



## **Effective Use of Electronics in the Front Ensemble:**

*Let's Take a Look Under the Hood*

### **CLINICIANS:**

**Tom McGillen and John Brennan**

### **SPONSORS:**

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## **Texas Bandmasters Association 2013 Convention/Clinic**



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SAN ANTONIO, TEXAS**

# EFFECTIVE USE OF ELECTRONICS IN THE FRONT ENSEMBLE:

*Let's Take a Look Under the Hood*

Presented by: Yamaha, Avedis Zildjian, Innovative Percussion, Remo, Planet Waves, and Lone Star Percussion



Tom McGillen and John Brennan, Clinicians

Texas Bandmasters Association Convention July 22, 2013

**Tom McGillen** is beginning his third year as Adjunct Professor of Percussion at the University of Tulsa. At the university, his duties include teaching and arranging for the marching band, percussion ensemble, percussion methods, and applied lessons.

Mr. McGillen has served as the audio and electronics specialist for the Cavaliers Drum and Bugle Corps since 2010. He has also been involved as an audio and electronics specialist with the Music City Mystique and Gateway World Class Independent WGI Percussion Ensembles.

In the scholastic realm, Mr. McGillen is an amplification, electronic implementation, and percussion design consultant and clinician for many marching bands across the country. Since 2011 he has worked with many programs including Broken Arrow, Carmel, Union, Owasso, Plano East, Flower Mound, Cypress Falls, and Ronald Reagan High School. Before his appointment at the University of Tulsa, Mr. McGillen served as the district percussion specialist and arranger for the Broken Arrow Public schools from 2001 to 2011.

Tom holds a bachelor's degree in Music Education and a master's degree in Percussion Performance from Oklahoma State University. He is an educational artist for Innovative Percussion Inc, Evans Drum Heads, Planet Waves Cables, and he is a Yamaha Performing Artist.

**John Brennan** is in his twelfth year as Associate Director of bands at Plano East Senior High. Prior to this appointment, Mr. Brennan was the percussion specialist for the East Cluster of the Plano Independent School District. His responsibilities at Plano East include conducting the Jazz Ensemble, Symphonic Band, Percussion Class, and team teaching the Wind Ensemble, Concert Band, Varsity Band, and Marching Band. Mr. Brennan consults and writes for many top high schools and colleges throughout the United States.

Mr. Brennan's drum corps experience is primarily with the Cavaliers Drum and Bugle Corps from Rosemont, Illinois where he marched from 1992 to 1995. John has taught the battery of the Cavaliers percussion section off and on from 1997 to present winning multiple world championships and high percussion awards. In 2009 and 2010, he also went out on the road as a consultant for the Crossmen Drum and Bugle Corps. A published author, John has written several articles for Percussive Notes magazine. Mr. Brennan is an educational artist/endorser for Yamaha, Zildjian, Remo, and Innovative Percussion.

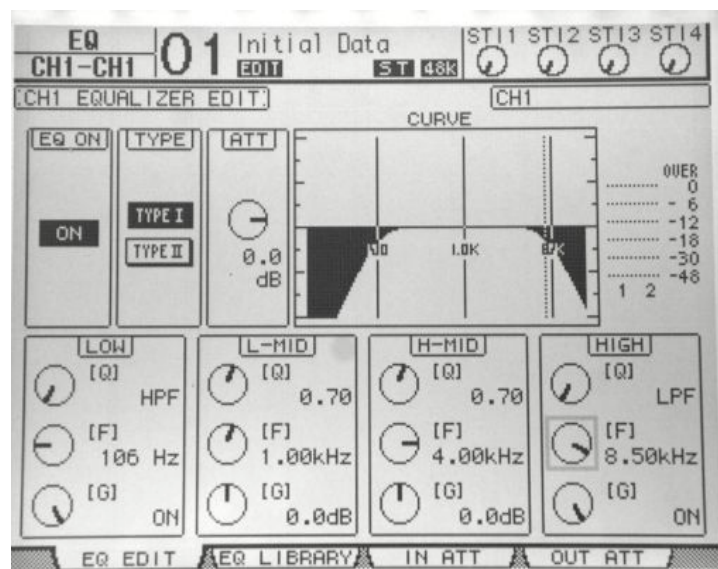
John has studied drum set with Stockton Helbing, John Riley, Joe Morello, Antonio Sanchez, Keith Carlock, and Dave Weckl. All of his knowledge on sound and electronics comes from working with Mr. Tom McGillen. John holds a BME from Northwestern State University and a MM in performance from Texas A&M University – Commerce. He is an active clinician, adjudicator, and performer throughout the United States and holds professional memberships in TMEA, TBA, PAS, and Phi Mu Alpha.

## Developing EQ for Percussion Instruments

Frequency Ranges for Common percussion instruments

Instrument	Low frequency	High frequency
Low C Marimba (5.0 octave)	65 Hz	2093 (2.093 kHz)
Low F Marimba (4.5 octave)	87 Hz	2093 (2.093 kHz)
Low A Marimba (4.3 octave)	110 Hz	2093 (2.093 kHz)
4.0 octave Vibraphone	131 Hz	2093 (2.093 kHz)
3.0 octave Vibraphone	175 Hz	1397 (1.397 kHz)
32" Timpani	73 Hz	117 Hz
29" Timpani	87 Hz	139 Hz
26" Timpani	110 Hz	175 Hz
23" Timpani	131 Hz	208 Hz
20" Timpani	165 Hz	262 Hz

Mathematically speaking, the frequency doubles every octave. (A4=440 Hz; A5=880 Hz). Try setting HPF (high pass filter) and LPF (low pass filter) settings on the outside of your EQ to help isolate the frequencies you are trying to pick up. Remember to leave at least 2 octaves above the high frequency of each instrument sounding so that you do not remove all of the overtones present beyond the fundamental pitch being played. This information can help you to isolate and enhance frequencies as you develop EQ for your ensemble.



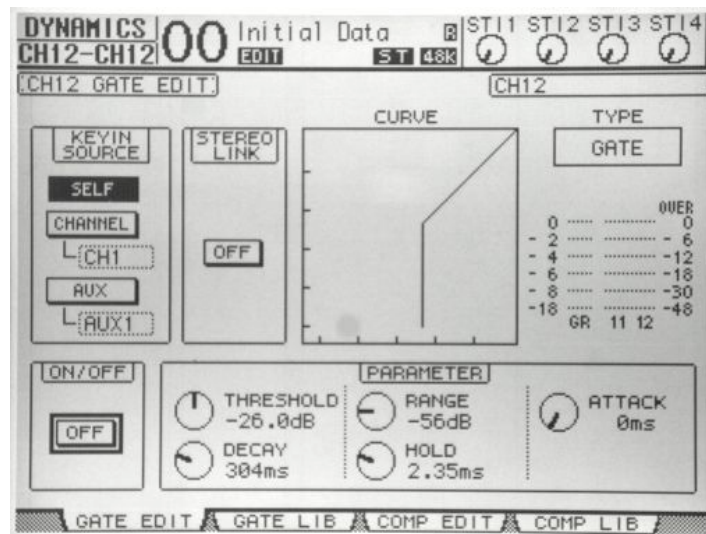
EQ Edit with HPF and LPF settings

## Gates

Gates can be used to turn microphones on and off when they are not being used. This can help to “tighten up” the sound coming from the PA and reduce the chance and occurrence of feedback. It can also help to reduce wind noise and ambient sounds from around the microphone.

The following settings can be adjusted in the Gate Edit menu.

- **Threshold**-Controls the dB that must be reached for the gate to “open” and turn on the mic.
- **Range**-The amount the signal will be reduced by in dB.
- **Attack**-This is the time it takes for the gate to fully open once the signal exceeds the threshold.
- **Decay**-How fast the gate will take to close after the Hold time has been met.
- **Hold**-Sets the amount of time for the gate to go from open to fully closed. A fast hold abruptly cuts off the sound once it has fallen below the threshold and might produce a “click” sound, a slower hold smoothly changes from open to closed, much like a slow fade out.



Dynamics-Gate Edit

By default, the gates are in the **Off** position on each channel. To turn it on, select the On/Off box in the bottom left hand corner of the above menu using the arrow keys and press Enter to turn the gate into the On position. Use the arrows keys and scroll wheel to edit the parameters. You can copy each gate setting you develop into the gate library for easy access in the future and to apply it to other channels.

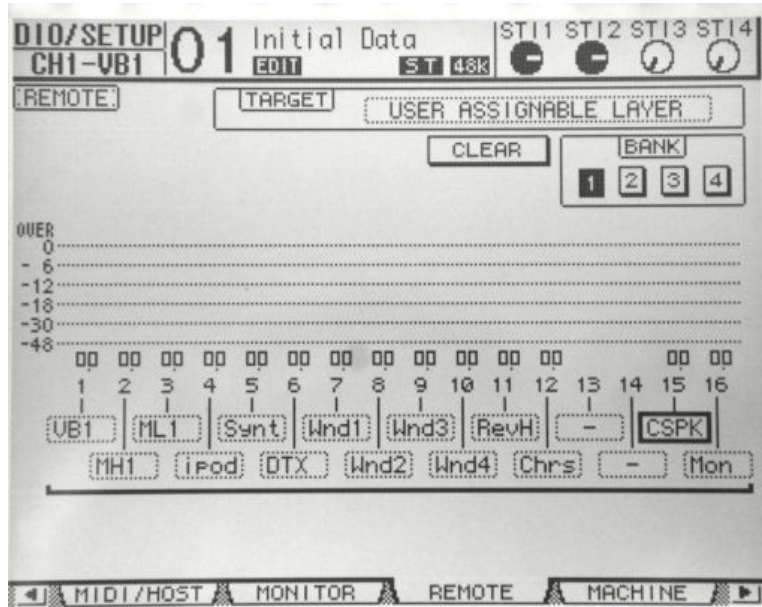
## Compression

Compression is the process of lessening the dynamic range between the loudest and quietest parts of an audio signal. This is done by “boosting” the quieter signals and attenuating or “quieting” the louder signals. This helps control the range of expression or input signal for instruments such as vocals and drum set. It will limit the range of expression, however.

You can also use a compressor to limit the amount of input from a channel. This can help to prevent clipping of an input or output. When this is done, the compression is often called a “**limiter**”. Try using a limiter on electronic percussion instruments, samplers, iPods, and for the outputs of the mixer to your loud speakers to insure you do not “clip” or get a distorted sound.

## Remote-User Assignable Layer

There are 4 layers to the mixer. By using these buttons, it affects what the faders are controlling. Buttons 1-16 and 17-32 can be used to control the inputs that are routed to these channels. The Master layer is used to control the Aux 1-8 faders and the Group Busses 1-8. The Remote layer can be set up to be used as a User Assignable Layer. This allows you to set up the function of the 16 faders to control any of the Input channels 1-32 or the Master layer faders.



Remote-User Defined Layer

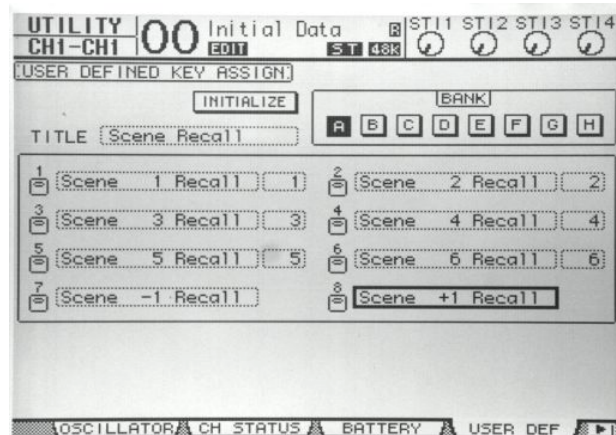
Vibraphone, Marimba High and Low, iPod, Synthesizer, DTX 12, 4 Wind solos, 2 Effects, Center speakers, and Monitor speaker sends pictured. Moving one fader will affect everything within the input fader group.

## User Defined Keys

Setting up a set of user defined keys can help a student, staff member, or parent run the mixer in real time for rehearsals and performances successfully. Each key can recall a scene, move forward or backward a scene, or mute the microphones. Develop a set up that works for your ensemble's use and label this part of the mixer.



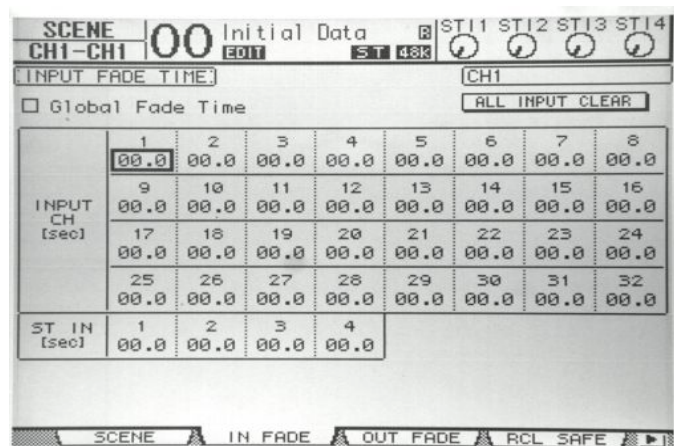
Bottom right side of console



Utility-User Defined Key Assign

## Using Scenes

Scenes and Scene changes can be used to balance the amplification and electronics of the front ensemble with the winds to achieve a consistent mix. The Scene-Input fade time menu will allow you to adjust the time that it takes (0-30 seconds) for each input fader (Input channels 1-32 and Stereo Inputs 1-4) to move to its new position in the new scene. Remember, this is how long it takes the fader **to arrive here** in the new scene. To adjust the time, use the arrows and scroll wheel on the right of the LCD screen to make your adjustments to each channel you wish to affect. The fader will gradually move to its new position in the time you have indicated when you change a scene.



Scene-Input Fade Time view

This powerful feature and the use of the motorized faders will let you control the dynamics of the instruments through the PA system. This can lead to consistent dynamic changes for electronic instruments when scene changes are implemented accurately in real time. It can also create gradual changes in dynamics from acoustic players to get an appropriate mix with the wind section.

Use the following formula to determine the amount of time you want to make a scene fade occur:

$$\text{(Number of beats x 60)} / \text{Tempo} = \text{Fade time in Seconds}$$

There are a number of options and approaches for using scenes. Here are a couple of ideas for how to use them in increasing number and complexity:

- Scenes could control microphone on/off settings to mute and un-mute microphones as soloists play and are tacet. (*1-5 Scenes for a show*)
- Scenes could be used in large rehearsal marking sections to balance the electronics and front ensemble amplification with the wind section. (*1-10 scenes per movement or production; 30-50 overall scenes*)
- Scenes could be used to control crescendo and diminuendo of phrases for electronic players instead of using expression pedals. (*15-20 scenes per movement; 50+ scenes*)

While changing the scene at the right time and being on the right scene may not seem like a difficult task, it is extremely important so that all of the “programming” and “digital re-mastering” you have done is realized in a performance. Make sure you take this into account as you develop and design how many scenes you want to use and the complexity you want to approach this element of your design.

## Studio Manager

Studio Manager with the 01v96i or 01v96VCM Editor is a powerful and useful program that can be used with a PC or Mac to program and control the mixer. The only functions that have to be done on the mixing console are setting the User defined layer and programming Scene input and output fade times. All of the other items can be programmed ahead of time and downloaded with a Studio Manager file onto the console. You can also back up the settings of your mixer. This can make the 01v96 a versatile piece of equipment; used equally by the marching band, jazz band, percussion ensemble, steel drum band, and as a PA for meetings and events. This software is available as a free download from Yamaha. Visit: [www.yamahaproaudio.com](http://www.yamahaproaudio.com)

Make sure to get the correct file for you operating system. (*Windows 32, 64 bit, or Macintosh*)

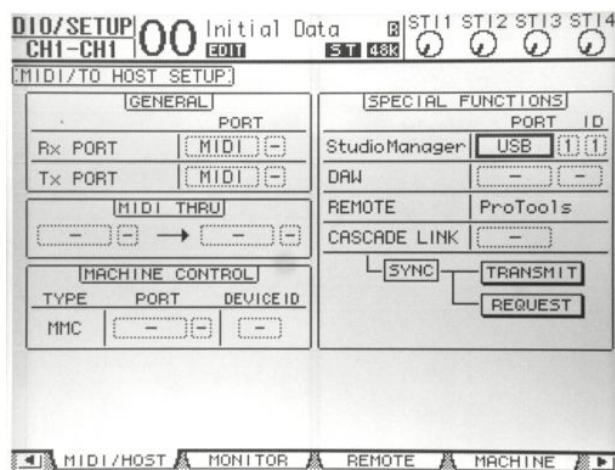
You will need a USB cable and the following items to get up and running with your mixer:

- USB driver
- Studio Manager Host Program
- 01v96i Editor or 01v96 VCM Editor

For a brief video on setting up your computer to work with Studio Manager, visit:

[http://www.youtube.com/watch?v=OKEFHgs\\_HyY](http://www.youtube.com/watch?v=OKEFHgs_HyY)

Make sure you have changed the Studio manager to USB using the arrow keys and scroll wheel in the Dio/Set up-MIDI/Host screen on the mixing console.



DIO/Setup MIDI/To Host Menu-Set Studio Manager to USB

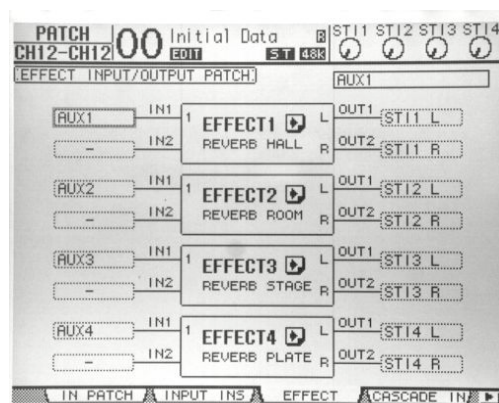


## Using Effects with the Yamaha 01v96i Digital Mixing Console

1. First, audio needs to be routed into the effect. Select the **Aux 1 Fader** using the Fader Mode buttons to the left of the LCD.



*By default, the effect sends are routed to Aux 1-4. This can be changed in the Patch: Effect Input/Output menu if desired.*



**Patch-Effect Input and Output Patch**

Push the selected channel's fader up to the required level. (*I recommend 0 dB*).

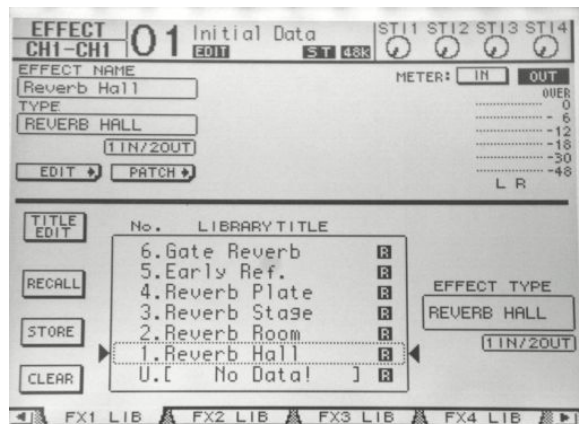
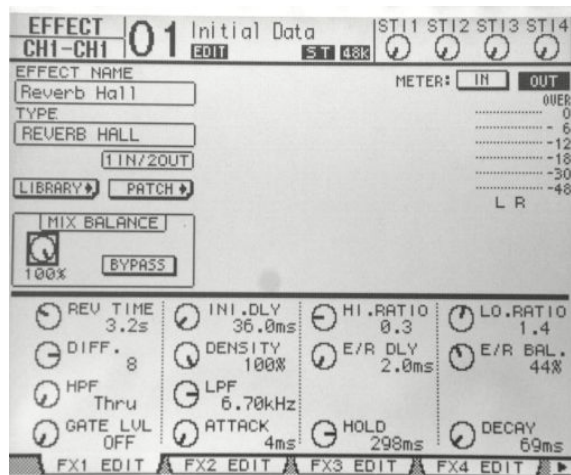
2. Check that the Aux 1 fader in the **Master Layer** is up to 0 dB. Select the Master Layer and adjust the fader position if necessary. (*You can adjust this fader in the Master layer or Assign it to a fader in the Remote User Defined Layer to adjust the amount of effect send in real time.*)



- Turn up the **ST IN 1 dial** (*right side of the mixer*) to start hearing the effect's output in the Stereo bus or PA speakers. Select the top layer for the ST IN channels. The level can be viewed in the top right corner of the LCD. (*I recommend making the circular dial that represents ST IN 1 face 3 o'clock. This setting is 0 dB and the circle will go black then.*)



- You can monitor, edit, or change the effect in the Effect Edit and Effect Library.



## Yamaha Motif XF and XS Synthesizer

The Yamaha Motif XF and XS series music production synthesizers are extremely versatile instruments that offer a wide variety of great sounds. There are 4 major modes (Voice, Performance, Song, and Master) that can be used with a Motif for performance in real time.

**Voice**-Voice mode is the replication of one instrument or voice for the full range of the keyboard.

*Example: Full Concert Grand Piano*



**Performance**-Performance mode is the combination or layering of up to 4 Voices. This can make for different sounds out of different playing zones of the instrument or the layering of two or more sounds in the same playing area to create new “instruments”.

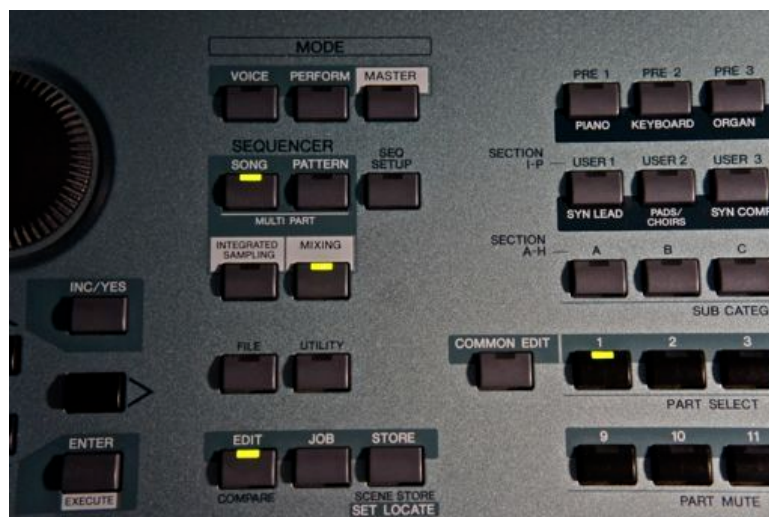
*Example: Nativity choir pad sounding in octaves except in the low register, Background Strings layered throughout the entire playing zone, and Lo Boy Bass in the bass register.*



**Song**-Song mode can be used to combine or layer up to 16 voices. This mode can create an incredibly large sound palette on the instrument. This mode can also be used in conjunction with an additional MIDI controller (keyboard, Mallet KAT, drum module, etc) that can trigger the sound engine of the MOTIF in addition to the MOTIF player.



To edit one of the voices in Song mode, Press Song-Mixing-Edit





- **Receive channel**-This is the MIDI channel that is being used to sound the selected voice. By making the receive channel the same, you can layer multiple voices to sound in various registers. You can also trigger sounds via an external MIDI controller and use the internal sound module of the Motif.
- **Bank and Number**-Select which voice you want to use for this Part.
- **Volume**-Select the volume (0-127) to use for the selected Part.
- **Note Shift**-By adjusting this number, you will alter the pitch that this voice is sounding out in half steps. You can move a pitch up to 2 octaves from the note you are playing. (Example: +12 = up one octave; -12= down one octave)
- **Note Limit**-This is the key zone that activates this voice. To adjust, you can scroll the wheel once selected or hold down the SF6 button beneath the screen and play the low or high note that you want to adjust.

**Master**-The Master mode can be used to place the Voice, Performance, and Song modes into an organized and sequential pattern for ease of use in a real time performance.



## Yamaha DTX-Multi 12

The DTX-Multi 12 is an extremely versatile electronic percussion instrument. Within a given “Kit”, the twelve velocity-sensitive pads can trigger up to 4 sounds each for a total of 48 sounds. It comes preloaded with 50 Preset Kits for immediate use. You can also create and save up to 200 of your own User Kits. It is possible to import up to 64 MB of AIF and WAV audio files from a wide range of sources and save them internally to the unit. This allows you to add virtually any sound you can imagine to your marching band, winter drum line, or percussion ensemble.

### Samples

To load samples into the DTX, you must use a formatted USB memory device. To format, plug the USB memory device into the side, navigate to the Format page (Utility 7-5 FORMAT) and press Enter. The flash drive is now formatted and ready to use with your instrument.

After the flash drive has been formatted, place the drive in your computer and move the WAV or AIFF file to be imported to the USB device’s root directory. Plug the USB device back into the DTX’s USB port.

To assign **individual** audio files into the DTX-Multi 12; hold down the SHIFT button and press the WAVE button to open the IMPORT page. Use the -/Dec and +/Inc buttons to select the audio file you want to import. Press the ENTER button to import the file.

The IMPORT page will allow you to assign the sample to a pad within the currently selected kit. Use the -/Dec and +/Inc buttons or hit the pad you want to assign the audio file to. You can also save the imported wave file by selecting the “off” setting.

When you have assigned the wave file, press the ENTER button to complete the procedure. Press the KIT button to return to the KIT setting area. Press the STORE button to store the current kit and its new wave assignment as a User kit. When asked to confirm that you want to store the kit, press the ENTER button to proceed.

The DTX-Multi 12 also has a vast number of great internal sounds that can be made into user defined percussion “kits” and used in a variety of ways. You can also connect other electronic drum pads, pedals, and triggers and use them in conjunction with the DTX.

For more instructions on using the many features of the DTX, consult the easy to use manual included with the unit or visit [www.yamaha.com](http://www.yamaha.com) for a PDF version.

## Amplification and Digital Mixing tips for percussion instruments

### Marimba

- Marimbas often use 2 microphones. They should NOT be paired, as they would then share the same EQ for the high and low microphone.
- Use an Input Fader Group to group marimba high and low microphones.
- Use an Input Mute Group to mute all marimba microphones easily.
- Develop an EQ setting of a HPF and LPF to isolate the frequency range that you are trying to pick up with the microphone. This should be different for the high and low microphone.
- Develop a gate that works for your microphone placement, instruments, and players. Try to have it turn the microphones on when they play a soft volume, but off when they are tacet.
- Decide on how you want to pan the instrument by its set up. This may be different from marimba to marimba or you can leave it centered to get an equal sound out of both speakers.
- Save your channel information into the channel library (one for the High marimba and one for the Low Marimba) and easily apply it to other marimba channels. Adjust the Pan for each as appropriate (*see above bullet point*).

### Vibraphone

- Vibraphones often use one microphone. Due to microphone placement (usually lower), the gain is often different on this instrument than the marimba.
- Use an Input Fader Group to group vibraphones and move them as a choir with one fader.
- Use an Input Mute Group to mute all vibraphone microphones easily.
- Develop an EQ setting of a HPF (high pass filter) and LPF (low pass filter) to isolate the frequency range that you are trying to pick up with the microphone. Leave some room for the frequencies at the top of the instrument to ring. (*at least 2 octaves above the highest note is recommended*)
- Develop a gate that works for your microphone placement, instruments, and players-try to have it turn the microphones on when they play a soft volume, but off when they are tacet. *The hold and decay settings are typically longer for vibraphone gates due to the instrument's resonant nature. Make sure the gate doesn't cut the sound off in the PA before the natural sound of the instrument has decayed on long tones.*
- Decide on how you want to pan the instrument by its set up. This may be different from vibraphone to vibraphone or you can leave it centered to get an equal sound out of both speakers.
- Save the channel information into the channel library and easily apply it to other vibraphone channels. Adjust the Pan for each as appropriate (*see above bullet point*).

## Timpani

- Timpani often use 2 or more microphones. Try to place the microphone aiming down at the drum head to reduce wind noise and other sounds near the performer.
- Use an Input Fader Group to group timpani microphones and move them as a choir with one fader.
- Use an Input Mute Group to mute all timpani microphones easily.
- Develop an EQ setting of a HPF and LPF to isolate the frequency range that you are trying to pick up with the microphone. Leave some room for the frequencies at the top of the instrument to ring. *(at least 2 octaves above the highest note is recommended)*
- Develop a gate that works for your microphone placement, instruments, and players-try to have it turn the microphones on when they play a soft volume, but off when they are tacet. *The hold and decay settings are typically longer for timpani gates due to the instrument's resonant nature. Make sure the gate doesn't cut the sound off in the PA before the natural sound of the instrument has decayed on long tones.*
- Decide on how you want to pan the instrument by its set up. You may decide to pan the sound so that it is directional to the player's set up or you can leave it centered to get an equal sound out of both speakers.
- Save your channel information into the channel library for future use.

## Drum set *(also applies to hand drums and percussion amplification)*

- The drum set often use 5 or more microphones. Make sure you are using the correct microphone for this application and try and get the microphone placement correct to achieve your best sound.
- Make sure the gain settings are so that the channel does not clip when played aggressively.
- After you have a mix of the separate channels of the drum set, use an Input Group to group the drum set microphones and move them as a choir with one fader.
- Use a Mute Group to mute all of the drum set microphones easily.
- Use the built in EQ Library for the components of your drum set. Experiment with the different variations until you find a sound that you like.
- Use the built in Library of gates and compressors as a start. This is more important for sound "bleed over" on a drum set due to the proximity of the microphones to each other.
- Develop a gate that works for your microphone placement, especially for the snare drum and toms. This will help to isolate the sound of each drum.
- Don't use a gate on the Hi hat. You will want to capture all of the sensitive playing that this instrument displays.
- If you use two snare drum microphones (top and bottom), make sure to put one of the microphones out of phase with the other.



## Electronic Instruments (Synthesizers, Samplers, Electronic Drums, iPod)

- Pair the inputs in adjacent channels.
- Pan one channel L63, the other R63 to correspond to the L and R output from the instrument. This will give you the ability to pan on the instrument and have that affect come across in your PA.
- Set a limiting compressor (limiter) so that the instrument cannot clip due to a wrong setting or being played too aggressively.
- Do **not** use a gate. Consider using some compression on synthesizers for weaker players to “average out” their playing. Be aware that this will reduce the performer’s range of musical expression.

## Expanding, Controlling, and Refining your PA’s Output

The Omni Outs 1-4 on the rear panel of the mixer can be used in conjunction with the Aux 1-4 Faders (*Master layer*) to add additional speaker sets to the Stereo L/R Main outputs of your system for further sound reinforcement and to create special sound effects. You can also create a separate subwoofer or monitor mix with these outputs.

## Speakers

- **Active**-amplifier is attached to the speaker; uses XLR or 1/4” cable for signal and an extension cord for power
- **Passive**-uses an XLR or 1/4” cable out of the mixer to the amplifier; amplifier sends signal and power using a Speak on cable or 1/4” speaker cable
- **Subwoofer**-a subwoofer typically handles the lower frequencies in a PA system; usually 150 Hz and lower. 15” and 18” sized “woofers” are common.
- **Full Range**-a full range speaker can handle high, mid, and low frequencies. A horn and two 15” woofers are common in a “tower” like shape.
- **Mid/High Range**-a mid/high range speaker is designed to handle mid and high frequencies. They can go down into what is considered “low” frequencies, but they are best used in conjunction with a subwoofer.
- **Monitor**-monitor speakers are used by the performers so that they can hear themselves more clearly. They are often smaller sized speakers.

## Amplifier

Provides power to passive speakers. Yamaha amplifiers come equipped with a crossover. A **crossover** is an element that can discern and distribute the signals by frequency in Hz to a speaker. This is often used with subwoofer and high/mid range speakers to keep the appropriate frequencies routed to their respective speakers.

## Electronic Instruments

- **Synthesizer**-Yamaha MOTIF, MOX, and MX Series-able to produce single or layered sounds
- **Samplers and Electronic Drums**-Yamaha DTX 12 Multi Percussion Instrument and Sampler and the DTX series of Electronic drum kits and sound modules
- **Accessories**-Yamaha FC 3 Half damper and FC 4 Sustain Pedals, Yamaha FC 5 Switch pedal, Yamaha FC 7 Expression pedal, Furman SS 6B Power strip
- **DI Box**-a Direct-Inject box is used with electronic instruments that cannot be plugged directly into the mixer with 1/4" cables. A DI box makes a "line level" signal out of this instrument and its used helps to avoid the "hum" one can experience when using electronic instruments with cables over a distance greater than 10 feet.

## Microphones

- **Audio Technica 2035 with shock mount**-larger condenser=greater fidelity and range of pick up; feeds back easier when not set up properly
- **Shure Beta 98 H/C with built in shock mount**-smaller condenser=less fidelity and smaller range of pick up than AT 2035; does not feed back as easily as the AT 2035 and easier to attach to instruments (especially winds)

## Cables

- **XLR Male and Female**-balanced cables that are used with microphones
- **1/4" Balanced or Stereo (TRS or Tip Ring Sleeve)**-2 *lines*-used with some electronic instruments and parts of your PA system
- **1/4" Instrument or Mono (TS or Tip Sleeve)**-1 *line*-used with some electronic instruments
- **Speak-On**-latching speaker cable for passive speakers and amplifiers
- **MIDI**-5 Pin cable used to connect controllers and electronic instruments together
- **RCA or Phono**-used with some samplers and iPods
- **ADAT**-used for external preamps; can carry multiple channels of audio in one small cable
- **BNC (Word Clock)**-used for external preamps to sync digital signals
- **DB 25**-used for multiple XLR microphone connections with one cable
- **Planet Waves Breakout and Core Cables**-connect up to 8 channels of XLR with one cable
- **Audio Stage Snake**-contain XLR and 1/4" Sends and Returns in various lengths

Look for an iBook on Front Ensemble Amplification and the Yamaha 01v96 Mixer in the Spring of 2014.

For more information or to setup electronics and amplification consulting contact:

Tom McGillen at [tommcgillen@me.com](mailto:tommcgillen@me.com) or John Brennan at [john.brennan@pisd.edu](mailto:john.brennan@pisd.edu)