



US-428 Four Control Banks Specification

These two control protocols are intended to provide better control of software synthesizers and samplers by allowing the US-428 to generate scores of MIDI controller messages, not just a dozen or so. It does this in several ways, most importantly by supporting four independent "banks" of control surfaces.

The two protocols, which are listed in the US-428 control panel as "Four Control Banks (Pots)" and "Four Control Banks (Encoders)", are almost identical. They only differ in how the rotary encoders are interpreted. Each protocol is described in detail below. There is also a .GIF file included which summarizes controller and note numbers, and gives a graphical representation of the control banks.

The purpose of this protocol is to provide an operational mode in which users can program the US-428 to work with software synths and other applications requiring the mapping of a large number of messages. The ability of the US-428 to work in this mode will enable users to create their own templates for use with virtual synths and other applications.

Banks

There are four banks, or sets, of controls. Think of each bank as a "layer"...the US-428's control surface sends out a different set of messages for each bank. The active bank is indicated by its associated AUX LED (e.g., AUX1 is lit for Bank1; AUX2 is lit for Bank2, etc.). Banks can be selected directly by pressing one of the AUX buttons; they can also be selected sequentially with the BANK button. (When you first select the Banks protocol, it opens with Bank1 active.)

MIDI Notes and Controllers - Nomenclature used in this document

Some button presses result in the US-428 sending a MIDI Note On message to the application via the US-428 Control Port, while other actions may send a MIDI Controller message. The note or controller number sent depends, in most cases, on the currently active bank. For example, Fader 1 is listed as:

Fader 1 MIDI Controller (0 + 32*B)

The "B" here means the Bank number minus 1. When Bank 1 is active, B = 0; when Bank 4 is active, B = 3. This means that moving Fader 1 sends the current fader position as a MIDI controller message (a value of 0....127), with the MIDI controller number being 0 in Bank1, 32 in Bank2, 64 in Bank3, and 96 in Bank4. This allows the single physical Fader 1 to act as four different controllers, one in each bank.

MIDI messages are always sent and received on channel 1 of the US-428 Control Port, except for "Global Controls" (described below), which are sent and received on channel 2.

MUTE Buttons

Pressing a MUTE button sends a MIDI Note On message with a velocity of 127. Releasing the button sends a Note On message with a velocity of 0. The SOLO button acts like a shift/modifier key for the MUTE buttons. Pressing the SOLO button (SOLO LED is lit) causes the MUTE buttons to transmit a different note than when the SOLO LED is not lit.

When SOLO LED is off:

MUTE 1 button	sends	MIDI note (0 + 32*B)
MUTE 2 button	sends	MIDI note (1 + 32*B)
MUTE 3 button	sends	MIDI note (2 + 32*B)
MUTE 4 button	sends	MIDI note (3 + 32*B)
MUTE 5 button	sends	MIDI note (4 + 32*B)
MUTE 6 button	sends	MIDI note (5 + 32*B)
MUTE 7 button	sends	MIDI note (6 + 32*B)
MUTE 8 button	sends	MIDI note (7 + 32*B)

When SOLO LED is on:

MUTE 1 button	sends	MIDI note (8 + 32*B)
MUTE 2 button	sends	MIDI note (9 + 32*B)
MUTE 3 button	sends	MIDI note (10 + 32*B)
MUTE 4 button	sends	MIDI note (11 + 32*B)
MUTE 5 button	sends	MIDI note (12 + 32*B)
MUTE 6 button	sends	MIDI note (13 + 32*B)
MUTE 7 button	sends	MIDI note (14 + 32*B)
MUTE 8 button	sends	MIDI note (15 + 32*B)

SELECT Buttons

In much the same manner as with the MUTE and SOLO buttons, the SELECT buttons can also send one of two possible MIDI note messages. The REC button acts like a shift/modifier key for the SELECT buttons. The note sent depends on whether the REC button is lit or not.

When REC LED is off:

SELECT 1 button	sends	MIDI note (16 + 32*B)
SELECT 2 button	sends	MIDI note (17 + 32*B)
SELECT 3 button	sends	MIDI note (18 + 32*B)
SELECT 4 button	sends	MIDI note (19 + 32*B)
SELECT 5 button	sends	MIDI note (20 + 32*B)
SELECT 6 button	sends	MIDI note (21 + 32*B)
SELECT 7 button	sends	MIDI note (22 + 32*B)
SELECT 8 button	sends	MIDI note (23 + 32*B)

When REC LED is on:

SELECT 1 button	sends	MIDI note (24 + 32*B)
SELECT 2 button	sends	MIDI note (25 + 32*B)
SELECT 3 button	sends	MIDI note (26 + 32*B)
SELECT 4 button	sends	MIDI note (27 + 32*B)
SELECT 5 button	sends	MIDI note (28 + 32*B)

SELECT 6 button	sends	MIDI note (29 + 32*B)
SELECT 7 button	sends	MIDI note (30 + 32*B)
SELECT 8 button	sends	MIDI note (31 + 32*B)

In any given bank, the last active SELECT button will be remembered. If you last used SELECT 3 in Bank 1, and then changed to Bank 4, when you return to Bank 1 SELECT 3 will be active.

Channel Faders

Moving any of the 8 channel faders sends the current fader position as a MIDI controller message:

FADER 1	sends	MIDI controller (0 + 32*B)
FADER 2	sends	MIDI controller (1 + 32*B)
FADER 3	sends	MIDI controller (2 + 32*B)
FADER 4	sends	MIDI controller (3 + 32*B)
FADER 5	sends	MIDI controller (4 + 32*B)
FADER 6	sends	MIDI controller (5 + 32*B)
FADER 7	sends	MIDI controller (6 + 32*B)
FADER 8	sends	MIDI controller (7 + 32*B)

In any given bank, the last known fader positions for all 8 channel faders will be remembered. When switching between banks, the FADER NULL function may be used to align the fader positions just as it is in Native Mode.

The Pan Knob

Turning the PAN knob sends a controller message. The MIDI controller number used depends on the selected bank, but also on the currently lit SELECT LED. If "S" represents the currently lit SELECT LED number, then the PAN knob sends:

MIDI controller (7 + S + 32*B)

Again, the "B" here means the Bank number minus 1. This means that moving the PAN with SELECT LED 1 lit sends a MIDI controller message (a value of 0.....127), with the MIDI controller number being 8 in Bank1, 40 in Bank2, etc.

PAN / SELECT 1	sends	MIDI controller (8 + 32*B)
PAN / SELECT 2	sends	MIDI controller (9 + 32*B)
PAN / SELECT 3	sends	MIDI controller (10 + 32*B)
PAN / SELECT 4	sends	MIDI controller (11 + 32*B)
PAN / SELECT 5	sends	MIDI controller (12 + 32*B)
PAN / SELECT 6	sends	MIDI controller (13 + 32*B)
PAN / SELECT 7	sends	MIDI controller (14 + 32*B)
PAN / SELECT 8	sends	MIDI controller (15 + 32*B)

Each bank simulates 8 fixed-position pan pots initially centered at MIDI value 64. Turning the PAN knob one click left decreases the value by 8, down to 0; turning it to the right increases the value by 8, up to 127.

Holding the SET button places the PAN knob in fine mode, and the increments increase and decrease in values of 1. (Note that once SET is released and PAN returns to coarse mode, the values will re-align to multiples of 8. For example, if the current value is 60 when SET is released, the next two clicks will be 64 and 72.)

EQ Knobs

Much like the PAN knob, the EQ knobs simulate fixed-position pan pots. In each of the four banks, each of the three EQ knobs sends a different MIDI controller message depending on which EQ band LED is lit. (Three EQ knobs times four EQ bands times four banks.) Pressing an EQ bank button lights the associated LED, and the last selected EQ band for each of the four banks is remembered.

To describe the MIDI controller numbers used for the EQ knobs, we will number the EQ bands from bottom to top; LO=0, LO MID=1, HI MID=2, HI=3. "E" represents the currently-active EQ band/LED:

GAIN knob	sends	MIDI controller (18 + 3*E + 32*B)
FREQ knob	sends	MIDI controller (17 + 3*E + 32*B)
Q knob	sends	MIDI controller (16 + 3*E + 32*B)

The values sent follow the same rules as described for the PAN knob, including coarse and fine control with the SET button.

Data Wheel

The DATA wheel will also send 4 different MIDI controller number messages in each of the four banks. The controller number sent depends on whether the ASN, F1, F2 or F3 LED is lit.

If we label the currently-lit LED as "F", and number the buttons as ASN=0; F1=1; F2=2; and F3=3, then the DATA wheel sends MIDI controller number:

DATA Wheel	sends	MIDI controller (28 + F + 32*B)
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Again, the same rules apply as with the PAN and EQ knobs, including the coarse and fine increment modes as modified by the SET button.

Global Controls

Some of the US-428 controls have the same behavior in all four banks. These include the MASTER fader, LOCATE buttons, and transport buttons. All of these global controls are transmitted on MIDI channel 2 of the US-428 control port (as opposed to all the bank-related controls, which transmit on channel 1 of the control port).

MASTER fader	sends	MIDI controller 7
REW button	sends	MIDI note 0
FFWD button	sends	MIDI note 1
STOP button	sends	MIDI note 2
PLAY button	sends	MIDI note 3
RECORD button	sends	MIDI note 4
<LOCATE button	sends	MIDI note 5
LOCATE> button	sends	MIDI note 6

Controlling LED's

Some LED's may be controlled by the application. LED's are turned on with a Note On message with a velocity of 127, and turned off with a Note Off message with a velocity of 0. Four banks of MUTE and REC LED's can be controlled by sending messages to channel 1 of the Control port. Transport LED's can be controlled by sending messages to channel 2.

MUTE 1 LED	MIDI note (0 + 32*B)
MUTE 2 LED	MIDI note (1 + 32*B)
MUTE 3 LED	MIDI note (2 + 32*B)
MUTE 4 LED	MIDI note (3 + 32*B)
MUTE 5 LED	MIDI note (4 + 32*B)
MUTE 6 LED	MIDI note (5 + 32*B)
MUTE 7 LED	MIDI note (6 + 32*B)
MUTE 8 LED	MIDI note (7 + 32*B)

REC 1 LED	MIDI note (8 + 32*B)
REC 2 LED	MIDI note (9 + 32*B)
REC 3 LED	MIDI note (10 + 32*B)
REC 4 LED	MIDI note (11 + 32*B)
REC 5 LED	MIDI note (12 + 32*B)
REC 6 LED	MIDI note (13 + 32*B)
REC 7 LED	MIDI note (14 + 32*B)
REC 8 LED	MIDI note (15 + 32*B)

REW LED	MIDI note 0
FFWD LED	MIDI note 1
PLAY LED	MIDI note 3
RECORD LED	MIDI note 4

Four Controller Banks (Encoders)

This protocol is nearly identical to the "Four Controller Banks (Pots)" protocol. The only difference is the treatment of the rotary encoders (GAIN, FREQ, Q, PAN and DATA Wheel).

Instead of emulating potentiometers, a turn one click to the right would send a MIDI value of 68 (or 65 if SET is held down). A turn one click to the left would send a MIDI value of 60 (or 63 if SET is held down). The result makes changing banks "seamless" to the user.

Initialization

When one of these protocols is first selected, SEL 1, LO and ASN are selected in all four banks, and BANK1 (AUX1) is selected. In "Four Controller Banks (Pots)" mode, all rotary controls in all four banks are set to the physical fader positions. The channel faders in the other three banks are set to 0 value.