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AKAI PROFESSIONAL APC KEY 25 MK2 COMMUNICATIONS PROTOCOL (v1.1)

APC Key 25 mk2 is a USB bus-powered, compact controller for Ableton Live and other software applications. It features a 5x8 grid of RGB launch clips, velocity-sensitive keybed, 8 knobs, and 20 UI buttons for software control.

This document describes the format of messages between the APC Key 25 mk2 and the PC/Mac Host.

Brief Glossary

Outbound: The term "outbound" is used to describe messages sent from the PC Host to the device (i.e., from the viewpoint of the PC Host).

Inbound: The term "inbound" is used to describe messages sent from the device to the PC Host (i.e., from the viewpoint of the PC Host).

LED Control via MIDI Messages

APC Key 25 mk2's pad and button LEDs can be controlled by MIDI Note On/Off messages on Port 1 with 3-byte messages determining 3 factors: Pad/Button value, Behavior (solid, blink, pulse), and Color (pads = RGB, buttons = single color LED). You can control individual LEDs or send bulk commands for the entire UI surface.

Example - If I want to solidly light pad 1 red, send the following:

96 00 05

Yellow = MIDI CH determining LED behavior

Green = Pad/Button Value

Blue = RGB Color as velocity

These values will be in HEX

Pad/Button Values

Byte 2 (green) in the above example message determines which pad/button you are trying to light up. MIDI message construction changes depending on if it is an RGB LED (matrix pads) or a Single LED (smaller square buttons and transport controls).

Use the below guide to determine pad/button values and which type of LED message (RGB or Single) you will need to send.

Pad Matrix:
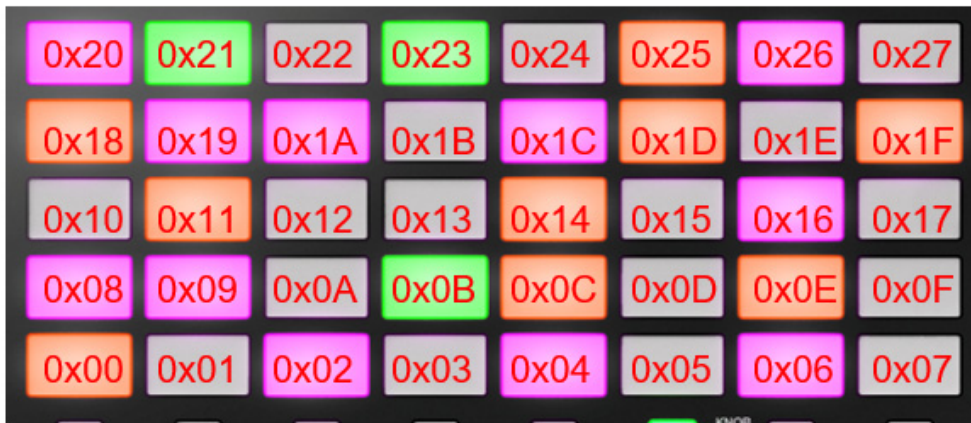
UI Buttons:

Button Name	Note #	Channel	LED	Port #
Track Button 1	0x40	0	Red	1
Track Button 2	0x41	0	Red	1
Track Button 3	0x42	0	Red	1
Track Button 4	0x43	0	Red	1
Track Button 5	0x44	0	Red	1
Track Button 6	0x45	0	Red	1
Track Button 7	0x46	0	Red	1
Track Button 8	0x47	0	Red	1
Scene Launch 1	0x52	0	Green	1
Scene Launch 2	0x53	0	Green	1
Scene Launch 3	0x54	0	Green	1
Scene Launch 4	0x55	0	Green	1
Scene Launch 5	0x56	0	Green	1
Stop All Clips	0x51	0	None	1
Play	0x5b	0	Green	1
Record	0x5d	0	Red	1

RGB LED Behavior (Solid, Blink, Pulse)

RGB LEDs can be lit solid at varying brightness and blink/pulse at different rates. This behavior is determined by what MIDI Channel MIDI note on message is sent on (MIDI CH 00-0F).

Looking at our above example, 96 00 05, we see that a value of 96 on byte 1 is used which instructs the LED to stay solidly lit at 100% brightness. If we change byte 1 to 97, our LED will pulse red at 1/16 notes synced with an external clock rate.

MIDI Channel	Byte 1 Value	Port	Function
0	90	0	On 10% brightness
1	91	0	On 25% brightness
2	92	0	On 50% brightness
3	93	0	On 65% brightness
4	94	0	On 75% brightness
5	95	0	On 90% brightness
6	96	0	On 100% brightness
7	97	0	Pulsing 1/16
8	98	0	Pulsing 1/8
9	99	0	Pulsing 1/4
10	9A	0	Pulsing 1/2
11	9B	0	Blinking 1/24
12	9C	0	Blinking 1/16
13	9D	0	Blinking 1/8
14	9E	0	Blinking 1/4
15	9F	0	Blinking 1/2

RGB LED Color

The below table designates 128 RGB values assigned to a velocity value which is represented by byte 3 in the RGB LED message. This color palette is predetermined and cannot be changed.

Again, taking the above example, 96 00 05, let's change pad 1 to solid lit orange:

96 00 09

96 = Solid lit at 100%

00 = Pad 1

09 = Velocity 09 = Orange

Velocity to RGB Color Chart

Color	Velocity	Color	Velocity	Color	Velocity
#000000	0	#142B00	19	#004152	38
#1E1E1E	1	#4CFF4C	20	#001019	39
#7F7F7F	2	#00FF00	21	#4C88FF	40
#FFFFFF	3	#005900	22	#0055FF	41
#FF4C4C	4	#001900	23	#001D59	42
#FF0000	5	#4CFF5E	24	#000819	43
#590000	6	#00FF19	25	#4C4CFF	44
#190000	7	#00590D	26	#0000FF	45
#FFBD6C	8	#001902	27	#000059	46
#FF5400	9	#4CFF88	28	#000019	47
#591D00	10	#00FF55	29	#874CFF	48
#271B00	11	#00591D	30	#5400FF	49
#FFFF4C	12	#001F12	31	#190064	50
#FFFF00	13	#4CFFB7	32	#0F0030	51
#595900	14	#00FF99	33	#FF4CFF	52
#191900	15	#005935	34	#FF00FF	53
#88FF4C	16	#001912	35	#590059	54
#54FF00	17	#4CC3FF	36	#190019	55
#1D5900	18	#00A9FF	37	#FF4C87	56

Color	Velocity	Color	Velocity	Color	Velocity
#FF0054	57	#88E106	85	#DCFF6B	113
#59001D	58	#72FF15	86	#80FFBD	114
#220013	59	#00FF00	87	#9A99FF	115
#FF1500	60	#3BFF26	88	#8E66FF	116
#993500	61	#59FF71	89	#404040	117
#795100	62	#38FFCC	90	#757575	118
#436400	63	#5B8AFF	91	#E0FFFF	119
#033900	64	#3151C6	92	#A00000	120
#005735	65	#877FE9	93	#350000	121
#00547F	66	#D31DFF	94	#1AD000	122
#0000FF	67	#FF005D	95	#074200	123
#00454F	68	#FF7F00	96	#B9B000	124
#2500CC	69	#B9B000	97	#3F3100	125
#7F7F7F	70	#90FF00	98	#B35F00	126
#202020	71	#835D07	99	#4B1502	127
#FF0000	72	#392b00	100	#404040	117
#BDFF2D	73	#144C10	101	#757575	118
#AFED06	74	#0D5038	102	#E0FFFF	119
#64FF09	75	#15152A	103	#A00000	120
#108B00	76	#16205A	104	#350000	121
#00FF87	77	#693C1C	105	#1AD000	122
#00A9FF	78	#A8000A	106	#074200	123
#002AFF	79	#DE513D	107	#B9B000	124
#3F00FF	80	#D86A1C	108	#3F3100	125
#7A00FF	81	#FFE126	109	#B35F00	126
#B21A7D	82	#9EE12F	110	#4B1502	127
#402100	83	#67B50F	111		
#FF4A00	84	#1E1E30	112		

Single LED Behavior/Color

UI Buttons on the periphery of the APC Key 25 mk2 are single-color LEDs and have their own unique control message.

In this example, we want to solidly light the Track 1 LED, which will always be red.

90 40 01

90 = MIDI Ch 00 *This will always be 90 for single LED commands. RGB blink/pulse values do not apply.*

40 = Volume button value

01 = LED On

Use the below table to construct your single LED MIDI message.

Byte number	Value	Description
1	0x90	MIDI CH Note-On
2	<Button Value>	0x40-0x5B *See **Pad/Button Values** above*
3	<Velocity>	Used to determine LED behavior as follows: LED Off = 0x00 LED On = 0x01, 0x03-0x7F LED Blink = 0x02

LED Bulk Message Format

RGB Matrix – Pad values are constant, MIDI Ch and RGB color are variable.

9X 00 XX	9X 0E XX	9X 1C XX
9X 01 XX	9X 0F XX	9X 1D XX
9X 02 XX	9X 10 XX	9X 1E XX
9X 03 XX	9X 11 XX	9X 1F XX
9X 04 XX	9X 12 XX	9X 20 XX
9X 05 XX	9X 13 XX	9X 21 XX
9X 06 XX	9X 14 XX	9X 22 XX
9X 07 XX	9X 15 XX	9X 23 XX
9X 08 XX	9X 16 XX	9X 24 XX
9X 09 XX	9X 17 XX	9X 25 XX
9X 0A XX	9X 18 XX	9X 26 XX
9X 0B XX	9X 19 XX	9X 27 XX
9X 0C XX	9X 1A XX	
9X 0D XX	9X 1B XX	

Single LED UI Buttons – Button values and MIDI Ch are constant, LED behavior is variable.

90 40 XX	90 52 XX
90 41 XX	90 53 XX
90 42 XX	90 54 XX
90 43 XX	90 55 XX
90 44 XX	90 56 XX
90 45 XX	90 51 XX
90 46 XX	90 5B XX
90 47 XX	

RGB LED Color Lighting

Alternatively, RGB pad colors can be customized using SysEx commands. This message is sent to the device to set one or several of the unit's RGB LEDs to a specific color. The color is created by sending three 8-bit color values for each color component (Red, Blue, and Green). Standard MIDI only supports 7-bit messages, so each color in the RGB Color Lighting message will be expressed using MSB/LSB.

Byte number	Value	Description
1	0xF0	MIDI System exclusive message start
2	0x47	Manufacturers ID Byte
3	0x7F	System Exclusive Device ID
4	0x4E	Product model ID
5	0x24	Message type identifier
6	<total MSB>	Number of data bytes to follow (most significant)
7	<total LSB>	Number of data bytes to follow (least significant)
8	0x00-0x3F	Start Pad
9	0x00-0x3F	End Pad
10	0x00-0x7F	Red Brightness MSB
11	0x00-0x7F	Red Brightness LSB
12	0x00-0x7F	Green Brightness MSB
13	0x00-0x7F	Green Brightness LSB
14	0x00-0x7F	Blue Brightness MSB
15	0x00-0x7F	Blue Brightness LSB
…	…	Repeat bytes 8-15 for each additional pad color change
<bytes total>	0xF7	MIDI System exclusive message terminator

Generic SysEx Messages

Depending on the software implementation required, APC Key 25 mk2 will respond to/with the following SysEx request/ return messages.

MIDI System Exclusive

The System Exclusive messages exchanged between the Host and the device will be of the following format:

Byte number	Value	Description
1	0xF0	MIDI System exclusive message start
2	0x47	Manufacturers ID Byte
3	0x7F	System Exclusive Device ID
4	00x4E	Product model ID
5	<Message ID>	Message type identifier
6	<DataLengthMSB>	Number of data bytes to follow (most significant)
7	<DataLengthLSB>	Number of data bytes to follow (least significant)
8	*n* data bytes	Data field – *n* bytes long
n+8	0xF7	MIDI System exclusive message terminator

Device Enquiry

APC Key 25 mk2 supports the standard MMC Device Enquiry message. These System Exclusive messages are part of the MIDI Machine Control Standard and do not follow the general format for Inbound System Exclusive message.

Byte number	Value	Description
1	0xF0	MIDI System exclusive message start
2	0x7E	Non-Realtime Message
3	0x00	Channel to inquire. (Set to 0 for this protocol.)
4	0x06	Inquiry Message
5	0x01	Inquiry Request
6	0xF7	MIDI System exclusive message terminator

APC Key 25 mk2 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	00x4E	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

Byte number	Value	Description
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	<Serial1>	Serial Number first digit
16	<Serial2>	Serial Number second digit
17	<Serial3>	Serial Number third digit
18	<Serial4>	Serial Number fourth digit
19	<Manufacturing1>	Manufacturing Data byte 1
20	<Manufacturing2>	Manufacturing Data byte 2
21	<Manufacturing3	Manufacturing Data byte 3
22	<Manufacturing4>	Manufacturing Data byte 4
23	<Manufacturing5>	Manufacturing Data byte 5
24	<Manufacturing6>	Manufacturing Data byte 6
25	<Manufacturing7>	Manufacturing Data byte 7
26	<Manufacturing8>	Manufacturing Data byte 8
27	<Manufacturing9>	Manufacturing Data byte 9
28	<Manufacturing10>	Manufacturing Data byte 10
29	<Manufacturing11>	Manufacturing Data byte 11
30	<Manufacturing12>	Manufacturing Data byte 12
31	<Manufacturing13>	Manufacturing Data byte 13
32	<Manufacturing14>	Manufacturing Data byte 14
33	<Manufacturing15>	Manufacturing Data byte 15
34	<Manufacturing16>	Manufacturing Data byte 16
35	0xF7	MIDI System exclusive message terminator

Introduction Message

This message is sent before any other device-specific message (i.e., other than Device Enquiry). It instructs the APC Key 25 mk2 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 APC Key 25 mk2 firmware.

| Byte number	Value	Description
1	0xF0	MIDI System exclusive message start
2	0x47	Manufacturers ID Byte
3	00x7F	System Exclusive Device ID
4	0x4E	Product model ID
5	0x60	Message type identifier
6	0x00	Number of data bytes to follow (most significant)
7	0x04	Number of data bytes to follow (least significant)
8	0x00	Application/Configuration identifier
9	<Version High>	application Software version major
10	<Version Low>	application Software version minor
11	<Bugfix Level>	Application Software bug-fix level
12	0xF7	MIDI System exclusive message terminator

Response from APC Key 25 mk2 Introduction message:

Byte number	Value	Description
1	0xF0	MIDI System exclusive message start
2	0x47	Manufacturers ID Byte
3	0x7F	System Exclusive Device ID
4	0x4E	Product model ID
5	0x61	Message type identifier
6	0x00	Number of data bytes to follow (most significant)
7	0x04	Number of data bytes to follow (least significant)
8	<Fader #1 Value>	Sends the current value of Fader #1.
9	<Fader #2 Value>	Sends the current value of Fader #2.
10	<Fader #3 Value>	Sends the current value of Fader #3.
11	<Fader #4 Value>	Sends the current value of Fader #4.
12	<Fader #5 Value>	Sends the current value of Fader #5.
13	<Fader #6 Value>	Sends the current value of Fader #6.
14	<Fader #7 Value>	Sends the current value of Fader #7.
15	<Fader #8 Value>	Sends the current value of Fader #8.
16	<Fader #9 Value>	Sends the current value of Fader #9.
17	0xF7	MIDI System exclusive message terminator

Control Mapping

Use the below data to determine APC Key 25 mk2 MIDI values corresponding to hardware controls and modes.

Pads/Buttons
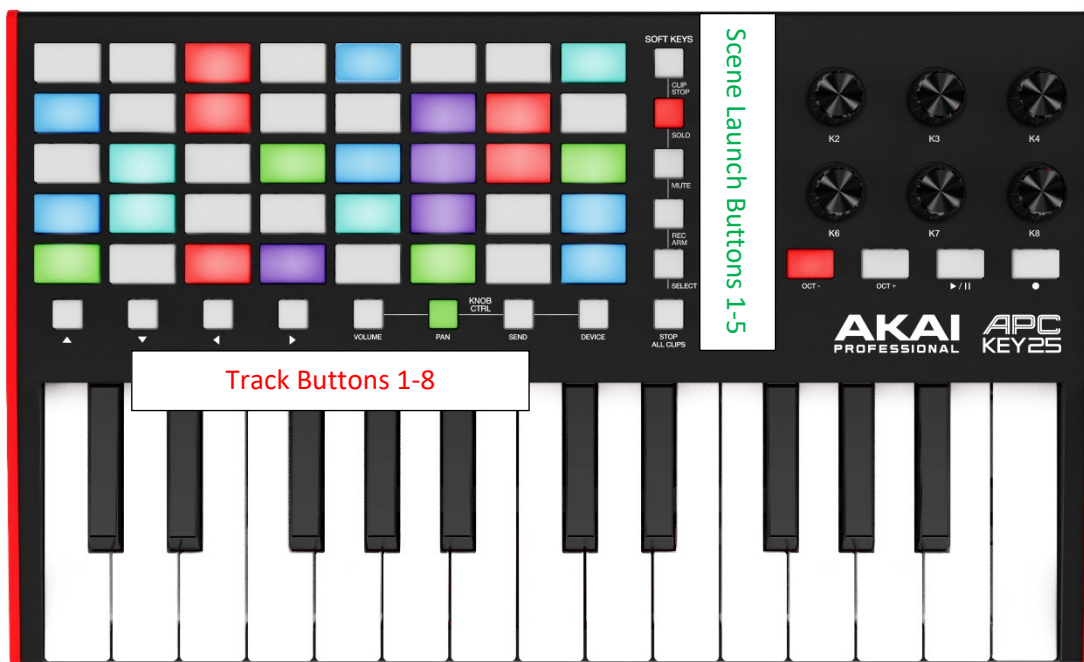
The following chart shows the MIDI Note # associated with each button. This number will be used for the Inbound Note-On/Off values when the buttons are pressed, and Outbound Note-On messages to control the button's LEDs, if applicable.

Button Name	Note #	Channel	LED	Port #	Notes
Track Button 1	0x40	0	Red	1	
Track Button 2	0x41	0	Red	1	
Track Button 3	0x42	0	Red	1	
Track Button 4	0x43	0	Red	1	
Track Button 5	0x44	0	Red	1	
Track Button 6	0x45	0	Red	1	
Track Button 7	0x46	0	Red	1	
Track Button 8	0x47	0	Red	1	
Scene Launch 1	0x52	0	Green	1	
Scene Launch 2	0x53	0	Green	1	

Button Name	Note #	Channel	LED	Port #	Notes
Scene Launch 3	0x54	0	Green	1	
Scene Launch 4	0x55	0	Green	1	
Scene Launch 5	0x56	0	Green	1	
Stop All Clips	0x51	0	None	1	
Play	0x5b	0	None	1	
Record	0x5d	0	None	1	
Shift	0x62	0	None	1	
Oct Down	-	-	-	-	Transposes keybed by an octave. Does not send Note On/Off.
Oct Up	-	-	-	-	Transposes keybed by an octave. Does not send Note On/Off
Clip Launch Button 0-39	0x00 – 0x27	*See notes*	RGB	1	Numbered bottom left to upper right. MIDI Channel is used to determine LED illumination Status on CH 00-0F. *See section on **RGB LED Behavior**.*
Sustain	0x40	0	None	0	Midi CC# message
Keybed	0x00 – 0x7f	0	None	0	Full range accessible using Oct Down / Oct Up buttons

Knobs

The following chart lists the CC# for each knob control.

Control Name	CC#	Channel	Port	Notes
Knob 1	0x30	0	1	Relative
Knob 2	0x31	0	1	Relative
Knob 3	0x32	0	1	Relative
Knob 4	0x33	0	1	Relative
Knob 5	0x34	0	1	Relative
Knob 6	0x35	0	1	Relative
Knob 7	0x36	0	1	Relative
Knob 8	0x37	0	1	Relative