

# 음악 프로그래밍

2017.9.14.

조 현 의

## ❖ Music Programming 과정 개요

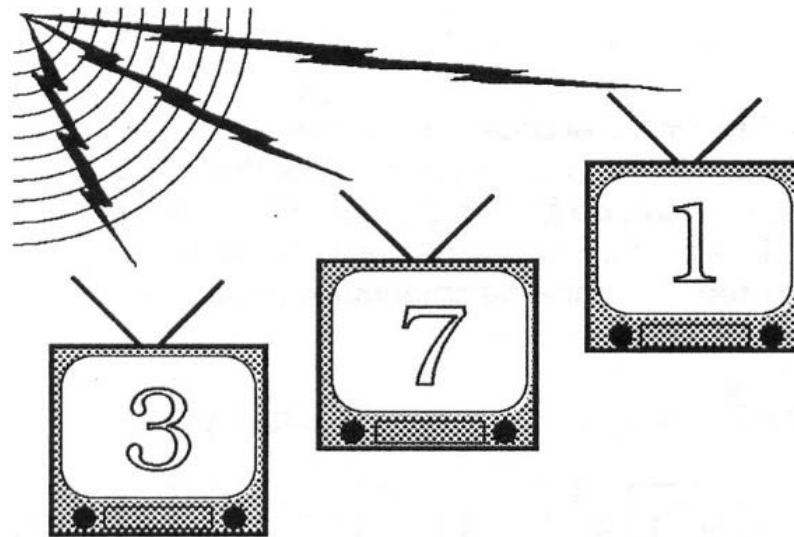
- 1 단계 - MIDI 시스템
- 2 단계 - MaxMSP 활용
- 3 단계 - Chuck 언어를 이용한 프로그래밍

## ❖ MIDI

- MIDI - **M**usical **I**nstrument **D**igital **I**nterface
- 현대 대중음악과 프로덕션 관련 산업의 발전에 큰 기여
- 여러 개의 디지털 장비들이 기능적으로 연결되어 음악을 연주/제작할 수 있게 함
  - synthesizers
  - samplers
  - drum machines
  - control surfaces
  - computers

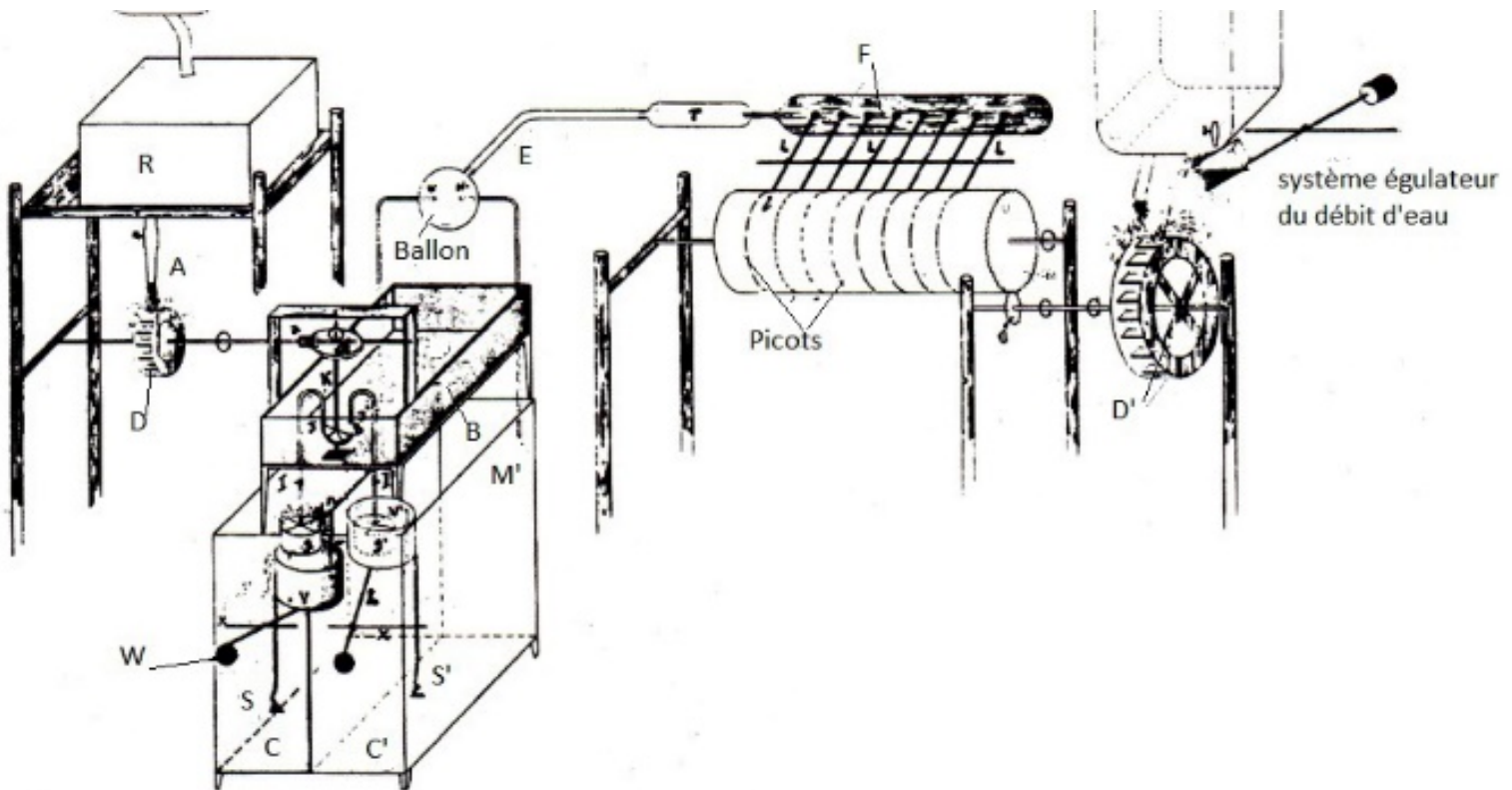
## ❖ MIDI 신호의 전송

- 8bit Primitive Computer protocol
- 단방향 통신, TV 신호의 전송과 유사
- 여러 개의 채널로 구분된 프로토콜을 전송



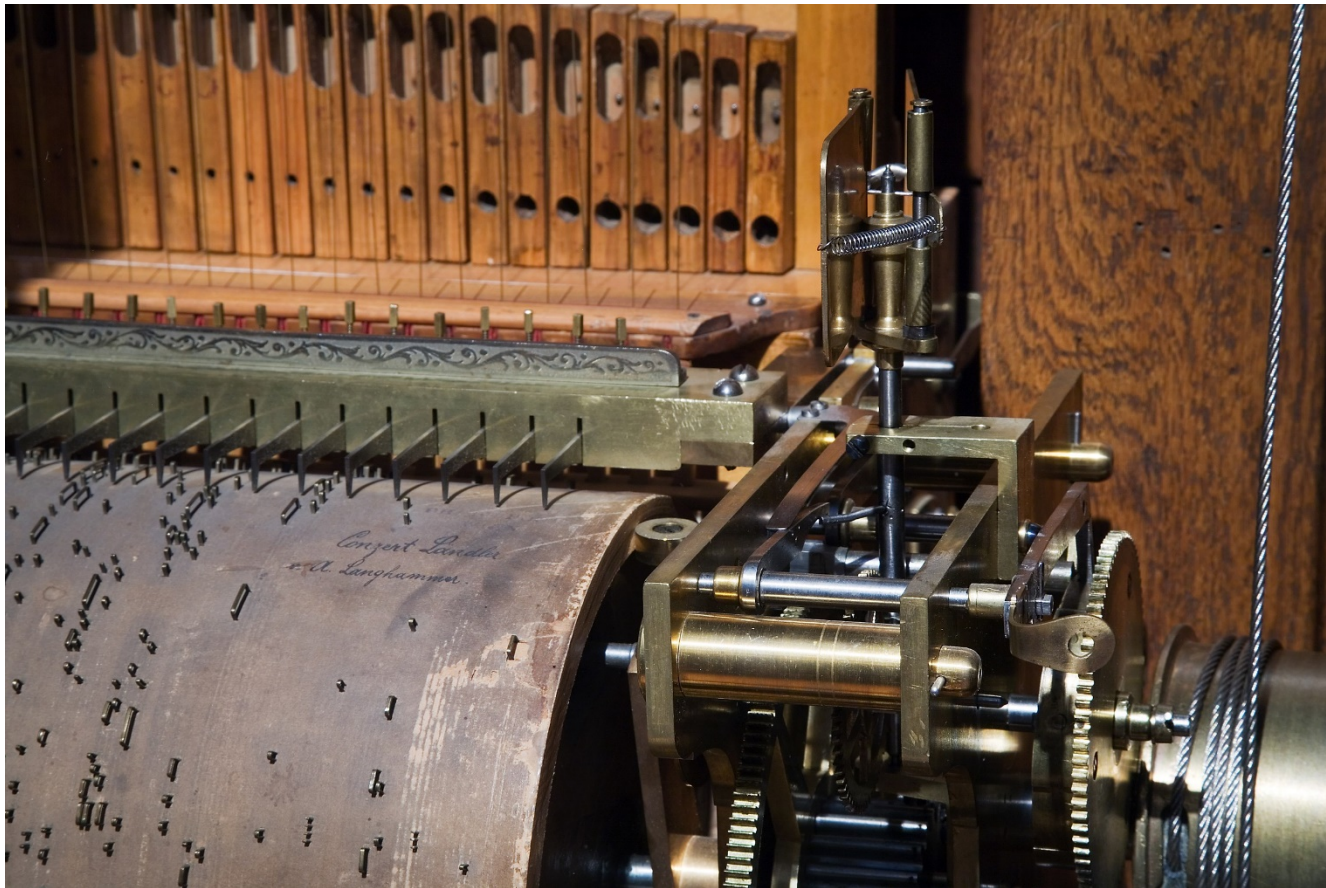
## ❖ MIDI 의 역사

- 서기 850년 이란에서 발명된 최초의 기계적 악기 연주 시스템



## ❖ MIDI 의 역사

- 1980년대 초 MIDI 시스템 개발



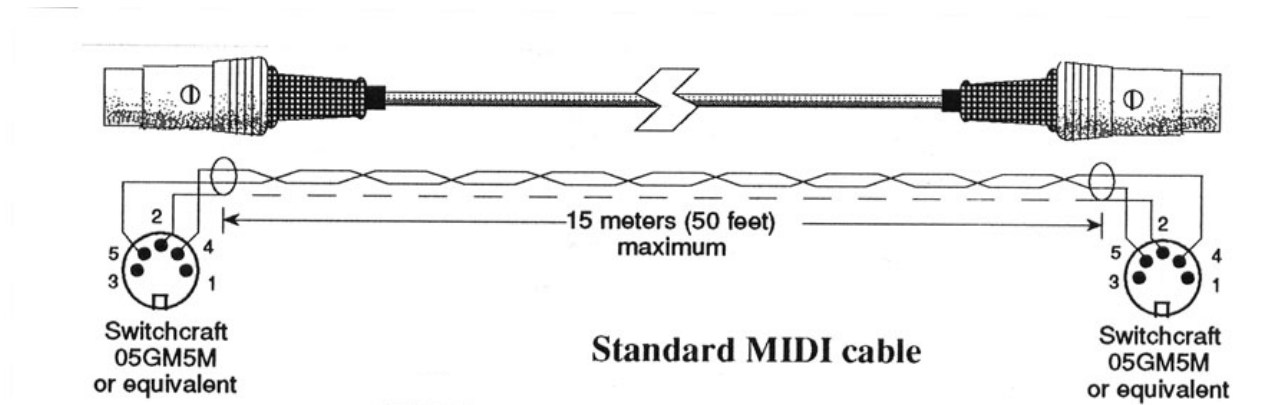
## ❖ MIDI 의 역사

- 1960년대 Synthesizer 개발 – 전자 악기의 시작
- 1980년대 초 Dave Smith & Ikutaro Kakehashi(Roland) MIDI 개발
- 초기 많은 뮤지션들에 의해 '느리고 어렵다'는 이유로 외면
- 짧은 시간에 현대 대중음악의 틀을 바꾼 혁명
- 현재도 MIDI spec 은 ver 1.0



## ❖ MIDI cable

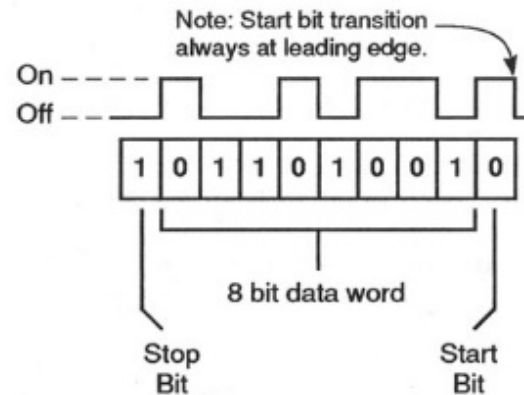
- MIDI 시스템 신호 전송에는 5-pin DIN plug 사용



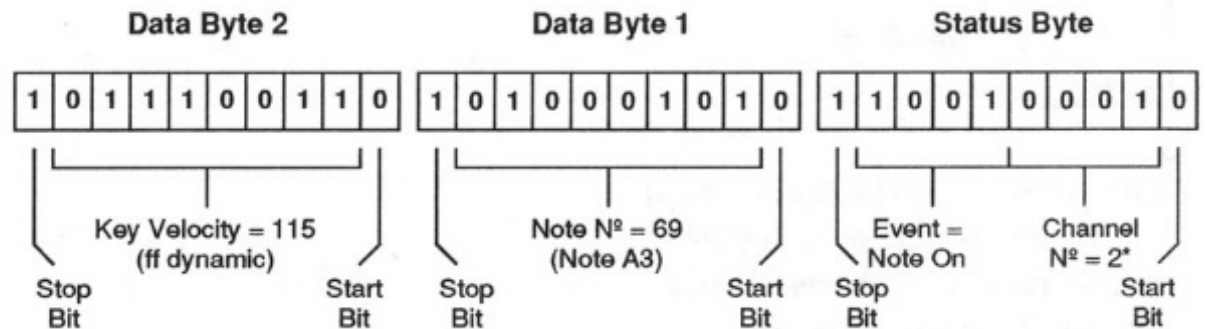


## ❖ MIDI Data Structure

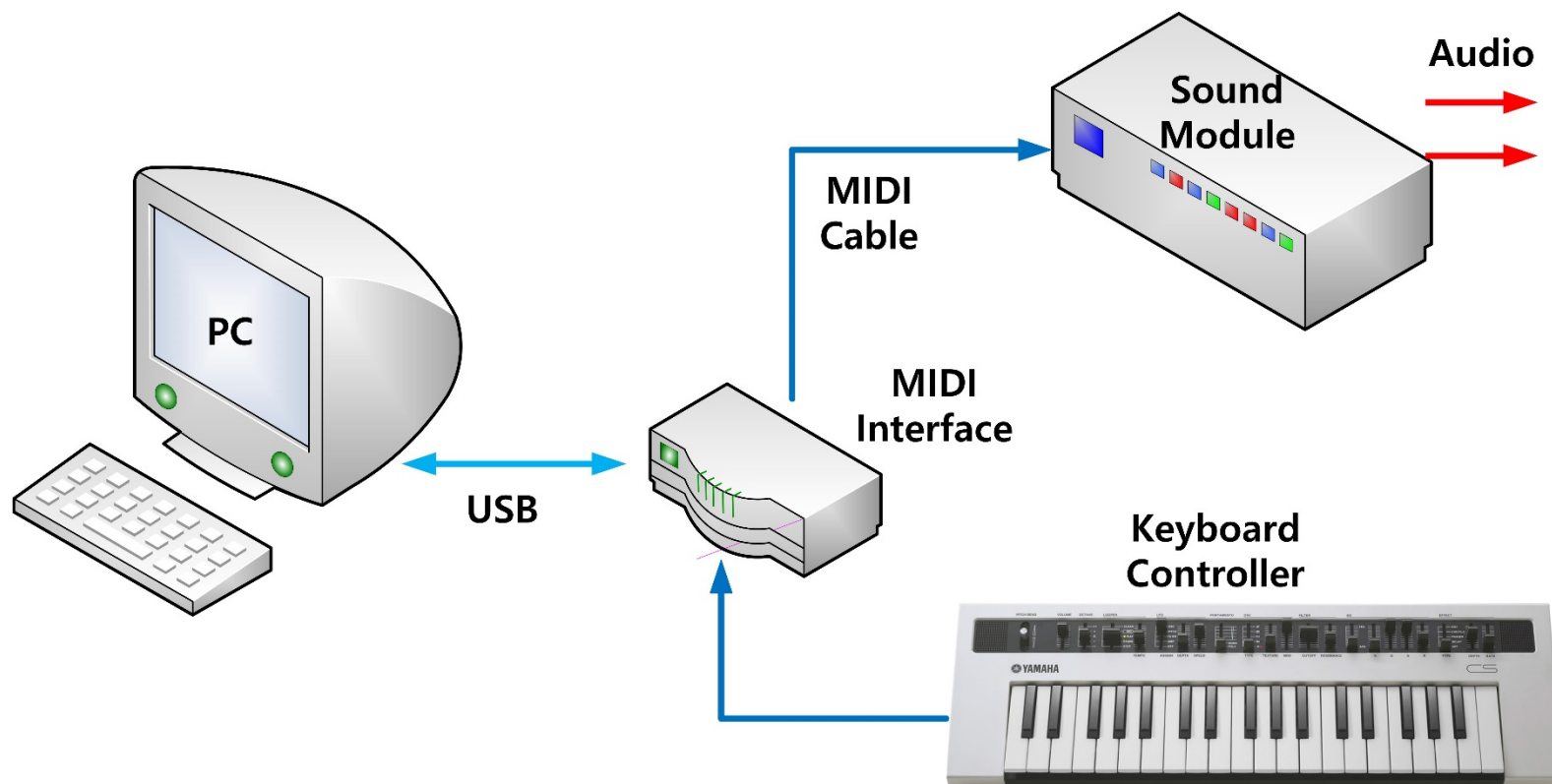
### MIDI Data Byte Structure



### MIDI Message Structure



## ❖ MIDI System Setup



## ❖ MIDI Interface 의 구조



Front

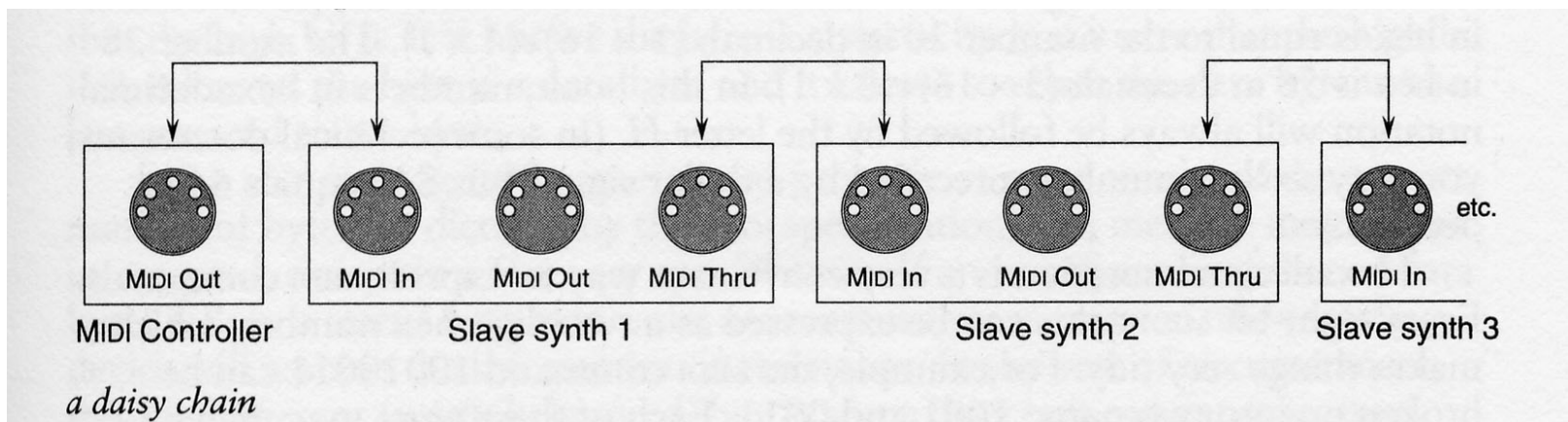


Back

USB port

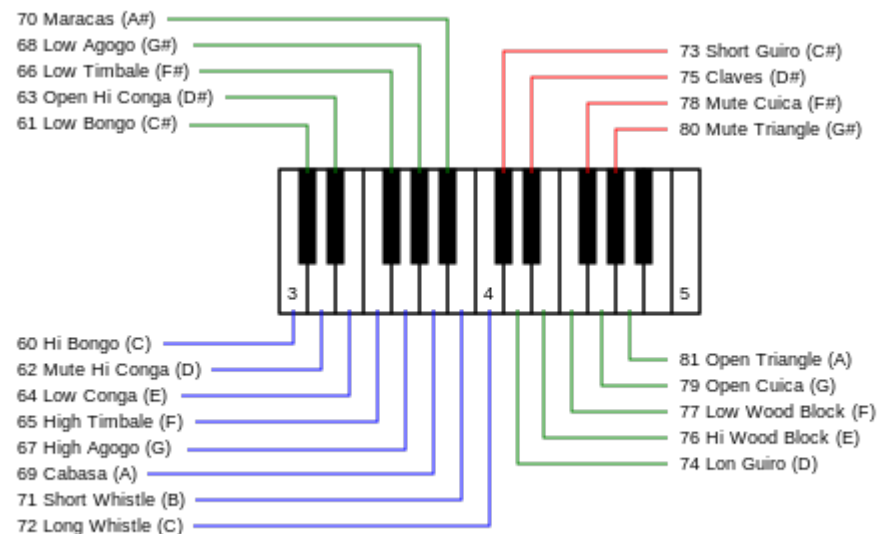
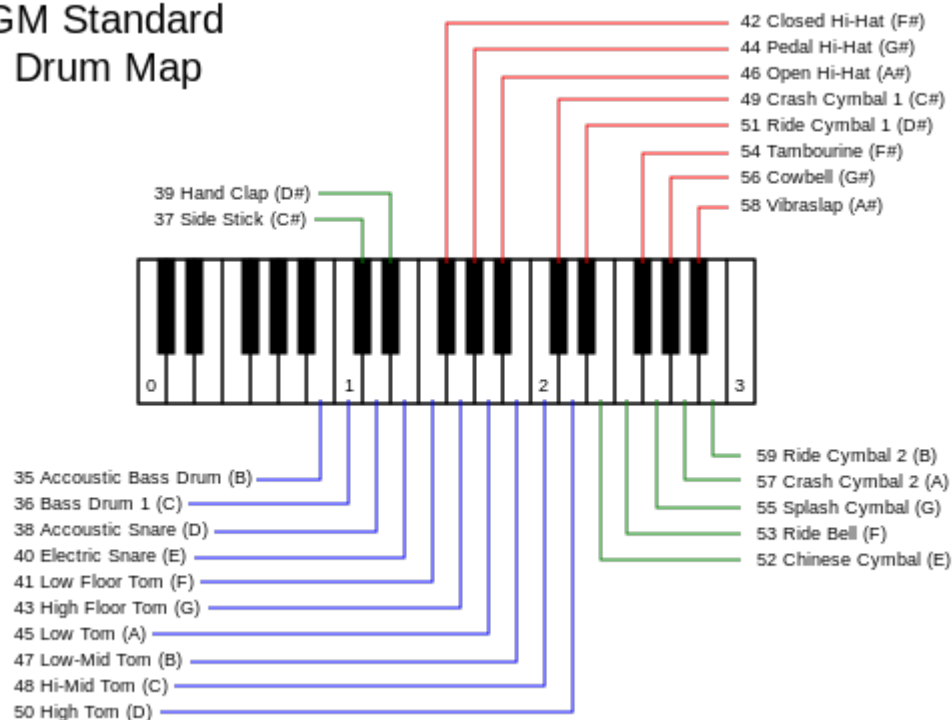
## ❖ MIDI Instrument 구성

- MIDI Port : 각 케이블에 1개의 포트 설정 가능
- MIDI Channel : 각 포트에 16개의 채널 지정 가능
- 여러 개의 악기가 동일한 포트 공유 가능(daisy Chain)



# ❖ General MIDI

## GM Standard Drum Map



## ❖ Standard MIDI File

서로 다른 시퀀서 또는 시퀀스 소프트웨어 사이에 연주 데이터를 호환하기 위한 시퀀스 데이터 포맷. 표준 스탠더드 MIDI 파일을 통해 시퀀서나 시퀀스 소프트웨어 간에 자유로운 연주 데이터 교환이 가능하며, 동일한 연주를 재현할 수 있다. 스탠더드 MIDI 파일에는 포맷 0/1/2의 세 가지의 포맷으로 구성됨

A. 포맷 0 : 멀티 MIDI 채널이 기록되는 하나의 트랙으로 구성. 스탠더드 MIDI 파일의 가장 기본적인 형식이며, 호환되는 시퀀서와 시퀀스 소프트웨어도 가장 많다.

B. 포맷 1 : 멀티트랙 포맷의 미디 파일. 시퀀서나 시퀀스 소프트웨어의 대부분은 멀티트랙 구성이므로, 그 트랙 구성을 유지한 채 기록되어 여러 대의 시퀀서로 편집할 때 유효한 포맷이다.

C. 포맷 2 : 멀티트랙 구성 + 여러 곡 저장 가능하다. 을 기록할 수 있다. 이것은 여러곡을 시간 순서로 연결하여 재생 가능하지만, 시퀀서나 시퀀스 등의 상호 호환성이 떨어진다.

## ❖ MIDI Continuous Controllers

Continuous controller (CC) is a MIDI message capable of transmitting a range of values, usually 0-127. The MIDI Spec makes 128 different continuous controllers available for each MIDI channel, although some of these have been pre-assigned to other functions. CC's are commonly used for things like MIDI controlling volume (#7), pan (#10), Modulation wheel (#1) and other variable parameters.

⚠ Use of continuous controllers in performance and sequencing can be a major factor in adding life to MIDI music – but beware, over-use of CC messages can result in MIDI log-jam, where the amount of data being sent is more than the bandwidth of MIDI can support. (Most sequencers support commands for “**thinning**” CC data if this becomes an issue)

## ❖ MIDI Continuous Controllers #2

MOST COMMON MIDI CONTINUOUS CONTROLLERS (CC)			
0	Bank Select	65	Portamento (on/off)
1	Modulation Wheel	66	Sostenuto Pedal (on/off)
2	Breath Controller	67	Soft Pedal (on/off)
4	Foot Pedal	68	Legato Pedal (on/off)
5	Portamento Time	74	Cutoff
6	Data Entry	93	Effect 3 Depth (Chorus Send Level)
7	Volume	120	All Sound Off
8	Balance	121	All Controllers Off
10	Pan Pot	123	All Notes Off
11	Expression	124	Omni Modulation Off
12	Effect Control 1	125	Omni Modulation On
13	Effect Control 2	126	Mono Operation
64	Hold Pedal (on/off)	127	Poly Operation



## ❖ Modulation Wheel (Controller number 1)

- Modulation Wheel data is added to the MIDI stream each time the position of the wheel changes.
- There are 128 positions from Off (value = 0) to Full (value = 127).
- How the sound generator responds to Modulation Wheel values is implementation-specific.
- It might adjust the distortion on an electric guitar, affect the loudness, or change the amount of an LFO filter on the patch. Almost anything is possible.



Yamaha 계열



Roland 계열



Korg 계열

# ❖ Modulation Event List

Type	Start	End	Length	Data 1	Data 2	Data 3	Channel	Comment
Note	1. 1. 1. 0	1. 1. 2. 83	0. 0. 1. 83	G1	107	73	1	
Note	1. 1. 3. 0	1. 1. 4. 77	0. 0. 1. 77	C1	121	110	1	
Note	1. 2. 1. 0	1. 2. 2. 98	0. 0. 1. 98	A1	109	95	1	
Note	1. 2. 3. 0	1. 2. 4. 61	0. 0. 1. 61	C1	117	55	1	
Note	1. 3. 1. 0	1. 3. 2. 91	0. 0. 1. 91	B1	109	97	1	
Note	1. 3. 3. 0	1. 3. 4. 116	0. 0. 1. 116	C1	117	122	1	
Note	1. 4. 1. 0	2. 4. 3. 68	1. 0. 2. 68	C2	117	59	1	
Note	3. 1. 1. 0	3. 1. 2. 86	0. 0. 1. 86	G1	111	104	1	
Note	3. 1. 3. 0	3. 1. 4. 90	0. 0. 1. 90	C1	109	95	1	
Note	3. 2. 1. 0	3. 2. 2. 90	0. 0. 1. 90	A1	113	101	1	
Note	3. 2. 3. 0	3. 2. 4. 65	0. 0. 1. 65	C1	113	76	1	
Note	3. 3. 1. 0	3. 3. 2. 74	0. 0. 1. 74	B1	109	69	1	
Note	3. 3. 3. 0	3. 3. 4. 106	0. 0. 1. 106	C1	117	123	1	
Note	3. 4. 1. 0	4. 4. 3. 112	1. 0. 2. 112	C2	107	125	1	
Controller	4. 1. 2. 117			CC1	0		9	Modulation
Controller	4. 1. 3. 16			CC1	1		9	Modulation
Controller	4. 1. 3. 23			CC1	2		9	Modulation
Controller	4. 1. 3. 29			CC1	3		9	Modulation
Controller	4. 1. 3. 36			CC1	4		9	Modulation
Controller	4. 1. 3. 42			CC1	5		9	Modulation
Controller	4. 1. 3. 49			CC1	6		9	Modulation
Controller	4. 1. 3. 55			CC1	7		9	Modulation
Controller	4. 1. 3. 68			CC1	8		9	Modulation
Controller	4. 1. 3. 75			CC1	9		9	Modulation
Controller	4. 1. 3. 81			CC1	10		9	Modulation
Controller	4. 1. 3. 88			CC1	11		9	Modulation
Controller	4. 1. 3. 94			CC1	12		9	Modulation
Controller	4. 1. 3. 101			CC1	13		9	Modulation
Controller	4. 1. 3. 107			CC1	14		9	Modulation
Controller	4. 1. 4. 0			CC1	15		9	Modulation
Controller	4. 1. 4. 7			CC1	16		9	Modulation
Controller	4. 1. 4. 14			CC1	17		9	Modulation
Controller	4. 1. 4. 20			CC1	18		9	Modulation
Controller	4. 1. 4. 27			CC1	19		9	Modulation
Controller	4. 1. 4. 33			CC1	20		9	Modulation

1) Note Start point

2) Note End point

3) Note Length

4) Note Name

5) Note Velocity

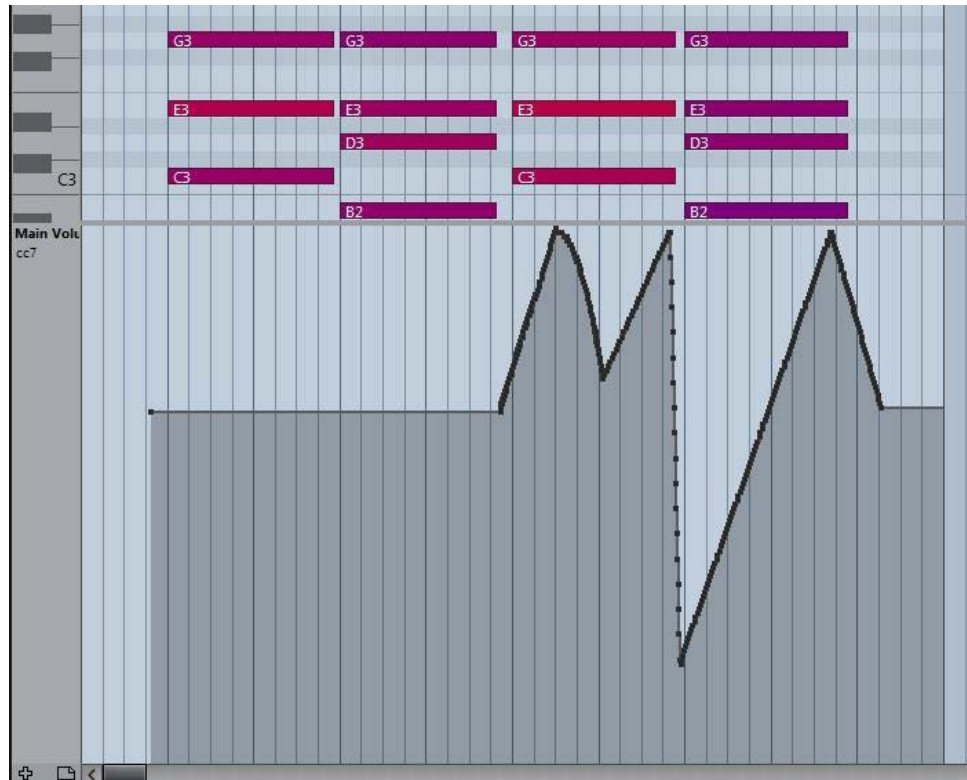
6) Channel 1~16

7) Modulation Control

Messages (CC#1)

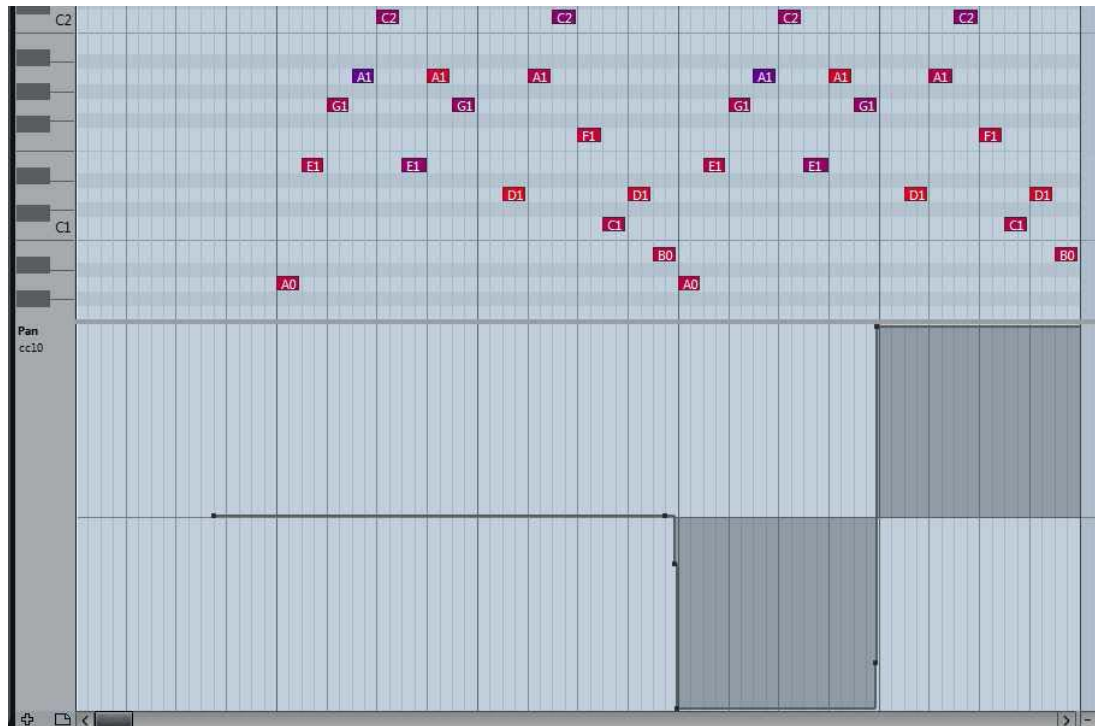
## ❖ Volume (Controller number 7)

- CC7 Volume data is designed to adjust the relative loudness of each channel
- In final mix session can tuning each track level.



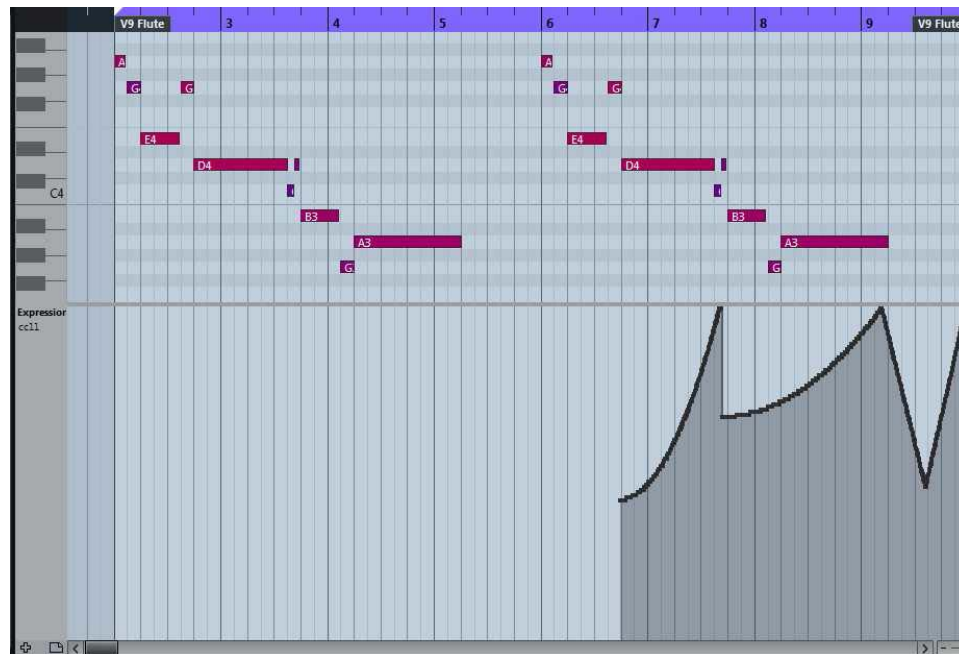
## ❖ Panpot (Controller number 10)

- CC10 Panpot data is transmit Panning codes by adjusting the relative loudness of the sound in the two stereo channels, giving the listener an impression of the instrument being left or right of the center line.



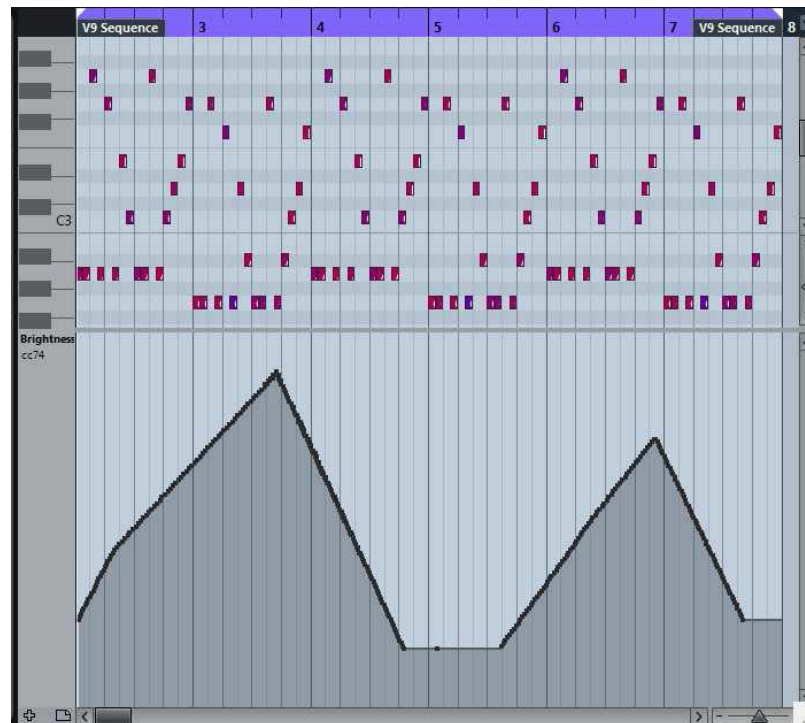
## ❖ Expression (Controller number 11)

- **Expression** and **Volume** are two different codes associated with **dynamics**.
- **CC11** is intended to be used to add the moment-by-moment dynamics that mimic the way live musicians are constantly adjusting the force of the breath or the pressure of the bow on the strings to achieve musicality.
- These changes produce the dynamic arc of a melody or even swells in individual notes.



## ❖ Brightness (Controller number 74)

- CC74 Brightness
- Cutoff can affect sound Brightness, Use CC74 parameter can control Synthesizer or module's filter produce dark or Brighten sound, The patch become more fusion & cool. In electronic dance music change sound Brightnes is impotent skill.



## ❖ Effect 3 Depth (Controller number 93)

- CC93 Effect 3 Depth (Chorus Send Level)
- Chorus effect usually occurs when individual sounds with approximately the same timbre, and very similar pitch converge and are perceived as one. While similar sounds coming from multiple sources can occur naturally, as in the case of a choir or string orchestra, it can also be simulated using an electronic effects unit or signal processing device.

