



## **Technology Institute for Music Educators**

### **TI:ME COURSE 2A** **Electronic Instruments**

Syllabus, Workbook, and Appendices  
By Lynn Purse & Dr. Thomas Rudolph

Edited by Bill Purse

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# TI:ME 2A Electronic Instruments – Syllabus

By Lynn Purse & Dr. Thomas Rudolph

## **Objective:**

The objective of Electronic Instruments is to impart practical skills and knowledge to in-service teachers (ISTs) to allow them to integrate electronic instruments effectively into teaching and learning.

The course covers skills in analyzing and editing sound sources in instruments, electronic performance techniques, electronic orchestration and arranging, creating electronic and electro-acoustic ensembles, designing and maintaining keyboard labs, and developing composition and improvisation curriculum.

The format of the course alternates presentations with class activities, many of which serve to assess IST progress. Satisfactory participation in class activities and successful completion of multiple final projects are required for certification. TI:ME Course 1A Electronic Instruments, MIDI Sequencing and Notation is the prerequisite for this course.

## **Additional Information:**

Electronic Instruments is offered as either a two-credit or three-credit graduate course. Topics in ALL CAPS within topics need not be included in the course when it is offered for two graduate credits only. The instructor of the course must be approved by TI:ME and an expert in teaching electronic instruments to in-service music teachers. It is strongly recommended that the class size be limited to allow for one IST per instrument/computer and no more than sixteen ISTs per instructor. Additional ISTs may be accommodated if additional workstations and assistants are available. Each IST will need approximately 20 hours working alone on a workstation in order to complete the final projects and class activities.

## **Hardware Requirements:**

A computer lab/classroom consisting of MIDI keyboards connected to computers is the standard recommended configuration. Keyboards should be programmable and have basic sound design editing and basic performance controls such as pitchbend and modulation wheels or a joystick. Printers must be available for output of projects. The teacher's station should have a projection device and sound system to allow the instructor's screen to be viewed by the entire class. A sound system connecting all MIDI devices in the room (either through headphones or speakers) is required to allow for class ensemble activities. A variety of alternate electronic instruments (guitar, wind, percussion, etc.) available for student exploration is highly recommended.

## **Software Requirements:**

MIDI accompaniment/music-minus-one software designed for either computers or workstation sequencers. Professional level notation and sequencing software for computers.

## **Other Resource Requirements:**

A variety of ensemble scores and keyboard methods (See Appendix # )  
Audio and video recordings of electronic instrument performances (see Appendix # for recommending listening list)

Please Note: The activities in this syllabus often specify the use of specific scores that are included in the course materials. Instructors may substitute other similar pieces for these activities.

**Text:**

The instructor may specify appropriate required text(s) in addition to the supplied TI:ME course resources. (See bibliography on p.

**Required Texts**

- Instructor specified performance repertoire.
- Technology Strategies for Music Education by Thomas Rudolph, Floyd Richmond, David Mash, and David Williams; Published by Technology Institute for Music Education 305 Maple Ave. Wyncote, PA 19095 www.ti-me.org

**Prerequisites:** TI:ME Level One Certification, or completed a minimum of 2 courses in music technology, or comparable experience using music sequencing and notation software with a Macintosh or Windows PC plus a basic knowledge of MIDI Theory. TI:ME Course 1A Electronic Instruments, MIDI Sequencing and Notation is strongly recommended.

The outline is designed for 25 one-hour units on electronic instruments within a 2-credit graduate workshop. Items in UPPERCASE can be added if the course is offered for 3 graduate credits.

**Introduction:** The primary objective of TI:ME 2A Electronic Instruments is to impart practical skills and knowledge to in-service teachers (ISTs) to allow them to integrate a variety of uses of electronic instruments effectively into classroom activities. The purpose of this course is to instruct ISTs in using electronic instruments for performance alone and with others, improvisation, composition, arranging and orchestration, and basic sound editing and design. The instructor will also provide ISTs with the information they need to make critical judgments about the appropriateness of selected sequencing and accompaniment programs for particular educational applications as well as a diverse selection of performance repertoire. The format of this course alternates presentations with class activities, many of which serve to assess the participant's progress. In addition to satisfactory participation in class activities, final projects in arranging and curriculum design are required for certification.

**Objectives:**

**Declarative Knowledge**

(assessed via arrangements/orchestrations, lesson plans, and Workbook Sheets)

Arrangements/Orchestrations

- The IST creates two simple orchestrations or arrangements for electronic instruments, each a minimum of 32 measures in length. One arrangement should be a MIDI accompaniment

sequence for a solo performer; the accompaniment can be in the form of a standard MIDI file or readily available accompaniment software such as Band-In-A-Box; the solo performance part must be notated with computer notation software. The other arrangement should be for at least four performers on electronic instruments, with or without additional MIDI accompaniment. The arrangements should use General MIDI voice assignments for ease of performing on a variety of synthesizers; patch changes should be noted in score. The performance parts must be notated with computer notation software and printed with both a score and parts. If a MIDI file is included, it should be saved as a Standard MIDI file. Four voice chorales are one recommended source of material.

(Sample files of public domain songs are available from the TI:ME web site.)

**THE IST WILL CREATE A SIMPLE ORCHESTRATION OF A PIANO PIECE FOR FOUR OR MORE PERFORMERS ON ELECTRONIC INSTRUMENTS.** (See Appendix 3 for guidelines)

Each arrangement should include a short paper (one page minimum) containing a brief description of the process (specific problems and solutions, musical decisions regarding timbres, effects, performance notes, etc.)

#### Two Lesson Plans

Students will develop a curriculum outline for keyboards and review ways to write a proposal for the use of keyboards. The IST will describes several ways to use electronic instruments to enhance teaching and learning. This description will be in the form of two lesson plans that incorporate the MENC National Standards for music. (Appendix Z includes a sample lesson plan.)

#### Completed Workbook Sheets

Successful completion of workbook sheets in knowledge areas including:

- a. Use of Electronic Instruments in a classroom or ensemble setting
- b. History of Electronic Musical Instruments
- c. MIDI Theory as it relates to performance techniques
- d. Basics of Sound Design and Editing

#### **Procedural Knowledge:**

(assessed via class activities)

The IST demonstrates skills in using MIDI instruments in a variety of classroom and ensemble situations. The skills to be acquired include the following:

- Knowledge of Basic MIDI Concepts
- ISTs will select, name, categorize, and alter electronic sounds. The properties of sound will be manipulated.
- ISTs will use keyboard functions including transposition, tuning, and multi-sounds. These functions will be applied to specific skills.
- ISTs will edit sounds sources and performance controls in an electronic instrument.

- ISTs will perform with electronic instruments in small chamber groups and they will include ways to enhance the overall sound of melodies and compositions using electronic keyboards.
- ISTs will perform with recorded sequences and learn to operate a sequencer for practice and performance.
- ISTs will create improvisations using drum patterns, ostinatos, algorhythmic accompaniments, or sequences as a basis for musical exploration and improvisation.
- ISTs will use a music notation program to create and print orchestrations and arrangements for electronic instrument ensembles and solo performers.
- ISTs will apply standard synthesizer performance techniques such as pitch bending, modulation, and aftertouch to the ensemble performance materials.

## **Introduction**

The prediction of today’s art of electronic music instruments dates back to 1624 when Francis Bacon, in his book New Atlantis, wrote . . .

“We have also sound-houses, where we practice and demonstrate all sounds, and their generation. We have harmonies, which you have not, of quarter-sounds, and lesser slides of sound. Diverse instruments of music likewise to you unknown, some sweeter than any you have; together with bells and rings that are dainty and sweet. We represent small sounds as great and deep; like- wise great sounds extenuate and sharp; we make diverse tremblings and warblings of sounds, which in their original are entire.”

“We represent and imitate all articulate sounds and letters, and the voices and notes of beasts and birds. We have certain helps which set to the ear do further the hearing greatly. We have also diverse strange and artificial echoes, reflecting the voice many times, and as it were tossing it: and some that give back the voice louder than it came; some shriller, and some deeper; yes, some rendering the voice differing in the letters or articulate sound from that they receive. We have also means to convey sounds in trunks and pipe, in strange lines and distance.”

## **Overview of Electronic Instruments**

### **Historical Developments in Electronic Instruments**

<b>2nd Century, BC.</b>	Greek Aeolian Harp was first automatic instrument. It was named for Aeolus, the Greek god of the wind. The instrument had two bridges over which the strings passed. The instrument was placed in a window where air current would pass, and the wind current activated the strings. The strings were all the same length and tuned to the same pitch the different string thickness, produced varying pitches.
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<b>1400s</b>	Development of an organ-grinder-like instrument called the hurdy-gurdy,
<b>1600</b>	Athanasius Kircher, described in his book, Musurgia Universalis (1600), a mechanical device that composed music. He used number and arithmetic-number relationships to represent scale, rhythm, and tempo relations, called the Arca Musarithmica.
<b>1700's</b>	Hand-cranked street organs began life in the eighteenth century as little tiny hand-cranked table organ that were called serinettes (French for bird). They were designed to teach songbirds how to sing lovely little songs.
<b>1738</b>	Mechanical singing birds and barrels organs popular, which had music, composed by Mozart.
<b>1796</b>	Carillons invented that used slivers of steel, shaped, polished, tempered and then secured into a position where projections on a rotating cylinder could pluck at their free extremity,
<b>1804</b>	Panharmonium designed by Maelzel. Driven by air pressure and reproduced the timbres of traditional instruments. Beethoven wrote Battle of Vittoria for the Panharmonium, unfortunately it was not performed due to various technical problems.
<b>1895</b>	Boch and Wachter developed the calliope that used metal disks with holes punched into it to represent music.
<b>1897</b>	E.S. Votey invented the Pianola, an instrument that used a pre-punched, perforated paper roll moved over a capillary bridge. The holes in the paper corresponded to 88 keys of the piano. Openings in the paper roll sounded a note.
<b>1906</b>	Thaddeus Cahill invented the Dynamophone or also called the Telharmonium, a machine that produced music by an alternating current running dynamos. This was the first additive synthesis device. The instrument weighed over 200 tons and was designed to transmit sound over telephone wires; however, the wires were too delicate for all the signals. He was the 'Father of Muzak.' The generators produced pure tones of various frequencies and intensity; volume control supplied dynamics.
<b>1914</b>	The first concert of Futurist music took place. The " <u>art of noises</u> " concert was presented by Marinetti and Russolo in Milan, Italy.
<b>1920's</b>	Givelet and Coupleux's Pipeless Organ. One of the first programmable analog music synthesizers. Seeburg, Wurlitzer and others were building the first electronic jukeboxes.  Lev (Leon) Theremin, Russia, invented the Theremin or Thereminovox). The instrument used 2 vacuum tube oscillators to produce beat notes. "heterodyning" from oscillators, which varied pitch, created musical sounds. Changing the distance between 2 elements altered a circuit. The instrument had a radio antenna to control dynamics and a rod sticking out the side that controlled pitch. The performer would move his/her hand along the rod to change pitch, while simultaneously moving his/her

	other hand in proximity to the antenna. Many composers used this instrument including Varese.
<b>1922</b>	Darius Milhaud (b. 1892) experimented with vocal manipulation via phonograph speed changes.
<b>1928</b>	Maurice Martenot (b. 1928, France) built the Ondes Martenot. The instrument used the same basic idea as the Theremin, but instead of a radio antenna, it utilized a moveable electrode was used to produce capacitance variants. Performers wore a ring that passed over the keyboard. The instrument used subtractive synthesis. Composers such as Honegger, Messiaen, Milhaud, Dutilleux, and Varese all composed for the instrument.
<b>1929</b>	Laurens Hammond (b. 1895, USA), built instruments such as the Hammond Organ, Novachord, Solovox, and reverb devices in the United States. The Hammond Organ used 91 rotary electromagnetic disk generators driven by a synchronous motor with associated gears and tone wheels. It used additive synthesis to produce its sound.
<b>1949</b>	Pierre Schaeffer and engineer Jacques Poullin worked on experiments in sound which they titled "Musique concrete."
<b>1949-50</b>	Schaeffer and Henry (1927-96), along with Poullin composed Symphonie pour un homme seul (Symphony for a Man Alone); the work actually premiered March 18, 1950.
<b>1951-53</b>	Eimert and Beyer (b. 1901) produced the first compositions using electronically-generated pitches. The pieces used a mechanized device that produced melodies based on Markov analysis of Stephen Foster tunes.
<b>1950's</b>	MUSICOMP composition language developed for Lejaren Hiller and Leonard Isaacs's IBM Illiac 7090 computer at the University of Illinois – first significant work a string quartet called the Illiac Suite. In addition the RCA Mark II Synthesizer used operating codes punched on cards or paper tape.
<b>1956</b>	Martin Klein and Douglas Bolitho used a Datatron computer called Push-Button Bertha to compose music. This computer was used to compose popular tunes; the tunes were derived from random numerical data that was sieved, or mapped, into a preset tonal scheme.
<b>1958</b>	Max Mathews, of Bell Laboratories, generated music by computers.
<b>1960's</b>	The transistor helps Don Buchla create an analog synthesizer with the first built-in sequencer.
<b>1961</b>	Robert Moog met Herbert Deutsch, and together they created a voltage-controlled synthesizer.
<b>Late 1960's</b>	The Sal-Mar Construction was built. This instrument was named for composer Salvatore Martirano and designed by him. The Sal-Mar Construction weighed over fifteen hundred pounds and consisted of "analog circuits controlled by internal digital circuits controlled by the composer/performer via a touch-control keyboard with 291 touch-sensitive keys.
<b>1964</b>	The fully developed Moog was released. The modular idea came from the miniaturization of electronics.

<b>1967</b>	Walter Carlos (later Wendy) composed Switched on Bach using a Moog synthesizer.
<b>1970's</b>	Analog and digital synthesizers featured built in real time sequencing capabilities (Fairlight, Synclavier, Lynn Drum Machine, and Prophet). Roland produced the first digital sequencing device under control of a microprocessor.
<b>1974</b>	The Mellotron was built. The instrument was an early sample player that used tape loops. There were versions that played string sounds or flute sounds, and the instrument was used in movie soundtracks and on recordings.
<b>1980's</b>	Birth of MIDI implementation and growth of the personal computer. Yamaha DX-7 and Roland Jupiter 6 were two of the first synths to embrace MIDI. The birth of the MIDI workstation (sequencer, synth voices, drum sounds and a keyboard). Computers began to have sound cards and software control.
<b>1986</b>	Jam Factory written by programmer David Zicarelli. He was trying to create a program that would listen to MIDI input and 'improvise' immediately at some level of proficiency, while allowing (Zicarelli) to improve its ability.
<b>1990's</b>	Sequencing is welcomed into the recording industry and performance side, especially pop music. Sequencers are refined as music notation, digital audio and video become integrated.

*Historical Developments in Music Sequencing Compiled from the books "Experiencing Music Technology" by David Williams and Peter Webster p351-352 (see bibliography) and "Electronic and Experimental Music" by Thomas B. Holmes p. 89-93*

### **Class Activities**

The instructor will briefly discuss the historical development of electronic musical instruments.

## **TOPIC #1 –Historical Overview of Electronic Instruments**

### **IST Objectives:**

- To understand the historical development of electronic instruments
- To understand the historical development of performance and composition using electronic instruments

### **Procedures:**

- Trace historical development of instruments using a time-line (see above)
- Examine and discuss photographs, concert reviews, and audio and video recordings of historical instruments as available
- Discuss the impact of performance techniques developed for early electronic instruments and their usefulness with contemporary instruments.

**Activities:**

Conduct an Internet search for sites that are specific to contemporary and historical Instruments. List five sites with the address and a brief description.

**TOPIC #2 - Review of Basic MIDI Concepts****IST Objectives:**

- 1) To understand the functions of MIDI IN/OUT/THRU parts
- 2) To understand how MIDI channels operate
- 3) To understand the terms voice, polyphony, multi-timbral, and multi-part interface
- 4) To understand the MIDI channel voice messages most frequently used in performance and sequencing.
- 5) To understand the General MIDI (GM) specifications.

**Procedures:**

The instructor and ISTs will explore in detail the content of MIDI Basics in class.

**Activities:**

ISTs should be encouraged to ask questions about the material in this topic. It is important that they understand this material before advancing to other topics. Have the ISTs visit the website Electronic Music Interactive for an overview of MIDI and the basics of MIDI systems . Located at [nmc.uoregon.edu/emi](http://nmc.uoregon.edu/emi).

**MIDI Basics**

1A) Review the definition of MIDI – a digital communication system that MIDI-equipped instruments and devices use to communicate with each other.

1B) Review the function of the MIDI ports: IN (receiver), OUT (transmitter), and THRU (relayer)

2) Review MIDI channels – 16 separate electronic pipelines that can transmit or receive different MIDI data streams simultaneously. Only the MIDI device set to the same channel number will execute MIDI data sent on a specific MIDI channel.

3) Review the following terms:

*Voice* – an individual pitch on an instrument. For example, a six-string acoustic guitar is a six-voice instrument; it can play up to six pitches at once. An acoustic piano is an eighty-eight-voice instrument. The first synthesizers were one-voice (monophonic) instruments; only one key could be played at a time on a keyboard. As technology advanced, synthesizers with increased polyphonic capabilities were introduced: 4-voice instruments, 8 voice, and then 16, 32, and 64 voices. Most instruments manufactured today have at least 32 voices which means that you can hear up to 32 different pitches at once.

*Polyphony* – the number of voices (or individual pitches) that an instrument can play at the same time.

*Multi-timbral* – an instrument or tone generator that can simultaneously play several programs (or sounds) on separate MIDI channels.

*Multi-port MIDI interface* – two or more separate sets of MIDI In and OUT parts. A 6x6 multi-part interface will allow up to six MIDI instruments to be connected to a computer, with all 16 channels available on each instrument (for a total of 96 MIDI channels). (Review various connection methods for MIDI interfaces – Modem, printer, serial, parallel, USB, etc.)

4) Review the MIDI channel voice messages most often used in performance and sequencing:

1. *Note on/off* – note names (usually C-1 to G8, where piano middle C is C3). Also includes note on velocity ranging from 1-127. In sequencer edit mode, most note events contain five parameters” position within the song, note name, length (in ticks or pulses per quarter note), velocity and MIDI channel.
  - 
  - a. *Program change* – a command that sets up a specific sound on a specific MIDI channel (review the two program numbering systems – 1-128 and 0 –127).
    - 
    - *Pitch bend* – a continuous controller that allows you to slide a note up or down. The most common range of pitch bend is +0 - -2 semitones. Pitch bend messages offer 16384 possible settings within the pitch bend range. For example, if the pitch bend range is set to +1-2 semitones, then a value of “-8192” would produce a pitch change two semitones down. A value of “4096” would produce a pitch change of one semitone up.
      - 
      - *Aftertouch* – aftertouch information is generated on many electronic keyboards by applying additional pressure to a key after it is depressed. As the key is pressed harder, more and more information is transmitted. (0-127). This information is commonly used to increase the brightness of a sound or to increase the amount of vibrato.
        - *Modulation* (Continuous Controller #1) the modulation controller most often used to add vibrato to a sound. The control range is from 0 – 127.
        - *Volume* (Continuous controller #7) the control range for volume (also called Main Volume) is from 0 – 127.
        - *Pan* (Continuous controller #10) “Pan” is short for “panpot” which is short for “panoramic potentiometer”. The pan controller makes it possible to assign sounds to different positions in a stereo mix. The control range is 0 –127 where 0 is usually hard left, 64 is center and 127 is hard right.
        - *Sustain footswitch* (controller #64) this controller is a switch controller – a value of 0 is off, and a value of 127 is on. (Some sequences may interpret any value between 1 and 63 as off, and any value between 64 and 126 as on.)

5) Review the following information about General MIDI (GM):

Why and how it was developed

Specifications (minimum)

- a) 24 voice polyphony
- b) 16 part multi-timbral capability (with dynamic voice allocation)

- c) 128 instrumental sounds and one drum kit (47 drum sounds)
- d) Channel 10 assigned to drums
- e) Reverb and chorus effects (described in detail later)
- f) Standardized use of controllers: 1 (Modulation), 7 (Volume), 10 (Pan), 11 (Expression), 64 (Sustain), 121 (Reset All Controllers), and 123 (All Notes Off). The default settings for all 16 channels in GM mode are as follows:

Pitch Bend = 0  
 Pitch Bend Sensitivity = +/- 2 semitones  
 Channel Pressure (Aftertouch) = 0  
 Modulation = 0  
 Pan = 64 (center)  
 Expression = 127  
 Sustain = 0 (off)

### **GM Supersets**

Review the basic differences between GM, GM Level 2, GS, and XG

## **General MIDI Level 2 Specification**

### **Introduction**

General MIDI System Level 1 made great strides in the music industry by providing a platform for compatibility between device manufacturers and content providers. Still, many manufacturers felt there needed to be additional functionality. General MIDI Level 2 is a group of extensions made to General MIDI Level 1, which increases both the number of available sounds and the amount of control available for sound editing and musical performance. All GM2 devices are also fully compatible with General MIDI Level 1.

Portions of the MIDI Specification which have been enhanced include MIDI Tuning, Controllers, RPNs, and Universal System Exclusive Messages. Of particular significance are the new Universal System Exclusive Messages, including Controller Destination Setting, Key-Based Instrument Controllers, Global Parameter Control, and Master Fine/Coarse Tuning.

### **Summary of GM2 Requirements**

#### **GENERAL REQUIREMENTS**

Number of Notes: 32 simultaneous notes

MIDI Channels: 16

- Simultaneous Melodic Instruments = up to 16 (all Channels)
- Simultaneous Percussion Kits = up to 2 (Channel 10/11)

#### **SUPPORTED CONTROL CHANGE MESSAGES (Some Optional)**

- Bank Select (cc#0/32)
- Modulation Depth (cc#1)
- Portamento Time (cc#5)
- Channel Volume (cc#7)
- Pan (cc#10)
- Expression (cc#11)
- Hold1 (Damper) (cc#64)
- Portamento ON/OFF (cc#65)

- Sostenuto (cc#66)
- Soft (cc#67)
- Filter Resonance (Timbre/Harmonic Intensity) (cc#71)
- Release Time (cc#72)
- Attack time (cc#73)
- Brightness (cc#74)
- Decay Time (cc#75)
- Vibrato Rate (cc#76)
- Vibrato Depth (cc#77)
- Vibrato Delay (cc#78)
- Reverb Send Level (cc#91)
- Chorus Send Level (cc#93)
- Data Entry (cc#6/38)
- RPN LSB/MSB (cc#100/101)

**SUPPORTED RPNs (Registered Parameter Numbers)**

- Pitch Bend Sensitivity
- Channel Fine Tune
- Channel Coarse Tune
- New! Modulation Depth Range (Vibrato Depth Range)
- RPN NULL

**SUPPORTED UNIVERSAL SYSTEM EXCLUSIVE MESSAGES**

- Master Volume
- New! Master Fine Tuning
- New! Master Coarse Tuning
- New! Reverb Type
- New! Reverb Time
- New! Chorus Type
- New! Chorus Mod Rate
- New! Chorus Mod Depth
- New! Chorus Feedback
- New! Chorus Send to Reverb
- New! Controller Destination Setting
- New! Scale/Octave Tuning Adjust
- New! Key-Based Instrument Controllers
- New! GM2 System On

**GM 2 INSTRUMENT SOUND SET**

**GM 2 PERCUSSION SOUND SET**

**GS** – Extension of GM protocol developed by Roland. Important features:

- At least 226 instrumental sounds (can accommodate up to 16,384 sounds)
- More controllers available for greater control of sounds.

**XG** – Extension of GM protocol developed by Yamaha. XG features include:

- a) A minimum of 480 instrumental sounds
- b) A minimum of nine drum kits (each with up to 72 sounds) and two sound-effects kits
- c) Use of up to three simultaneous drumkits
- d) 32 voice polyphony
- e) 3 effects processors
- f) the capability of adding one or two audio signals.

Although the **GS** and **XG** supersets are more powerful than the original **GM** specification, they are not as widely available. The **GM** format should be used to guarantee maximum compatibility with other tone modules.

### **TOPIC #3: Review of Electronic Instruments**

#### **IST Objectives:**

- Understand the basic differences between a MIDI workstation, a controller, a sound module, a synthesizer, and a sampler
- How to change timbres on the instruments
- Location of MIDI In, Out, and Thru ports on instrument
- Location of audio out and pedal jacks
- How to access the General MIDI sound bank and other sound banks
- How to use the drum sounds and how to read the drum chart in the appendix
- How to put the synthesizer in multi-timbral mode
- How to use the onboard sequencer and disk drive (if applicable)
- How to transpose the keyboard by one or more octaves
- Basic use of pitch bend and modulation wheels/joysticks

#### **Procedure:**

The instructor will present a short overview on the types of electronic instruments. The instructor will review the basic navigation and use of the electronic keyboard available at the workstation.

#### **Activities:**

ISTs will perform all tasks listed above using a checklist and worksheet

## **Electronic Instruments Worksheet: KEYBOARD SOUND CLASSIFICATION AND MANIPULATION**

### **A. Classify General MIDI Sounds**

1. Procedure: Go through the General MIDI sounds and assign several to each of the categories listed below. Write in the program numbers of the sounds you have selected.

- a. Brass \_\_\_\_\_
- b. Woodwind \_\_\_\_\_
- c. Strings \_\_\_\_\_
- d. Percussion (pitched) \_\_\_\_\_
- e. Percussion (un-pitched) \_\_\_\_\_
- f. Keyboard sounds \_\_\_\_\_
- g. Non-Traditional Instrument Sounds \_\_\_\_\_
- h. Sound Effects \_\_\_\_\_
- i. Electrified or Synthesized Sounds \_\_\_\_\_

#### Possible Teaching Applications:

- Ask students to select sounds that are imitative of acoustic instruments and sounds that are abstract rather than imitative
- Have a competition for the most annoying sound.
- When teaching the instruments of the orchestra, ask students to select an instrument by family type.
- When teaching a music history unit, such as the Baroque era, ask students to play a sound of an instrument that was or was not available during a particular time period.
- Ask students to identify a particular instrument by sound.

Other applications:

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2. Application: Assume that you have one synthesizer keyboard in your classroom. Brainstorm one or more possible applications. Write out the details of how you could use the electronic keyboard i.e. performance instrument, demonstrating instrument sounds, discussing the properties of sound, etc. Write out your idea below and be prepared to share it with the class.

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3. Assume you have a keyboard lab in your music room - one for each student or 2 students at a keyboard. How could the above activities be used?

Grade level \_\_\_\_\_

Application \_\_\_\_\_

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**B. Define:**

General MIDI: \_\_\_\_\_

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MIDI Workstation: \_\_\_\_\_

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Sound Module: \_\_\_\_\_

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## **TOPIC #4: Review of Computer Sequencing Software**

The instructor will review the following:

- Definition of a sequencer
- Types of sequencers
- Loading sound files into sequencers
- Basic song playback features
- Basic song recording features
- Basic note editing features (pitch, duration, placement)
- Choosing timbres for tracks
- Altering playback features such as tempo and track selection/muting

### **IST Objectives:**

Review and master basics given above.

### **Procedure:**

Instructor will provide a MIDI file for playback and experimentation

### **Activities:**

- IST will record and edit a short passage, experimenting with playback and editing features.
- Complete Worksheet #4

## Worksheet # 4: The Sequencer

A. Definition of a Sequencer \_\_\_\_\_

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B. Using the built-in sequencer of an integrated workstation

1. Load a song
2. Select a song
3. Start and stop the sequencer
4. Change the tempo

Advantages of using a self-contained sequencer: \_\_\_\_\_

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C. Using a Computer-based or Software Sequencer

1. Set the keyboard to “sequencer” mode
2. Load a sequence into the computer
3. Start and stop the sequencer
4. Mute and solo various parts

Advantages of using a software (computer-based) sequencer:

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National Standards that can be enhanced with the use of sequencers:

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## **TOPIC #5: Review of Computer Notation software**

### **IST Objectives:**

IST will demonstrate working knowledge of the following:

- Score set-up
- Note entry
- Adding chord symbols
- Adding multiple voices on a single staff
- Changing beaming, spacing, and page layout
- Adding dynamics and other expressive markings
- Copy/paste procedures
- Transposition
- Part extraction
- Printing
- Converting to and from Standard MIDI files

### **Procedure:**

The instructor will review and demonstrate the skills listed above.

### **Activities:**

The IST will enter a short sample of piano music that includes layered notes on one staff

The IST will enter a short (four measures) multiple instrument score, then prepare the score for printing and extract the parts.

## **TOPIC #6: Basic Structure of Electronic Instruments**

### **IST Objectives:**

- To understand how sound is produced in a synthesizer
- To understand how sound is produced in a sampler
- To understand the basic parts of a synthesizer or electronic instrument and how it is used to produce sound in a musical way

### **Procedure:**

The instructor will analyze and compare the parts of an acoustic instrument with that of an electronic instrument in the area of sound source, user interface, and expressive capabilities. Both acoustic and electronic instruments will be analyzed for sound source, modifiers, and controllers, with similarities and differences noted and discussed including a discussion of polyphony in electronic instruments. . The Instructor will direct the ISTs to particular sounds in the workstation instruments that illustrate examples of effects processing, filters, pedal use, split voicing, etc. Instructor and ISTs will play a variety of acoustic and electronic sounds and discuss the idiosyncrasies of each instrument. If possible, audio and video recordings of virtuoso performances of both acoustic and electronic instruments will be used to further illustrate some of these differences.

**Activity:**

The IST will write a short description of his or her acoustic instrument describing its source of sound, possible modifiers of its sound (mutes, etc.), and how the sound is controlled via the instrument. Comparisons should then be drawn between the IST's acoustic instrument and the electronic instrument (keyboard or otherwise) available at the lab workstation.

**The Electronic Sound Source**

All sound is created by vibration. Acoustic instruments may produce sound by vibrating a string, a column of air, or a membrane. Electronic instruments depend on the electrical vibration of an oscillator to create sound; the oscillator is responsible for the pitch and wave shape of a sound. The sound designer can usually choose from a variety of sound source patterns, including wave shapes and samples. Sounds are generally categorized as imitative (imitating the sound of an acoustic instrument) or abstract (not imitating any known acoustic sound or instrument).

**Sound Modifiers**

Most electronic instruments offer detailed control and modification of the available sound sources. The modifiers may be readily available by real time controls such as knobs and faders on the outer body of the instrument or may be altered internally through the internal processor for editing and storing sound modifiers.

Envelope Generators-John Cage, in his exploration of sound, defined the shape or contour of a sound by the terms of its Attack, Decay, Sustain, and Release or the envelope of a sound. The acronym ADSR became adopted by early synthesizer manufacturers to describe the electronic control over the contour of a sound. Each of the three parameters of sound can be changed over time by what is called an Envelope Generator, or EG. Imagine that the sound wave is a flexible column of air. Using an envelope generator on a parameter of sound is like enclosing the air column in a long balloon and then twisting it into a variety of shapes. A Pitch EG changes the quality of pitch over time; striking a note altered in this way may trigger a sound that begins under pitch and then slowly glides up to the correct frequency. An amplitude EG may trigger the volume of the sound to begin very softly and grow louder over time or it may create a regular pulsing effect.

Filters-in general, a filter alters and selectively changes the harmonic overtones or partials present in a sound, particularly affecting the timbre of a sound. An acoustic instrument can apply a filter through the use of devices such as mutes. An electronic instrument has detailed control over the timbre of its sounds through electronic filters.

Effects processing – special effects such as reverb, echo, distortion, etc. can be applied to the sound permanently or changed by a real time control, depending on the capabilities of the instrument. Effects such as reverb can be used to change our perception of distance from the source of the sound and the size of the environmental space, such as a small room or a large concert hall.

## **Sound Controllers**

The Controllers of an instrument are part of the instrument's physical interface that the musician uses to trigger and control musical sound. The keys and pedals of a piano and the valves of a trumpet are examples of controllers in acoustic instruments. In addition to the expected physical controllers of synthesizers such as keys and pedals, additional controllers may include pitch bend and modulation wheels/joysticks, aftertouch, ribbon controllers, velocity switching, etc. Even the keys on many synthesizer keyboards can be programmed for additional control of sound through the use of aftertouch, split voices, and velocity switching; pedals may be programmed to control volume, modulation and filter effects. Most controllers can be edited for sensitivity and range and are used to control musical articulation and nuance in performance.

## **TOPIC #7: Basics of Sound Design**

### **IST Objectives:**

To find, identify and edit the three parameters of sound in an electronic instrument:

- Pitch: tuning, octaves, envelope generator
- Timbre: sound sources, filters
- Loudness/Amplitude: volume, velocity control

### **Procedure:**

The instructor will guide the ISTs through the program edit area of the synthesizer, identifying each editable area of pitch, timbre and loudness.

The instructor will demonstrate the independence of these elements in an electronic instrument and direct the student in how to edit and save sounds after changing these parameters.

### **Activities:**

The IST will alter the pitch of a sound of choice and save to disk (if possible)

The IST will alter the timbral qualities of a sound of choice and save to disk (if possible)

The IST will alter the amplitude of a sound of choice and save to disk (if possible)

The IST will complete Worksheet #7

## **The Three Parameters of Sound**

Sound is created from disturbance of molecules in air, similar to the way that waves in a pond are created by throwing a stone into the surface. A disturbance in the air creates waves of air molecules, forming distinctive shapes. The sounds we regard as musical pitches are created from periodic vibration or the regular repetition of sound waves.

Pitch—the frequency of wave shape repetition—how often the waves repeat in one second, expressed as cycles per second or hertz. A=440, the concert pitch that ensembles use for tuning, is the pitch of A vibrating at 440 times a second, or 440 Hz (hertz). The octave above this pitch is created by doubling the cycle per second rate, or 880 Hz. The octave

below A 440 is A220 Hz. Tuning systems are built on the frequency rates between individual intervals.

Timbre-the shape of a wave; overtones or upper partials arising from the trigger of the fundamental sound, affects the color of the sound, its distinctive quality. This affects the shape of the wave; a square wave is formed by the odd numbered partials and is similar to the sound of a clarinet; a sine wave, which has no overtones, is similar to the sound of an electric piano.

Loudness-the height of a soundwave (the distance between its highest and lowest points) determines its amplitude or loudness. Generally, the more force applied to the creation of a sound, the greater the displacement of the sound molecules and the higher the sound wave.

In acoustic instruments, these three elements of sound are often inextricably intertwined. Playing a note louder often changes the timbre by adding more overtones to the waveshape—louder often results in brighter. Volume can also affect the pitch; it is difficult to play very softly at the top pitch range of a wind instrument. Pitch can affect the timbre of many acoustic instruments, such as the chalameau range of the clarinet or the distinctive upper range of the bassoon as used in the opening of Stravinsky's "Rite of Spring." Only in electronic instruments are these three qualities of sound completely independent elements, controllable by the user. All programmable synthesizers have access to edit the three parameters of sound.

## TOPIC #7 Worksheet: The Properties of Sound

1. Select the program or individual instrument mode of your synthesizer
2. Select a simple instrument sound such as a clarinet or trumpet and enter the edit area for that sound.
3. There are three basic parameters of sound. The first is **pitch**.

Play the lowest pitch, play the highest pitch

Ways to alter the pitch:

1. \_\_\_\_\_

2. \_\_\_\_\_

Concept: Pitch is controlled by \_\_\_\_\_.

4. The second parameter of sound is **Timbre**

Locate the editing area (usually involves filters) that controls timbre and experiment making the sound brighter and darker.

Concept: Timbre is controlled by \_\_\_\_\_.

Did changing the timbre of the sound change its apparent loudness?

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5. The third property of sound is **loudness** or **amplitude**

Locate the editing area (usually involves amplifiers) that controls volume of a sound and experiment making the sound softer and louder.

Loudness is controlled by \_\_\_\_\_.

6. The shape of a sound can be controlled over time by an envelope generator. The attack is the beginning of the note and the release is the end of the note. Exit the editing area and:

- a. \_\_\_ Choose a sound with a slow attack
- b. \_\_\_ Choose a sound with a quick attack
- c. \_\_\_ Choose a sound with a quick release

- e. \_\_\_ Choose a sound with a long release

Describe a musical reason for altering the attack or decay of a synthesizer patch.

8. Teaching applications of the properties of sound

- a. Ask students to listen to acoustic instruments and identify the characteristics of the sound. For example, play an instrument for the class or use a demonstration CD or other recording.
- b. Ask students in a lab setting to try and create acoustic and other sounds by focusing on the properties of sound in a synthesizer.

Teaching Application: Ask students to compare the General MIDI Bank and the manufacturer's unique sound banks:

Similarities \_\_\_\_\_

Differences \_\_\_\_\_

**D. The properties of sound and the National Standards:**

1. Which National Standard(s) can be addressed using the properties of sound? (see back of workbook for a listing of the National Standards)

\_\_\_\_\_

2. Specifically how could the properties of sound be used with these standards?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **TOPIC #8: Basics of Sound Design, Part 2**

### **IST Objectives:**

To find, identify, and edit the three parts of an electronic instrument:

- Sound source: samples, waveforms, PCM, etc.
- Sound modifiers: filters, envelope generators, effects processing, etc.
- Sound Controllers: joysticks and wheels, pedals, ribbon controllers, aftertouch, velocity, etc.

### **Procedure:**

The instructor will guide the ISTs through the program edit area of the synthesizer, identifying each editable area of sound modifiers and controllers.

### **Activities:**

The IST will alter the sound source of a program sound

The IST will alter the envelope generator of a program sound

The IST will alter the effects processing of a program sound

The IST will alter the settings of a controller assignment such as a pedal assignment, joystick control, keyboard sensitivity, velocity, etc.

## Worksheet #8: Editing Sounds

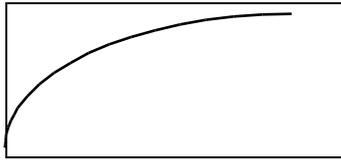
1. Take an existing sound and modify it using the concepts reviewed above.

- a. Select the Program Mode.
- b. Chose General MIDI bank, sound 001 Piano
- c. In the edit mode, select the OCTAVE
- d. Change the octave (this is a good way to play an extremely high or low sound).
- e. Select the ATTACK. Change the attack from 1-10.
- f. Select the RELEASE. Change the release from 1-10
- g. Select the EFFECT. Change the effect for the sound.
- h. Experiment with other timbres.

Activity: Select a traditional sound such as the trumpet, violin, etc. Change the sound in some way. Try to stump the class - share your altered sound.

2. Additional activities

- a. Draw different shapes of attacks and releases for the students and ask them to try to re-create the graphs with a particular sound. For example:



Draw a shape of a sound below and then find or create a sound:



- b. Have a naming competition. For example, a piano sound with a long, string-like attack might be called a Vio-ano. Have students create sounds and then create an inventive name for the sound. Create a sound and then name it \_\_\_\_\_

### F. Using the Combination or Performance Mode

1. \_\_\_ Experiment with the pre-set sounds
2. List 2 ways that combination sounds could be used in your teaching situation:

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### **G. Tuning to another instrument**

1. \_\_\_ Select a sound from the Program Mode such as 001 Piano
2. \_\_\_ Select Global Mode.
3. \_\_\_ Decide who is going to be A and who is going to be B
4. \_\_\_ A person - slightly de-tune your instrument, sharp or flat. Cover your window so your partner cannot see.
5. \_\_\_ B person - ask your partner to play their pitch and try to tune your instrument to match. When you think you have it in tune, ask them to read the number of cents sharp or flat. If you are within + or - 5 cents - Congratulations!
6. \_\_\_ Now switch roles: A person tunes to B

Other ideas for using the tuning mode:

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### **H. Alternate Tuning: using the Global Mode**

1. Select a piano sound and play a scale or short melody using all of the various tunings
2. How are they different?
3. How could these alternate tunings be used?
  - a. Simulate Baroque Era Tunings
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

## **TOPIC #9: MIDI Control of Sound**

### **IST Objectives:**

- To understand the difference between a basic keyboard synthesizer using local control and a MIDI controller with no sounds of its own
- To understand the difference between direct (local) control of sound and control of sound through MIDI
- To understand the properties of musical expression that can be controlled through MIDI and how they are sent from the controller and received and responded to by the sound source. This includes:
  - Volume
  - Velocity
  - Note on/off
  - Breath control
  - Modulation
  - Filters and effects
  - Pitch bend
- To read and understand a MIDI Implementation Chart (see example in Appendix ?)

### **Procedure:**

The instructor will demonstrate how to disengage local control on the keyboard

The instructor will demonstrate remote control of another keyboard or sound module through the use of MIDI control from a master instrument.

The instructor will demonstrate the importance of setting the sound source to respond to expressive control through MIDI

The instructor will review the use of a MIDI Implementation Chart and its application to the use of remote MIDI Controllers.

### **Activities:**

The ISTs will explore and experiment with the degree of musical expression available on the sounds they have previously edited. They will alter and fine-tune those sounds for increased expressive control.

### **MIDI Modes**

Understanding MIDI Modes is critical to understanding how various controllers transmit MIDI data to the sound sources and how those sound sources (either internal sounds or independent sound modules) respond to the incoming MIDI data. There are four MIDI modes in the MIDI specification. Omni on and omni off refer to how a MIDI instrument will respond to MIDI data transmitted via the 16 MIDI channels. Poly and mono refer to the number of voices, or polyphony, that is available on an instrument or through a MIDI channel.

Mode 1—Omni On/Poly The MIDI sound source will receive and respond polyphonically to MIDI data on any or all MIDI channels. The Omni On mode was used in early MIDI instruments to easily test MIDI connections.

Mode 2—Omni On/Mono The MIDI sound source will receive and respond monophonically to MIDI data on any or all MIDI channels, playing only one note at a time. This mode is seldom used.

Mode 3—Omni Off/Poly The MIDI sound source will receive and respond polyphonically to MIDI data on assigned MIDI channels. This is the setting most commonly used by multi-timbral instruments.

Mode 4—Omni Off/Mono The MIDI sound source will receive and respond to MIDI data monophonically on one or more assigned MIDI channels. MIDI string instruments most commonly use this mode, where each string is assigned to a MIDI channel of its own and will only transmit one note per channel.

## **TOPIC #10: Expressive Techniques for Electronic Keyboards**

### **IST Objectives:**

To gain control the expressive aspects of an electronic musical performance through the performance techniques of pitch bend, modulation, velocity, volume, and any other expressive means available (breath control, aftertouch, portamento, etc.)

### **Procedure:**

The instructor will demonstrate the performance techniques listed above and guide the ISTs through a series of short performance exercises.

### **Activities:**

The ISTs will practice a series of exercises designed to help them acquire expressive controller techniques. Mastery of these techniques will be demonstrated in ensemble and solo performances throughout the week.

### **Pitch Bend Exercises:**

Bending the pitch of a note on the keyboard is the attempt to manipulate the half step intervals inherent in the traditional acoustic keyboard. Unhindered by the mechanics of an acoustic instrument, electronic keyboards take advantage of the minute changes in pitch available between half step intervals, usually with the use of a pitch bend wheel or joystick. While the usual method is to play the pitch by striking a key and then altering it with the wheel or joystick, a less obvious performance approach is to alter the pitch with the device before striking the key, then sliding into the fundamental pitch. The rate of pitch bend range, usually assigned in half step increments, is normally an editable function of basic

sound design; smaller increments of assigned pitch bend allow for subtlety and nuance, particularly useful when imitating acoustic instruments. Setting a large interval of pitch bend range permits wild effects, frequently used on analog and other traditional synthesizer timbres. Pitch bend is often assignable to aftertouch or a ribbon controller if one is available.

Pitch Bend Exercise #1: Choose an appropriate reed, brass, or synthesizer solo path that responds well to pitch bend. Play the scale below by playing the first note, then slur up to the second note using the pitch bend device. Play the third note, then slur to the fourth note. Continue in this manner to the end of the scale, being careful of half steps. Try this same technique on other scales.

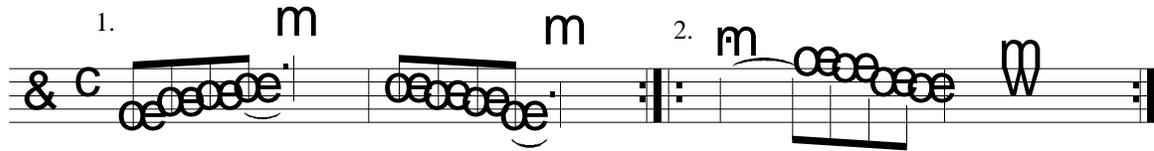


Pitch Bend Exercise #2: Play the scale above by first bending the pitch bend wheel or joystick down by one whole step and holding it, then playing the second note of the scale and slur up to that note. Bend the pitch bend device down, play D (which should sound like C), then slur up to D. Repeat the process with every other note, being careful of half steps. Try this same technique on other scales, particularly blues scales.

### **Modulation Exercises:**

Modulation is the electronic equivalent to vibrato or tremolo and is generally created by adding a low frequency oscillator (LFO) with no pitch of its own to trigger periodic variations in a sustained tone. Modulation can be programmed to be always present in a sound, to enter after the sound is played and held, or to be triggered in real time performance by a modulation wheel or joystick or less often through aftertouch or a ribbon controller. There are three main types of modulation, each of which is related to the three properties of sound. Pitch modulation is the regular and rhythmic variance of pitch, which is closest to what we think of as vibrato. Timbral or filter modulation is the regular fluctuation of the overtones or upper frequencies of the sound, similar to singing a tone and using a rapidly moving mouth or cheek movement to change the sound quality. Amplitude modulation is the creation of a pulsing tone by rapidly and regularly altering the volume of a held tone, similar to acoustic tremolo. Each of these forms of modulation can be further altered by applying a wave shape filter to the modulation.

Modulation Exercise #1: The trills indicate modulation. Choose a double reed or trumpet patch for the first exercise. On the held notes, very gradually add modulation using the mod wheel or joystick (or aftertouch) at the trill marking in order to give a realistic vibrato effect to the instrument's sound.



Modulation Exercise #2: Choose a distorted electric guitar sound. Add excessive modulation to the notes indicated by the trill symbol for a whammy bar effect. Try adding pitch bend for more effect.

### **Volume Exercises:**

MIDI volume is used not only to set the initial volume of a patch or program used in a sequence but in live performance is used to change the volume of a sound after it has been triggered. Velocity only affects the initial attack of a note; volume can be changed at any point in the life of the note as it is sustained. While this is not a viable technique for an acoustic piano, electronic keyboards can use a volume pedal or even manipulate the main instrument volume control to simulate the changing volume of a woodwind or string instrument. Volume control may also be manipulated with a breath controller device, effectively simulating breath powered acoustic instruments.

Volume Exercise: Choose a sound capable of being sustained over a long period of time, such as a string or voice patch. Play and hold a note or chord, gradually making the volume crescendo and decrescendo by using a volume slider or pedal. Make the changes as smooth and gradual as possible.

### **Velocity Exercises:**

Velocity is measured by the speed with which a key is struck but is perceived as the volume or loudness of the initial attack of a note. MIDI velocity has 128 values and can be tied to various parts of a synthetic sound. Varying levels of velocity can be programmed to change the timbre of a sound. In most acoustic instruments, the force of attack of a note can have a definitive influence on the timbre or tonal color of that note; generally, higher velocities trigger more upper partials and brighten the tone. Electronic instruments have independent control over this feature, so while acoustic instrument programs or sounds may follow this pattern, it can also be altered for unique effects that are not imitative.

Velocity control is often used to access different timbres layered in a Performance or Combination mode. Known as Velocity Switching, lower velocities can trigger one program or patch while a higher velocity can add another layer of sound or introduce a completely new sound while ignoring the program or patch triggered by low velocity. An example of this type of programming might be a string ensemble patch triggered by low velocities and a pizzicato string patch triggered by high velocities. The Velocity Switch Point, the point at which the sounds change, is generally programmable to accommodate a variety of individual playing styles.

Velocity Switch Exercise: Find one or more patches that change dramatically when played at low and high velocities. Often, these are brass or small combo band performance

combinations. Play the following examples, observing the dynamic and articulation marks; use velocity to change the dynamics rather than a volume pedal or slider.

The image shows a musical score for two staves, likely piano and a second instrument. The score is divided into two measures, labeled '1.' and '2.'. Each measure contains two staves of music. The first staff in each measure has a treble clef and a common time signature (C). The second staff has a bass clef and a common time signature (C). The music consists of chords and single notes. Dynamic markings include 'p' (piano) and 'f' (forte). Articulation marks include accents (>) and slurs. The first measure starts with a piano dynamic and moves to forte. The second measure starts with a piano dynamic and moves to forte. The score ends with a double bar line.



## **TOPIC #11: Alternate MIDI Controllers**

### **IST Objectives:**

- To gain an understanding of how MIDI Controllers other than keyboards are set up and used for performance
- To understand the advantages and limitations of performing with alternate MIDI Controllers
- To understand how MIDI is implemented for various alternate controllers
- To understand how to connect an alternate controller to an independent sound source

### **Procedure:**

The instructor will discuss and demonstrate through print and recorded resources and hands-on demonstration (as available) a variety of alternated MIDI controllers, discussing the strengths and weaknesses of each and the various ways in which MIDI is implemented in each.

### **Activities:**

The ISTs will discuss in class possible ways to incorporate alternate MIDI controllers into the curriculum and performing ensembles.

### **What Is An Alternate Controller?**

A MIDI Controller is defined as an instrument that transmits MIDI data and has performance controls. While keyboards are the most common MIDI controllers, there are a variety of controllers that either imitate other acoustic instruments in look and feel or are a completely new type of instrument that does not use any acoustic instrument as its model.

Alternate MIDI Controllers fall into five general categories:

- Guitar Controllers
- Percussion Controllers
- Wind Controllers
- String Controllers
- Unconventional Controllers

### **Guitar Controllers**

Guitar controllers were the first non-keyboard MIDI controllers. While they are extremely expressive instruments, the strings sometimes have trouble tracking the MIDI signal when they depend on a pitch-to-MIDI system. Generally, each of the six strings is set up to trigger notes on its own MIDI Channel, using the Omni Off/Mono mode. Some guitar synthesizers include a sound module designed to interface effectively with the guitar, bypassing MIDI altogether; synthesizer pickups can be easily added to any electric guitar to plug into these systems.

### **Percussion Controllers**

Percussion controllers include both pitched and unpitched instruments; some may imitate a trap set while others are patterned after mallet percussion. Single pads or small portable multi-pad triggers are an inexpensive alternative to the more complex electronic percussion kits and mallet instruments. The most significant and idiomatic part of any sound is its attack. Since percussion sounds possess a distinctive attack and limited sustain, they are excellent candidates for sampling; percussion controllers take advantage of this quality and are particularly effective controllers. Recent developments in the sensitivity and resilience of the electronic drum heads make for increased performance sensitivity. Sound modules with a wide array of percussive sounds are normally included as part of the larger percussion controllers but most are equipped with a MIDI OUT port to easily trigger additional sound modules and to input MIDI data into a sequencing program. Percussion controllers generally use the OMNI off/ Poly Mode.

### **Wind Controllers**

Wind controllers are patterned after their acoustic counterparts and use standard Boehm fingering with variations to accommodate the differences between saxophones, clarinet, and flute. A series of thumb keys provides a six to seven octave range on most instruments. MIDI breath control, continuous controller #2, is the driving force behind these instruments and is normally used to control MIDI volume. A wind controller may or may not come with a sound module; if a separate sound module is used, breath control information is often mapped to translate as volume or modulation control. Most wind controllers can be easily adjusted to play in C, Eb, or Bb and provide user control over the amount of air and reed pressure that feels natural to the performer and suits their playing style. Wind controllers trigger MIDI notes exceptionally well and can be very expressive. Wind controllers may use OMNI off/Mono Mode or Poly Mode, depending on the model of controller and sound module.

### **String Controllers**

String controllers, available in violin, viola, cello and bass models, are modeled after guitar controller technology, using a pitch to MIDI pickup. The lack of frets for precise tuning and the use of a bow to trigger notes complicate the MIDI triggering process, making string controllers one of the more difficult controllers to use effectively. Recent innovations have resulted in a series of fretted violins that trigger the MIDI notes more accurately and development in these instruments continues. Like the guitar, string controllers use the Omin Off/Mono Mode.

### **Unconventional Controllers**

Unconventional controllers abandon any duplication of acoustic instrument design and may vary widely in their use of MIDI to control sound as well as their human interface. Examples include the Buchla Thunder, the Video Harp, and the Chapman stick as well as the classic Theremin with MIDI capabilities.

## **TOPIC #12: Electronic Orchestration Overview**

### **IST Objectives:**

- To understand the basic techniques of orchestrating electronic instruments for ensembles, sequences, and MIDI accompaniments
- To understand the nature of synthesized sound and the effective combination of timbres
- To consider a variety of approaches in orchestrating electronic instruments for both solo and ensemble pieces

### **Procedure:**

The instructor will analyze an electronic ensemble piece and a “music minus one” piece for effective timbral choices, voice placement, etc.

### **Activities:**

The ISTs will experiment with a Standard MIDI file of an ensemble piece, changing timbres, rearranging and doubling voices, etc. They will observe and comment on the effectiveness of those changes. They will save and demonstrate to the class two different orchestrations of the piece.

## **TOPIC #13: Electronic Ensemble Rehearsals (3 sessions)**

### **IST Objectives:**

- To gain experience in performing electronic keyboard ensemble arrangements
- To be able to evaluate and choose a variety of electronic ensemble pieces suitable for particular grade and skill levels

### **Procedure:**

The instructor will conduct at least two read through sessions of electronic ensemble pieces representing a variety of styles, levels and number of parts.

If appropriate, some ensemble pieces will be performed with MIDI accompaniments.

The third session should consist of performing the ISTs’ required ensemble arrangements.

### **Activities:**

- The ISTs will perform a variety of ensemble parts, choosing sounds, following a conductor, and working within a group experience
- The ISTs will evaluate the pieces from the first two sessions using a provided worksheet
- For the final rehearsal session, the ISTs will perform the ensemble pieces created for the final projects

## Worksheet #13 Evaluating Electronic Keyboard Ensemble Repertoire

### Basic Structure of Piece

Number of parts \_\_\_\_\_ Can parts be doubled easily to expand the number of players?

Grade level of piece \_\_\_\_\_ Are the parts appropriate for the stated grade level? (keep in mind that ensemble parts should be a grade easier than solo pieces to allow for learning additional group performance skills)

Is the size of the printing realistic for younger students?

Is there a teacher or advanced student part?

Is a Standard MIDI file available for the piece?

Are there any unwieldy page turns in the performer or conductor score?

### Orchestration of Piece

All electronic ensemble pieces should take full advantage of the variety of instrument sounds available in a keyboard lab.

Are General MIDI sounds used? Are the sound assignments for the parts marked clearly? Are they marked in the conductor's score?

Are the assigned sounds imitative or abstract or a combination of both?  
Are they effectively used?

Are pitch bend and modulation required in any of the parts? \_\_\_\_\_ Would the parts still be playable if those controllers were unavailable?

Can any of the parts be performed on alternate controllers or with a combination of acoustic and electronic instruments?

Electronic instruments can often be used effectively to demonstrate historical or non-western instruments. Does this piece take advantage of this capability? \_\_\_\_\_

### Performance Issues

Does the conductor part include performance notes and guidelines?

Is background information on the piece included? Composer's thoughts?

Are suggestions made for alternate sound patch selections?

## **TOPIC #14: Creating an Electronic Ensemble Arrangement**

### **IST Objectives:**

- To apply principles of electronic orchestration to a four piece ensemble arrangement
- To create and print a score and parts for the arrangement
- To assign electronic sounds effectively to the parts
- To create a Standard MIDI File usable for rehearsal purposes

### **Procedure:**

- The instructor will present several models and examples of orchestrating simple pieces for an electronic ensemble.
- The instructor will demonstrate how ensemble pieces can be created quickly and creatively in class by students in orchestrating a Bach Chorale in a variety of ways. (See Appendix 2 for “Orchestrating a Bach Chorale.”)

### **Activities:**

The ISTs will orchestrate at least three different versions of a single Bach chorale of their choosing. The orchestrations will be realized through a sequencing or notation program that has MIDI playback capabilities.

## **TOPIC #15: Orchestrating a Music-Minus-One Piece**

### **IST Objectives:**

- To apply principles of electronic orchestration to the supporting tracks of a solo line piece
- To create and print notation for the solo part for the arrangement
- To assign electronic sounds effectively to the supporting parts, realized by either a sequence, an algorithmic accompaniment, or ostinato rhythm tracks
- Evaluate keyboard and piano methods that use this technology as an integral part of the method (See Bibliography)

### **Procedure:**

- The instructor will present several models and examples of creating accompaniment files for a solo performer
- The instructor will present and discuss a variety of MIDI accompaniments used in keyboard method books
- The instructor will demonstrate a variety of approaches available in hardware and software technology, including drum tracks, ostinatos, jazz chordal arrangements, etc.

### **Activities:**

The IST will create a simple accompaniment for a solo line, using the method of their choice.

**THE IST WILL CREATE A SHORT ACCOMPANIMENT FOR A CHORD PROGRESSION OR 12 BAR BLUES**

## **TOPIC #16: Composition and Electronic Instruments**

### **IST Objectives:**

- Analyze and explore sounds as a departure point for creating a composition
- Apply resources of electronic sounds and a keyboard lab environment to a composition program

### **Procedure:**

- The instructor encourage the exploration and analysis of synthesizer sound as the starting point for composition ideas
- The instructor will lead the ISTs through a sample children’s composition lesson (See Appendix 4 “Composing with Sound”)
- The class will discuss ways in which composition can be taught using electronic instruments in a variety of settings

### **Activities:**

The IST will create a short composition in the context of the sample lesson, to be recorded through a sequence or notation software.

## **TOPIC #17: Creating and Using a Keyboard Lab**

### **IST Objectives:**

- Acquire evaluations skills for purchase decisions
- Evaluate your need for technology to support your curriculum
- Acquire strategies for grant writing

### **Procedure:**

The instructor will present a variety of lab configurations, pricing, and funding options. The instructor will present a variety of keyboard and group piano curriculum (See Bibliography)

### **Activities:**

The ISTs will discuss in class the curriculum opportunities available through the use of a Keyboard Lab, particularly as they apply to the Standards.

### **Keyboard Lab Configuration**

The basic Keyboard Lab configuration consists of a group or lab controller, four to sixteen keyboard instruments, headsets and wiring that allow the instructor and students to communicate as well as hear their own and others’ instruments.

In addition to the basic set-up, peripherals such as cassette recorders, CD players, and sequencers may be wired to the teacher's station through the lab controller. A PA system can usually be added to the output of the controller, permitting an audience to hear the instruments without headphones. Often, computers are added to each station, expanding the possibilities for sequencing, notation, composing and improvising. The greatest advantage of any Keyboard Lab is that many students of various skill levels can be taught in one classroom that can accommodate private practice as well as group experiences.

### **Keyboard Lab Checklist**

Group or Lab Controller

Instruments

Headphones

Wiring cables

### **Optional additions:**

Peripherals-cassette recorders and CD players

Computers equipped with sequencing, notation, ear training, and improvisational software

Dedicated sequencer units

Projector for teacher's computer

External sound system

Furniture for accommodating computers and other workstation peripherals

### **Curriculum Opportunities with Keyboard Labs**

Piano classes

Keyboard Ensembles

Theory and Ear Training

Composition

Improvisation

Notation and sequencing capabilities when equipped with appropriate hardware/software

Physics of sound/sound design

Multimedia capabilities, interface with art and theatre programs

## Developing a Proposal for a Music Lab

### 1. Writing a Proposal

#### a. Needs Assessment

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

#### b. Objectives

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

#### c. Activities

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

#### d. Personnel, Facilities, and Budget

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

#### e. Evaluation - the Results of the Project

1. \_\_\_\_\_

2. \_\_\_\_\_

## **TOPIC #18: Preparing an Electronic Ensemble for Performance**

### **IST Objectives:**

- Assess the rehearsal space needs of an electronic ensemble, whether a keyboard lab or a collection of MIDI controllers
- Gain an understanding of the particular rehearsal techniques unique to Electronic Ensembles
- Make informed decisions about sound reinforcement for group rehearsals and performances
- Understand the necessary procedures to present a trouble free Electronic Ensemble concert

### **Procedure:**

- The instructor will review a variety of Electronic Ensemble configurations and models
- The instructor will review a variety of Electronic Ensemble concert repertoire and rehearsal and conducting techniques particular to the use of electronic instruments
- The instructor will review the procedures of set-up, sound reinforcement, and performance controls when using electronic instruments in concert

### **Activities:**

Each IST will conduct the class in a short passage of Electronic Ensemble music, either an arranging/orchestration assignment or a published piece. Various techniques and approaches will be discussed within the class. Review the material in Appendix 5, “Performing with Electronic Ensembles.”

## **TOPIC #19: Copyright Issues**

### **IST Objective:**

To discuss copyright issues and Sequencer software.

### **Procedures:**

The instructor and ISTs will discuss copyright and fair use for educators and look at the supplied list of public domain (PD) works in appendix F.

### **Public Domain Information Project (Visit this site)**

<http://www.pdinfo.com/proof.htm>

### **Topic: - Copyright**

#### Proof of Public Domain

You should use a public domain composition only if you have proof of public domain from a legitimate source. If you do not have a legitimate source in your possession, there is no way you can be certain that the music you use is in the public domain. A legitimate source is a tangible copy of the work with a copyright date old enough to be in the public domain. Sources are usually either an original or a copy of a book or sheet music. could result in your having to pay substantial royalties.

#### Simple Guide for Copyright Date Old Enough to be in the Public Domain

- United States and most countries - copyright notice of 1903 or earlier
- United States only - copyright notice between 1904 and 1922

#### Legitimate Sources - Sheet Music or Books

For sheet music, the copyright date is usually shown on the first page of the music notation. If you are obtaining copies of original sheet music as proof of PD, you should get a photocopy of the cover page as well as the actual pages of music notation. While getting a copy of the cover page may not be absolutely necessary, you may not be able to show whether the copy was made from sheet music or from a book of music without a copy of the cover page. It is always best to be able to absolutely identify your PD source.

#### Legitimate Sources for Proof of Public Domain

- Original Book with PD copyright date on the Title Page
- Original Book with PD copyright date for the individual composition

- Original Sheet Music with PD copyright date
- Photocopy of a Book or Sheet Music with PD copyright date which you photocopied yourself
- Notarized photocopy of a Book or Sheet Music with PD copyright date from a person or company you trust
- Photocopy of a Book or Sheet Music with PD copyright date from a person or company you trust
- Digital copy of a Book or Sheet Music with a PD copyright date printed on your printer from an internet web site you know to be reliable
- Digital copy of a Book or Sheet Music with a PD copyright date printed from a CD or DVD published by a person or company you trust

#### Invalid Sources for Proof of Public Domain

- Original or photocopy of a Book or Sheet Music with no copyright dates
- The name of the song on a list of public domain music
- An old-looking book with no title page and no copyright dates anywhere in the book
- An old-looking page of music with no copyright date ripped from an old-looking book
- Photocopy of a Book or Sheet Music when you do not know who made the photocopy
- An individual telling you that a song is PD, even if you know and trust the individual.
- An email from anyone telling you a song is PD

# Appendix 1

## Categorizing Sounds According to Function

By Lynn Purse ©1997

Categorize the sounds or timbres available to you according to their possible functions. If you have explored the sounds on your instruments, you can begin organizing them for arrangement purposes. The following categories are useful, but keep in mind that a particular sound can fulfill more than one function:

Melodic instruments: useful imitative ones are flute, oboe, violin, some string ensembles, glockenspiel, and vibes. Useful abstract examples are square and sawtooth waves, synth voices, and sounds with a quick attack and good sustaining quality.

Inner Voice instruments: These can be divided into two categories; 1) percussive/rhythmic and 2) fill in/"pad" sounds. The first category would include acoustic and electric pianos, tuned percussive sounds such as vibes and marimba, muted guitar, pizzicato strings, and abstract sounds sharing the similar qualities of quick attack and release. The second category, used to add warmth and tone color to an arrangement, includes the lush timbres of string ensembles and voices, as well as complex abstract sounds with rich sweeping timbres that are effective across the length of the keyboard.

Bass instruments: Imitative sounds include upright and electric bass, cello, voice and string timbres; abstract choices include the "pad" sounds listed above as well as percussive synthesizer bass timbres.

Untuned percussion and drum kit sounds: Wood and metallic timbres can provide steady rhythms or colorful accents; the more unusual ones can be used in a programmatic context to suggest certain images. The pops and bleeps frequently associated with abstract synthesis can also provide unique rhythmic elements.

Sound Effects: Digital samples of birds singing, doors creaking, wind howling, and so forth can be quite realistic and provide an atmospheric quality to an arrangement if used with restraint.

## Appendix 2

### Orchestrating a Bach Chorale

By Lynn Purse ©1996

Bach Chorales make excellent four part arrangements and lend themselves well to a variety of orchestration techniques, as the following passage from *Break Forth, O Beauteous Heavenly Light* demonstrates:

A musical score for a four-part arrangement of a Bach chorale. It consists of four staves, numbered 1 through 4 from top to bottom. The top two staves (1 and 2) are in treble clef, and the bottom two staves (3 and 4) are in bass clef. The key signature is one sharp (F#), and the time signature is common time (C). The music is written in a four-part setting, with each staff containing a distinct melodic line. The score is enclosed in a double bar line on both the left and right sides.

The parts can be assigned a variety of ways. Intermediate students could be given the score in two clef piano form, and each student plays all of the notes, but is assigned a different sound. Possible imitative orchestrations for two to four players could include a varying combination of organ, strings, and voices, possibly doubled an octave higher with a harpsichord or glockenspiel sound. Abstract "pad" sounds can also be used effectively in a slow piece such as this. Care must be taken with the doublings and layers of timbres, so that the overall sound does not become too thick and unwieldy.

A more flexible and sonically interesting approach divides the lines into four separate parts, opening up a multitude of orchestration possibilities.

### Choir Approach

In the "choir" approach, Parts 1-4 can be assigned a string sound, with four more players assigned a voice sound, and four more players a harpsichord sound. Twelve students are involved, forming three layered "choirs" of sound. Four more students could be assigned a rich synthesizer "pad" sound, with perhaps the top and bottom voices transposed outwards for octave doublings. In this manner, simple arrangements can become complex when lines are doubled using a variety of synthesizer timbres. A 4-part keyboard arrangement can quickly expand to 8, 12, or 16 players when the same parts are played on different timbres.

A melody line can be easily doubled by another player using a different sound. Melodies doublings can then be moved up an octave or two, while bass lines or lower ostinatos can be doubled an moved down an octave.

### **Chamber Music Approach**

A "chamber music" approach would assign melodic instruments to each part: a Flute sound to Part 1, an Oboe or Clarinet to Part 2, a French Horn to Part 3, and a Cello to Part 4. Abstract sounds which function as melodic instruments can be substituted for these instruments, or double them.

### **Full Orchestra Approach**

A "full orchestra" approach would double each part with a melodic instrument and a pad instrument, and perhaps add orchestral percussion such as cymbals and tympani.

## Appendix 3

### Orchestrating a Keyboard Piece

By Lynn Purse ©1997

#### A Program Music Approach

Composers such as Berlioz and Stravinsky established the concept of program music, in which an extra-musical idea forms the basis for a musical work. The tremendous variety of timbres and textures available in synthesizers lends itself to a programmatic approach in orchestrating. The following examples demonstrate the application of this approach to a simple keyboard piece.

*The Moon and Bats* is a simple beginner's piece from Roland Corporation's "Etudes for Young Musicians", Book 2, consisting of five note scale patterns played by alternating hands with no change in hand position. The first four measures are illustrated below:



The assignment was to create an eight-part ensemble arrangement for early beginners, which would use a variety of synthesizer timbres. The title of the piece and the use of a minor scale suggested an eerie, haunting mood evocative of Halloween, and I chose my sounds accordingly. A four-measure introduction (not shown) uses Wind and Windchime (W.C.) patches to set the mood; at measure five, the remainder of the ensemble enters. The original melodic lines are played antiphonally on Syn Vox and Space Voice (Space), timbres reminiscent of ghost-like voices but which have a good initial Attack. The Crystal part, a shimmering bell-like sound, provides a rhythmic counterpart to the quarter notes of the melody and gives momentum to the arrangement. The Glass, Sweep, and Soundtrack (S.Track) parts, arranged in octaves and fifths, function as the inner-voice pads, lending rich tonal color to the simple moving lines of the melody. The Windchimes and Wind parts continue throughout the piece, supporting the overall mood.

5

SynVox *mf*

Space *mf*

Crystal *mp*

Glass *mp* 8va

Sweep *mp*

S. Track *mp*

W.C. *mp*

Wind *mp*

By taking a programmatic approach, a simple piano piece has been transformed into an ensemble arrangement that is easy to play, and also highly satisfying musically; the young student has participated in a musical experience which is aesthetically interesting and fun to play.

### **Orff arrangements**

The Orff-Schulwerk method of ensemble playing lends itself especially well to keyboard ensembles. The tuned and untuned percussion instruments which form the basis of many of the Orff arrangements are common to electronic keyboards, and the method of arranging simple ostinato parts into complex forms suits itself especially to the keyboard classroom containing students of varying degrees of skill and development. The following example of a piece written in Orff style demonstrates the orchestration possibilities of this method:

The image displays a musical score for a keyboard ensemble, consisting of 12 staves. The staves are labeled as follows: Bls 1, Bls 2, Rec. 1, Rec. 2, Str. 1, Str. 2, UC 1, UC 2, Perc 1, and Perc 2. The score is arranged in three measures. Bls 1 and Rec. 1 play a melodic line with eighth notes. Bls 2 and Rec. 2 play a bass line with quarter notes. Str. 1 and Str. 2 play a chordal accompaniment with dotted quarter notes. UC 1 and UC 2 play a simple bass line with quarter notes. Perc 1 and Perc 2 play a rhythmic pattern with eighth notes and rests.

Because the players can double up on a keyboard, the parts can be arranged in pairs of sounds, so that an upper and lower part for each timbre is built into the arrangement, i.e. Strings 1 & 2, Pan Flute 1 & 2, etc.. Use timbres that sound good in both the high and low range of the keyboard. If percussion sounds are available from one or more of the keyboards, write them into a part; it adds a rhythmic element, which is often missing in keyboard ensembles. Electronic keyboards can often be split into two sounds; use this ability to advantage in your arrangements.

## Appendix 4

### **Composing with Sound**

Adapted from Lesson Two of Exploring Sound, Creating Music: A Guide for Young Composers by Lynn Purse ©1992

#### Sounds that Contrast

Different kinds of sounds can have very different, or contrasting, qualities. Some sounds are loud, and others are soft. Some are scratchy and some are smooth. Sometimes the attack and sustain of the sounds are different. For example:

A fire siren may start out with a slow attack and then get louder.

A hand clap may start out with a quick and loud attack, but die away very quickly with no sustain

Explore your synthesizers and find two sounds that you think contrast with each other. Describe them below according to their Attack, Sustain, and Release.

Remember:

The Attack is the beginning of a sound. Is it quick or slow to start?

The Sustain is the middle of a sound. Is it long or short?

The Release is the end of a sound. Does it end quickly or does it take a long time to die away?

Sound #1      Attack                      Sustain                      Release

Sound #2      Attack                      Sustain                      Release

Use this pair of sounds to create a short composition. Look for musical ways to show the contrast between the sounds. Be prepared to play your composition for the class.

## **Appendix 5**

### **Performing with Electronic Ensembles**

By Lynn Purse, ©1999

#### **The Electronic Ensemble**

An electronic ensemble may arise out of a keyboard lab experience or may be a collection of different MIDI controllers, from keyboards to drum and guitar synthesizers. It may also be an electro-acoustic ensemble, a combination of electronic and acoustic instruments. The instruments themselves are very flexible in terms of available sounds, so the range and style of material performed is almost unlimited.

#### **The Rehearsal**

Allow for enough space for the instruments, any extra wiring and the demands of the sound system. A space where the instruments can be safely left in place between rehearsals is ideal. If the ensemble normally rehearses in a keyboard lab on headphones, several rehearsals should be scheduled with a sound reinforcing system to accustom the students and conductor to hearing themselves in a different system.

Test each instrument for a sound level at the beginning of each piece. Because the sound of the instrument is amplified through speakers or headphones, it is often hard for the student to judge their own volume. Patch changes also may vary widely in their sound output. Both the conductor and the students must be able to hear themselves and each other clearly. When rehearsing with a sound reinforcement system, make sure that each student has a monitor of some types, whether it is the internal speaker of a keyboard or a floor monitor tied into the main system. Some ensembles use the internal speakers of their digital pianos, some use a small amplifier for each instrument, and others depend on a more complex system of a sound reinforcement system with floor monitors for each player or group of players. If you have a complex set-up, it is extremely useful to assign someone to run the sound system for rehearsals as well as for the performance. This may be an AV technician in your school or a student with good audio skills.

#### **The Set-up and Soundcheck**

As soon as a performance is scheduled outside of the rehearsal space, several things must be considered. The size of the performance space, sound reinforcement needs, presence of steps and other obstacles for moving heavy equipment. Get as much information about the performance space as possible and review it with your sound engineer or stage manager.

A critical element to success in any electronic ensemble performance is to create a thorough checklist. Many performances have gone awry because of missing pedals, cords, stands, etc. Create an exhaustive checklist of every piece of equipment (especially cords and wires) required for the set-up. Do not pack or leave the studio without using this checklist. An alternative is to create a small bag or pouch for the wires and pedals of each instrument; each player is responsible for the pouch belonging to their instrument and can quickly unpack it and set it up at the performance area.

Another useful tool is to sketch a stage set-up plan in advance. It should match the rehearsal configuration as closely as possible. Making copies of the plan available to the student performers will facilitate the placement and setup of the instruments and reduce confusion and questions. A copy in advance for the sound engineer will be invaluable for planning an adequate sound reinforcement system.

Often, the complexity and richness of synthesizer sounds are best served by larger speaker systems in a performance hall. Chamber recitals are easily met by smaller sound systems or even internal speakers in some cases. The same issues outlined for rehearsals apply to the type of performance setting.

A thorough sound check is critical to the success of the performance. Allow enough time for this, and err on the side of generosity to allow for any last minute technical difficulties.

### **The Performance**

Thorough planning and a good sound check will insure a minimum of technical problems. Remember to allow each performer enough time to set up their instruments sound before starting each piece. Make sure everyone is ready to play before the downbeat starts; someone may encounter a small technical difficulty that must be corrected before the piece begins.

## Appendix 6 Sequencing, Computer, & Music Technology Terminology

If this is your first experience with sequencing software or the dedicated sequencer and MIDI workstation, you should take some time to learn the basics from a guided tour for gaining security in working with a computer mouse. The following important computer and sequencing terms should be understood or assimilated, and will apply to all available computer software.

Active Window -- the currently selected window, where the next action will take place. The active window is always on the top of all other windows, and its title bar is highlighted.

A/D Converter -- Analog to Digital converter; a device that encodes a continuously varying (analog) audio signal into a string of (digital) numeric values. Each of these numbers represents a measurement of the amplitude of the analog signal at a particular instant. A converter's resolution is specified in bits (binary digits), typically 8, 12 or 16. The greater the bit resolution the less distortion. The rate at which the analog signal is converted into is called the sample rate. Typical sample rates used in MIDI audio sequencers are 22 or 44.1 thousand times per second. The highest frequency a digital system can reproduce is equal to one half the sample rate of the A/D converter.

Aliasing -- A weird form of digital distortion that is highly audible. It is caused when a audio signal is introduced into a digital system (A/D converter) that is higher than one half the sample rate.

All Notes Off -- A MIDI message that turns all the notes off in a MIDI network. Helpful if you have a “stuck” MIDI note. These can occur when an instrument did not get a MIDI message to turn off the note when the unit was switched off.

Alphanumeric Keyboard -- an acronym for a computer keyboard that is a combination of letters (alphabet-alpha) and numbers (numeric) used for computer input.

Application -- a computer software program designed to speed up and or simplify "real world" human tasks such as accounting, word processing, sequencing, music notation, etc.

Arpeggiator -- Some sequencers offer an arpeggiator feature that will randomly change the order of notes in a chord or sequencer track or arpeggiate to a preprogrammed order. Typical arpeggiator modes up Down, Up/Down.

Autolocate -- Some sequencers allow you to locate and or set specific temporal locations and allow the user to instantly return to them.

Autocorrect -- all sequencers allow the user the ability to correct timing to a specified rhythmic value (i.e. eighth notes, sixteenth notes, eighth note triplets, etc.). This should be used sparingly as it makes sequencer tracks sound perfect or robotic in nature.

Channel -- A term applied to MIDI for one of its 16 available ‘software transmission lines over which MIDI data can be sent or received.

Channelize -- A term used for assigning MIDI data to a particular MIDI channel.

Clicking -- by clicking the mouse button, you are signaling the computer that a piece of information is being selected. The video will invert (white will become black) signifying that the object or icon is selected. Shift clicking will allow you to select more than one icon or object.

Click Track -- A metronome track generated by the sequencer to which a performer may listen to as they record overdubs. This will help to maintain rhythmic cohesiveness during the course of recording a sequence.

Clock -- A master timing reference used by a sequencer

Command Key or Control Key -- used in conjunction with specified characters as a substitute for the mouse. If you look at many of the menu commands, you will see the command symbol to the right followed by a letter or number. Pressing the command key while typing the letter or number will cause the same results as pulling down the menu and releasing the mouse button.

Contiguous -- items on a computer screen that is immediately next to each other. (See antonym Non-Contiguous)

Continue -- A MIDI message that tells a sequencer or drum machine to continue playing from the current location if they have been stopped previously by a MIDI Stop message.

Continuous Controller -- A MIDI generated signal that can express data over a wide range; as opposed to a switch controller that has only two possible states on or off.

Controller #7 -- The controller number assigned to affect MIDI volume changes.

DAC -- Digital to Analog Converter is a circuit that accepts a digital word that represents the amplitude of a sound wave and produces a corresponding analog voltage at its output that can be fed to a speaker or headphone system.

Default -- when several options are available with a computer program and you do not pick one, then one is automatically assigned by default. You can also design personal default setting for options when you launch a program.

Default Window -- A computer or user assigned window that appears when a program is launched.

Delete Key -- A computer keyboard key which will backspace, removing a single letter or setting in a dialog box field. If a handle is selected for a number or word in a field, the Delete Key will eliminate it from your score.

DeskTop -- consists of a white menu bar and the gray or colored desk surface. Objects can be placed on the desk surface, moved about and removed. It can be thought of as an actual desk.

Dialog Box -- a box on the screen requesting information, or a decision from you.

Digitize -- To convert an analog audio signal into a digital code that represents that signal. See A/D Converter.

Disable -- To turn off a function.

Disk Initialization or Formatting -- Before a computer can store data on a disk, the disk must be organized into a form that allows data to be stored and retrieved -- a type of indexing system. Formatting/initialization typically involves inserting a blank disk in a disk drive and running a formatting/initialization program. The disk drive will then magnetically mark the disk where data is to be stored.

Diskettes (Floppy Disks 3.5 Inch) -- Where information is stored; can be transported and backed-up. They should always be inserted into the disk drive with the topside (the side without the metal circle in the center) facing up. The edge of the rectangular metal bar should be inserted into the disk drive. If this is done properly, you will notice a small arrow indented into the plastic cover surface of the diskette. The arrow should point towards the Macintosh's disk drive.

Document -- the file you create and modify with an application. A collection of information on a disk or in memory, grouped together and called by one name.

Double-clicking -- positioning the pointer and then quickly pressing and releasing the button on the mouse twice.

Dragging -- items on the computer screen can be moved about by dragging. Position the pointer on the icon or object and press the mouse button. While holding the mouse button move the pointer on the DeskTop surface. You'll see an outline of the object moving with the pointer, and when you release the mouse button the object will move to the new location.

Field -- a box in a dialog box that you type information into such as word or numerical data.

Folder -- a grouping of documents, applications and other folders that is represented by a folder-shaped icon on the desktop. Equivalent to a sub directory on the MS-DOS machines.

Font -- a collection of letters, numbers, punctuation marks and symbols with an identifiable and consistent look.

Graphic Editing -- An editing option that shows and manipulates data pictorially, as opposed to using numbers or text.

Hard Disk Recording -- The process of recording digital audio signals directly on to the hard drive for storage. Since digitized audio signals takes up a great deal of memory (CD-quality stereo 10 Meg a minute) and a hard drive have lots of memory, this is a logical way to record digitally.

Humanize -- To add minute variations in a sequencer's data to gain a more natural sound.

Icon -- a graphic representation, that looks like what it represents.

Interface -- a device that allows for the transfer, input, or viewing of information. The computer screen is an interface that displays information. The way in which software is designed to accept data would be its interface.

Launch -- double clicking on a computer application's icon to start or launch the program.

Local Control -- A MIDI feature that determines whether a keyboard's voice generators are controlled by the unit's keyboard (Local On) or by the MIDI in port (Local Off).

Loop -- A portion of a music sequencer's tracks that repeat for a specified number of times or infinitely.

Macros -- a combination of commands that may be called up by one computer command or keystroke(s).

Menu -- a list of functions available in a computer program or part of a computer program.

Menu Bar -- A bar used to select an option or command from a menu. May have pull down options when a key word is selected with a mouse.

MIDI Time Code -- a set of MIDI messages that allow MIDI gear to have events triggered according to times related to SMPTE time code.

Mouse -- A hand held input device for a computer that rolls around on a smooth surface and contains one or more single click switch(s).

Non-Contiguous -- items on a computer screen that are not next to each other. (See antonym Contiguous)

Option Key (Mac) -- Alt. Key (Windows) helps to expand the scope of the alphanumeric keyboard to include additional characters, and can have special functions with the different tools.

Pan -- A control that places the audio signal at a specific point within the stereo field of two speakers.

PPQ -- (Pulse Per Quarternote) The number of clock (sync) pulses a sequencer or drum machine subdivides a quarter note into for as a rhythmic reference. The higher the number the finer the resolution of the sequencer. This number must be divisible by three to allow triplets. Common numbers used for PPG 24, 48, 96, or 480.

PPQN -- See PPQ (Pulse Per Quarternote)

Preset -- A particular patch or program stored in a synthesizer that will be assigned to a specific MIDI program number.

Program Change -- A MIDI message that instructs the receiving MIDI device understanding the Program Change Command to jump the number specified by the command. MIDI channel specific.

Pointer -- what moves on the screen when you move the mouse. Its most common shapes are arrow, the I-beam, and wristwatch.

Pointing -- by putting the tip of the pointer inside something on the desktop, window, or folder, you are pointing at it. If the pointer is not inside something, then you are not pointing at it.

Punch In -- To initiate recording at a specific point in a composition with a sequencer. Punching in will erase existing material recorded starting at the punch in point, or it can add new material on top of existing material (sound on sound).

Punch Out -- To exit the recording process after initiating a punch in.

Quantization -- A term used interchangeably with autocorrect.

RAM -- Random Access Memory is a computer memory location that can be used repeatedly to temporarily store data. Both computer applications and documents are placed into RAM as you work. You have to save your work from RAM to a floppy disk or hard drive since when you turn off your computer all data in RAM is erased. RAM is very important in that it allows computers to run an unlimited array of software.

Radio Button --  A graphic image that is similar to the push buttons on older car radios, hence its name. When it is used to turn on a computer program option, another is deselected or pushed out; therefore for each column in a dialog box containing radio buttons, only one button can be selected (as opposed to a box where you may have multiple selections x-ed).

Real Time Recording -- To record data into a sequencer's memory as it is being played on a keyboard or other controller. In early computer programs, a composition had to be entered one note at a time.

Return Key -- The Return Key can function as a power key that will allow you to trigger the OK button in a dialog box, or as a new paragraph return in text input.

RTM -- Read The Manual

Scroll View -- the music is viewed as a continuous horizontal band on the computer screen. The computer redraws the screen quickly in Scroll View

Sampler -- A device that records and stores actual sounds into its digital memory to be played back from a keyboard or other type of MIDI controller or sequencer.

Sampling -- The act of recording sound into a sampler or computer memory.

Sampling Rate -- The rate at which a signal is digitized into samples. Reading back the samples at the same rate reproduces the original sound, at an altered higher or lower rate varies the pitch on playback.

Selection -- whatever is selected will be affected by the next command or action.

Shift-clicking -- Shift clicking will allow you to select or deselect non-contiguous handles or objects. When you are inputting notes, holding down the Shift key will allow you to input rests.

SMPTE -- (Society of Motion Picture and Television Engineers) originated at NASA for logging telemetry data and later adopted and modified by the Society of Motion Picture and Television Engineers to label each frame of a video tape by recording a unique piece of digital data on that frame. For the American standard (NTSC) each second of SMPTE time code is divided into 30 frames. A complete time code address includes  
hours:minutes:seconds:frames = 00:00:00:00.

Song Position Pointer -- A MIDI message that describes where a sequencer or drum machine is /or should locate to with respect to the beginning of the composition.

Song Select -- A MIDI message that instructs a sequencer or drum machine to select a particular song number that is stored in its memory.

Start -- A MIDI message that tells the sequencer or drum machine when to start and follow MIDI timing messages.

Status Byte -- A byte used in MIDI to identify the particular message type to which subsequent data bytes relate.

Step Time -- To enter notes into a sequencer or drum machine one note or chord at a time in a non-real time manner. Usually a note value resolution is selected beforehand and the pitch information is supplied by the controller or keyboard.

Stop -- A MIDI message that tells sequencer or drum machine when to stop playback.

Sub Menu -- a main menu item may contain a sub menu, which will allow several options which the user can select. You can tell if a menu item contains sub menus by the inclusion of an arrow to the right of the command. Access to the sub menu options can be selected by dragging the pointer to the right of the arrow and then releasing it on the sub menu pop-up command list.

System Exclusive Messages – MIDI messages that are unique to a particular manufacturer. These messages allow the manufacturer to send data that relates to their specific products and models with in MIDI messages.

Sysex --Abbreviated term for System Exclusive Message

Template -- A file that does not contain any note data but is pre- formatted for special layouts, such as grand staff for piano, tablature and staff guitar, etc. You can design you own or use the pre-made templates that come with your software package as a time saver when you create a score.

Toggle -- a computer command option that allows you move between two possible states like a toggle switch. Ex. on or off, page view or scroll view etc.

Track Shift – To shift or slide a sequencer track ahead or behind in time, usually in very small increments.

Window -- with computer programs, a "screen-within-a screen" that is some subset of the main screen. A window may be opened or closed, and a window's contents are known collectively as the icon's *directory*

*Close Box*- a small box that will collapse the window (upper-left corner)

*Opening a Windows* - a window appears when an icon is opened in one of two ways. By going to the open command in the file menu or by double clicking on an icon.

*Scroll Bar* - move vertical or horizontal in a window to see more text or information. Also left and right movement in a window. (bottom and right edges)

*Size Box* - allows resizing of a window. (lower-right corner)

*Title Bar*- (top edge)

*Zoom Box* - two states for a window small or filling the screen. (upper right corner)

## **Appendix 7**

### **WWW Resources for Electronic Instruments**

#### Music Sequencing Sites

University of Oregon's Electronic Music Interactive

[nmc.uoregon.edu/emi](http://nmc.uoregon.edu/emi)

Easy to digest of interactive explanations of topics such as synthesis, sound waves, and MIDI systems. 80 diagrams, 50 animations, and a 150 term glossary.

CCARH (Center for Assisted Research in the Humanities) sends a packet of music examples to over six dozen-notation software developers. Each has a particular notational idiosyncrasy. Software developers send back the examples notated with their software. Published in their annual Computing in Musicology (200 pages).

The Center for Assisted Research in the Humanities

525 Middlefield Road, Suite 120

Menlo Park CA 94025

The Media Lab  
Massachusetts Institute of Technology  
Cambridge, MA 02142-9949  
(617) 253-0300

PAN Performing Artist Network

Net Directory (Music)

<http://www.excite.com/Subject/Entertainment/Music/s-index.h.html>

Music Publishers Association

<http://host.mpa.org/mpa/Welcome.html>

World Wide Music

<http://www.WorldWideMusic.com>

**Public Domain Information Project**

<http://www.pdinfo.com/proof.htm>

The Mudcat Café a magazine dedicated to blues and folk music.

## **Appendix 8**

# **An Abridged Public Domain List from the Music in the Public Domain Site for Sequencing**

*A reference site to help the ordinary person identify music and songs in the public domain . . . royalty free music you can use anywhere and any way you choose . . . performance, teaching, sing-along, film, video, advertising, business, or personal. This list is intended only as help in researching public domain materials and is not sufficient documentation that music is in the public domain. You must work from an original or photocopy publication of the item with a copyright date old enough to qualify the item for public domain status.*

### **A**

A-Hunting We Will Go - Trad

Adeste Fideles - 1782

Afternoon of a Faun - Debussy ©1895

Air for the G String - c1700

Alouette - ©1879

Amazing Grace - John Newton c1800

America, My Country 'Tis of Thee - tune 1744, wds Rev Samuel Francis Smith 1832

America the Beautiful - ©1895  
Angels We Have Heard On High - 1800s  
Arkansas Traveler © 1851  
Ash Grove The trad Welsh  
Assembly (bugle call) Trad.  
Au Clair de la Lune 1811  
Auld Lang Syne music 1687 words 1711 verses 2&3 Robert Burns  
Aura Lee H - 1885 1861  
Ave Maria Gounod 1859  
Ave Maria Schubert 1826  
Away in the Manger ©1887

## **B**

Baa Baa Black Sheep 1765  
Bach Johann Sebastian 1685-1750)\*  
Barbara Allen '1885 1666  
Barber of Seville Rossini \* 1813  
Battle Hymn of the Republic Julia Ward Howe ©1862  
Beautiful Dreamer Foster © 1864  
Beethoven Ludwig v \*1770-1827)\*

Berlioz, Hector (1803-1869)\*  
Bill Bailey Won't You Please Come Home ©1902  
Bizet, Georges (1838-1875)\*  
Blue Bells of Scotland The '1885  
Borodin, Alexander (1834-1887)\*  
Brahms Johannes (1833-1897)\*  
Bridal Chorus Lohengrin '1885  
British Grenadiers '1885 1750

## **C**

Camptown Races Foster -©1850  
Can Can Offenbach 1858  
Careless Love (probably trad) c1895  
Carnival of Venice Bellak ©1854  
Chopin Frederic (1810-1849)\*  
Chopsticks ©1877  
Clementine ©1884  
Cockles and Mussels 1750  
Columbia the Gem of the Ocean 1843  
Come All Ye Faithful Reading 1885  
Comin' Thru the Rye 1796  
Concerto for Piano #2 Rachmaninoff ©1901  
Couperin , Francois (1668-1733)\*  
Czerny, Carl (1791-1857)\*

## **D**

Dance Macabre Saint-Saens ©1872  
Death and Transfiguration R Strauss ©1891  
Deck the Halls 1784  
Did you Ever See a Lassie  
Down by the Riverside ©1865  
Drink to Me Only with Thine Eyes tune 1780 words 1616  
Drunken Sailor The ©1891  
Dufay Guillaume (c1400-1474)\*

Dunstable John (1370?-1453)\*

## **E**

East Side, West Side (see "Sidewalks of New York")  
Entertainer The Joplin ©1902  
Eroica Symphony Beethoven  
Espana Tango Albeniz ©1890  
Evening Hymn (canon) Tallis 1890  
Eyes of Texas Are Upon You The ©1903

## **F**

Fantasia Impromptu Chopin 1855  
Farmer in the Dell ©1883  
Fifteen Miles on the Erie Canal  
First Call (bugle call)  
First Nowel The 1833  
Fisher's Hornpipe - 1849  
Flight of the Bumble Bee Rimsky-Korsikov ©1900  
Flying Dutchman Overture Wagner 1844  
For He's a Jolly Good Fellow 1783  
Frankie and Johnny c 1869  
Frere Jacques 1811  
Frog Went A'Courtin' 1580

From the New World Dvorak ©1893  
Funeral March Chopin 1840  
Funeral March of a Marionette Gounod ©1872  
Fur Elise Beethoven 1810  
Fux Johann Joseph (1660-1741)\*

## **G**

Git Along Little Dogies ©1893  
Give My Regards to Broadway ©1904  
Go Tell Aunt Rhody 1844  
Go Tell it on the Mountain ©1865  
God Rest You Merry Gentlemen c 1770  
Golden Slippers ©1879  
Goober Peas 1864  
Good King Wenceslas tune Swedish 1582 words ©1853-67  
Good Morning to All (tune of Happy Birthday) ©1893  
Goodnight Ladies 1853  
Gottschalk, Louis Moreau (1829-1869)  
Gounod, Charles Francis (1818-1893)  
Grand March--Aida Verdi  
Grande Valse Brilliante Chopin 1834  
Grandfather's Clock Henry C Work ©1876  
Greensleeves 1580  
Guido of Arezzo (d 1050 AD)  
Gypsy Chorus --Carmen Bizet  
Gypsy Music Liszt \*

## **H**

Habanera--Carmen Bizet  
Hail to the Chief Scott 1812  
Hallelujah Chorus 1767

Handel, George Frederick (1685-1759)  
Happy Farmer The Schumann 1849  
Hard Times Come Again No More Foster ©1855  
Hark the Herald Angels Sing 1855  
Haydn Franz Joseph 1732-1791)  
Here We Go Round the Mulberry Bush 1857  
Hey Diddle Diddle 1765  
Hickory Dickory Dock 1765  
Home on the Range c 1873  
Humoresque Dvorak ©1894  
Hungarian Dances Brahms \* #5--1859 ©1869  
Hungarian Rhapsodies Liszt \*

## **I**

I Gave My Love a Cherry 1850  
I Saw Three Ships Come Sailing 1765  
I'm a Yankee Doodle Dandy ©1904  
I've Been Working on the Railroad ©1894  
In the Good Old Summertime ©1902  
Invitation to the Dance Weber \* 1821  
Irish Washerwoman 1792  
It Came Upon a Midnight Clear 1850

## **J**

Jingle Bells 1857  
John Henry ©1873  
Johnny Has Gone for a Soldier, Irish trad.  
Joshua Fit the Battle of Jericho ©1865  
Josquin Des Pres (c1450-1521)  
Joy to the World Handel 1839

## **K**

Kreutzer LM Kreutzer R-1890

## **L**

La Boheme Puccini \*  
La Donna e Mobile--Rigolette Verdi  
Largo--New World Symphony Dvorak  
Liebestramme Liszt 1847  
Liszt, Franz (1811-1886)  
Little Boy Blue (Mother Goose) 1765  
Little Brown Jug Joe Winner ©1869  
Little Jack Horner 1765  
London Bridge 1744  
Londonderry Air 1855  
Long Long Ago Bayly ©1843  
Lord's Prayer The 1885  
Lullabye, Brahms  
Lully Jean Baptiste (1633-1687)

## **M**

Man on the Flying Trapeze The ©1868  
Maple Leaf Rag ©1899  
March of the Toys The ©1903  
March Slav Tchaikovsky ©1876

Marriage of Figaro The Mozart \* 1786  
Mary Had a Little Lamb Sarah Josepha Hale ©1866  
Meet Me in St Louis, Louis ©1904  
Mendelssohn-Bartholdy Felix (1809- 1847)  
Messiah The Handel \*  
Michael Row the Boat Ashore 1867  
Mighty Fortress Is Our God A 1529  
Minuet in G Beethoven 1796  
Monteverde Claudio (1568-1643)  
Moonlight Sonata Beethoven 1802  
More, Sir Thomas (1478-1535)  
Morely, Thomas (1557-1602)  
Mousorgsky, Modeste (1835-1881)  
Mozart, Wolfgang A (1756-1791)  
My Bonnie Lies Over the Ocean ©1881  
My Old Kentucky Home Foster -©1853

## **N**

New World Symphony Dvorak \*  
Night on Bald Mountain A Mussorgsky ©1887  
Nocturne op 9 no 2 Chopin 1832  
Norwegian Dance The Grieg ©1881  
Now I Lay Me Down To Sleep ©1866  
Nutcracker Suite The Tchaikovsky \*

## **O**

O Holy Night 1843  
O Little Town of Bethlehem ©1868  
O Tannenbaum Ernst Anschutz c 1824 trad tune

Obrecht Jacob (1430-1505)  
Offenbach, Jacques (1819-1880)

Oh Susannah Foster -©1848  
Oh Them Golden Slippers James A Bland ©1879  
Old Folks at Home The Foster -©1851  
Old MacDonald Had a Farm words 1706 tune 1859  
Orpheus in the Underworld Offenbach \*

## **P**

Pat-a-Cake Mother Goose  
Pathetique Sonata Beethoven 1799  
Pavanne for a Dead Infanta Ravel ©1899  
Peer Gynt Suite Grieg \* ©1888  
Peter and the Wolf Prokofiev\*  
Peter Peter Pumpkin Eater 1765  
Piano Concerto #1 Tchaikovsky ©1875  
Piano Concerto #2 Rachmaninoff  
Piano Concerto Grieg ©1873  
Pictures at an Exhibition Mussorgsky ©1887  
Pirates of Penzance Gilbert & Sullivan\*  
Pizzicato Polka Strauss  
Polly Wolly Doodle Foster 1885  
Polonaise Militaire Chopin 1840  
Polovetsian Dances Borodin ©1888  
Pomp and Circumstance Elgar ©1902

Pop Goes the Weasel ©1853  
Prelude in C# Minor Rachmaninoff ©1893  
Prelude op 28 no 7 Chopin 1839  
Purcell, Henry (1658-1695)

## Q

Quantz, Johann Joachim (1697-1733)

## R

Rameau, Jean Philippe (1683-1764)  
Red River Valley The ©1896  
Reverie Debussy ©1895  
Riddle Song The 1850  
Robert Burns \*  
Rock of Ages Hastings ©1832  
Rock-a My Soul 1830  
Romeo and Juliet Tchaikovsky\* 1871  
Rosini C M Rosini 1890  
Rossini Gioacchino Antonio (1792-1868)  
Rousseau, Jean Jacques (1712-1778)  
Row Row Row Your Boat words 1852 music 1881  
Rub-a-Dub-Dub Mother Goose

## S

Sailing Sailing (Over the Bounding Main) ©1880  
Sailor's Hornpipe 1795  
St Matthew's Passion Bach \*  
Scarlatti, Alessandro (1659-1725)  
Scarlatti, Domenico (1685-1757)  
Scheherazade Rimsky-Korsikov ©1890  
Schubert, Franz Peter (1797-1828)  
Schumann, Clara Josephine Weick (1819-1896)  
Schumann, Robert (1810-1856)  
Semper Fidelis Sousa ©1888  
Serenade Schubert 1824  
She'll Be Comin' Round the Mountain ©1899  
Shenendoah 1826  
Shoo Fly Don't Bother Me ©1869  
Silent Night Holy Night Josef Mohr M Franz Gruber 1818  
Silver Moon 1849  
Simple Simon 1765  
Slavonic Dances Dvorak ©1887  
Sleeping Beauty Waltz Tchaikovsky ©1890  
Sonatas of III Parts Henry Purcell\* 1683  
Song of India Rimsky-Korsikov ©1897  
Song of the Volga Boatman ©1867  
Sorcerer's Apprentice The Dukas ©1897  
Spring Song Mendelssohn 1844  
Star Spangled Banner 1885 9/13/1812 at Ft McHenry  
Stars and Stripes Forever March ©1897  
Strauss, Joseph (1827-1870)  
Streets of Laredo 1860  
Summer is Icumen In 1226  
Swan The Saint Saens ©1887  
Swing Low Sweet Chariot 1872

**T**

Ta Ra Ra Boom De Ay ©1891  
Tales from the Vienna Woods J Strauss ©1868  
Tallis Thomas (1505-1585)  
Taps  
Tarantella (Italian trad )  
Tchaikovsky Peter Illich (1840-1893)  
Teleman Georg Philipp (1681-1767)  
Tenting Tonight on the Old Camp Ground Kittredge -© 1864  
There is a Tavern in the Town ©1883  
There Was A Crooked Man (Mother Goose)  
There Was an Old Woman Who Lived in a Shoe 1765  
Three Blind Mice 1609  
Till Eulenspiegel R Strauss ©1895  
Toreador Song-Carmen Bizet ©1873  
Toyland Herbert 1885 ©1903  
Tramp!Tramp!Tramp! Root -© 1864  
Trois Gymnopedies Satie  
Turkey in de straw 1834  
Twinkle Twinkle Little Star 1765

**U**

Unfinished Symphony Schubert

**V**

Verdi Giuseppe (1813-1901)  
Vivaldi, Antonio (c 1680-1743)

**W**

Wagner, Wilhelm Richard (1813-1883)  
Waltz of the Flowers- The Nutcracker Suite Tchaikovsky ©1891  
Waltzing Matilda ©1903  
We Three Kings of Orient Are - 1857  
Weber Carl Marie von (1786-1826)  
Wedding March A Midsummer Night's Dream Mendelssohn 1844  
Wedding March - Lohengrin Wagner 1852  
Wedding March Mendelssohn  
Well-Tempered Clavier 1 Bach \* 1722  
When Johnny Comes Marching Home Lambert -© 1863  
When the Saints Go Marching In ©1896  
Wildwood Flower (I'll Twine Mid the Ringlets) Maude Irving & JD Webster©1860  
William Tell Overture Rossini 1829  
Wolf, Hugo (1860-1903)

**X**

No songs with X.

**Y**

Yankee Doodle c 1775 melody pub Glasgow 1782  
Yellow Rose of Texas J K ©1853

**Z**

No songs with X.

## Appendix 9

### Time-On Controller (Improve Your Technique With A TOC Plan)

By Bill Purse ©1997

TIME-ON-CONTROLLER, OR "TOC", is a critical issue for the MIDI guitarist or synthesist. This concept is quite simple; enhance your controller performance skills by practicing with your MIDI controller and sound module in a systematic way, rather than without a practice plan, or random experimentation at a gig. Technical exercises performed on your controller and synth can employ TOC creatively through the ideas I will present, and through your own self-designed musical objectives.

By devoting TOC to technical exercises such as arpeggio and scale studies, you can accelerate your overall synthesizer performance technique development. TOC can also solve the technological difficulties of guitar synth tracking by demanding perfection in right and left hand coordination. Instant feedback of a glitched performance immediately illustrates the controller's total objectivity in evaluation of your performance technique.

#### **Velocity Switching**

Touch and dynamic considerations can be developed by the use of Velocity Switching. Try using two completely unrelated velocity switched timbres as one of your TOC exercises. One sound might be triggered at a low velocity while only a high velocity triggers the other. When one timbre sounds, the other timbre remains silent. The sounding of the second timbre will present feedback that you have exceeded the velocity limit you had set for this practice session.

#### **Alternating Pick Velocity**

Another approach could be an alternation of sound timbres for each successive note, triggered by an alternating pick velocity level creating a solo performance hocket (a medieval music concept where two singers will rapidly alternate singing one note or a short group of notes while the other rests).

#### **Attack layering**

Try using TOC with two layered sounds containing varying attack characteristics, i.e. one, which responds slowly while the other has a much faster attack. This attack layer concept can be worked into developing speed studies where the fast phrase, scale, or arpeggio will sound only one timbre and the slow legato performance will result in a timbral duet. Attack layering can be incorporated with the velocity-switching concept, designing a patch, which is highly controllable through performance articulation.

#### **Patch Editing**

TOC can be incorporated into Patch editing sessions while in the tweaking stage. Exploration of the pitch transpositions of your sound as you edit and map multi-sounds to

keyboard or fingerboard regions can present a TOC challenge. Why not have a performance objective when you work with your sound while designing its envelope adjustment controlled by performance?

The significance of the TOC concept is that it enhances controller performance skills and provides a practice workout similar to that of runners who train with ankle weights, using restraint in practice to increase strength for competition once removed. This article has only briefly scratched the surface of TOC concepts that can enhance your musical skills while taking on the inherent difficulties of guitar and other controller performance techniques. In conclusion, I hope that if you as a reader have ideas or controller practice routines we can share with each other. Bill Purse (maestrobp@aol.com).

## Appendix 10

### Bibliography for Further Study

#### **Ensemble Arrangements**

Carden Keyboard Ensemble, Book I  
Carden Keyboard Ensemble, Book II

#### **Group Keyboard Method Books**

Carden Keyboard Method  
Alfred's

#### **Books on Sound Design and Synthesis**

De Furia, Steve *The Secrets of Analog and Digital Synthesis* (ISBN 0—88188-516-9) • Hal Leonard Books • 122 pages • 1986

De Furia, Steve Wilkes, Steve & Scacciaferro, Joe *The Art of Digital Drumming* (ISBN 0-88188-869-9) • Leonard Books • 144 pages • 1989

De Furia, Steve *Power Play DX!* • (ISBN 0—88188-901-6) • Hal Leonard Books • 160 pages • 1988

Pressing, Jeff *Synthesizer Performance (And Real-Time Techniques)* • (ISBN 0-89579-257-5) • A-R Editions, Inc. Madison WI, 462 pages • 1992

Scacciaferro, Joe & De Furia, Steve *Synthesis With Style* (ISBN 0-88188-868-0) • Hal Leonard Books • 127 pages • 1989

LeTourneau, Paula *Drum Machine Patterns* (ISBN N/A) • Hal Leonard • 79 Pages • 1985

#### **Books on Computers and Music Education**

Mash, David *Computers and the Music Educator* • (Phone 800/963-TREE) • SoundTree Publishing Co. New York, 102 pages • 1996.

Music Educators National Conference *The School Music Program: A New Vision* • (ISBN 1-56545-039-6) • MENC, Reston VA, Phone 1 800 336-3768, 42 pages • 1994.

Rudolph, E Thomas *Teaching Music with Technology* • (ISBN 094105092-0) • GIA Publications, Inc. Chicago, 316 pages • 1996.

## **Music Technology & Music References**

Anderton, Craig *The Electronic Musician's Dictionary* • (ISBN 0-8256-1125-3) • Amsco Publications, New York, NY, 119 pages • 1988.

Apel, Willie *Harvard Dictionary of Music* • (ISBN 0-674-37501-7) • Belknap Press of Harvard University Press, Cambridge, MA, 935 pages • 1981.

Lee, William *Music in the 21st Century: The New Language* • (ISBN 0-7604-0065-2) • CPP/Belwin, Inc., Miami Florida, 193 pages • 1994.

Tomlyn, Bo & Leonard, Steve *Electronic Music Dictionary: A glossary of specialized terms relating to the music and sound technology of today.* • (ISBN 0-88188-904-0) • Hal Leonard Books, Milwaukee, WI, 77 pages • 1988

Williams, David & Webster, Peter *Experiencing Music Technology:*. • (ISBN 0-02-872914-5) • Schirmer Books, NY, NY, 594 pages & CD-ROM • 1996.

# Appendix 11

## TI:ME 2B Electronic Instruments Lesson Planer

Short Answer Worksheet for creating Computer Notation Software Lesson Plans

Electronic Instruments and the MENC National Standards

- Which national standard(s) can be addressed using Electronic Instruments?

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- What specific ways could Electronic Instruments be used to address these standards?

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MENC Standards:

1. Singing, alone and with others, a varied repertoire of music.
2. Performing on instruments, alone and with others, a varied repertoire of music.
3. Improvising melodies, harmonies, and accompaniments.
  - Composing and Arranging Music within specified guidelines.
  - Reading and notating music.
  - Listening to, analyzing and describing music.
  - Evaluating music and music performances.
  - Understanding relationships between music, the other arts, and disciplines outside the arts.
- Understanding Music in Relation to History and Culture

Now review the Teaching Strategies listed in the TI:ME technology strategies document. See Appendix A of the *Technology Strategies for Music Education*. Describe one or more ways to use Electronic Instruments in your teaching situation:

TI:ME Tech. Strat.

# Teaching Application

<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

List three ways that Electronic Instruments can be used in your teaching:

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# Sample Lesson Planer

## I. ADVANCE PLANNING

### A. GRADE LEVEL AND SUBJECT

*For what grade/age is the plan?*

*How long is the class?*

*Where are the students developmentally?*

### B. MATERIALS AND EQUIPMENT

*Which books (page numbers) are needed for the plan?*

*Which song materials are needed?*

*Which visual aids (flashcards, photos, and charts) are needed?*

*Which aural aids (recordings, cassette tapes) Are needed?*

*Which instruments are needed? Do they need to be tuned?*

*Which equipment (chalkboard, chalk/ eraser, and sketchpad) is needed?*

*Is a filmstrip projector, tape recorder, or VCR/monitor needed?*

*Which props are needed?*

*Does the plan require open space for movement?*

### C. SPECIFIC PROGRAM OBJECTIVES

*List here several objectives for the YEAR to meet in the activities of singing, playing, reading, moving, creating, or listening.*

*List here several objectives for the YEAR to meet teaching goals based on music elements (melody, rhythm, harmony, form, expression, and timbre).*

### D. LESSON OBJECTIVES

*List here several specific music objectives for THIS particular class.*

*The objectives will answer, in sentence form: WHO, WHAT SPECIFIC ACTIVITY (ACTIVE VERB), WHAT MUSIC IS USED, HOW WELL THE GOAL IS ACCOMPLISHED.*

## II. THE LESSON

### A. MOTIVATION

*Give a brief sentence or two explaining how the teacher will get the students interested in the music lesson.*

### B. PROCEDURES

*In complete sentences, describe the steps you (the teacher) will take to teach the music/songs, Lead the students to understand the music concepts, the types of questions you will ask, the activities that will take place, etc. Have you included at least three activities? singing, playing, moving, listening, creating, reading? Are you teaching music concepts? Have you planned enough activities to fill the time allotted? Have you built in procedures to evaluate the students' understanding? Have you allowed for individual modifications?*

### C. EVALUATION

*Ask yourself questions about the objectives planned for the lesson.*

## III. FOLLOW-UP LESSONS

*Include six or more ideas to expand or continue concepts/activities from this lesson into future classes, using music activities (singing, playing, moving, listening, creating, and reading) AND/OR music elements (melody, rhythm, harmony, form, expression, timbre). Where could the lesson go in the next class?*

# Appendix 12

## MIDI Implementation Chart

Function ...		Transmitted	Recognized	Remarks	
Basic Channel	Default Changed	1 ~ 16 1 ~ 16	1 ~ 16 1 ~ 16	Memorized	
Mode	Default Messages Altered	×	3 ×		
Note Number:	True voice	09~120/16~115 *****	0 ~ 127 0 ~ 127	Only Sequence Data will be transmitted.	
Velocity	Note ON Note OFF	○ 9n. V= 1 ~ 128 ×	○ 9n. V= 1 ~ 127 ×	Only Sequence Data will be transmitted.	
After Touch	Key's Ch's	○ ○	○ ○	Key's : Sequence Data only #5, 6 #5	
Pitch Bender		○	○	Only Sequence Data will be transmitted. #1	
Control	0, 32	○	○	Bank (MSB, LSB) #3	
	1, 2	○	○	Mod Wheel #1	
	6, 38	○	○	Data Entry (MSB, LSB) #2	
	7	○	○	Volume #1	
	10	○	○	Pan Pot #1	
	11	×	○	Expression #1	
	12, 13	○	○	FX 1,2 Cntrl #1	
	64	○	○	Damper #1	
	Change	91, 92	○	○	FX 1,2 ON/OFF #1
		96, 97	○	○	Data Increment/Decrement #2
100, 101		×	○	RPN (LSB, MSB) #2	
121		×	○	Reset All Cntrl's (Sequence Data) #6	
0~101		○	○		
Prog Change: True #	○ 0 ~ 99 *****	○ 0 ~ 127 0 ~ 99	#3		
System Exclusive	○	○	#2		
System Common: Song Pos	○	○	#4		
Song Sel	○ 0 ~ 29 ×	○ 0 ~ 29 ×	#4		
Tune					
System Real Time: Clock	○	○	#4		
Commands	○	○	#4		
Aux Messages : Local ON/OFF	-×	○			
: All Notes OFF	×	○ 123~127			
: Active Sense	○	○			
: Reset	×	×			
Notes *1 Transmitted and recognized when CONTROL=ENA in global mode. *2 Transmitted and recognized when EXCLUSIVE=ENA in global mode. *3 Transmitted and recognized when PROG CHANGE=ENA in global mode. *4 Transmitted but not recognized when using Internal Clock. Recognized but not transmitted when using External Clock. *5 Transmitted and recognized when AFTER TOUCH=ENA in global mode.				*6 Only Sequence Data will be transmitted and recognized.	

Mode 1 : OMNI ON, POLY  
Mode 2 : OMNI ON, MONO

Mode 3 : OMNI OFF, POLY  
Mode 4 : OMNI OFF, MONO

○ : Yes  
× : No