AD41 Ableton Live Developers Reference

V1.07

Introduction

The Akai AD41 Controller is a device that provides a control surface interface to audio software. The means of communication will be by MIDI messages over USB.

Using a sysex command, knob names can be edited. This will allow software DAWs and such to display custom knob names on the screen. These messages, when received, should replace the current name of the knob in the edit buffer.

Scope

This document describes the intended use and workflow of the product's software integration, and the format of MIDI messages between these devices and the PC/Mac Host. Consult the above Table of Contents for document navigation.

Product Identifiers

Name	MPK mini 4
USB VID	0x09E8
USB ID	0x005D
MIDI VID	0x47
MIDI ID	0x5D

MIDI Port and DATA distribution

Port 1: "MPK Mini IV MIDI Port"

This port will send Keybed, drum pads, pitch and modwheels, sustain pedal, and knob controls. Messages sent to this port are expected to be recorded and edited by a Host DAW. Messages received from this port can be resent to the MIDI DIN port, depending on the settings.

Port 2: "MPK Mini IV DAW Port"

This port will send all interface controls, screen control and transport controls. Messages sent to this port are expected to be used for DAW control. It is not expected to be recorded or edited by a DAW. Messages received from the computer on this port will be used for LED control of buttons and pads, SYSEX messages to control the screen, SYSEX messages for preset editing, and configurations, preset and edit buffer dumping and receiving.

Port 3: "MPK Mini IV Plugin Port"

This port will send all interface controls, screen control and transport controls. Messages sent to this port are expected to be used for SVK0 software. It is not expected to be recorded or edited by a DAW.

Port 4: "MPK Mini IV NKS Control"

This port will send all interface controls, screen control and transport controls. Messages sent to this port are expected to be used for NKS bridge software. It is not expected to be recorded or edited by a DAW. This will be a hidden port and only utilized by NKS bridge for integration with NI plugins.

Port 5: "MPK Mini IV Din Port"

This port is the physical 5-pin output. By default, all traffic to port 1 will be mirrored to port 2. This is configurable per control when editing the preset.

AD41 Presets/General Routing

AD41 will have multiple software script integrations with third party DAWs and our own Studio Instrument Collection (SIC) plugin player. To avoid mapping conflicts, AD41 will have a dedicated preset for each software integration. Preset data will include unique MIDI Port assignments for select hardware controls e.g. UI Buttons, Pads, Knobs, Keys, Wheels, FW buttons. This will ensure that a given preset will only send/receive MIDI data on the expected MIDI ports for the corresponding software script.

Preset Overview

- **DAW Preset:** For use with SASB control scripts, including integrations with Ableton, Logic, FL, Bitwig and Cubase.

    o   UI buttons send/receive on Port 2

    o   Pads send on Ports 1 and 2, receive on Port 2

    o   Knobs send/receive on Port 2

    o   Keys/Wheels send on Port 1 only

- **Plugin Preset:** For use with SIC only

    o   UI buttons send/receive on Port 3

    o   Pads send on Ports 1 and 3, receive on Port 3

    o   Knobs send on Ports 1 and 3, receive on Port 3

    o   Keys/Wheels send on Port 1 only

- **User Presets 1-13:** For using AD41 as a generic MIDI controller in an unsupported DAW/Software

    o   UI buttons send on Port 1 (where designated by the Control MIDI Map above)

    o   Pads send on Ports 1

    o   Knobs send on Port 1

    o   Keys/Wheels send on Port 1

- **NKS Preset (hidden):** This preset is hidden and not viewable in the preset menu on AD41. This preset is intended for use with NI's NKS Bridge protocol. It will be loaded via sysex when AD41 is

initialized in NKS Bridge.

- o UI buttons send/receive on Port 4
- o Pads send on Ports 1 and 4, receive on Port 4
- o Knobs send Ports 1 and 4, receive on Port 4
- o Keys/Wheels send on Port 1 only

MIDI Messaging

This section details the MIDI messages used to communicate with the PC/Mac host and details the device's preset format. Depending on the software integration (Plugin or DAW), AD41 will be expected to respond to certain SysEx messages as defined below.

"Universal" MIDI messages

The Note-On Message

byte number	value	description
1	0x9Chan	MIDI Note on, where Chan is a value from 0 – F and specifies the MIDI channel.
2	Note Number	Note Number
3	Velocity	Velocity of the key press. For controls that are not velocity sensitive, this value should be 0x7F

The Note-Off Message

byte number	value	description
1	0x8Chan	MIDI Note on, where Chan is a value from 0 – F and specifies the MIDI channel.
2	Note Number	Note Number
3	Velocity	Velocity of the key-release. For controls that are not velocity sensitive, this value should be 0x7F

The Controller Change Message

AD41 Sends MIDI Controller Change messages from its knobs, pads, and sustain input jack.

byte number	value	description
1	0xBChan	MIDI Controller Change, where Chan is a value from 0 – F and specifies the MIDI channel
2	Controller	Midi Continuous Controller Number

| 3 | Value | Midi Continuous Controller value 0x00 – 0x7F range |

Knobs

Knobs have two different modes, **Absolute** and **Relative**.

Absolute

In standard mode, the knobs will send a 0-127 value based on their current position.

When the same CC# is sent to the AD41 on the same channel as the knob is set, the knob will update its value based on this CC# value.

Relative Controller messages

Knob controls will report a relative change in their value. This will be done using a MIDI controller message. The field normally associated with controller number will be used to specify the Control ID. The field normally associated with controller value will be used to report the change in the control value.

byte number	value	description
1	0xB chan	MIDI Controller.
2	ControlID	identifier for control surface object
3	data	control change

Interpretation of MIDI Controller values for Relative Controllers

The value in the data field will indicate a relative change; values 01 to 63 describe a positive change and values 127 down to 64 describe a negative change.

data value sent	interpretation
0x00	No change occurred. Control is stationary.
0x01	The controller incremented its value by 1 since the last report
0x02	The controller incremented its value by 2 since the last report
…	…
0x3f	The controller incremented its value by 63 since the last report
0x40	The controller decremented its value by 64 since the last report
0x41	The controller decremented its value by 63 since the last report
…	…
0x7e	The controller decremented its value by 2 since the last report
0x7f	The controller decremented its value by 1 since the last report

The Program Change Message

AD41 Sends MIDI Program Change messages when changing KEYS and DRUM sounds.

byte number	value	description
1	0xCChan	MIDI Program Change, where Chan is a value from 0 – F and specifies the MIDI channel
2	Program Number	Midi Program Change Number

The Poly Pressure Message

AD41 can be configured to send MIDI poly pressure messages from its pads.

byte number	value	description
1	0xAChan	Poly pressure message, where Chan is a value from 0 – F and specifies the MIDI channel
2	Note Number	Note played by the pads
3	Value	Pressure Value

The Channel Pressure Message

AD41 can be configured to send MIDI Channel pressure messages from its pads. Note that when multiple pads are pressed and Channel Pressure is selected, only the highest value will be sent.

byte number	value	description
1	0xDChan	Channel pressure message, where Chan is a value from 0 – F and specifies the MIDI channel
2	Value	Pressure Value

External LED Control

Buttons and pads with associated LEDs can be controlled by MIDI Note-Ons and Note-Offs.
Any MIDI Note-Off, on any channel, will turn the associated LED off.
The MIDI Note-On definition differs across LED types: single, bicolor, and RGB.
All button/pad LEDs can be lit solidly, pulsed, or blinked:
- Pulsing – LED smoothly ramps up and down from 25% to 100% at the specified repeat rate
- Blinking – LED abruptly blinks between 0% and 100% at a 50% duty cycle at the specified repeat rate

Pulsing/Blinking repeat rate to be determined in the controller by measuring internal, or incoming MIDI clock rate. Pulsing/blinking patterns will reset upon seeing MIDI SongStart.

LED Type	Status 0x9X	Note Number 0xYY	Velocity 0xZZ
Single	Where X = [0x00 … 0x0F] 0x0: Solidly Lit at 10% brightness 0x1: Solidly Lit at 25% brightness		Where ZZ = [0x00…0x7F] 0x00: OFF 0x01…0x7F: ON
RGB	0x2: Solidly Lit at 50% brightness 0x3: Solidly Lit at 65% brightness 0x4: Solidly Lit at 75% brightness 0x5: Solidly Lit at 90% brightness 0x6: Solidly Lit at 100% brightness 0x7: Pulsing at 1/16 rate 0x8: Pulsing at 1/8 rate 0x9: Pulsing at 1/4 rate 0xA: Pulsing at 1/2 rate 0xB: Blinking at 1/24 rate 0xC: Blinking at 1/16 rate 0xD: Blinking at 1/8 rate 0xE: Blinking at 1/4 rate 0xF: Blinking at 1/2 rate	Where YY = [0x00…0x7F] Button Assignment (See MIDI Note Table)	Where ZZ = [0x00…0x7F] Color palette selection

RGB Color Chart

Consult the following charts to determine the selected LED or Display screen row color. The LEDs color is expressed in three 8-bit values to indicate the brightness of each of the RGB LED's color. Example:

#FF4C4C

Red	Green	Blue
0xFF	0x4C	0x4C

RGB/Velocity Color Chart

The color palette for RGB LEDs and screen color control is as follows. Velocity levels that are blank should not be used:

0	#000000	32	#4CFFB7	64	#033900	96	#FF7F00		
1		33	#00FF99	65	#005735	97	#B9B000		
2	#7F7F7F	34	#005935	66	#00547F	98	#90FF00		
3	#FFFFFF	35		67	#0000FF	99			
4	#FF4C4C	36	#4CC3FF	68	#00454F	100			
5	#FF0000	37	#00A9FF	69	#2500CC	101	#144C10		
6		38	#004152	70	#7F7F7F	102	#0D5038		
7		39		71		103			
8	#FFBD6C	40	#4C88FF	72	#FF0000	104			
9	#FF5400	41	#0055FF	73	#BDFF2D	105			

10		42		74	#AFED06	106	#A8000A
11		43		75	#64FF09	107	#DE513D
12	#FFFF4C	44	#4C4CFF	76	#108B00	108	#D86A1C
13	#FFFF00	45	#0000FF	77	#00FF87	109	#FFE126
14		46		78	#00A9FF	110	#9EE12F
15		47		79	#002AFF	111	#67B50F
16	#88FF4C	48	#874CFF	80	#3F00FF	112	
17	#54FF00	49	#5400FF	81	#7A00FF	113	#DCFF6B
18	#1D5900	50		82	#B21A7D	114	#80FFBD
19		51		83		115	#9A99FF
20	#4CFF4C	52	#FF4CFF	84	#FF4A00	116	#8E66FF
21	#00FF00	53	#FF00FF	85	#88E106	117	
22	#005900	54		86	#72FF15	118	#757575
23		55		87	#00FF00	119	#E0FFFF
24	#4CFF5E	56	#FF4C87	88	#3BFF26	120	#A00000
25	#00FF19	57	#FF0054	89		121	
26	#00590D	58		90	#38FFCC	122	#1AD000
27		59		91	#5B8AFF	123	
28	#4CFF88	60	#FF1500	92	#3151C6	124	#B9B000
29	#00FF55	61	#993500	93	#877FE9	125	
30	#00591D	62	#795100	94	#D31DFF	126	#B35F00
31		63	#436400	95	#FF005D	127	

UI Encoder

The detented push encoder will send:
- A MIDI CC# due to button push
- A different MIDI CC# for movement

Value sent over the CC is a signed 7bit integer interpreted as:
- 0x01 = 1 clicks CW since last report
- 0x02 = 2 clicks CW since last report
- 0x3F = 63 clicks CW since last report
- 0x40 = 64 clicks CCW since last report
- 0x41 = 63 clicks CCW since last report
- 0x7F = 1 click CCW since last report

Control MIDI Map

Each control will send to the shown ports only. Any control going to port 1 can be configured to be mirrored to port 2.

What is considered a UI button is highlighted green, and depending on the AD41 preset, will send/receive on port 1,2, 3 or 4 exclusively (See 0x64 Program Load message).

Similarly, depending on the current AD41 preset, pads and knobs will either send on Port 1, 2, 3 or 4.

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
- Button	send	CC#	80	1	Port 2, 3, 4	N/A	N/A	N/A	N/A
+ Button	send	CC#	81	1	Port 2, 3, 4	N/A	N/A	N/A	N/A
ARP / config	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BANK A/B	Send/Rcv	Sysex & CC	Sysex Message0x3a & CC12	1	Port 4	Sysex & CC	Sysex Message 0x3a & CC12	1	Port 3,4
K1	send	CC#	24	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K2	send	CC#	25	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K3	send	CC#	26	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K4	send	CC#	27	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K5	send	CC#	28	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K6	send	CC#	29	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K7	send	CC#	30	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
K8	send	CC#	31	1	Port 1,2,3,4	N/A	N/A	N/A	N/A
Keybed	Send	Note On, Velocity	Note On, Velocity	1	Port 1	N/A	N/A	N/A	N/A
Keybed / Arp Freeze	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Arp Octave Range.	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Arp Play Direction	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
Keybed / Chord	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Mutate	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Pattern	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Pattern Edit	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Swing	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Sync	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Keybed / Time Division	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LATCH / full level	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LOOP/Global	Send / Rcv (LED)	CC#	74	1	Port 2,3, 4	Note On	74	Channel selects blink status	Ports 2,3, 4
Mod wheel	send	CC#	1	1	Port 1	N/A	N/A	N/A	N/A
NOTE REPEAT/ config	No outbound data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OCT - / Prog Edit	Send/Rcv	sysex	Message 0x3b	sysex	Port 3,4	sysex	Message 0x3b	sysex	Port 3,4
OCT + / Save	Send/Rcv	sysex	Message 0x3b	sysex	Port 3,4	sysex	Message 0x3b	sysex	Port 3,4
OVER DUB / Automation	Send / Rcv (LED)	CC#	78	1	Port 1,2 3, 4	Note On	78	Channel selects blink status	Ports 2,3, 4
Pad 1A CC	Send/rcv (LED)	CC#	32	1	Port 1,2,3,4	Note On	36 velocity	Channel selects	Port 2,3,4

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
							selects color	blink status	
Pad 1A Note	Send / Rcv (LED)	Note#	36	10	Port 1,2,3,4	Note On	36 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 1A PC	Send	Prog Change#	0	10	Port 1,2,3,4	Note On	36 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 1B CC	Send/rcv (LED)	CC#	40	1	Port 1,2,3,4	Note On	44 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 1B Note	Send / Rcv (LED)	Note#	44	10	Port 1,2,3,4	Note On	44 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 1B PC	Send/rcv (LED)	Prog Change#	8	10	Port 1,2,3,4	Note On	44 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 2A CC	Send/rcv (LED)	CC#	33	1	Port 1,2,3,4	Note On	37 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 2A Note	Send / Rcv (LED)	Note#	37	10	Port 1,2,3,4	Note On	37 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 2A PC	Send/rcv (LED)	Prog Change#	1	10	Port 1,2,3,4	Note On	37 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 2B CC	Send/rcv (LED)	CC#	41	1	Port 1,2,3,4	Note On	45 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 2B Note	Send / Rcv (LED)	Note#	45	10	Port 1,2,3,4	Note On	45 velocity selects color	Channel selects blink status	Port 2,3,4

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
Pad 2B PC	Send/rcv (LED)	Prog Change#	9	10	Port 1,2,3,4	Note On	45 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3A CC	Send/rcv (LED)	CC#	34	1	Port 1,2,3,4	Note On	38 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3A Note	Send / Rcv (LED)	Note#	38	10	Port 1,2,3,4	Note On	38 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3A PC	Send/rcv (LED)	Prog Change#	2	10	Port 1,2,3,4	Note On	38 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3B CC	Send/rcv (LED)	CC#	42	1	Port 1,2,3,4	Note On	46 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3B Note	Send / Rcv (LED)	Note#	46	10	Port 1,2,3,4	Note On	46 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 3B PC	Send/rcv (LED)	Prog Change#	10	10	Port 1,2,3,4	Note On	46 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 4A CC	Send/rcv (LED)	CC#	35	1	Port 1,2,3,4	Note On	39 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 4A Note	Send / Rcv (LED)	Note#	39	10	Port 1,2,3,4	Note On	39 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 4A PC	Send/rcv (LED)	Prog Change#	3	10	Port 1,2,3,4	Note On	39 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 4B CC	Send/rcv (LED)	CC#	43	1	Port 1,2,3,4	Note On	47 velocity	Channel selects	Port 2,3,4

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
							selects color	blink status	
Pad 4B Note	Send / Rcv (LED)	Note#	47	10	Port 1,2,3,4	Note On	47 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 4B PC	Send/rcv (LED)	Prog Change#	11	10	Port 1,2,3,4	Note On	47 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5A CC	Send/rcv (LED)	CC#	36	1	Port 1,2,3,4	Note On	40 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5A Note	Send / Rcv (LED)	Note#	40	10	Port 1,2,3,4	Note On	40 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5A PC	Send/rcv (LED)	Prog Change#	4	10	Port 1,2,3,4	Note On	40 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5B CC	Send/rcv (LED)	CC#	44	1	Port 1,2,3,4	Note On	48 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5B Note	Send / Rcv (LED)	Note#	48	10	Port 1,2,3,4	Note On	48 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 5B PC	Send/rcv (LED)	Prog Change#	12	10	Port 1,2,3,4	Note On	48 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 6A CC	Send/rcv (LED)	CC#	37	1	Port 1,2,3,4	Note On	41 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 6A Note	Send / Rcv (LED)	Note#	41	10	Port 1,2,3,4	Note On	41 velocity selects color	Channel selects blink status	Port 2,3,4

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
Pad 6A PC	Send/rcv (LED)	Prog Change#	5	10	Port 1,2,3,4	Note On	41 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 6B CC	Send/rcv (LED)	CC#	45	1	Port 1,2,3,4	Note On	49 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 6B Note	Send / Rcv (LED)	Note#	49	10	Port 1,2,3,4	Note On	49 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 6B PC	Send/rcv (LED)	Prog Change#	13	10	Port 1,2,3,4	Note On	49 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7A CC	Send/rcv (LED)	CC#	38	1	Port 1,2,3,4	Note On	42 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7A Note	Send / Rcv (LED)	Note#	42	10	Port 1,2,3,4	Note On	42 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7A PC	Send/rcv (LED)	Prog Change#	6	10	Port 1,2,3,4	Note On	42 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7B CC	Send/rcv (LED)	CC#	46	1	Port 1,2,3,4	Note On	50 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7B Note	Send / Rcv (LED)	Note#	50	10	Port 1,2,3,4	Note On	50 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 7B PC	Send/rcv (LED)	Prog Change#	14	10	Port 1,2,3,4	Note On	50 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 8A CC	Send/rcv (LED)	CC#	39	1	Port 1,2,3,4	Note On	43	Channel selects	Port 2,3,4

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
							velocity selects color	blink status	
Pad 8A Note	Send / Rcv (LED)	Note#	43	10	Port 1,2,3,4	Note On	43 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 8A PC	Send/rcv (LED)	Prog Change#	7	10	Port 1,2,3,4	Note On	43 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 8B CC	Send/rcv (LED)	CC#	47	1	Port 1,2,3,4	Note On	51 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 8B Note	Send / Rcv (LED)	Note#	51	10	Port 1,2,3,4	Note On	51 velocity selects color	Channel selects blink status	Port 2,3,4
Pad 8B PC	Send/rcv (LED)	Prog Change#	15	10	Port 1,2,3,4	Note On	51 velocity selects color	Channel selects blink status	Port 2,3,4
Pad Play mode indicator (pressing Shift+Pad(Note/CC/PC)	send	Sysex (message 2a)	Sysex (message 2a)	Sysex	Port 2, 3, 4	N/A	N/A	N/A	N/A
Pitchbend Wheel	send	pitchbend	PB Standard	1	Port 1	N/A	N/A	N/A	N/A
PLAY/STOP/ Continue	Send / Rcv (LED)	CC#	76	1	Port 1,2, 3, 4	Note On	76	Channel selects blink status	Ports 2,3, 4
PLUGIN / DAW / DAW Select	send	Sysex (message 2d)	Sysex (message 2d)	Sysex	Port 2,3, 4	N/A	N/A	N/A	N/A
Push Encoder push	Send	CC#	13	1	Port 2,3, 4	N/A	N/A	N/A	N/A
Push Encoder Rotate	Send	CC#	14	1	Port 2,3, 4	N/A	N/A	N/A	N/A

Control Name	Send / Receive	Device > computer MIDI type	Device > computer Msg	Device > computer Send Ch	Device > computer Port	computer > device MIDI type	computer > device Msg	computer > device Rcv Ch	
RECORD / Quantize	Send / Rcv (LED)	CC#	77	1	Port 1,2, 3, 4	Note On	77	Channel selects blink status	Ports 2,3, 4
SHIFT	send	CC#	17	1	Port 2,3, 4	N/A	N/A	N/A	N/A
Sustain Pedal	Send	CC#	64	1	Port 1	N/A	N/A	N/A	N/A
TAP TEMPO/ metronome	Send / Rcv (LED)	CC#	82	1	Port 2,3, 4	Note On	11 velocity selects color	Channel selects blink status	Ports 2,3, 4 (2)
UNDO/Redo	Send / Rcv (LED)	CC#	73	1	Port 2,3, 4	Note On	73	Channel selects blink status	Ports 2,3, 4

System Exclusive Messages

All message responses will be transmitted on the received port.

Message Number	Message Name	Notes	Device > Computer Port	Computer > Device Port
0x06	Device Inquiry	Standard MIDI protocol format	Any	Port 1, 2, 3, 4
0x10	Set Display String	Sets screen text	N/A	Port 2, 3, 4
0x11	Set Display Row Color	Sets the color of selected row using velocity color table	N/A	Port 2, 3, 4
0x12	Sysex Knob Value Updating	Changes value display of knobs when in INC/DEC mode	N/A	Port 2, 3, 4
0x13	Set Custom Keybed Curve	Sets Keyboard response	Any	Port 1, 2, 3, 4
0x14	Set Display Row Color RGB	Sets the color of selected row using RGB	N/A	Port 2, 3, 4
0x15	Clear Line Text	Clears an entire line, sets color	N/A	Port 2, 3, 4
0x17	Get Device Intro	Request device ID		Port 2, 3, 4
0x18	Return Device Intro	Send device ID	Port 2, 3, 4	Port 2, 3, 4
0x19	Screen Status Monitor	Polls software to confirm latest screen messaging is received.	Port 2, 3, 4	Port 2, 3, 4
0x1C	Set Screen Owner	Sets control owner of display 0: internal firmware 1: SVK0 2: DAW 3: Editor	Port 2, 3, 4	Port 2, 3, 4
0x2a	Set/Get Pad Play Mode	Sets Pad Play Mode to: 0=Note 1=PC 2=CC	Port 2, 3, 4	Port 2, 3, 4
0x2b	Enable/Disable Pad CC/PC data	Determines whether pads send PC/CC data or not (independent of Pad Play Mode): 0=Enable 1=Disable	Port 2, 3, 4	Port 2, 3, 4

0x2c	Set/Get Knob Mode	Sets knobs to relative or absolute modes: 0=Absolute 1=Relative	Port 2, 3, 4	Port 2, 3, 4
0x2d	Set/Get Plugin/DAW Mode	Sets preset to DAW or Plugin: 0=DAW 1=Plugin	Port 2, 3, 4	Port 2, 3, 4
0x2e	Change Pad Data MIDI Port Assignment	0=Use default pad port assignment from current preset 1=Disable pads sending data on Port 1 2=Disable pads sending data on Port 3 3=Disable pads sending data on Port 4	2, 3, 4	2, 3, 4
0x3a	Set/Get Pad Bank A/B Status	0=Pad Bank A 1=Pad Bank B	3, 4	3, 4
0x3b	Set/Get Keybed Octave Status	(0x00) = -4 octaves … (0x04) = 0 octaves … (0x08) = +4 octaves	3, 4	3, 4
0x5a	Set/ Get Pad Sensitivity	To tune pad performance	Any	Port 1, 2, 3, 4
0x60	Introduction Message	Causes AD41 to respond with control values	Port 2, 3, 4	Port 2, 3, 4
0x62	Load Program Message	Loads one of the stored programs	N/A	Port 1, 2, 3, 4
0x64	Load Program Settings	Loads program data into AD41	N/A	Port 1, 2, 3, 4
0x66	Request Program Data	initiated AD41 to send program data	N/A	Port 1, 2, 3, 4
0x67	Request Program Response	Request response in program format	Any	N/A
0x68	Request Program Number	Asks for AD41s current program number	N/A	Port 1, 2, 3, 4
0x69	Request Prog Num Response	Reports current program number	Any	N/A
0x6a	Set / Get Device Parameters		Port 2, 3, 4	Port 2, 3, 4
0x6b	Set / Get Arp Pattern		Port 2, 3, 4	Port 2, 3, 4

0x6c	Set / Get Tempo		Port 2, 3, 4	Port 2, 3, 4
0x6d	Set / Get Program Name		Port 2, 3, 4	Port 2, 3, 4
0x6e	Set / Get Knob Name		Port 2, 3, 4	Port 2, 3, 4
0x70	Program Custom Pad Color		N/A	Port 2, 3, 4
0x71	Set / Get Screen Image	For post v1.0	Port 2, 3, 4	Port 2, 3, 4
0x72	Set /Get Screen Data	For post v1.0	Port 2, 3, 4	Port 2, 3, 4
0x73	Set Screen Color Fill		N/A	Port 2, 3, 4
0x74	Enter Update Mode		N/A	Port 2, 3, 4
0x79	Program Serial	Reset serial	Port 2, 3, 4	Port 2, 3, 4

Message Format

All MIDI SysEx packets will conform to the following format:

Byte Offset	Value(s)	Description
0	0xF0	MIDI SysEx Start
1	0x47	Manufacturer ID
2	0x7F	Device ID
3	0x5D	Product ID
4	[0x00 … 0x7F]	Message ID
5	[0x00 … 0x7F]	PayloadLen[13:7]
6	[0x00 … 0x7F]	PayloadLen[6:0]
…	[0x00 … 0x7F]	PAYLOAD
7 + PayloadLen	0xF7	MIDI SysEx Stop

Device Inquiry

The device will respond accordingly to a MIDI Device Inquiry: F0 7E 7F 06 01 F7
The device will respond with the following:

Byte Index	Value	Description
0	0xF0	MIDI System Exclusive message start
1	0x7E	Non-Realtime Message
2	0x00	System Exclusive Device Id (channel)
3	0x06	Inquiry Message (Sub-Id #1)
4	0x02	Inquiry Response (Sub-Id #2)
5	0x47	Manufacturers ID
6	0x5D	Manufacturer Product ID
7 – 8	00 19	Payload Length
9 – 12	MMML mMmL	Firmware Version in Hex
13	00	System Exclusive device ID
14 – 17	00 00 00 00	Serial Number, no longer used

byte number	value	description
18 – 32	ManfData[1:16]	Manufacturer Data (serial number data) Matches product barcode programmed into device at factory
33	F7	MIDI System exclusive message terminator

Format of response from AD41 to Device Inquiry message

The AD41 Controller will respond to a Device Inquiry Request message with the following message:

byte number	value	description
1	0xF0	MIDI System exclusive message start
2	0x7E	Non-Realtime Message
3	MIDI Channel	Common MIDI channel setting
4	0x06	Inquiry Message
5	0x02	Inquiry Response
6	0x47	Manufacturers ID Byte
7	0x5D	Product model ID
8	0x00	Number of data bytes to follow (most significant)
9	0x19	Number of data bytes to follow (least significant)
10	Version1	Software version major most significant
11	Version2	Software version major least significant
12	Version3	Software version minor most significant
13	Version4	Software version minor least significant
14	DeviceID	System Exclusive Device ID
15	Reserved1	Reserved, Set to 0x00 in this application
16	Reserved 2	Reserved, Set to 0x00 in this application
17	Reserved 3	Reserved, Set to 0x00 in this application
18	Reserved 4	Reserved, Set to 0x00 in this application
19	Serial1	Serial Data byte 1
20	Serial2	Serial Data byte 2
21	Serial3	Serial Data byte 3
22	Serial4	Serial Data byte 4
23	Serial5	Serial Data byte 5

24	Serial6	Serial Data byte 6
25	Serial7	Serial Data byte 7
26	Serial8	Serial Data byte 8
27	Serial9	Serial Data byte 9
28	Serial10	Serial Data byte 10
29	Serial11	Serial Data byte 11
30	Serial12	Serial Data byte 12
31	Serial13	Serial Data byte 13
32	Serial14	Serial Data byte 14
33	Serial15	Serial Data byte 15
34	Serial16	This byte should be set to 0x00
35	0xF7	MIDI System exclusive message terminator

0x10: Set Display String

Allows software to set one of the 4 strings displayed on the LCD.
Strings can be up to 32 characters in length including a mandatory NULL terminator. Characters after a NULL will be ignored.

When font = 24, then StringID can be Line 1~3.
When font = 16, then StringID can be Line 1~5.

Payload Offset	Value(s)	Description
0	[0x00 – 0x03]	FontID: 0=16pt 1=16pt BOLD 2=24pt 3=24pt BOLD
1	[0x00 … 0x04]	StringID 0-4 = lines 1-5 4+5 valid for 16pt only
2 - 33	[0x00 … 0x7F]	char[31:0] – ASCII + null terminator (0x00)

0x11: Set Display Row Color

Allows software to set color of one of the 3 rows displayed on the LCD.
Colors follow the RGB color chart in this document.

When 0x11 is sent to AD41, the text alignment will default to center justified. Text alignment can be overwritten (left or right) by sending the 0x14 message.

Example!

Also, text color should automatically change to white or black depending on the row color sent by 0x11. If the row color is light, black text should be used. If the row color is dark, white text should be used. Text color defaults for RGB background colors can be overwritten by the 0x14 message. See RGB color chart with text color assignments to see what defaults should be for each RGB background color, pg. 36.

When font = 24, then StringID can be Line 1~3.
When font = 16, then StringID can be Line 1~5.

Consult the RGB color table

Payload Offset	Value(s)	Description
0	[0x00 ... 0x04]	StringID 0-4 = lines 1-5 4+5 valid for 16pt only
2	0x00 - 0x7F	background color (per table)

* Consult the RGB color table

0x12 Sysex knob value updating

When in INC / DEC Mode, sysex knob value updating will allow DAWs to report the actual value of the controls in software, rather than showing INC / DEC on the screen. Using a sysex command, knob names can be edited.

Payload Offset	Values	Description
0	Knob number	Selects knob 1-8
n	Text	Hex text string

0x14 Set Display Row Color (RGB)

Allows software to set color of one of the 3 rows displayed on the LCD using separate bytes for each RGB channel, as well as font choice, and text alignment on the screen. It is recommended to send this message initially before 0x10 so that foreground/background colors are defined before text is displayed. Once 0x14 is sent, the message does not need to be sent again until there is a need to adjust foreground/background colors.
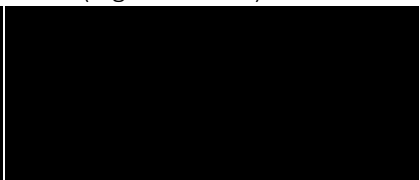
0x00 (Left justified)   0x01 (Center justified)   0x02 (Right Justified)
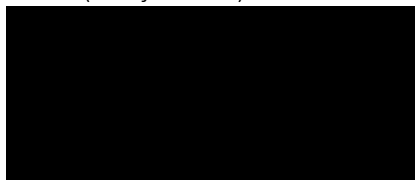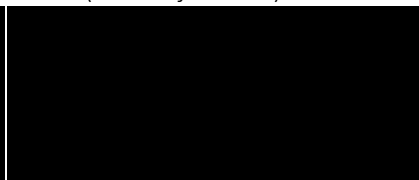
Payload Offset	Value(s)	Description
0	[0x00 ... 0x03]	FontID: 0=16pt 1=16pt BOLD 2=24pt 3=24pt BOLD
1	[0x00 ... 0x04]	StringID 0-4 = lines 1-5 4+5 valid for 16pt only
2	[0x00 ... 0x02]	Justification 0 = Left 1 = Center 2 = Right
3	0x00 - 0x1F	foreground color (Red)
4	0x00 - 0x3F	foreground color (green)
5	0x00 - 0x1F	foreground color (blue)
6	0x00 - 0x1F	background color (Red)
7	0x00 - 0x3F	background color (green)
8	0x00 - 0x1F	background color (blue)

0x15 Clear Line Text

This message will clear all text from the selected line and apply the selected RGB color to the entire line.

Payload Offset	Value(s)	Description
0	[0x00 ... 0x05]	LineID
1	0x00 - 0x1F	background color (Red)
2	0x00 - 0x3F	background color (green)
3	0x00 - 0x1F	background color (blue)

0x19: Screen Status Monitor

When under control by software other than AD41's internal firmware, the system will report its status. This is accomplished by sending 0x19 in 2 second intervals. The message sent will include the current screen owner (IE 0x01 for SVK0, 0x02 for DAW).

If there is no software response after 3 attempts (6 seconds), the system should automatically return to Firmware for ownership.

AD41 firmware must retain the 16-byte identifier of the software which currently has display ownership (DAW, NKS or SVK0). As well, the firmware must respond back with the 16-byte software identifier upon receiving the 0x19 get command.

This message sent with no payload is the query. Expected response is below.

0	0x00-0x03	Screen owner confirmation:

		0x00 Firmware (payload is 1 byte) 0x01 SVK0 (payload is 17 bytes total) * 0x02 DAW (payload is 17 bytes total)* 0x03 NKS (payload is 17 bytes total)* *First byte will designate FW, SVK0, NKS or DAW. The following 16 bytes are a 16-byte unique software instance identifier which will be generated by the inMusic software and transmitted to AD41.

0x1c Set Screen Owner

This message sets the expectation of where screen control will be accessed. The available choices are:

- 0x00 – internal firmware
    - o Screen control is retained by the internal firmware.
    - o Controls are shown on-screen when moved.
- 0x01 – SVK0
    - o SVK0 is in control of the screen.
    - o The firmware should expect screen control from port 3 in the form of sysex messages.
    - o This message is expected on Port 3.
- 0x02 - DAW
    - o A third-party DAW is in control of the screen (IE Ableton Live).
    - o Screen messages will be received via messages.
        - ▪ This message is expected on Port 2
- 0x03 – NKS
    - o NKS Bridge is in control of the screen
    - o This message is expected on Port 4

If screen ownership is changed, AD41 should send 0x19 with the new screen owner to confirm the change has happened. This will inform the former screen owner that it no longer controls the screen.

0	0x00-0x03	Screen owner confirmation: 0x00 Firmware (payload is 1 byte) 0x01 SVK0 (payload is 17 bytes) 0x02 DAW (payload is 17 bytes) 0x03 NKS (payload is 17 bytes)

0x1d Hybrid Screen Mode

This screen ownership mode will allow the host DAW to control line 1 (24pt), while AD41 FW remains in control of lines 2-3. As knobs are turned, host DAW will send the below sysex block with 8 knob parameter names and values. From this message, FW will determine which knob is actively being turned

and display the corresponding parameter name and value on lines 2 and 3 of the display.

0	[0x00 … 0x7F]	K1 parameter name 1, characters 1-8
8	[0x00 … 0x7F]	K2 parameter name 2, characters 1-8
16	[0x00 … 0x7F]	K3 parameter name 3, characters 1-8
24	[0x00 … 0x7F]	K4 parameter name 4, characters 1-8
32	[0x00 … 0x7F]	K5 parameter name 5, characters 1-8
40	[0x00 … 0x7F]	K6 parameter name 6, characters 1-8
48	[0x00 … 0x7F]	K7 parameter name 7, characters 1-8
56	[0x00 … 0x7F]	K8 parameter name 8, characters 1-8
64	[0x00 … 0x7F]	K1 parameter value 1, characters 1-8
72	[0x00 … 0x7F]	K2 parameter value 2, characters 1-8
80	[0x00 … 0x7F]	K3 parameter value 3, characters 1-8
88	[0x00 … 0x7F]	K4 parameter value 4, characters 1-8
96	[0x00 … 0x7F]	K5 parameter value 5, characters 1-8
104	[0x00 … 0x7F]	K6 parameter value 6, characters 1-8
112	[0x00 … 0x7F]	K7 parameter value 7, characters 1-8
120	[0x00 … 0x7F]	K8 parameter value 8, characters 1-8

0x2a: Set/Get Pad Play Mode

This message sets the Pad Play Mode for AD41's pads and whether they will send PC, CC or Note MIDI messages.

Payload Offset	value	description
0	00-02	0=note 1=program change 2=cc#

Get Pad Play Mode

Current Pad Play Mode can be retrieved from the unit by sending message 0x2a with no payload.

0x2b: Enable/Disable Pad CC/PC Data

This message will enable or disable PC/CC MIDI messages within Pad Play Modes. When PC/CC messages are disabled, pads will only send MIDI Note on/off messages, even if the Pad Play Mode is set to PC or CC. Enabling PC/CC data will restore the PC and CC Pad Play Modes to their original function, sending PC or CC data as assigned.

Payload Offset	value	description
0	00-01	0=Enable PC/CC data in Pad Play Modes (Default) 1=Disable PC/CC data in Pad Play Modes (pads exclusively send MIDI note on/off data irrespective of Pad Play Mode setting)

Get PC/CC Data Status

Current PC/CC data status can be retrieved from the unit by sending message 0x2b with no payload.

0x2c: Set/Get Knob Mode

This message will assign all 8 knobs to send data in Relative or Absolute modes.

Payload Offset	value	description
0	00-01	0=Absolute (Default) 1=Relative

Get Knob Mode

Current Knob Mode can be retrieved from the unit by sending message 0x2c with no payload.

0x2d: Set/Get Plugin/DAW Mode

This message will instruct AD41 to load the DAW or Plugin preset. Ableton will need to monitor the preset sysex to resend initialization sysex whenever the AD41 DAW preset is loaded within their SW:

- Disable Pad PC/CC data via sysex 0x2b
- Disable port 1 for MIDI pad data via sysex 0x2e
- Set screen owner to Ableton via sysex 0x1c

Payload Offset	value	description
0	00-01	0=DAW Preset (Default) 1=Plugin Preset 2=User

Get Plugin/DAW Mode

Current Plugin/DAW Mode can be retrieved from the unit by sending message 0x2d with no payload.

0x2e: Change Pad Data MIDI Port Assignment

This message will instruct AD41's pads to temporarily change the assigned MIDI port that they transmit data on. This is used to slightly differentiate the DAW preset for use with different DAWs.

Payload Offset	value	description
0	00-04	0=Use default pad port assignment from current preset 1=Disable pads sending data on Port 1

Payload Offset	value	description
		2=Disable pads sending data on Port 2 3=Disable pads sending data on Port 3 4=Disable pads sending data on Port 4

0x60: Introduction Message

This message is sent before any other device-specific message (i.e. other than Device Enquiry). It instructs the AD41 to perform the necessary initialization and informs the firmware of the version number of the application in order that changes in the application can be catered for in the AD41 firmware.

Payload Offset	Value(s)	Description
0	0x00	Application/Configuration identifier
1	Version High	PC application Software version major
2	Version Low	PC application Software version minor
3	Bugfix Level	PC Application Software bug-fix level

Format of response from AD41 Introduction message

Payload Offset	Value(s)	Description
0	Knob #1 Value	Sends the current value of Knob
1	Knob #2 Value	Sends the current value of Knob
2	Knob #3 Value	Sends the current value of Knob
3	Knob #4 Value	Sends the current value of Knob
4	Knob #5 Value	Sends the current value of Knob
5	Knob #6 Value	Sends the current value of Knob
6	Knob #7 Value	Sends the current value of Knob
7	Knob #8 Value	Sends the current value of Knob
8	Current Pad Bank	Bank A or B
9	Current Pad Mode	Sending Note, CC or PC
10	ScreenOwnership	0=internal firmware 1=SVK0 2=DAW 3=NKS

0x6a: Set/Get Device Parameter

Individual parameters can be adjusted by referencing the parameter number as shown in the chart in MSB/LSB format. Multiple parameters can be edited in a single message by increasing the payload size.

Set Device Parameter

Payload Offset	Value(s)	Details
0	0x00-0x01	Parameter number MSB
1	0x00-0x7f	Parameter number LSB
2	0x00-0x7f (see chart)	Parameter Value
…	Additional parameters	Additional parameters

Parameter Table

Parameter#	Parameter Name	Value
0	Keyboard, Knob, Sustain Input Jack MIDI Channel	MIDI Channel of Keyboard, knobs, and sustain input jack. (0-15)
1	Pads Midi channel	(0-15)
2	Octave	Current Octave (range of -4 to +4) (0x00) = -4 octaves (0x01) = -3 octaves (0x02) = -2 octaves (0x03) = -1 octave (0x04) = 0 octaves (0x05) = 1 octave (0x06) = 2 octaves (0x07) = 3 octaves (0x08) = 4 octaves
3	Keyboard Transpose	0x00 – 0x18
4	Tap Tempo Taps	Number of Taps for Tap Tempo (2-4)
5	Pad Aftertouch Type	0=Off 1=Channel (default *for all programs*) 2=Poly pressure
6	Pad Play Mode	0=note 1=program change 2=cc#
7	Pad Toggle	0=Off 1=On
8	Write Protect	0=Off 1=On
9	velocity	On, on/fixed

10	fixed value	127, 01-127
11	Transport Type	On, On/Off
12	Keybed Curve	Light, Normal, Heavy
13	Arp Enable	0 = Off 1 = On
14	Arp Mode	Arpeggiator Mode 0 = UP 1 = DOWN 2 = INCL (Inclusive) 3 = EXCL (Exclusive) 4 = RAND (Random) 5 = ORDR (Order) 6 = CHORD
15	Arp Time Division	Arpeggiator Time Division 0 = 1/4 note 1 = 1/4 triplet 2 = 1/8 note 3 = 1/8 triplet 4 = 1/16 note 5 = 1/16 triplet 6 = 1/32 note 7 = 1/32 triplet
16	Arp Octave	Arpeggiator Octave (0-3)
17	Swing Value	0x00 – 0x1A = Swing 50% - 75%
18	Mutate On/Off	0 = Off 1 = On
19	Mutate Percentage	01-99%
20	Arp Random Percentage	01-100%
21	Arp Clock	0 = Internal 1 = External
22	Arp_Gate	10%-99%
23	Freeze	On, off
24	Freeze Channel	0-15
25	Arp Latch	0 = Off 1 = On
26	ARP Pattern	On, off
27	Pad View	Note/Accent, Tie, Ratchet

28	Play Style	Skip or Rest
29	Length	8 or 16 steps
30	Accent Amount	10-100
31	Scale Mode	Off, On
32	Scale_play_Mode	Off, Transposed, Ignored
33	Scale Root Key	C, C#, D, D#, E, F, F#, G, G#, A, A#, B
34	Scale Type	Off (Chromatic), Major, natural minor, harmonic minor, major pentatonic, minor pentatonic, dorian, phrygian, lydian, mixolydian, aeolian, Locrian, blues, flamenco, hungarian, whole tone
35	Chord Mode	Off, On
36	Chord Type	1-3-5, +7, +7+9, Maj7, Min7, Dom7
37	Chord Inversion	None, 1st, 2nd, 3rd
38	Pad 1A – Note #	Pad 1 Note Number (0 – 127)
39	Pad 1A – CC #	Pad 1 CC Number (0 – 127)
40	Pad 1A – prog chng#	Pad 1 Program change Number (0 – 127)
41	Pad 1A On Color	0-31
42	Pad 1A Off Color	0-31
43	Pad 2A – Note #	Pad 1 Note Number (0 – 127)
44	Pad 2A – CC #	Pad 1 CC Number (0 – 127)
45	Pad 2A – prog chng#	Pad 1 Program change Number (0 – 127)
46	Pad 2A On Color	0-31
47	Pad 2A Off Color	0-31
48	Pad 3A – Note #	Pad 1 Note Number (0 – 127)
49	Pad 3A – CC #	Pad 1 CC Number (0 – 127)
50	Pad 3A – prog chng#	Pad 1 Program change Number (0 – 127)
51	Pad 3A On Color	0-31
52	Pad 3A Off Color	0-31
53	Pad 4A – Note #	Pad 1 Note Number (0 – 127)
54	Pad 4A – CC #	Pad 1 CC Number (0 – 127)
55	Pad 4A – prog chng#	Pad 1 Program change Number (0 – 127)
56	Pad 4A On Color	0-31
57	Pad 4A Off Color	0-31
58	Pad 5A – Note #	Pad 1 Note Number (0 – 127)

59	Pad 5A – CC #	Pad 1 CC Number (0 – 127)
60	Pad 5A – prog chng#	Pad 1 Program change Number (0 – 127)
61	Pad 5A On Color	0-31
62	Pad 5A Off Color	0-31
63	Pad 6A – Note #	Pad 1 Note Number (0 – 127)
64	Pad 6A – CC #	Pad 1 CC Number (0 – 127)
65	Pad 6A – prog chng#	Pad 1 Program change Number (0 – 127)
66	Pad 6A On Color	0-31
67	Pad 6A Off Color	0-31
68	Pad 7A – Note #	Pad 1 Note Number (0 – 127)
69	Pad 7A – CC #	Pad 1 CC Number (0 – 127)
70	Pad 7A – prog chng#	Pad 1 Program change Number (0 – 127)
71	Pad 7A On Color	0-31
72	Pad 7A Off Color	0-31
73	Pad 8A – Note #	Pad 1 Note Number (0 – 127)
74	Pad 8A – CC #	Pad 1 CC Number (0 – 127)
75	Pad 8A – prog chng#	Pad 1 Program change Number (0 – 127)
76	Pad 8A On Color	0-31
77	Pad 8A Off Color	0-31
78	Pad 1B – Note #	Pad 1 Note Number (0 – 127)
79	Pad 1B – CC #	Pad 1 CC Number (0 – 127)
80	Pad 1B – prog chng#	Pad 1 Program change Number (0 – 127)
81	Pad 1B On Color	0-31
82	Pad 1B Off Color	0-31
83	Pad 2B – Note #	Pad 1 Note Number (0 – 127)
84	Pad 2B – CC #	Pad 1 CC Number (0 – 127)
85	Pad 2B – prog chng#	Pad 1 Program change Number (0 – 127)
86	Pad 2B On Color	0-31
87	Pad 2B Off Color	0-31
88	Pad 3B – Note #	Pad 1 Note Number (0 – 127)
89	Pad 3B – CC #	Pad 1 CC Number (0 – 127)
90	Pad 3B – prog chng#	Pad 1 Program change Number (0 – 127)
91	Pad 3B On Color	0-31

92	Pad 3B Off Color	0-31
93	Pad 4B – Note #	Pad 1 Note Number (0 – 127)
94	Pad 4B – CC #	Pad 1 CC Number (0 – 127)
95	Pad 4B – prog chng#	Pad 1 Program change Number (0 – 127)
96	Pad 4B On Color	0-31
97	Pad 4B Off Color	0-31
98	Pad 5B – Note #	Pad 1 Note Number (0 – 127)
99	Pad 5B – CC #	Pad 1 CC Number (0 – 127)
100	Pad 5B – prog chng#	Pad 1 Program change Number (0 – 127)
101	Pad 5B On Color	0-31
102	Pad 5B Off Color	0-31
103	Pad 6B – Note #	Pad 1 Note Number (0 – 127)
104	Pad 6B – CC #	Pad 1 CC Number (0 – 127)
105	Pad 6B – prog chng#	Pad 1 Program change Number (0 – 127)
106	Pad 6B On Color	0-31
107	Pad 6B Off Color	0-31
108	Pad 7B – Note #	Pad 1 Note Number (0 – 127)
109	Pad 7B – CC #	Pad 1 CC Number (0 – 127)
110	Pad 7B – prog chng#	Pad 1 Program change Number (0 – 127)
111	Pad 7B On Color	0-31
112	Pad 7B Off Color	0-31
113	Pad 8B – Note #	Pad 1 Note Number (0 – 127)
114	Pad 8B – CC #	Pad 1 CC Number (0 – 127)
115	Pad 8B – prog chng#	Pad 1 Program change Number (0 – 127)
116	Pad 8B On Color	0-31
117	Pad 8B Off Color	0-31
118	Knob 1 – CC #	Knob 1 Controller Change Number (0-127)
119	Knob 1 – Low Val	Knob 1 Low Value (0-127)
120	Knob 1 – Hi Val	Knob 1 High Value (0-127)
121	Knob 1 – Mode	Absolute, Relative
122	Knob 2 – CC #	Knob 2 Controller Change Number (0-127)
123	Knob 2 – Low Val	Knob 2 Low Value (0-127)
124	Knob 2 – Hi Val	Knob 2 High Value (0-127)

125	Knob 2 – Mode	Absolute, Relative
126	Knob 3 – CC #	Knob 3 Controller Change Number (0-127)
127	Knob 3 – Low Val	Knob 3 Low Value (0-127)
128	Knob 3 – Hi Val	Knob 3 High Value (0-127)
129	Knob 3 – Mode	Absolute, Relative
130	Knob 4 – CC #	Knob 4 Controller Change Number (0-127)
131	Knob 4 – Low Val	Knob 4 Low Value (0-127)
132	Knob 4 – Hi Val	Knob 4 High Value (0-127)
133	Knob 4 – Mode	Absolute, Relative
134	Knob 5 – CC #	Knob 5 Controller Change Number (0-127)
135	Knob 5 – Low Val	Knob 5 Low Value (0-127)
136	Knob 5 – Hi Val	Knob 5 High Value (0-127)
137	Knob 5 – Mode	Absolute, Relative
138	Knob 6 – CC #	Knob 6 Controller Change Number (0-127)
139	Knob 6 – Low Val	Knob 6 Low Value (0-127)
140	Knob 6 – Hi Val	Knob 6 High Value (0-127)
141	Knob 6 – Mode	Absolute, Relative
142	Knob 7 – CC #	Knob 7 Controller Change Number (0-127)
143	Knob 7 – Low Val	Knob 7 Low Value (0-127)
144	Knob 7 – Hi Val	Knob 7 High Value (0-127)
145	Knob 7 – Mode	Absolute, Relative
146	Knob 8 – CC #	Knob 8 Controller Change Number (0-127)
147	Knob 8 – Low Val	Knob 8 Low Value (0-127)
148	Knob 8 – Hi Val	Knob 8 High Value (0-127)
149	Knob 8 – Mode	Absolute, Relative

Get Device Parameter

Current Device Parameters can be retrieved from the unit by sending message 0x6a parameter number, and no value.

Payload Offset	Value(s)	Details
0	0x00-0x01	Parameter number MSB
1	0x00-0x7f	Parameter number LSB

0x70: Program Custom Pad Color

This command will allow a number of pads to be programed with custom RGB values for their colors. Note that this is not saved with the preset, but is solely designed for compatibility with software capable of communicating pad coloring interactively, such as MPC and Ableton Live.

Payload offset	value	description
0	Pad #	0x00-0x0f (A1-B8)
1	Pad 1A Red Off Brightness MSB	0x00-0x01
2	Pad 1A Red Off Brightness LSB	0x00-0x7F
3	Pad 1A Green Off Brightness MSB	0x00-0x01
4	Pad 1A Green Off Brightness LSB	0x00-0x7F
5	Pad 1A Blue Off Brightness MSB	0x00-0x01
6	Pad 1A Blue Off Brightness LSB	0x00-0x7F
7	Pad 1A Red On Brightness MSB	0x00-0x01
8	Pad 1A Red On Brightness LSB	0x00-0x7F
9	Pad 1A Green On Brightness MSB	0x00-0x01
10	Pad 1A Green On Brightness LSB	0x00-0x7F
11	Pad 1A Blue On Brightness MSB	0x00-0x01
12	Pad 1A Blue On Brightness LSB	0x00-0x7F
	…. additional pads	

AD41 + Ableton Live Integration

On Device Startup

AD41 will:
- Load the DAW preset into memory
- Firmware will retain screen control

Live on startup

Live will:
- Set screen owner to Ableton via sysex 0x1c

AD41 will:
- Set screen owner to Ableton Live, except for internal FW functions

Live on Shutdown

Live will:
- Return screen ownership to AD41 FW via 0x1c

AD41 will:
- Assume FW control of the display

TFT LCD

When in an Ableton Live-aware operating mode, the unit will display track or device information provided by Ableton Live on the TFT-LCD. The info about the track or device is provided over MIDI SysEx, detailed later in this document.

The screen layout is as follows:

String1
String2
String3

The table below describes the expected fields to be populated by Ableton Live:

| | | 7 - DeepBass | Vocoder |
| | | **Volume** | **Resonance** |
		-3.5 dB	**75%**
1	Centered	Track # and Name	Device Name
2	Centered	Last Touched Fader Name	Last Touched Param Name
3	Centered	Last Touched Fader Value	Last Touched Param Value

Any strings provided which do not fit in their allocated region will be handled by the firmware (truncated, scrolled, etc....). It is suggested that Ableton Live abbreviate long strings if it makes sense.

Screen colors will be determined by the MIDI CC assigned to Current Track color. The unit will adjust the text color automatically should the track color be pure black.

A 4th string, the Tempo string, allows Live to send a value string for the BPM of the project. The unit will show this string when the user presses and holds the Tempo button.

Screen Interaction Model
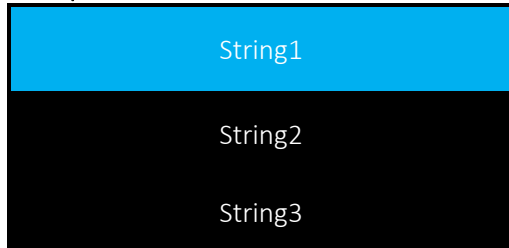
The Screen will display information using text.
Fonts of 16 point and 24 point are available in both regular and bold.
5 lines of text are supported at 16 point.
3 lines of text are supported at 24 point.

The background and foreground color of each line is controlled with MIDI messages.

Example:

List Navigation

- On entry
  - String2, the parameter list is highlighted.
    - List position moved to the beginning
  - Scroll with Encoder to select items in the parameter list
  - Press the encoder
    - String2 is unhighlighted
    - String3 is highlighted to indicate selection
      - Encoder edits the selected value.
      - Push to return to the parameter list.

Screen Status Monitoring

When under control by software other than AD41's internal firmware. The system should monitor for status. If the software is not responding, the system should automatically return to FW for ownership after 6 seconds. See sysex 0x19.

MIDI Sync

Ableton Live should send MIDI Clock, SongStart, SongStop, and Continue on USB MIDI. The unit will use this information two ways:

1. The unit will measure the period of incoming MIDI clock to blink/pulse the LEDs. The blinking/pulsing sequence will sync up to SongStart to ensure the LED behavior is aligned with the musical beat.
2. The unit will run the arpeggiator based on the incoming MIDI.

Functions
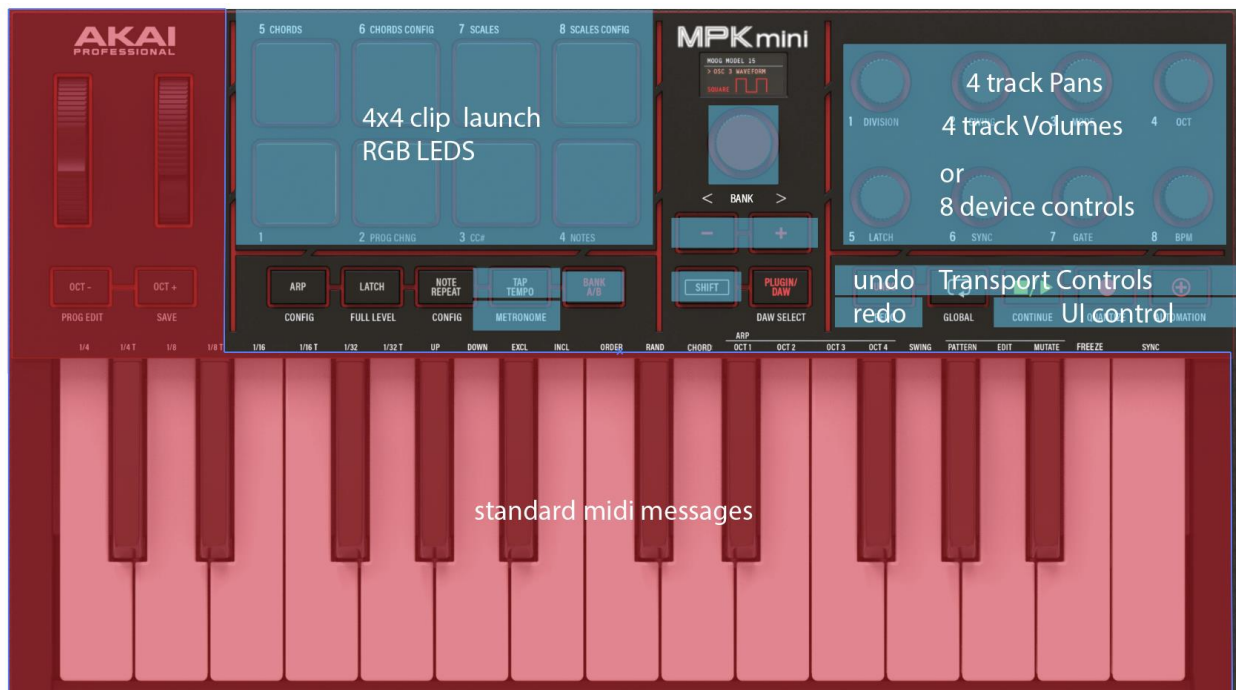
Keyboard, Pitch, Mod Wheel, Sustain

These controls will be used for controlling synths, internal sounds, VSTs etc. They will not be part of the Ableton control script and send on Port 1 exclusively.

Pads / Knobs

- The pad banks will be used for clip launching in a 4x4 matrix, and track management
- The 8 knobs will be used for volume, pan, and send FX and Device Control

Central Controls

The following controls will be used for project and track navigation.

+ and - buttons

- Pressing will move to the next/previous Track
- Pressing Shift and these buttons move to the next/previous knob bank in either Device Control Mode or Mixer Mode.

Encoder

- Encoder turn will move the 4x4 matrix up/down by selecting scenes and moving the 4x4 matrix at its edges.
- Encoder press will launch the currently selected scene.
- Shift+Encoder turn will navigate through different devices in Device Control Mode.
- Shift+Encoder press toggles between device and mixer mode for the knobs.

Screen

- Live maintains control of the screen, except when internal FW functions are accessed from AD41.
  - The screen will follow behavior illustrated in the above sections.

The RGB Backlit pads will serve multiple purposes. They can be in one of 3 modes. Sysex 0x2a will change or report these modes when Shift+Pad Mode is pressed.
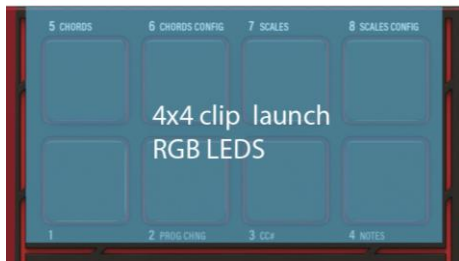
- **Notes:**
    - 4x4 Drum Rack
    - Colors and blinking controlled by RGB Note messaging
- **CC#:**
    - Bottom row of 4 pads
        - 4 track rec arms
    - Top row of 4 pads
        - 4 track clip stops
    - Shown for both banks
    - Colors and blinking controlled by RGB Note messaging
- **Program Change:**
    - Clip launching
        - 2x8 (use +/- buttons to access tracks 5-8)
    - Shown for both banks
    - Colors and blinking controlled by RGB Note messaging

Bank Button

Message sent via MIDI CC# to identify to Ableton Live what bank is currently active.

The Knobs will serve multiple purposes including device control and track mixer functions. Shift+Encoder Push will toggle between these 2 knob modes: Device Mode and Mixer Mode, each with their own accessible banks.

Implementation of Device Control Mode (Default):
- Knobs will be mapped to Device Control on the currently selected track.
- Shift+Encoder Turn will bank the knob parameters through the device chain, selecting the next device and its associated 8 parameters.
- Shift and +/- buttons move to the next/previous bank of parameters in the selected device
- +/- buttons will select the next/previous track and automap knobs to the first device on that track

Knob Bank 1

Knob 1	<Current device control k1>
Knob 2	<Current device control k2>
Knob 3	<Current device control k3>
Knob 4	<Current device control k4>
Knob 5	<Current device control k5>
Knob 6	<Current device control k6>
Knob 7	<Current device control k7>
Knob 8	<Current device control k8>

Implementation of Mixer Mode (Default):
- Knobs will be mapped to mixer controls on the currently selected track
- Shift and +/- buttons move to the next/previous bank of parameters on the selected track
- +/- buttons will select the next/previous track and automap knobs to the first bank of Mixer Mode controls

Bank 1

Knob 1	Track Pan
Knob 2	Send 1
Knob 3	Send 2
Knob 4	Send 3
Knob 5	Track Volume

Knob 6	Send 4
Knob 7	Send 5
Knob 8	Send 6

Bank 2

Knob 1	Send 7
Knob 2	Send 8
Knob 3	Send 9
Knob 4	Send 10
Knob 5	Send 11
Knob 6	Send 12
Knob 7	Send 13
Knob 8	Send 14

Tap Tempo / Metronome

Tap Tempo will:
- Send CC# to Ableton for tap tempo purposes
- Press and hold tap tempo to show tempo on screen.
    - Single color LED usage for LED control.
- Shift + Tap Tempo will toggle the metronome on or off.
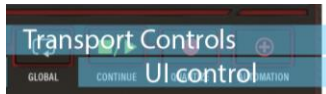   - Single color LED usage for LED control while shift is held.

Undo / Redo

Undo / redo will:
- Act as if CTRL-Z or CTRL-SHIFT-Z keystroke has been pressed.

Transport / UI Controls

Loop

- Toggles Ableton Live's Loop Switch
  - Single color LED usage for LED control while shift is held.

Start / Stop / Continue

- Start / Stop will act identically to the Space Bar keystroke.
- Continue will act identically to Shift+Spacebar keystroke.
- Single color LED usage for LED control.

Record / quantize

- Will act as arrange record button in Live.
- Shift + record will toggle record quantize on / off
- Single color LED usage for LED control.

Overdub / Automation

- Will act MIDI Overdub in Live.
- Shift + record will toggle record Automation Record on/off
- Single color LED usage for LED control.

Document History

Date	version	Notes	Author
2025-03-31	1.00	Draft	Dan Gill
2025-04-07	1.01	• Added 0x14	Dan Gill
2025-04-14	1.02	• Updated 0x14 to include text justification • Added 0x15 to clear entire lines of txt with one short message	Dan Gill
2025-04-21	1.03	• Updated control tables. Updated sysex messages. • Removed hidden port requirements. • Updated knob UX section.	Dan Gill
2025-06-20	1.04	• Updated the Control MIDI Map, pg. 7 • Updated 0x10 and 0x11 messages, pg. 19 and 20 • Updated 0x19 and 0x1c messages, pg. 21 • Added set/get pad play mode sysex, pg. 23 • Added disable/enable pad PC/CC data sysex message, pg. 23 • Added set/get knob mode sysex, pg. 23 • Added set/get Plugin/DAW mode sysex, pg. 23 • Added MIDI port pad adjust sysex, pg. 23 • Added hybrid screen share sysex, pg. 22 • New sysex messages for Live initialization and shutdown, pg. 32 • Changes +/- and encoder behavior, pg. 35 • Changed knob assignments and implementation, pg. 36	Eliza C.
2025-06-30	1.05	• Updated knob implementation, pgs. 36/37 • Changed integration for +/- and encoder activity, pg. 35	Eliza C.
2025-07-17	1.06	• Added additional sysex commands to 0x2d message, pg. 25 • Updated Control MIDI Map with set/get sysex on port 4 for bank a/b and oct -/+, pgs. 7-14 • Sysex Messages table, pgs. 15-16 • Removed default colors for 0x10 message, pg. 19 • Updated 0x19 and 0x1c messages, pg. 22 • 0x60, byte 10, added NKS port, pg. 25	Eliza C.

Date	version	Notes	Author
2025-08-22	1.07	• Removed foreground color payload from 0x11 message, added automatic color and center justification for text, pg. 21	Eliza C.