note.   Choose this setting carefully, as the best setting will probably be somewhere in the middle.   Setting the resolution to look for shorter notes also significantly increases the duration of the recognition process.

The first section has thirty-second timing resolution applied.   The next section has sixteenth timing resolution applied.
The last section has eighth timing resolution applied.

Beats Per Chord, Timing Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Indicate how long a typical chord lasts in the song before changing to another chord by typing in the number of taps for each chord or using the spinner.   Even if you want monophonic recognized, chords are often implied by the pattern of the notes used.   IntelliScore automatically detects these implied chords and writes them to the MIDI file as markers, although not all sequencers can display markers.   Even if you do not plan on using the chords detected by IntelliScore, this setting is useful as it affects the accuracy of the notes that will be detected.   If you can't determine out the Beats Per Chord, just leave it at the default value.

Speed, Timing Tab
*User Level: Advanced*
MIDI File Usage: Playback, Notate

Use the horizontal spinner control to change the rate at which the MIDI file will play.   The position of the needle in the gauge moves to the left if the speed is reduced or to the right if the speed is increased.   The speed is unchanged if the needle is exactly vertical.   Click the "Z" button to easily make the needle exactly vertical.

Dynamics Tab, Project Editor (accelerator key: D)
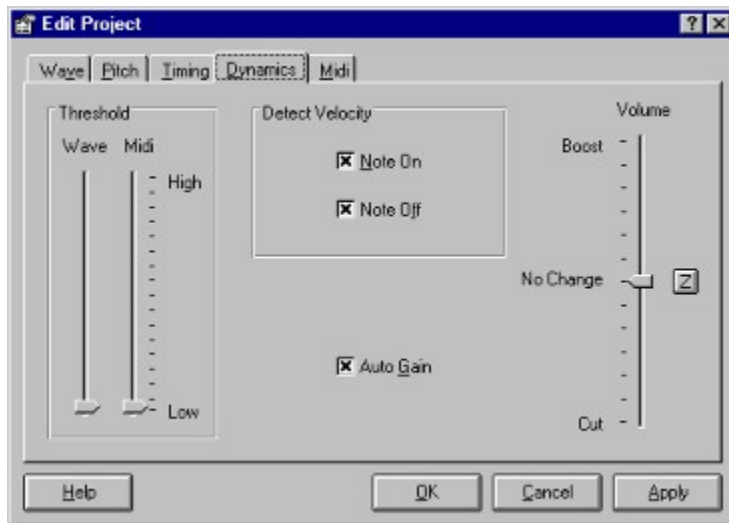
Contains settings indicating the volume of the wave file and affecting the relative volume of notes in the created MIDI file.   Note that no properties are visible if the User Level is set to **Basic**.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
Wave Threshold		1	32767	512
Midi Threshold		1	127	3
Note On Velocity	N			checked
Note Off Velocity	F			checked
Auto Gain	G			checked
Volume		12.5%	800%	100%

Wave Threshold, Dynamics Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

If your wave file contains a lot of non-musical content such as noise or audience sounds, you may want to increase the wave threshold to a higher value.   IntelliScore will ignore parts of the recording that are quieter than the level you set (before applying Auto Gain, if enabled).   This is similar in function to a noise gate.   If the created MIDI file misses too many of the quieter notes, try setting the wave threshold lower.   If this is not an issue, leave the Wave Threshold at the default value at the lowest setting.

Midi Threshold, Dynamics Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

Use this slider control to set the minimum volume of notes to include in the MIDI file.   Most erroneous notes in a MIDI file created by IntelliScore are the quieter ones.   Adjust the value so that it is high enough to filter out the erroneous notes without being so high as to filter out the correct notes as well.   The default setting is affected by the Polyphony and Wave Instrument you select.   The Midi Threshold is not affected by the Volume setting.

Detect Note On/Off Velocity, Dynamics Tab
User Level: Advanced
MIDI File Usage: Playback

For each note in a MIDI file created by IntelliScore, there can be up to four pieces of information: when the note starts, the velocity of the note when it starts, when the note stops, and the velocity of the note when it stops.   "Note On Velocity" in MIDI terms refers to how quickly a note is struck.   "Note Off Velocity" indicates how quickly a note is released.   IntelliScore treats velocity as equivalent to volume.   Depending on the patch that is used when the MIDI file is played through a MIDI editor, velocity might map to volume. Sometimes IntelliScore assigns to certain notes velocities that are too slow, resulting in these notes being too quiet when the MIDI file is played.   In this situation you can prevent velocity information from being included in the MIDI file by unchecking the appropriate boxes.   When the velocity feature is deactivated, the every note will be assigned the same velocity.   You can adjust this velocity by specifying the Volume.

Auto Gain, Dynamics Tab
User Level: Advanced
MIDI File Usage: Playback, Notate

IntelliScore recognizes louder music more accurately than quieter music.   If the music recorded in your wave file has several quiet sections, you may want to check this box.   On the other hand, using Auto Gain has the side effect of squeezing out the overall dynamics of music similar to a compressor, so that the softer and louder parts of the wave file both end up equally loud in the created MIDI file.

Volume, Dynamics Tab
User Level: Advanced
MIDI File Usage: Playback

You can change the volume of the notes so that they are louder or softer in the created MIDI file than in the original wave file.   Boosting the volume will make them louder, while cutting the volume will make them softer.   In the center position there is no change.   You can click on the "Z" button to easily return the slider to the center position.   You may need to boost the volume in order to make the note volumes in the MIDI file match the wave file.   The default setting is affected by the Polyphony and Wave Instrument you select and generally achieves the appropriate level of boost.

Midi Tab, Project Editor (accelerator key: M)
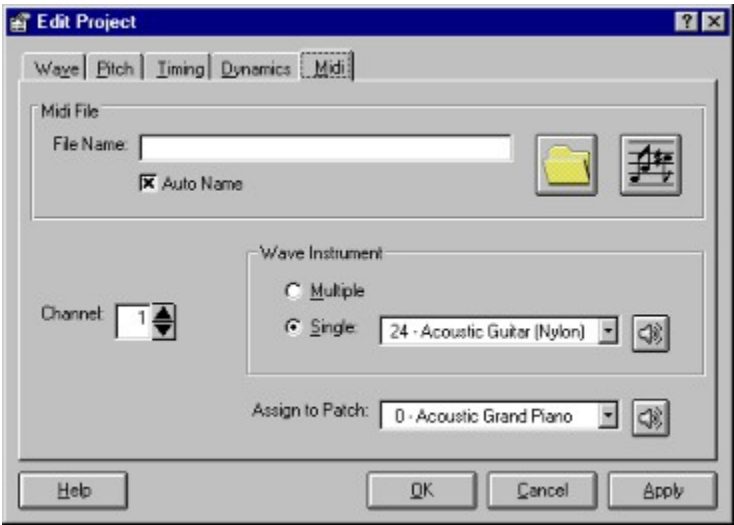
Contains the name to assign to the MIDI file that IntelliScore will create, as well as the channel and patch to use in the MIDI file.

Item	Accelerator Key	Minimum Value	Maximum Value	Default Value
File Name				Wave File Name
Auto Name				checked
Channel		1	16	1
Wave Instrument	M - Multiple, S - Single	95 selected instrument filters		0
Assign to Patch		0	127	0

Midi File Name, Midi Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

In the "File Name" box, type the full path and filename to assign to the MIDI file that IntelliScore will create.   Initially this will be the same name as the wave file you selected, except with a **.mid** extension at the end.   If you want to replace an existing MIDI file, you can click the button containing the Folder icon to open a dialog window to help you find the file you want to replace.   After selecting a MIDI file and closing the dialog, its name appears in the File Name box.   Clicking the button with the Musical Notes icon launches the MIDI editor specified in the Options Window.   If the MIDI file you specified in the File Name box currently exists, it is automatically loaded when the MIDI editor starts, if your MIDI editor supports this feature.

Auto Name, Midi Tab
User Level: Basic, Advanced
MIDI File Usage: Playback, Notate

If you check this box, IntelliScore will automatically create a name for the MIDI file to be created.   Whenever you select a   wave file, your MIDI file name will be in the same folder and have the same name as your wave file, except that the extension is changed from **.wav** to **.mid**.   You may of course modify the name of the MIDI file if you like.   If you do not check this box, the MIDI file name will not change if the name of your wave file changes.

Channel, Midi Tab
User Level: Advanced
MIDI File Usage: Playback

IntelliScore assigns all notes in the MIDI file to the same MIDI channel.   Type the number of the   channel you want to use or adjust it using the spinner control.   The range is 1 to 16.   On General MIDI synthesizers, channel 10 is reserved for rhythm instruments.   You will see a warning if you select channel 10.

Patch, Midi Tab
User Level: Basic, Advanced
MIDI File Usage: Playback

Select an instrument name from the drop-down list box that most closely resembles the prominent instrument used in the wave file. This will be the patch used when the MIDI file is played back through your MIDI editor or MIDI instrument, if it is General MIDI compliant. Although your wave file may contain several different instruments playing at the same time, they will all be played back from the MIDI file using the same patch. Of course, the accuracy of the instrument sounds is determined by your playback device, not by the MIDI file itself. To hear what the selected patch would sound like through your MIDI editor, click the Speaker button. Whenever a new Wave Instrument is selected, the patch will be set to the same instrument. It you would like to experiment, you can set the patch to an instrument that has no relation to the instrument used in the wave file, to see what the music would sound like played if it were played on a different instrument.

Help Button, Project Editor

Displays the general topic in the help file relating to the Project Editor.

OK Button, Project Editor

Preserves any changes you have made and closes the Project Editor.   If you have supplied all the necessary information, IntelliScore prompts you to run the recognizer.

Cancel Button, Project Editor

Discards any changes you made since the last time you clicked the Apply button.   The Project Editor is then closed.

Apply Button, Project Editor

Preserves any changes you have made.

Status Window

To begin the recognition process, select "Tools | Recognize" in the Menu Bar or click on the Lightening Bolt Icon in the Tool Bar.   While the recognizer is working, a status window displays to indicate the Time Elapsed and how much is done, as well as the Estimated Time Remaining and the Estimated Total Time.   The percent complete is shown with a gauge that gradually fills as the process approaches completion.   The recognition time is affected by many factors, including the length of the project properties; the length, complexity, and format of the wave file; the speed of the processor; and the operating environment.   If the recognition time seems unreasonably high, try selecting a smaller portion of the wave file for recognition or reduce settings such as Pitch Range and Notes Per Beat (Timing Resolution).   Following a brief initialization period at the beginning of the recognition process, all values are updated each second.   If the recognition completes successfully, the MIDI editor you specified in the Options window will open with the generated MIDI file.
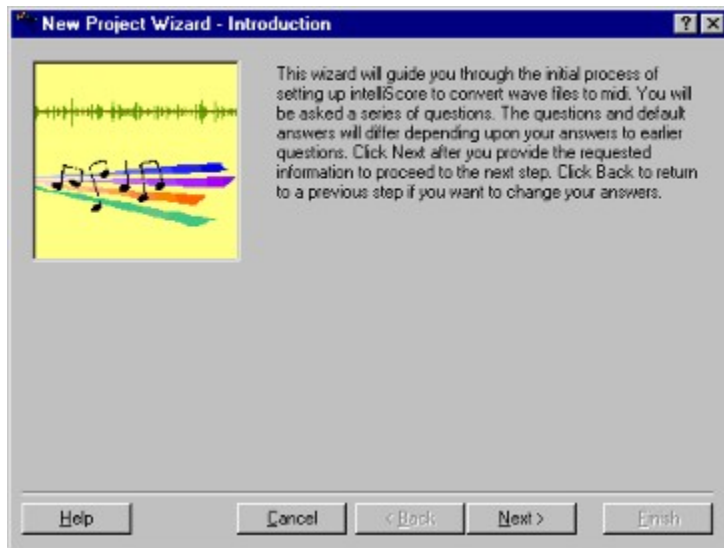
Button Caption	Accelerator Key
Stop	S

Stop Button, Status Window

Click this button to stop the recognition process at any time.   The MIDI file that was in the process of being created by the recognizer will still be playable, but it will not contain the entire Time Range as set in the project.

New Project Wizard

Whenever you click the Blank Document icon on the toolbar or select File | New Project, the New Project Wizard appears.   The wizard asks you a series of questions and guides you through the steps required to prepare IntelliScore to recognize your music.   The set of steps and default values will differ depending upon the information you provide in earlier steps.

Buttons

Caption	Accelerator Key
Help	H
Cancel	C
Back	B
Next	N
Finish	F

Help Button, New Project Wizard

Displays the general topic in the help file relating to the wizard.

Cancel Button, New Project Wizard

Clicking this button ends the wizard.   All of the information you entered while using the wizard is discarded.

Back Button, New Project Wizard

Clicking this button returns you to the previous step in the wizard where you can review and/or change the information you provided.

Next Button, New Project Wizard

Clicking this button takes you to the next step in the wizard once you have entered the information requested for the current step.

Finish Button, New Project Wizard

After you have entered all of the information requested by the wizard, clicking this button closes the window and starts the recognizer.

Error Message:
The Wave Editor file '*filename*' does not exist.

Possible Solutions:
- The Wave Editor you specified in the Options Window cannot be currently be used because it does not exist. Install the editor at the location you specified.

- Select another editor.

Error Message:
Unable to run Wave Editor.

Possible Solutions:
- An unknown problem occurred while attempting to start the Wave Editor.   Make sure the editor exists at the location you specified in the Options Window.

- Perhaps the editor program is corrupted.   Reinstall it.

- Perhaps your computer has run out of memory. See instructions for the "Out of memory" error.

Error Message:
The Midi Editor file '*filename*' does not exist.

Possible Solutions:
- The Midi Editor you specified in the Options Window cannot be currently be used because it does not exist. Install the editor at the location you specified.

- Select another editor.

Error Message:
Unable to run Midi Editor.

Possible Solutions:
- An unknown problem occurred while attempting to start the Midi Editor.   Make sure the editor exists at the location you specified in the Options Window.

- Perhaps the editor program is corrupted.   Reinstall it.

- Perhaps your computer has run out of memory. See instructions for the "Out of memory" error.

Error Message:
The CD Player file '*filename*' does not exist.

Possible Solutions:
- The CD player program you specified in the Options Window cannot be currently be used because it does not exist.   Install the CD player program at the location you specified.

- Select another CD player program.

Error Message:
Unable to open CD Player.

Possible Solutions:
- An unknown problem occurred while attempting to start the CD player.   Make sure the CD player program exists at the location you specified in the Options Window.

- Perhaps the CD player program is corrupted.   Reinstall it.

- Perhaps your computer has run out of memory. See instructions for the "Out of memory" error.

Error Message:
The Volume Control file '*filename*' does not exist.

Possible Solutions:
- The volume control program you specified in the Options Window cannot be currently be used because it does not exist.   Install the volume control program at the location you specified.

- Select another volume control program.

Error Message:
Unable to open Volume Control.

Possible Solutions:
- An unknown problem occurred while attempting to open the volume control.   Make sure the volume control program exists at the location you specified in the Options Window.

- Perhaps the volume control program is corrupted.   Reinstall it.

- Perhaps your computer has run out of memory. See instructions for the "Out of memory" error.

Error Message:
Wave File does not currently exist.

Possible Solution:
- The Wave File name you specified in the Project Editor does not currently exist.   You will need to place it there before running the recognizer.

Error Message:
Wave File format not supported.

Possible Solutions:
- IntelliScore supports uncompressed (PCM) wave files in monaural or stereo, 8-bit or 16-bit sampling resolution, and sample rates of 11025 Hz, 22050 Hz, or 44100 Hz.   Make sure you record your wave file using only these settings.

- If you cannot re-record the wave file, convert it to a supported format.   You may use the Sound Recorder utility supplied with Windows to accomplish this, as follows:
    1. In the Start | Programs | Accessories program menu, locate Sound Recorder, and open it.
    2. In the Sound Recorder menu, click File | Open...
    3. In the Open window, select the wave file you want to convert and click the Open button.
    4. Back at the menu, click File | Save As…
    1. In the Save As window, enter the name of the file you want to use for the wave file having the new format and click the Change… button.
    1. In the Sound Selection window, select **Telephone Quality** from the list of format names and click the OK button.
    1. Back in the Save As window, click on the Save button.
    2. Back at the menu, click File | Exit.

Error Message:
Error accessing Wave File information.

Possible Solutions:
- The file you specified is not really a wave file.   Specify a different file in the Project Editor.

- The wave file may be corrupted.   Recopy the wave file.

Error Message:
Invalid Start Time format.

Possible Solution:
- In the Project Editor, specify the Start Time in *hh*:*mm*:*ss* format, where *hh* is hours, *mm* is minutes, and *ss* is seconds.   For example, **00:04:36**.

Error Message:
Invalid End Time format.

Possible Solution:
- In the Project Editor, specify the End Time in *hh*:*mm*:*ss* format, where *hh* is hours, *mm* is minutes, and *ss* is seconds.   For example, **00:04:36**.

Error Message:
Invalid Low Note.

Possible Solution:
- Applies if you indicated in the Options window that you intend to notate the MIDI file. In the Project Editor, specify the Low Note as the letter of the note followed by an octave number. You can include a sharp ("#") or flat ("b") if desired after the note letter. Include a negative sign before the octave number if appropriate. Examples of valid values include: A#3, Bb-1, G8, F-2, C0. Middle C is considered C3.

Error Message:
Invalid High Note.

Possible Solution:
- Applies if you indicated in the Options window that you intend to notate the MIDI file.   In the Project Editor, specify the High Note as the letter of the note followed by an octave number.   You can include a sharp ("#") or flat ("b") if desired after the note letter.   Include a negative sign before the octave number if appropriate. Examples of valid values include: A#3, Bb-1, G8, F-2, C0.   Middle C is considered C3.

Error Message:
Any error message containing "MMSYSTEM"

These errors indicate a problem with the use of your sound card. They can occur when you click one of the speaker buttons, when playing the wave file using the Tempo Tracker, or when attempting to start the metronome.

Possible Solutions:
- If any application is running that works with wave or MIDI files, such as sequencers, close them and try again.

- If you are attempting to record music while using intelliScore's metronome, your sound card must support simultaneous wave recording and MIDI playback.

- You may not have the proper drivers or hardware installed.   Refer to your sound card or Windows documentation for help.

Error Message:
Specified Project does not exist.

Possible Solutions:
- Make sure to specify a project that exists when you run the recognizer.

- Check the spelling and path of the project filename.

Error Message:
No Wave File specified.

Possible Solution:
- Specify a wave file in the Project Editor before running the recognizer.

Error Message:
Specified Wave File does not exist.

Possible Solutions:
- Make sure the wave file you specified in the Project Editor exists before running the recognizer.

- Make sure the drive containing the wave file is available.

Error Message:
Unable to read Wave File.

Possible Solutions:
- The file you specified is not really a wave file.   Specify a different file in the Project Editor, then run the recognizer again.

- The wave file may be corrupted.   Recopy the wave file, then run the recognizer again.

Error Message:
Wave format not supported or invalid.

Possible Solutions:
- IntelliScore supports uncompressed (PCM) wave files in monaural or stereo, 8-bit or 16-bit sampling resolution, and sample rates of 11025 Hz, 22050 Hz, or 44100 Hz.   Make sure you record your wave file using only these settings, then run the recognizer again.

- If you cannot re-record the wave file, convert it to a supported format using a utility such as the one supplied with Windows.

Error Message:
Unable to create Midi File.

Possible Solutions:
- Make sure the path and filename you specified in the Project Editor are valid and that the path already exists.

- Make sure the drive you specified for the MIDI file is available and not write-protected.   For example, you cannot create a Midi File on a CD-ROM.   If you are writing to a floppy drive, a non-write-protected diskette must already be in the drive.

Error Message:
Unable to create Midi File due to timing settings.

Possible Solutions:
- Tap at a different pace using the Tempo Tracker, adjust Notes Per Beat (Timing Resolution), and/or Note Value within the Meter so that the settings are more toward the center of the range.

Error Message:
Unable to write to Midi File.

Possible Solutions:
- Make sure there is ample space available on the drive you specified to store the MIDI file.

- Make sure the drive you specified for the MIDI file is still available.

Error Message:
User aborted recognition process.

Possible Solution:
- You clicked on the Stop button in the Status Window while the recognizer was running.   You may use the portion of the MIDI file that was written prior to the abort or rerun the recognizer.

Error Message:
Not enough taps.

Possible Solution:
- You only tapped once while attempting to record the tempo using the Tempo Tracker.   You need to tap at least twice to indicate the period of the wave file you want recognized.   Pressing the Start and Stop buttons do not count as taps.

Error Message:
You waited too long between taps.

Possible Solution:
- You waited over 65 seconds between the current tap and the previous tap while using the Tempo Tracker, resulting in a tempo that is too slow.   Be sure to tap more frequently.

Error Message:
Out of memory.

Possible Solutions:
- Reboot your computer and try again.

- Close all other applications, including help files, before running the recognizer.

- If you manually set the size of your virtual memory swap file, increase it.

- Increase the amount of physical memory in your computer.

Error Message:
Missing license.

Possible Solutions:
- IntelliScore could not find the license for your product.   Reinstall IntelliScore.

Error Message:
Error displaying Web site.

Possible Solutions:
- You may not have Microsoft Internet Explorer installed on your computer or it may be corrupt.   Reinstall Internet Explorer.

Error Message:
Any "General Protect Fault" (GPF) error or "Fatal Exception" error

Possible Solutions:
- Reboot your computer and try again.

- Email the Help Desk.

What To Do If Nothing Else Helps

If you have tried everything suggested in this User Guide and yet are still experiencing difficulties, try visiting our Web site at http://www.intelliscore.net for the troubleshooting tips and patches.   If you don't find what you need, email the Help Desk for assistance at support@intelliscore.net for a prompt and courteous response.   Alternately, registered users may call 954-753-3278.   Please provide the following information in your email:

- Your name (so we can identify you as a registered customer)

- The edition and version of your software

- Exactly what you were doing when the error occurred

- The exact error message, including the error code if one is displayed

Audio CD

A compact disc containing a digital audio recording in a format playable by a CD player such as the one that may be part of a stereo system or in a car.   CD-ROM drives in computers are also capable of playing audio CDs.   They are a high quality source from which to record wave files.

Copyist

A person who writes down sheet music of a song by listening to the song a little at a time and picking out each note. IntelliScore essentially does this tedious task automatically, so you can spend more time playing or studying music rather than transcribing it.

General MIDI

An extension to the MIDI standard that specifies specific instrument sounds that are to be associated with different patch numbers.   The list of instruments and patch numbers can be found at the Patch list box in the Project Editor. The standard was created so that there was some consistency between different synthesizers playing the same MIDI information, although each synthesizer is free to interpret what each instrument should sound like.

Hz

Hertz is a measure of frequency.   A Sample Rate of 11025 Hz, for example, means that the waveform is measured 11025 times per second.   Hertz is also used to indicate the pitch of a note.   For example, the note A3 typically has a frequency of 440 Hz, or 440 cycles per second in its waveform.   Higher notes have higher frequencies.

Instrument Filter

If a single type of musical instrument was used in recording your wave file, you should select it from the provided list of 95 instruments on the Midi tab of the Project Editor for best accuracy.   IntelliScore understands the unique characteristics for each individual instrument in the list, allowing better recognition results for single instrument recordings than when using the generic Multiple instrument setting.

Marker

A section name occurring in the midst of a MIDI file.   IntelliScore uses markers to indicate chord changes that transpire over the course of a MIDI file.

Metronome

A device that produces a clicking sound at an adjustable, steady rate to aid musicians in playing at a consistent pace. IntelliScore contains a metronome in the Record Wave File window for use when playing an instrument directly into IntelliScore.   Use of the metronome bypasses the need use the Tempo Tracker.

MIDI

Musical Instrument Digital Interface.   A standard developed to help musical devices communicate with each other.   It is sort of the musical equivalent of a computer modem.   It specifies what note should be played and released when and with what velocity, as well as other information.

MIDI Channel

Up to 16 different MIDI devices can be connected together in a network.   Each device is assigned its own channel so that it knows what messages to act upon and which are for other devices and should therefore be ignored.   You can specify which one you want IntelliScore to send out with the Channel text box in the Project Editor.

MIDI Editor

A software program designed to create, edit, and play MIDI files similar to a sequencer.   Many MIDI editors can also convert a MIDI file into sheet music.

MIDI File

A file that complies to the MIDI File Specification, containing a recording of MIDI information for later use.   It normally has a filename extension of **.mid** and can be managed through a MIDI editor.

MIDI Instrument

A musical instrument that contains a MIDI interface.   This allows it to receive MIDI information and play music automatically similar to a player piano.   It can also transmit MIDI information so that performances played on the instrument can be recorded.

MIDI Interface

A device that goes between a piece of musical equipment and cables which makes that device MIDI-enabled.   Most sound cards contain a MIDI interface so that you can connect your computer to a MIDI instrument and send MIDI information back and forth.

Monaural

Indicates music that is recorded with only one track so that both ears hear the same thing.   Music recorded this way does not have as much depth as stereo.   However, since IntelliScore produces a MIDI file with a single MIDI channel, it does not need a stereo recording.   You can convert a stereo recording to monaural through Windows or by setting the Stereo Balance in the Project Editor.

Notate

The process of creating sheet music from a music recording, such as a wave file or MIDI file.

PCM

Pulse Code Modulation.   This is the standard format used to record a waveform in an uncompressed wave file. IntelliScore can only recognize this type of wave file, as other formats used in Windows are proprietary.

Project

A file containing recognition parameters.   The primary purpose of IntelliScore's user interface is to assist you in managing projects.

Recognition Parameters

Settings that tell the recognizer what you want it to do.   These settings include the name of the wave file you want recognized, the name of the MIDI file you want created, and several properties that affect the accuracy and speed of the recognition process.   You indicate this information in the Project Editor.

Recognizer

The component of IntelliScore that actually performs the music recognition. Its behavior is controlled by the recognition properties you specify. You can monitor its progress through the Status Window.

Sample Rate

The number of waveform values measured per second.   At a sample rate of 11025 Hz, a measurement of the level of a waveform is taken 11025 times each second when creating a wave file.   The higher the sample rate, the more accurately the waveform will be converted from its natural analog form to the digital form required by computers because it has a higher frequency response.   Incidentally, a sample rate of 44100 Hz is used when recording an audio CD.

Sampling Resolution

The maximum accuracy of each measurement taken of a waveform when creating a wave file.   An 8-bit sampling resolution can record 256 different values, while a 16-bit sampling resolution can record 65536 different values.   Therefore, the higher the sampling resolution, the more accurately the waveform will be converted from its natural analog form to the digital form required by computers because it has a higher dynamic range.   However, 8-bit sampling resolution is sufficient for wave files you want recognized by IntelliScore.   Incidentally, a sampling resolution of 16 bits is used when recording an audio CD.

Sequencer

A device or software program used to record a sequence of notes and play them back.   This is only a subset of the functionality contained in most MIDI editors.

Sheet Music

Music represented in written form.   Many MIDI editors can create sheet music from a MIDI file.   A copyist has traditionally created sheet music from analog recordings.   IntelliScore listens to analog recordings in the form of wave files and creates MIDI files to be notated by a MIDI editor.

Sound Card

An add-on device attached to a computer that, in combination with appropriate software, gives it capabilities such as recording and playing wave files and MIDI files.   It can contain its own synthesizer and MIDI interface.

Stereo

Indicates music that is recorded with two tracks so that each ear hears slightly different sounds.   Music recorded this way has more depth than monaural because it creates the illusion of instruments placed at different locations in space.   However, since IntelliScore produces a MIDI file with a single MIDI channel, a stereo recording is unnecessary.   You can convert a stereo recording to monaural through Windows or by setting the Stereo Balance in the Project Editor.

Tracks

Music recorded from a single source, such as one microphone.   Two tracks that play simultaneously (such as if it is recorded from two microphones) is called stereo, while a single track is monaural.

Velocity

A measure of how rapidly a note is struck when it starts sounding or how rapidly it is released when it stops.   This information is recorded in MIDI files.   IntelliScore treats velocity as equivalent to volume.

Wave Editor

A software program designed to record, edit, and play wave files, such as the Sound Recorder utility that comes with Windows.   You can use this program or your own.

Wave File

A digital recording of an analog waveform, similar to the contents of an audio CD.   It normally has a filename extension of **.wav** and can be managed through a wave editor.

Waveform

An analog representation of sound, just as it exists in the real world.   Sound is created by oscillating air pressure. Each oscillation is represented as a cycle.   Our ears interpret shorter cycles as higher pitches than it does longer cycles.   Waveforms can be recorded as wave files or on an audio CD for use by a computer.

MIDI Note Number/Name Map

This table lists the MIDI note numbers and their equivalent note names.

0=C-2	1=C#-2 / Db-2	2=D-2	3=D#-2 / Eb-2
4=E-2	5=F-2	6=F#-2 / Gb-2	7=G-2
8=G#-2 / Ab-2	9=A-2	10=A#-2 / Bb-2	11=B-2
12=C-1	13=C#-1 / Db-1	14=D-1	15=D#-1 / Eb-1
16=E-1	17=F-1	18=F#-1 / Gb-1	19=G-1
20=G#-1 / Ab-1	21=A-1	22=A#-1 / Bb-1	23=B-1
24=C0	25=C#0 / Db0	26=D0	27=D#0 / Eb0
28=E0	29=F0	30=F#0 / Gb0	31=G0
32=G#0 / Ab0	33=A0	34=A#0 / Bb0	35=B0
36=C1	37=C#1 / Db1	38=D1	39=D#1 / Eb1
40=E1	41=F1	42=F#1 / Gb1	43=G1
44=G#1 / Ab1	45=A1	46=A#1 / Bb1	47=B1
48=C2	49=C#2 / Db2	50=D2	51=D#2 / Eb2
52=E2	53=F2	54=F#2 / Gb2	55=G2
56=G#2 / Ab2	57=A2	58=A#2 / Bb2	59=B2
60=C3	61=C#3 / Db3	62=D3	63=D#3 / Eb3
64=E3	65=F3	66=F#3 / Gb3	67=G3
68=G#3 / Ab3	69=A3	70=A#3 / Bb3	71=B3
72=C4	73=C#4 / Db4	74=D4	75=D#4 / Eb4
76=E4	77=F4	78=F#4 / Gb4	79=G4
80=G#4 / Ab4	81=A4	82=A#4 / Bb4	83=B4
84=C5	85=C#5 / Db5	86=D5	87=D#5 / Eb5
88=E5	89=F5	90=F#5 / Gb5	91=G5
92=G#5 / Ab5	93=A5	94=A#5 / Bb5	95=B5
96=C6	97=C#6 / Db6	98=D6	99=D#6 / Eb6
100=E6	101=F6	102=F#6 / Gb6	103=G6
104=G#6 / Ab6	105=A6	106=A#6 / Bb6	107=B6
108=C7	109=C#7 / Db7	110=D7	111=D#7 / Eb7
112=E7	113=F7	114=F#7 / Gb7	115=G7
116=G#7 / Ab7	117=A7	118=A#7 / Bb7	119=B7
120=C8	121=C#8 / Db8	122=D8	123=D#8 / Eb8
124=E8	125=F8	126=F#8 / Gb8	127=G8

Notes of note:
- Lowest note on piano: 21 (A-1)
- Lowest note on bass guitar: 28 (E0)
- Lowest note on guitar: 40 (E1)
- Middle C: 60 (C3)
- A440: 69 (A3)
- Highest note on piano: 108 (C7)