

## Lesson 2: The DAW

### #1 Lesson Overview

- Defining PRODUCTION: **Pre Production** - composing song, planning. **Production** is the actual tracking/recording. **Post Production** - Editing-Mixing-Mastering.
- All DAWs have the same basic features / functions.
- MIDI** (Musical Instrument Digital Interface) a realtime interpretation of a score.

### #2 Analog to Digital

**Computer can only process Binary Info:** Based on the **BIT**, single memory location. 1 or 0.

1 Bit word	2 Bit word	3 Bit word	Decimal number
0	00	000	0
1	01	001	1
10	010	010	2
11	011	011	3
	100	100	4
	101	101	5
	110	110	6
	111	111	7

2<sup>wordlength</sup>    2    4    8

$$2^8 = 256$$

$$2^9 = 512$$

$$2^{10} = 1,024$$

$$2^{11} = 2,048$$

$$2^{22} = 4,194,304$$

$$2^{23} = 8,388,608$$

$$2^{24} = 16,777,216$$

- CD Standard: 16-Bit word; In the studio: 24-bit, gives you a wider dynamic range. Every Bit doubles in value.
- Word Length** is related to **amplitude** (the longer the word length, the wider the dynamic range - resolution).

- 24-bit recording** allows you record quieter. Always do this!

- Sampling Rate (related to frequency)** how often we do the measurements. We have to measure 40,000 times per second. The higher the sampling rate the more accurately it represents the higher frequencies. Higher sampling rates are used in video. **Use 48,000 Hz sampling rate.** Speeding up the rate shortens up the length and vice versa.

**Audio CD Standard**  
**16-bit wordlength**  
**44,100 samples/sec.**

### #3 Buffer Size

- Computer collects a "QUE" (buffer) of samples.

**Lowering buffer size reduces latency, but also reduces the number of plugins that can be used.**

**Raising buffer size increases latency, and increases the number of plugins that can be used.**

**While recording use a low buffer size, try 128 samples. During post production raise buffer size to 1024 when necessary.**

- Everything is based on powers of 2.
- You always need to set your buffer size.

- Increase buffer size when computer starts choking.

- Freezing a Track** - computer records to audio and reduces CPU Strain.
- Buffer size** is a collection of individual samples.

**Sample Rate of 48 KHz**  
**= 48,000 samples/sec.**

**Buffer Size = 128 samples**

**Delay = 2 milliseconds**

**Sample Rate of 48 KHz**  
**= 48,000 samples/sec.**

**Buffer Size = 1024 samples**

**Delay = 21.3 milliseconds**

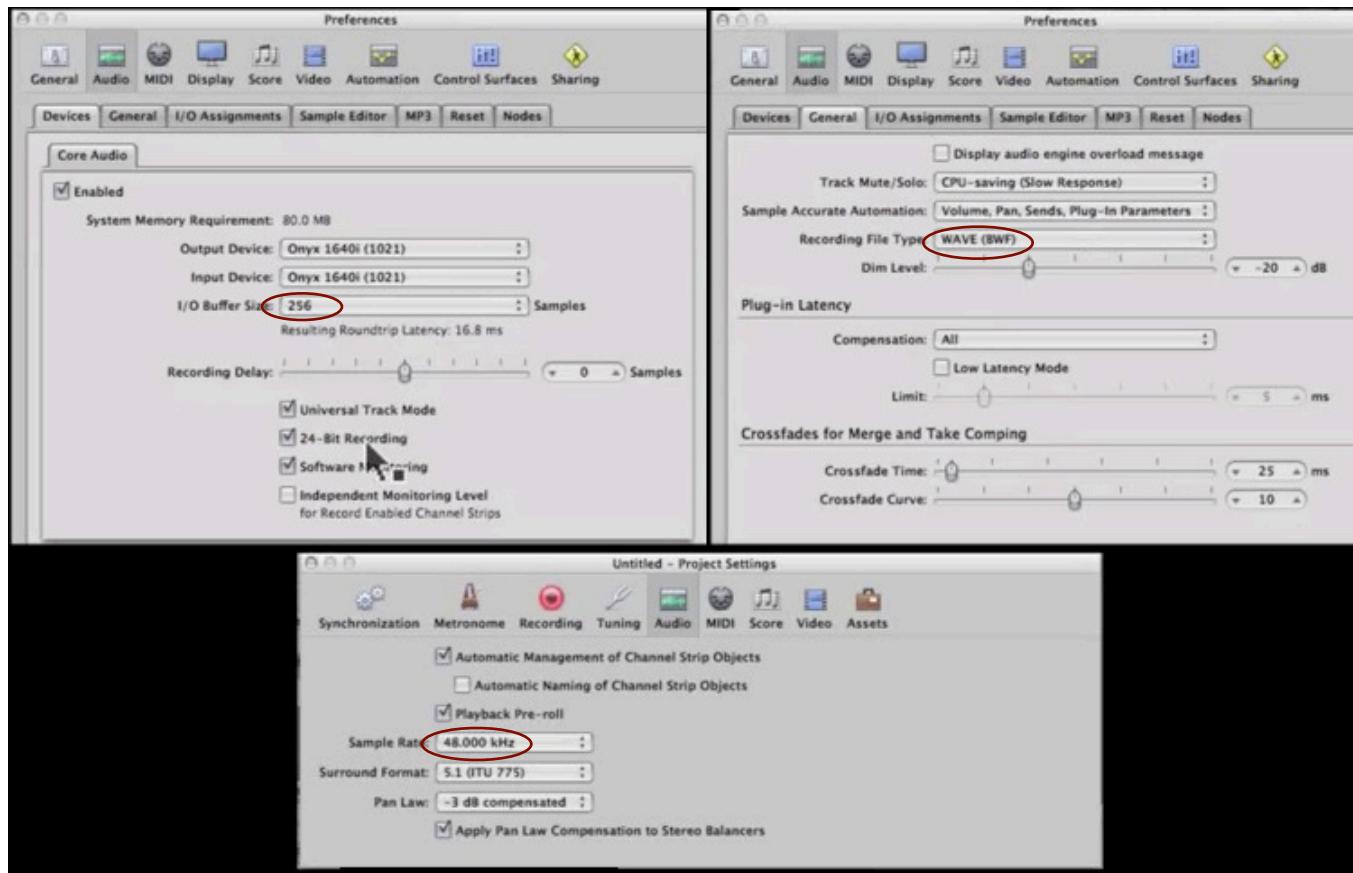
- You may need to constantly adjust buffer sizes during the production process if you do not have a high powered computer.

### #4 File Size

- An increase in **bit depth and sample rate** makes much larger files.
- Data Compression** - like a zip file - lossless, keeps all data but reduces file size.
- Audio Compression** - WAV or AIFF large, highest quality (lossless). **Broadcast Wav (BWF)** Files stores more metadata - use if possible.
- Interleaved (iTunes)** - single file that includes both left / right audio channel - use this, along with 24 Bit and 48 kHz Sample Rate. 128 samples Buffer Size for Recording.
- De-Interleaved** - separate files for left and right.

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### The LOGIC SETUP of PREFERENCES



### #5 Project Folder (6:18)

- Contains a Proprietary File and the ASSETS: Project File, Audio Files, Crossfades, Analysis Files, Undo History (Backups) and Intermediary files for time stretching. Look at your DAWs Folder.
- Do not save a project folder inside another project folder.**
- To Share:** Move the entire Project Folder with all the assets. Leave things the way are saved by the DAW. Zip.
- IN LOGIC:** 2 project files can occupy the same Project Folder, utilizing the same Audio Files Folder.

### #6 Project Checklist

#### Preproduction Checklist

- Proper Project Name and Location
- Digital Audio Preferences
- Recording File Type
- Hardware Settings
- Buffer Size**

### #7 Multitrack

- Types of Tracks:** **AUDIO** (some have Mono and Stereo); **MIDI** - real time "score"; **AUX** - provides routing capabilities, submix, effects, **routing tool**.
- INSTRUMENT** - inputs one type of data and outputs another. **GLOBAL** - tempo, & meter changes, markers and key changes.

### #8 Recording Audio

- Mono or Stereo** - Input makes a BIG difference. Single Mic or pickup (Mono) - use this most of the time. Name it for organization.
- Instrument** - buffer needs to be low, 24 bit, sample rate 48K.

#### Recording Checklist

Check your settings  
 Create a track (remember mono or stereo)  
 Name the track  
 Record enable the track  
 Set levels using the microphone preamp  
 Enable the click and countoff  
 Record

- Audio - 3/4 of the way up the meter. Always trust your ears.
- Turn off the click and listen.

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### #8 Recording Audio, Recording (LogicX), con't



- Record another version by duplicating the last track:



- You can edit between them and pick the best performance.

### #9 Trimming (LogicX)

- Strive to get a great recording rather than editing right away. **Use editing for fine tuning.**
- Two things are created when you record: an **Audio File** and a **REGION (Clip)** - it's a window into the sound file, a reference. Much of the editing we do is only to the regions. Non destructive editing, not editing the underlying data audio file.
- 1st thing we can do - adjust it to a region is **TRIMMING** - adjust it's bounds. (Play with editing the bounds of the regions in your DAW.)

### #10 Separating and Cutting (Split at Playhead) (LogicX)

- Split the region: REGION - (Logic) Split in icon bar at top. (or Cmd + T)

### #11 The Grid (LogicX)

- When Moving a Region - be able to turn off grid easily and change the resolution.
- Learn the modifier key that bypasses the grid: CNTL G.

Modifiers:  ⌘ Shift  
 ⌘ Ctrl  
 ⌘ Opt  
 ⌘ Cmd

### #12 Fades (LogicX)

- Sometimes there are pops or clicks at a split region. Use a perimeter to cut out at zero crossing, hides the noise of that sound.
- Learn key command to add a fade. **CNTL I (fade in) CNTL O (fade out)**
- When you are overlapping regions, apply a **cross-fade**. 1st region dips down and 2nd comes up. Usually in the regions, but see if there's a key command. **Option X**.

**Fade In** ⌘I   **Fade Out** ⌘O

### #13 Zooming (LogicX)

- Select First, then Zoom.** Keeps selection right in the middle of the screen. **Under + in far right corner.**

**Zoom Window**  
 ⌘M  
**Zoom Horizontal Out**  
 ⌘←  
**Zoom Horizontal In**  
 ⌘→  
**Zoom Vertical Out**  
 ⌘↑  
**Zoom Vertical In**  
 ⌘↓  
**Recall Zoom 1**  
 ⌘↑⌘1  
**Recall Zoom 2**  
 ⌘↑⌘2  
**Recall Zoom 3**  
 ⌘↑⌘3

### #14 Cycling (LogicX)

- (Repeat)** Learn how to cycle a section: turn off and turn on.

**Cycle Mode**

C

**Cycle Audition**

⌘C

### #15 Merging-Join (LogicX)

- With lots of regions and lots of cross-fades - you can make a new audio file with all the edits - consolidating or merging. **This is destructive edit.**

**Join Regions/Notes**

⌘J

**Join Regions per Tracks**

J

### #16 Naming and Coloring Regions (LogicX)

- Right mouse click to colorize, (Text Tool Under + in far right corner.)

**Show/Hide Colors**

⌘C

**Color Tracks by Region Color**

⌘⌘C

**Color Regions by Track Color**

⌘C

### #17 Markers (LogicX)

- Specific location in your song. Logic: In Global tracks. You can also colorize - pick color wheel, colors type.

**Create Marker**

⌘'

**Create Marker for Selected Regions**

⌘⇧'

**Delete Marker**

⌘⌫

**Go to Previous Marker**

⌘,

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### #18 Comping (LogicX)

- Choosing the best features from all tracks or takes into one track.
- Create a new track, set the input to NONE.
- Grid set to BAR.
- Using OPTION and select cuts and move to the new track.

**Rename Take or Comp**



**Delete Take or Comp**



**Toggle Take Folder Quick Swipe Comping Mode**



### #19 Midi

#### Musical Instrument Digital Interface

- Midi data messages are relayed in CHANNELS: 1-16 like TV Channels. Its not a direct representation of SOUND - it's like a SCORE.

**Common MIDI Messages:**  
**Note On and Off**  
**Control Change**  
**Pitch Bend**

- 2 data words** (7 bit numbers - see below): gives us the parameters of the message: On or Off, or what note it is, and the velocity.

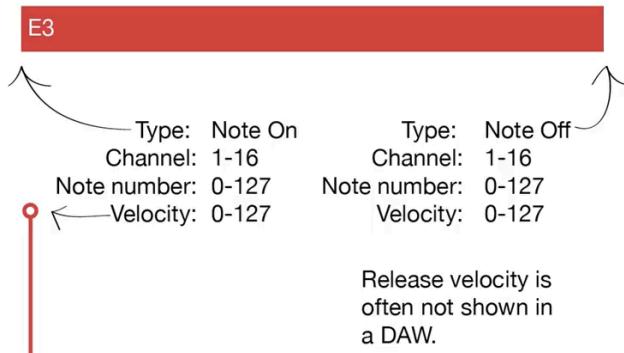
$$2^7 = 128$$

The two data words each have a range of **0-127**.

- Not all controllers send velocity.
- Stuck Note: A Panic sends a All Notes Off.

**"Sustain"**  
 is control channel 64

A MIDI note is two messages



- Channel Pressure is also known as Aftertouch.
- There's a SENDING machine and a RECEIVING device and the latter determines what happens with the data.
- Midi going to a DAW is Automation, to a Midi Synthesizer it's a control change message.

**"Synthesizer"**

creates sound from a geometric waveform or formula

**"Sampler"**

plays back pre-recorded audio

### #19 Midi Controllers

- Class Compliant:** doesn't need a driver.
- Uses 5 pin Din Cable. Midi keyboards are connected through a USB, which is bi-directional.
- 8 knobs on Midi Keys controls 8 parameters. Can be configured to send any Control Change (CC). Software can also be used.
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### #20 Software Instruments

- Midi Data Performance:** Plugins can be used in a DAW, virtual instruments.
- Go to your DAW and add a soft-synth.

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### #21 MIDI Edition: Velocity

- In Midi Data: every single note is a separate event that can be edited individually, just like audio, except that the view is different, like a BAR instead of a wave.
- Adjust the velocity in a piano roll in your DAW.

### #21 MIDI Editing: Quantization

- Tightens up a performance in by pulling up to subdivisions.
- First, set the grid, 16th note is a good place to start, but adjust according to your performance notes.
- Quantization strength - how close to the grid it goes: 100% pulls all the way the he grid.

Use 20% repeatedly until it sounds good enough that it still retains the human feel.

### #22 Common MIDI Recoding and Editing Functions

- Multi-Sampling:** different velocities recorded for an instrument.
- Synthesizers will tax your CPU, calculating the waveforms in real time.
- Piano Roll or Midi Editor** - find velocities for editing. You have to scroll vertical and horizontally and zoom.
- You can grab the edge, middle or move to a different pitch. To get an audio sound, use midi monitor or headphones icon in your DAW.
- To quantize small portions, right mouse click quantize, and set the grid, amount: 20% and keep using that until you like it. Some allow start/end quantize. Doing just the beginnings of notes and leaving the endings as they are make for a more musical performance.
- Overall Quantize: 50%.
- Voicing:** Octave (also called range or register) changing. He moved the lower note up an octave.
- Batch Processing:** Select all, move all velocities down at once.
- Overdub or Midi Merge** to add a melody over it. (Creates it on a line above the chords)

L  
O  
G  
I  
C  
X



**Lesson 2, Con't: The DAW****MIDI Control Change Messages – Continuous Controllers**

MIDI CC Number	MIDI CC Purpose	MIDI CC Description
MIDI CC 0	Bank Select	Allows user to switch bank for patch selection. Program change used with Bank Select. MIDI can access 16,384 patches per MIDI channel.
MIDI CC 1	Modulation	Generally this CC controls a vibrato effect (pitch, loudness, brightness). What is modulated is based on the patch.
MIDI CC 2	Breath Controller	Often times associated with aftertouch messages. It was originally intended for use with a breath MIDI controller in which blowing harder produced higher MIDI control values. It can be used for modulation as well.
MIDI CC 3	Undefined	
MIDI CC 4	Foot Controller	Often used with aftertouch messages. It can send a continuous stream of values based on how the pedal is used.
MIDI CC 5	Portamento Time	Controls portamento rate to slide between 2 notes played subsequently.
MIDI CC 6	Data Entry Most Significant Bit(MSB)	Controls Value for NRPN or RPN parameters.
MIDI CC 7	Volume	Control the volume of the channel
MIDI CC 8	Balance	Controls the left and right balance, generally for stereo patches. 0 = hard left, 64 = center, 127 = hard right
MIDI CC 9	Undefined	
MIDI CC 10	Pan	Controls the left and right balance, generally for mono patches. 0 = hard left, 64 = center, 127 = hard right
MIDI CC 11	Expression	Expression is a percentage of volume (CC7).
MIDI CC 12	Effect Controller 1	Usually used to control a parameter of an effect within the synth/workstation.
MIDI CC 13	Effect Controller 2	Usually used to control a parameter of an effect within the synth/workstation.
MIDI CC 14	Undefined	
MIDI CC 15	Undefined	
MIDI CC 16 – 19	General Purpose	
MIDI CC 20 – 31	Undefined	
MIDI CC 32 – 63	Controller 0-31 Least Significant Bit (LSB)	
MIDI CC 64	Damper Pedal / Sustain Pedal	On/Off switch that controls sustain. (See also Sostenuto CC 66) 0 to 63 = Off, 64 to 127 = On
MIDI CC 65	Portamento On/Off Switch	On/Off switch 0 to 63 = Off, 64 to 127 = On
MIDI CC 66	Sostenuto On/Off Switch	On/Off switch – Like the Sustain controller (CC 64). However it only holds notes that were "On" when the pedal was pressed. People use it to "hold" chords and play melodies over the held chord. 0 to 63 = Off, 64 to 127 = On

MIDI CC 67	Soft Pedal On/Off Switch	On/Off switch - Lowers the volume of notes played. 0 to 63 = Off, 64 to 127 = On
MIDI CC 68	Legato FootSwitch	On/Off switch - Turns Legato effect between 2 subsequent notes On or Off. 0 to 63 = Off, 64 to 127 = On
MIDI CC 69	Hold 2	Another way to "hold notes" (see MIDI CC 64 and MIDI CC 66). However notes fade out according to their release parameter rather than when the pedal is released.
MIDI CC 70	Sound Controller 1	Usually controls the way a sound is produced. Default = Sound Variation.
MIDI CC 71	Sound Controller 2	Allows shaping the Voltage Controlled Filter (VCF). Default = Resonance - also(Timbre or Harmonics)
MIDI CC 72	Sound Controller 3	Controls release time of the Voltage controlled Amplifier (VCA). Default = Release Time.
MIDI CC 73	Sound Controller 4	Controls the "Attack" of a sound. The attack is the amount of time it takes for the sound to reach maximum amplitude.
MIDI CC 74	Sound Controller 5	Controls VCFs cutoff frequency of the filter.
MIDI CC 75	Sound Controller 6	Generic – Some manufacturers may use to further shave their sounds.
MIDI CC 76	Sound Controller 7	Generic – Some manufacturers may use to further shave their sounds.
MIDI CC 77	Sound Controller 8	Generic – Some manufacturers may use to further shave their sounds.
MIDI CC 78	Sound Controller 9	Generic – Some manufacturers may use to further shave their sounds.
MIDI CC 79	Sound Controller 10	Generic – Some manufacturers may use to further shave their sounds.
MIDI CC 80	General Purpose MIDI CC Controller	Generic On/Off switch 0 to 63 = Off, 64 to 127 = On
MIDI CC 81	General Purpose MIDI CC Controller	Generic On/Off switch 0 to 63 = Off, 64 to 127 = On
MIDI CC 82	General Purpose MIDI CC Controller	Generic On/Off switch 0 to 63 = Off, 64 to 127 = On
MIDI CC 83	General Purpose MIDI CC Controller	Generic On/Off switch 0 to 63 = Off, 64 to 127 = On
MIDI CC 84	Portamento CC Control	Controls the <b>amount of Portamento</b> .
MIDI CC 85 – 90	Undefined	
MIDI CC 91	Effect 1 Depth	Usually controls reverb send amount
MIDI CC 92	Effect 2 Depth	Usually controls tremolo amount
MIDI CC 93	Effect 3 Depth	Usually controls chorus amount
MIDI CC 94	Effect 4 Depth	Usually controls detune amount
MIDI CC 95	Effect 5 Depth	Usually controls phaser amount

MIDI CC 96	(+1) Data Increment	Usually used to increment data for RPN and NRPN messages.
MIDI CC 97	(-1) Data Decrement	Usually used to decrement data for RPN and NRPN messages.
MIDI CC 98	Non-Registered Parameter Number LSB (NRPN)	For controllers 6, 38, 96, and 97, it selects the NRPN parameter.
MIDI CC 99	Non-Registered Parameter Number MSB (NRPN)	For controllers 6, 38, 96, and 97, it selects the NRPN parameter.
MIDI CC 100	Registered Parameter Number LSB (RPN)	For controllers 6, 38, 96, and 97, it selects the RPN parameter.
MIDI CC 101	Registered Parameter Number MSB (RPN)	For controllers 6, 38, 96, and 97, it selects the RPN parameter.
MIDI CC 102 – 119	Undefined	
MIDI CC 120 to 127 are "Channel Mode Messages."		
MIDI CC 120	All Sound Off	Mutes all sounding notes. It does so regardless of release time or sustain. (See MIDI CC 123)
MIDI CC 121	Reset All Controllers	It will reset all controllers to their default.
MIDI CC 122	Local On/Off Switch	Turns internal connection of a MIDI keyboard/workstation, etc. On or Off. If you use a computer, you will most likely want local control off to avoid notes being played twice. Once locally and twice when the note is sent back from the computer to your keyboard.
MIDI CC 123	All Notes Off	Mutes all sounding notes. Release time will still be maintained, and notes held by sustain will not turn off until sustain pedal is depressed.
MIDI CC 124	Omni Mode Off	Sets to "Omni Off" mode.
MIDI CC 125	Omni Mode On	Sets to "Omni On" mode.
MIDI CC 126	Mono Mode	Sets device mode to Monophonic.
MIDI CC 127	Poly Mode	Sets device mode to Polyphonic.