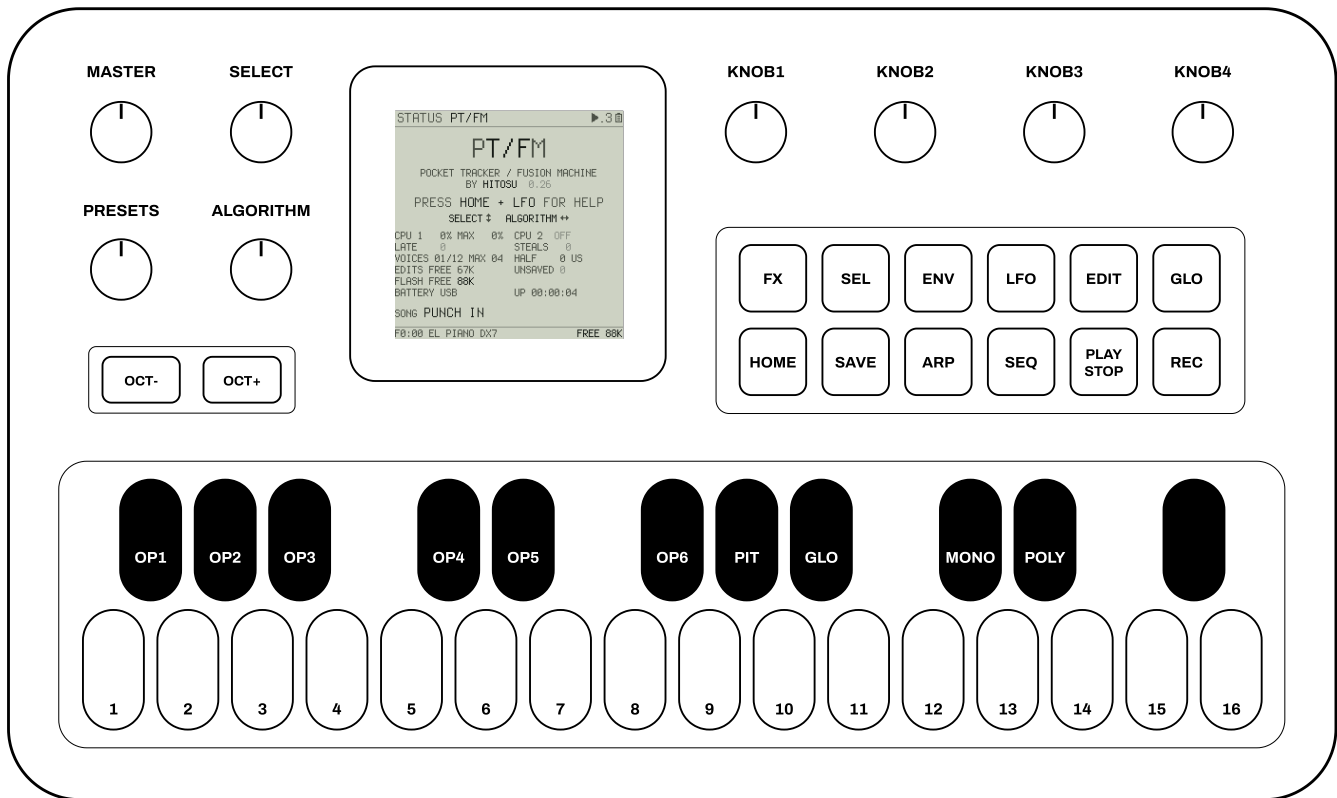


PT/FM OWNER'S MANUAL

POCKET TRACKER / FUSION MACHINE



for PT/FM 0.26

BY HITOSU

About this manual

PT/FM is a firmware for the M-VAVE FM-1. It turns the FM-1 into a tracker: you write music as patterns of notes, play them as songs, stack live loops, mix two songs like a DJ, and play six kinds of instrument from its keys.

Read chapters 1 to 5 first: they install PT/FM, show the panel, explain the few rules every screen follows, and walk you through your first hour. Chapters 6 to 15 explain each screen in detail. The rest of the manual is for looking things up: every shortcut, every message, troubleshooting, the instruments that come with PT/FM, the specifications, and a glossary of the words used (appendix G).

PT/FM's home is hitosu.github.io/ptfm: the latest version, its pages (the install page, the EDITOR page), the demo disk and this manual. Its source, free software, is at github.com/hitosu/ptfm.

In a hurry? Install PT/FM and the demo disk (chapter 2), then go straight to chapter 5: it plays a song in a minute, and names every key it uses.

The FM-1 also has its own help on every screen: press **HOME** + **LFO**. Its pages are short reminders of what this manual explains.

How this manual writes things

WRITTEN	MEANS
SEQ	a button or a knob, by the name printed on the panel. PLAY is the button printed PLAY / STOP.
POLY	a black key, by the name printed on it. The last black key has no print: this manual calls it the blank key.
③	a white key, counted from the left: white key 1 is the lowest, white key 16 the highest.
HOME + LFO	a combination: the first button held (or, for HOME, tapped first), then the second.
PLAY held	pressed and kept down for a moment (half a second unless you set HOLD DELAY otherwise).
SEL held + K1	the same, said where the holding matters: keep SEL down and turn K1.
HOME + white key held	a combination whose last key is kept down (here, the white key). "Held" after a combination is always about its last key.
SAVED	a message the FM-1 shows, exactly as it shows it. Numbers in messages change with the case (TRACK 02 MUTED).

On the web page on a computer, point at a key in the text and it lights on the FM-1 drawn beside the text; a row of a key table lights all its keys. Point at a key or knob of the drawing and its screen names it.

MEMO

Numbers on the FM-1 are mostly hexadecimal, two digits: tracks **00** to **0F** are the first to the sixteenth track, and patterns and cartridges count **00**, **01** ... **09**, **0A** ... **0F**, **10** and so on.

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1 | PT/FM AT A GLANCE

PT/FM stands for Pocket Tracker / Fusion Machine. It is a complete music workstation in the FM-1: write songs, play them, play over them live, and keep everything on the FM-1 itself.

What it does

- **A tracker.** Music is written as patterns: a grid of up to 16 tracks across and up to 128 rows down, each row a step in time. A cell holds a note, the instrument that plays it, a volume and up to 4 commands (a slide, an arpeggio, a tempo change ...). A song plays patterns in an order of your choice. The EDITOR writes patterns; SONGS arranges them.
- **Six kinds of instrument**, sharing one pool of voices; INSTRUMENTS picks, tries and edits them:
 - **DX7:** 6-operator FM, the classic digital synth.
 - **JUNO-106:** the classic analogue polysynth.
 - **TB-303:** the acid bass line, with slide and accent.
 - **CHIP:** the sound chips of 8-bit computers and consoles.
 - **Sampler:** recorded sounds, with loops and an envelope.
 - **FUSION:** an instrument made of a pattern, where **one note is one pattern row**. Each key plays its own row of the pattern (C-4 plays row 3C), every note written in that row at once, each on its own instrument: one key can play a chord, a layered sound, or a different drum on every key, a kit. The row's commands play as well, so a key can also start an arpeggio or a short riff (chapter 8).
- **Up to 16 notes at once** (SETTINGS' VOICES: 8, 12 or 16), from the songs, the loops and the keys together.
- **Effects:** GATE, FILTER, DRIVE, LO-FI, CHORUS, DELAY, REVERB, LIMITER and DUCK, each song with its own setup, plus a METRONOME. Held on the white keys, sixteen **punch-in effects** play over everything for as long as a key is down (FX).
- **LOOPS**, a loop station: record up to 16 loops of one length on top of each other, mute and solo them from the keys, and record the whole performance as a new song (RECORD LIVE).
- **DJ:** two songs on two decks, kept in time, mixed with a crossfader, with filters, pads and an LFO.
- **MIDI:** play PT/FM from a keyboard or a computer (USB, or the TRS MIDI IN jack), learn an outside controller's knobs and pads onto the FM-1's own, send the keys and everything that plays out over USB, or make the FM-1 a controller for the computer (MIDI CONTROLLER).
- **Sync** with other gear, three ways (chapter 16):
 - **MIDI clock in** (SETTINGS' SYNC EXTERNAL): PT/FM follows a sequencer's or a drum machine's clock, from USB or the MIDI IN jack, with its START, STOP, CONTINUE and song position, locked to it so nothing drifts.
 - **MIDI clock out** (CLOCK OUT ON): PT/FM leads, sending the clock, START / STOP / CONTINUE and the song position over USB.
 - **Audio sync pulse** (SETTINGS' OUTPUT SYNC PULSE L or R): a click on one side of the output every half beat, for instruments that follow a

sync pulse, the music in mono on the other side. It works while PT/FM leads (SYNC INTERNAL).

- **USB audio:** a computer connected by USB hears PT/FM as a sound card and can record it.
- **Everything stays on the FM-1:** SAVE writes your songs, patterns, instruments and settings into its own memory, where they survive power-off and firmware updates.

What comes with it

Built into the firmware are 11 synth cartridges, numbered F0 to FA: eight DX7 cartridges (F0 KEYS/ORGANS to F7 PERC/FX), F8 JUNO-106 (128 sounds), F9 CHIPTUNE (128 sounds) and FA TB-303 (64 sounds). They are always there, even on an empty FM-1. You can edit them like anything else; SAVE keeps your changes, and the originals come back with BACK TO BUILT-IN.

The demo disk is uploaded from the install page (chapter 2). It adds five sampler cartridges (a drum kit, percussion, band and orchestra instruments, voices, basses), the FUSION cartridge, six demo songs and twelve DJ loops. Appendix D lists them all.

The screens

PT/FM has ten screens. Each black key opens one (press **HOME**, then the black key), and FX has a button of its own:

KEY	SCREEN	FOR
OP1	SONGS	your songs: the list, and each song's order of patterns
OP2	EDITOR	writing patterns
OP3	INSTRUMENTS	cartridges and instruments: choose, try, edit
OP4	PLAYBACK	following what plays
OP5	DJ	two songs mixed live
PIT	VISUAL	the sound made visible
GLO	STATUS	the start screen: version, help, performance, storage
MONO	SETTINGS	settings and tools
POLY	LOOPS	the loop station
FX	FX	effects, punch-ins, the metronome, the mixer

The black key OP6 and the blank key have no screen yet.

2 | INSTALLING AND UPDATING

PT/FM is installed from a web page, **install.html**, that comes with the firmware. It works offline: the firmware and the demo disk are inside the page. Get the latest from PT/FM's home, hitosu.github.io/ptfm, or from its repository, github.com/hitosu/ptfm (the dist folder).

Before you start

- Open **install.html** in **Chrome or Edge**, on a computer or an Android phone. Safari and iPhones cannot talk MIDI from a web page.
- Connect the FM-1 by USB and switch it on. Keep it connected until the page says it is done.
- When the browser asks, allow MIDI devices, **SysEx included**: the whole install goes through MIDI.

NOTE

Changes not yet saved on the FM-1 are lost by an install, as when it is switched off. Press **SAVE** on the FM-1 first.

INSTALL FIRMWARE

Writes PT/FM over whatever firmware the FM-1 runs.

- 1 Open **install.html** and connect the FM-1.
- 2 Press **INSTALL FIRMWARE**. The page shows its progress, the kilobytes written of the firmware's; the FM-1 restarts by itself.
- 3 When the page says it is done, the FM-1 starts PT/FM on its STATUS screen.

Over PT/FM (an update), your songs, patterns, instruments, samples and settings stay where they are: the install writes nothing into PT/FM's own memory, the *user area*. **Over another firmware**, keep a copy of your work first: other firmwares erase that memory when they are installed. The EDITOR page saves the FM-1's whole library to a file (chapter 17).

Updates: a new version comes as a new install page, on PT/FM's home. Install it as above; STATUS shows the version the FM-1 runs.

CLEAN INSTALL

A fresh start. With the CLEAN INSTALL switch on, INSTALL FIRMWARE writes PT/FM and then erases everything the FM-1 holds: your work, the settings, and any damaged records. The FM-1 then starts with an empty user area and only the built-in cartridges. Upload the demo disk after it if you want the demo songs.

The FM-1 can do the same erase on its own, without a computer: SETTINGS, TOOLS, FACTORY RESET (chapter 13).

UPLOAD DEMO DISK

Needs PT/FM running on the FM-1. Afterwards the FM-1 holds exactly the demo disk: its songs, patterns, cartridges and samples take the place of yours, and what of yours is not on it is gone.

It is a fresh start with the demo disk: **everything you saved goes**, your settings, MIDI mappings, loops, DJ's decks and your changes to the built-in cartridges included. Only the built-in cartridges themselves stay.

- To keep your work, back it up first on the EDITOR page: READ, then DOWNLOAD DISK (chapter 17).
- To add the demo songs to your own work instead of replacing it, drop demo.ptfmdsk on the EDITOR page's TABLE, drag what you want onto its FM-1 panel, and WRITE.
- If the FM-1 has edits not saved, the upload is refused: press **SAVE** on the FM-1 (or revert them), then upload again.
- An upload cut short leaves what was there whole, unless the upload was replacing a nearly full FM-1's library: then part of it may be left. Either way, upload again. The FM-1 says what it found when it starts.

UPLOAD CUSTOM DISK

The same with a disk file you pick (**.ptfmdsk**): a backup the EDITOR page's DOWNLOAD DISK saved (chapter 17), or a disk someone gave you. Afterwards the FM-1 holds exactly that disk, everything else gone, as with the demo disk. A file that is no disk, or a disk holding nothing, is refused before anything is sent. A disk that leaves the FM-1 less than 64 KB free still goes in, and the page says what that costs its own saves: under 40 KB free, it saves nothing new until you delete something.

A disk that does not fit around what the FM-1 holds, but would fit it empty, is not written: the page offers **REPLACE ALL**, which erases everything the FM-1 holds and then writes the disk. Cut short, it leaves part of the disk: upload again.

USB RESCUE

If the FM-1 does not start, or does not answer the install page:

- 1** Switch the FM-1 off.
- 2** Hold **OCT-** and switch it on. The screen says **USB RESCUE**.
- 3** Press INSTALL FIRMWARE on the install page.

The FM-1 also starts in USB RESCUE by itself after two failed starts in a row.

NOTE

An install cut short (a cable pulled, the power lost) is not resumed by itself. Press INSTALL FIRMWARE again. If the FM-1 no longer answers the page, switch it off and start it in USB RESCUE (**OCT-** held at power-on), then install from there.

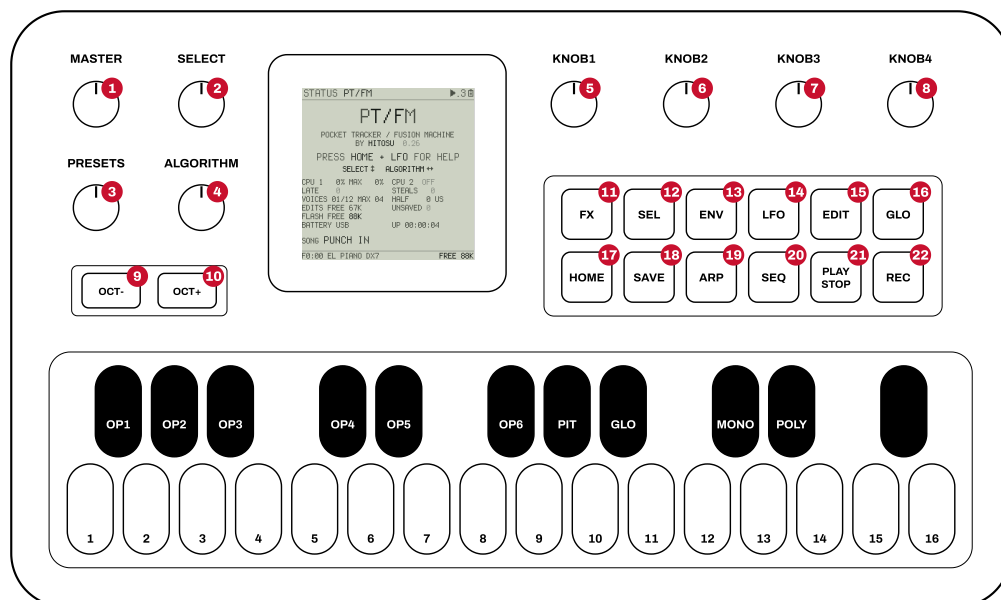
If something goes wrong

- **No FM-1 found:** close what else uses its MIDI port (a music program, another installer, another browser tab), then try again.
- **Back to another firmware:** PT/FM keeps the FM-1's update path, so another FM-1 firmware's installer replaces it, from USB RESCUE if need be.

3 | THE PANEL

Seven endless knobs and a volume knob, fourteen buttons, 27 keys and a 240 × 240 colour screen. Many of the buttons are printed for the FM-1's original synth; PT/FM gives each one job on every screen.

Knobs and buttons

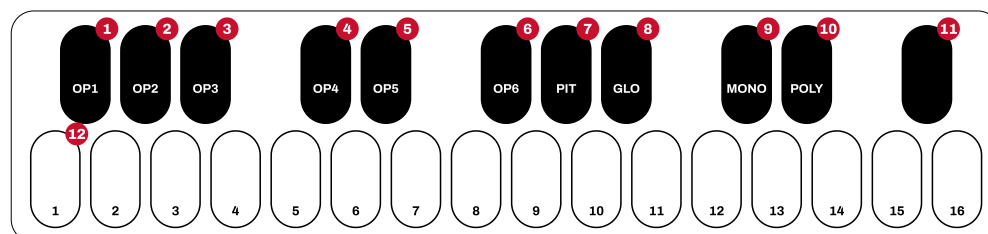


The knobs and buttons, numbered as in the table below.

CONTROL	ITS JOB
1 MASTER	The volume. It is a plain volume knob, never used for anything else.
2 SELECT	Moves the cursor up and down (rows, list items).
3 PRESETS	Picks the current instrument, on every screen: the sound the keys play.
4 ALGORITHM	Moves the cursor left and right (tracks, columns).
5-8 K1 K2 K3 K4	Change values at the cursor. The footer says what each one turns. (Printed KNOB1 to KNOB4.)
9, 10 OCT- OCT+	The keys' octave, -4 to +4.
11 FX	The FX screen. Held with a white key: a punch-in effect.
12 SEL	Select and act: the menu of the thing at the cursor. Held, a shift.
13 ENV	The lists: patterns, cartridges, samples, songs (read it as <i>Explore Named Vaults</i>).
14 LFO	Clear, or reset to the default (<i>Leave Field Open</i>). With HOME: the help.
15 EDIT	Open the thing at the cursor for editing; again, done.
16 GLO	The properties of what the screen shows: the song, the pattern, the view.
17 HOME	Back. At the top of a screen: the screens, mutes, rewind and help (HOME's combination).
18 SAVE	Write every change to the FM-1's memory.

CONTROL	ITS JOB
19 ARP	The arpeggiator (<i>Again, Repeat, Please</i>).
20 SEQ	The screen's next view (<i>Show Else, Quick</i>).
21 PLAY	Play / pause. Held: stop and go back to the start.
22 REC	Record: write notes in the EDITOR, record loops in LOOPS.

The keys



The black keys and the white keys.

The 27 keys play notes, F-3 to G-5 at octave 0; OCT- and OCT+ shift them down to C-0 or up to G-9. At octave -4 the seven lowest keys, which would be below C-0, are silent. Many screens give the keys other jobs:

- **The 16 white keys** are 16 tracks, 16 loops, 16 steps or 16 punch-in effects, depending on the screen. White key 1 is the leftmost.
- **The 11 black keys** open the screens (with HOME): OP1 to OP5, PIT, GLO, MONO and POLY. OP6 and the last, unprinted key, the **blank key**, have no screen yet.

KEY	WITH HOME, OPENS
1 OP1	SONGS (<i>Open Page 1</i>)
2 OP2	EDITOR
3 OP3	INSTRUMENTS
4 OP4	PLAYBACK
5 OP5	DJ
6 OP6	nothing yet
7 PIT	VISUAL (<i>Pictures In Time</i>)
8 GLO	STATUS
9 MONO	SETTINGS (<i>My Own Nerdy Options</i>)
10 POLY	LOOPS (<i>Party On, Loop Yourself</i>)
11 BLANK	nothing yet
12 white keys	tracks to mute or solo (HOME's combination)

Without HOME, some screens give the black keys jobs of their own: on DJ they work the two decks, on FX LIVE each picks an effect (and the blank key is BYPASS), on LOOPS' CONTROL mode they set the quantize and the next loops' mode. Each screen's chapter lists them.

The lights

Every button and key has a light, and the lights tell you what works:

- **dim:** it does something on this screen;
- **off:** it does nothing here;
- **on:** its mode or its list is open (REC on: writing; ARP on: the arpeggiator runs).

PLAY has two lights. Green means playing (brighter on each beat); red means paused. Green with a dim red means a loop is playing (the EDITOR's pattern or the loops), not a song. Red dim alone: nothing to resume yet. Both dark: PLAY has nothing to play here.

Some lights have rules of their own:

- **SAVE** is dim while something is not saved yet, dark when everything is saved, and blinks dim while a save waits for the music to pause.
- **OCT-** and **OCT+** show the octave. Both are dark at octave 0; OCT- lights for the octaves below, OCT+ for those above: dim at 1, full at 2, blinking slowly at 3 and fast at 4.
- **A fast blink** on a button means it cannot act just now: PLAY with no song to play, for example.
- **HOME breathes** (dim to full and back) while HOME's combination is open; then the black keys show the screens (the current one bright, the others dim, OP6 and the blank key dark) and the white keys show the tracks: dim while a track plays, dark while it is muted, bright while it is soloed.
- **REC** is on while the EDITOR writes, and blinks during a take.
- **The keys light with their notes:** full while a note is loud, dim as it fades, dark once it is quiet. A plucked sound flashes and fades, a held pad stays lit, so the keys show what sounds, not only what is pressed.
- **While FX is held** (and on FX LIVE) the white keys are the punch-ins: keys 1, 5, 9 and 13 light dim so you can find each group of four by touch, and a running punch-in lights full. Other screens that use the white keys as buttons (steps, DJ's pads) light them the same way.

The screen

Every screen has the same frame:

- **The header** (the top line): the screen's name in its group's colour, then what it shows (a pattern's number, a page, **SEQ** and the view SEQ switches to); on the right the voices sounding, the transport (a green triangle playing, two red bars paused, a red dot recording), the processor's load and the battery. The battery has three bars, its shell turning red when none is left; while a computer powers the FM-1 over USB, the bars fill one after another in light blue (a plain USB charger cannot be told apart, so it shows the battery). Short messages (*toasts*) take the name's place for two seconds, and so does a knob's name and value while you turn it.
- **The footer** (the bottom line): on the left the current instrument, the one the keys play (**F8:00** and its name: cartridge F8, slot 00); on the right what the knobs turn here.
- **The body** between them: the screen's own content.

The colours (in the DEFAULT theme; other themes keep the same roles):

COLOUR	MEANS
light red	a DX7 instrument, its notes

COLOUR	MEANS
light cyan	a JUNO-106 instrument, its notes
light green	a TB-303 instrument, its notes
light blue	a CHIP instrument, its notes; commands in a cell (at its right, where notes never stand); the MAKE screens' names
yellow	a sampler instrument, its notes; samples; something not saved; keys in the help
light magenta	a FUSION instrument, its notes
brown	volumes in a cell; a built-in item's number in a list; the HEAR screens' names
green	playing, on, done; the PLAY screens' names
red	recording, a warning, an instrument that is missing
magenta	the SYSTEM screens' names
dark grey	empty: an empty cell's dots

MEMO

The help (**HOME** + **LFO**) colours keys yellow, just as this manual sets them apart.

4 | BASIC OPERATION

A few rules work the same on every screen. Learn them once and every screen is easy: HOME takes you around, PLAY plays, SAVE keeps your work, the knobs move and change, and every button acts when you let it go.

HOME: back, and to everywhere

HOME backs out of whatever is open: a menu, a list, an edit, a dialog. At the top of a screen, with nothing to back out of, a tap opens **HOME's combination**: HOME breathes, the keys that work light up, and the next key you press does one of these:

AFTER HOME	DOES
HOME + OP1	Opens SONGS, the list of your songs.
HOME + OP2	Opens the EDITOR, where you write patterns.
HOME + OP3	Opens INSTRUMENTS, where you pick and edit sounds.
HOME + OP4	Opens PLAYBACK, which follows what plays.
HOME + OP5	Opens DJ, two songs mixed live.
HOME + PIT	Opens VISUAL, the sound made visible.
HOME + GLO	Opens STATUS, the start screen.
HOME + MONO	Opens SETTINGS.
HOME + POLY	Opens LOOPS, the loop station.
FX	Opens FX, the effects. FX has a button of its own, so it needs no HOME.
HOME + SELECT	Turns through the screens, one a click, round: STATUS, SONGS, EDITOR, INSTRUMENTS, PLAYBACK, VISUAL, FX, LOOPS, DJ, SETTINGS, and round again. Press HOME again to stay on the screen shown.
HOME + white key	Mutes or unmutes a track: white key 1 is track 00, white key 16 track 0F (TRACK 02 MUTED , TRACK 02 ON). Key after key, while it stays open. In LOOPS the white keys are the loops (chapter 14); on DJ, keys 1-8 the left deck's tracks, 9-16 the right deck's (chapter 10).
HOME + white key held	Solos the track instead (TRACK 02 SOLO). The same on the soloed track ends the solo (SOLO OFF); on another track it moves the solo there.
HOME + SEQ + white key	SEQ first switches the white keys to SOLO (and back to MUTE): then a tap solos.
HOME + PLAY	Rewinds what plays (or played last) to its start: BACK TO THE START (below). On DJ both decks go back to their cue points (BACK TO THE CUES , chapter 10).
HOME + REC	The CUT: all sound off at once (below).
HOME + LFO	The help for this screen, LOOK FOR ANSWERS (below).
HOME	Closes the combination; at a menu, a list or an edit, backs out of it.

AFTER HOME**DOES****HOME** held

Opens the same combination at once, for as long as it is held:
HOME held + a black key goes to a screen, and so on.

While the combination is open, the white keys show the tracks: dim while a track plays, dark while it is muted, bright while it is soloed. The black keys show the screens, the current one bright.

Mutes and solos are part of the performance: they are not saved with the song. Once the combination has done something (a mute, say), any other key closes it and does its own job.

Playing and stopping

There is one transport: one thing plays at a time, the current song, the EDITOR's pattern loop, the loops or DJ's decks. **PLAY** acts the moment it is pressed.

- **On SONGS, the EDITOR, LOOPS and DJ**, PLAY plays that screen's own thing: the song picked, the pattern shown (looped, from the cursor's row), the loops, both decks. If something else plays, it switches at once.
 - **On the other screens**, PLAY pauses and resumes whatever played last, so on FX or VISUAL it toggles what you hear.
 - **What plays plays on** from screen to screen until something else starts. Every edit is heard at once.
 - **PLAY held** stops: what plays goes back to its start, so the next PLAY plays it from the beginning (**BACK TO THE START**).
 - With no song to play, PLAY blinks: **NO SONG TO PLAY** .
-

The CUT: all sound off

HOME + **REC**, on every screen, stops every sound at once: notes, echoes, reverb tails. While REC is held there is no sound at all (**SOUND CUT: LET GO OF REC**), but what plays keeps its time; let go, it is heard again from its next notes.

Keep REC held for 2 seconds and every effect of what plays is switched off too (**SOUND CUT, EFFECTS OFF**). That is an edit like any other: SAVE keeps it, REVERT undoes it.

Saving your work

Every edit goes into the FM-1's working memory first and is heard at once. **SAVE** writes all of them to its flash memory, where they survive power-off. **Switching off loses unsaved edits.**

- The SAVE light is dim while something is not saved.
 - A save shows its progress (**SAVING 3 CHANGES**), then **SAVED** . With nothing to save: **NOTHING TO SAVE** .
 - SAVE while playing waits for a pause (**SAVE WAITS FOR A PAUSE**); SAVE blinks meanwhile. A save still waiting is lost if the FM-1 is switched off.
 - **REVERT**, in a screen's **SEL** menu, takes the thing that screen shows back to what was saved (a pattern, a song, a cartridge, the loops ...), after a question: **REVERTED** .
 - **REVERT ALL** drops every edit since the last save: **SAVE** + **OCT-**, or **SETTINGS, TOOLS, REVERT ALL**. It asks first, then reloads: **REVERTED TO SAVED** (**NOTHING TO REVERT** when there is nothing).
-

- **SAVE** held alone only shows what it does with other keys; let go then, it saves nothing. **SAVE** + **OCT+** saves.

NOTE

There is no undo step by step. What an edit changed only REVERT takes back, to what was saved. So the big actions ask first.

What SAVE keeps, and what switching off forgets:

SAVE KEEPS	NEVER SAVED: GONE AT POWER-OFF
Your songs, with their order, properties, mixer and effects	Track mutes and solos, and a loop's solo
Your patterns, and the EDITOR's own pattern	SONGS' play mode (ONE PLAY, REPEAT SONG, PLAY NEXT)
Your cartridges, and your changes to the built-in ones	PLAYBACK's speed and volume
The settings, the MIDI map and your GATE patterns	The clipboards (blocks, slots)
The loops, with their mutes; DJ's decks as they stand	The pattern recorder's steps
THE KEYS' setup and tempo	The arpeggiator being on, and the octave (SETTINGS' KEYS OCTAVE sets the octave at power-on)
The current instrument, and the pattern the EDITOR is on	What was playing, and where

Samples are the one exception to "SAVE writes": CLONE and MOVE of a sampler cartridge write its samples at once.

A power cut during a save loses nothing that was saved before: the FM-1 keeps either the old state or the new one, whole. The same holds when the battery runs out.

The memory for edits holds what differs from what is saved (about 650 changed tracks). When it runs low, the header reminds you: **SAVE CHANGES TO FREE MEMORY**. When it is full, an edit that needs more is not made and a question asks you to save (**MEMORY FOR EDITS IS FULL** , **SAVE BEFORE MAKING MORE EDITS**): **OCT+** **SAVE NOW** , **OCT-** back. After the save, make the edit again.

Storage full: a save that does not fit writes nothing and asks (**NOT ENOUGH STORAGE TO SAVE**): **OCT+** runs CLEAN UP, which offers to delete unused patterns, samples and instruments; or delete something yourself and save again. Your edits stay in memory meanwhile. STATUS shows the free storage.

Things that use other things

A note uses an instrument, a song uses patterns, a FUSION instrument uses a pattern, a sampler instrument uses a sample. Moving, swapping or deleting something in use asks first (**PATTERN 1A IS USED 3 TIMES** , **UPDATE REFERENCES?**):

- **YES** (**OCT+**): everything that used it follows the change, and everything is saved at once (**UPDATING 3 REFERENCES** , then **REFERENCES UPDATED, SAVED**).
- **NO** (**OCT-**): the change is made, and what used it keeps the old number, now pointing at whatever is there.

- **HOME**: nothing happens.

A reference to something missing is drawn in red and plays nothing. SETTINGS, TOOLS, CHECK REFERENCES lists them.

Built-in things

The built-in cartridges (F0 to FA) live in the firmware. Their numbers are brown wherever they are listed. You can play, use and edit them like anything else: SAVE keeps your changed copy under the same number, and it is used from then on, also after a firmware update. **BACK TO BUILT-IN**, in the cartridge list's SEL menu, brings the firmware's own back (**CARTRIDGE F0 BUILT-IN AGAIN**). Built-in things cannot be moved or deleted.

Taps, holds and combinations

- **Most buttons act when you let them go** (a tap), so they can also be held as a modifier. **PLAY**, **REC** and the **KEYS** act the moment they are pressed, for timing.
- **Held + another control** is a combination: **SEL** + **K1** means keep SEL down and turn K1. The combination repeats while the button stays held (turn on and on), and the held button's own tap does not happen.
- **A slack of 0.1 s**: a button let go a moment early still counts (SETTINGS' COMBO GRACE). So buttons that can combine act about 0.1 s after you let them go, and HOME then LFO can never clear a cell by mistake.
- **A button held alone** past the hold delay (half a second, SETTINGS' HOLD DELAY) shows what it does with the other keys and knobs, for as long as it is held. Letting go then does nothing else.
- **The key that opens something closes it**: a menu, a mode, an editor. **EDIT** opens an edit and leaves it keeping the changes; **HOME** leaves it dropping them (**CHANGES DROPPED**).

The knobs

- **SELECT** moves the cursor up and down, **ALGORITHM** left and right. The cursor stops at the ends; only the instruments, the cartridges and the screens go round.
- **K1** to **K4** change values at the cursor; the footer names what each turns. They never move the cursor.
- Turned fast, a knob takes bigger steps (SETTINGS' KNOB SPEED); turned slowly, always one.
- **SEL** + **K1** (SEL held, any of K1-K4) takes big steps: an octave for a note, 10 for a value.

The keys and the current instrument

The keys play the **current instrument** on every screen, unless the screen gives them a job. The footer shows it on the left.

- **PRESETS** picks the instrument, one a click, round within its cartridge (a cartridge is a bank of up to 128 instruments). While it turns, the cartridge's instruments show over the screen, the one picked highlighted; the list goes a second after the last click, or at once when you touch another control (SETTINGS' PRESETS LIST switches it off).

- **SEL** + **PRESETS** (SEL held, or tapped first) turns the cartridges instead: the list of cartridges opens and each click picks the next. Let go of SEL (or touch another control) and PRESETS turns the instruments again; **SEL** tapped again only closes the list.
- **OCT-** and **OCT+** shift the keys by an octave, from -4 to +4 (**OCT +3**).

The keys have no velocity: they play at SETTINGS' KEYS VOLUME. SETTINGS also sets the keys' default octave and how the effects treat them.

The arpeggiator

ARP switches the arpeggiator on and off on every screen but three: the EDITOR and LOOPS, where ARP has a job of its own, and DJ, where the keys are the decks'. While it is on, the keys you hold take turns as a rhythm instead of sounding together. Switched on with no key held, it waits for your first key.

- The notes follow SETTINGS' **ARPRHYTHM** (a row a step), in the order of **ARP PATTERN** (UP, DOWN, UP-DOWN, RANDOM, AS PLAYED).
- **ARPLATCH** keeps up to 1-8 notes playing after you let go of their keys; a key pressed with none held starts a new set. OFF: a note stops with its key.
- Held, ARP changes them from the knobs: **ARP** + **SELECT** the rhythm, **ARP** + **ALGORITHM** the pattern (**ARP UP**), **ARP** + **K1** the latch (**LATCH 4 NOTES**), **ARP** + **LFO** lets the latched notes go.
- To stop latched notes and keep the arpeggiator on, tap **ARP** with no key held: the first tap lets the latched notes go, and ARP stays on; the next tap switches it off.
- Changing screens switches it off.

Menus, questions and names

- **SEL** opens the menu of what is at the cursor (copy, paste, move, delete ...), its last choice ready. SELECT picks, SEL (or the key that opened it) chooses, HOME closes. Only what can act is listed: REVERT, for example, only when there is something not saved.
- **Groups**: an item marked > at the right holds more items (ROWS, TRANSFORM). SEL opens it; its first line, < **BACK**, goes back up; HOME closes the whole menu from any level.
- **MOVE**: SELECT carries the thing, SEL puts it down, HOME puts it back.
- **Questions**: the answers sit over their keys, in their own words (REVERT or KEEP, YES or NO): **OCT+** on the right answers yes, **OCT-** on the left no; **HOME** cancels, and nothing happens. Nothing else acts while a question shows.
- **Typing a name**: **ALGORITHM** moves along the name, **SELECT** changes the letter, **SEL** + **SELECT** jumps to the next group of characters (letters, digits, signs), **LFO** deletes a letter, **OCT+** adds a space; **EDIT** is done, **HOME** cancels. Names take capitals, digits, the space and : . - ? | \ * # \$ @ %. An instrument's name holds 10 characters, a cartridge's 12, a song's 16; a name left empty becomes NO NAME.

The help on the FM-1

HOME + **LFO**, on any screen, opens **LOOK FOR ANSWERS**: a few pages on the screen you are on, then pages shared by all screens (the global keys, HOME, the screens, buttons, knobs, saving). **SELECT** turns the pages; **HOME** gets you back. In

the help, keys are yellow, and a button whose print reads wrong gets its reading once: ENV (*Explore Named Vaults*), SEQ (*Show Else, Quick*), ARP (*Again, Repeat, Please*).

Keys on every screen

KEY	DOES
KEYS	The keys play the current instrument, unless the screen gives them another job (on LOOPS' CONTROL mode, DJ and FX's LIVE page, for example).
PRESETS	Picks the current instrument: the sound the keys play. It goes round within its cartridge.
SEL + PRESETS	Picks another cartridge (a bank of sounds): the cartridge list opens, and each click shows the next one. Hold SEL, or tap it first.
OCT- OCT+	Shift the keys an octave down or up, from -4 to +4.
SEL + OCT- SEL + OCT+	On FX's EDIT page, where OCT alone switches the effect off and on, these change the octave instead.
PLAY	Plays, or pauses, what the screen plays (or what played last).
PLAY held	Stops: what plays goes back to its start.
PLAY REC KEYS	These act the moment you press them, for timing. Every other button acts when you let it go.
SAVE	Saves all your changes. Its light is dim while something is not saved. While music plays, the save waits for a pause.
SAVE + OCT+	Saves too: use it when you held SAVE so long that letting go no longer counts as a tap.
SAVE held + OCT-	REVERT ALL: throws away every change since the last save, after asking.
FX	Opens the FX screen; press it again to go back.
FX + white key held	Plays a punch-in effect for as long as the white key is held (FX).
HOME	Backs out of whatever is open. At the top of a screen, opens HOME's combination.
HOME held	Opens HOME's combination at once, for as long as it is held.
HOME + OP1	Opens SONGS.
HOME + OP2	Opens the EDITOR.
HOME + OP3	Opens INSTRUMENTS.
HOME + OP4	Opens PLAYBACK.
HOME + OP5	Opens DJ.
HOME + PIT	Opens VISUAL.
HOME + GLO	Opens STATUS.
HOME + MONO	Opens SETTINGS.
HOME + POLY	Opens LOOPS.
HOME + SELECT	Turns through all the screens, one a click, round and round.

KEY	DOES
HOME + white key	Mutes or unmutes a track: white key 1 is track 00. In LOOPS it mutes a loop.
HOME + white key held	Solos the track instead.
HOME + SEQ + white key	SEQ first switches the white keys to solo: then a tap solos the track.
HOME + PLAY	Rewinds what plays to its start.
HOME + REC	The CUT: all sound off at once.
HOME + REC held	Silent for as long as REC is held; held for 2 seconds, it also switches every effect off.
HOME + LFO	Opens the help for this screen, LOOK FOR ANSWERS.
SELECT	Moves the cursor up and down.
ALGORITHM	Moves the cursor left and right; when typing a name, along the name.
K1 K2 K3 K4	Change the values at the cursor. The footer says what each one turns.
SEL held + K1	With SEL held, any of K1-K4 takes big steps: an octave for a note, 10 for a value.
SEL	Opens the menu of what is at the cursor, its last choice ready. During a MOVE, it puts the thing down. In most menus, REVERT takes the thing back to what was saved.
LFO	Clears, or resets a value to its default. When typing a name, deletes a letter.
ARP	Switches the arpeggiator on and off.
ARP + SELECT	Changes the arpeggiator's rhythm.
ARP + ALGORITHM	Changes the order its notes take turns in.
ARP + K1	Changes how many notes it keeps playing after you let go (the latch).
ARP + LFO	Lets the latched notes go.

5 | FIRST STEPS

Half an hour with PT/FM: play a demo song, play the keys, write a pattern, record a loop, and save. The demo disk should be on the FM-1 (chapter 2).

Play a demo song

- 1 Switch the FM-1 on. It starts on STATUS, which shows the version and how to get help.
- 2 Press **HOME** + **OP1**: SONGS, the list of songs.
- 3 Turn **SELECT** to a song, then press **PLAY**. Turn **MASTER** for the volume.
- 4 Press **PLAY** again to pause; hold it to stop and go back to the start.

MEMO

The FM-1's speaker plays one channel only, and PT/FM sends stereo at first, so a part panned to the other side is not heard on it. To hear the whole mix on the speaker, set SETTINGS' OUTPUT to MONO; set it back to STEREO for headphones. A cable in the output jack mutes the speaker.

Play the keys

- 1 Play the keys: they play the current instrument, named in the footer's left corner.
- 2 Turn **PRESETS** to try the instruments of its cartridge.
- 3 Hold **SEL** and turn **PRESETS** to change the cartridge: try F8, the JUNO-106, or FA, the TB-303.
- 4 Press **OCT-** or **OCT+** to play lower or higher.

Write a pattern

- 1 Press **HOME** + **OP2**: the EDITOR, with its own pattern. Tracks go across, rows go down; each row is a step in time.
- 2 Press **REC**: its light comes on, and the keys now write.
- 3 Play a key: the note is written at the cursor with the current instrument, and the cursor moves down. Play more. **SELECT** moves up and down, **ALGORITHM** to another track; **LFO** clears a cell.
- 4 Press **REC** to stop writing, then **PLAY**: the pattern plays in a loop from the cursor's row. To hear it from the top, turn **SELECT** back to row 00 first.

The loop plays at the current song's tempo and through its effects: the song at the cursor on SONGS. To make it faster or slower, change that song's TEMPO (SONGS, **GLO**), or make the pattern a song of its own, as below.

The EDITOR's own pattern is a sketch pad. To use it in a song, give it a number: **SEL**, STORE IN A PATTERN (chapter 7).

Make it a song

A song is a list of patterns played one after another, its *order*. From the pattern you wrote to a song of your own:

- 1 In the EDITOR, press **[SEL]** and pick STORE IN A PATTERN, then + **NEW PATTERN**: your pattern gets the first free number (**STORED IN PATTERN 00**), and the EDITOR follows it there.
- 2 Press **[HOME]** + **[OP1]** for SONGS. Press **[SEL]** and pick NEW: the pattern list asks what the song starts with (NEW SONG STARTS WITH). Turn **[SELECT]** to your pattern and press **[SEL]**. The song, NEW SONG, is added at the end of the list and becomes the current song.
- 3 Press **[EDIT]** to go into its order. **[SEL]** opens the position's menu: CLONE PATTERN puts a copy of the pattern after it, to vary; NEW PATTERN puts an empty one after it. **[K1]** changes which pattern a position plays, and EDIT PATTERN in the menu opens it in the EDITOR (**[HOME]** comes back). Press **[EDIT]** again when the order is done.
- 4 Press **[GLO]** for the song's properties: set its TEMPO with **[K1]** (the BPM it makes is shown beside it), give it a NAME (**[EDIT]** types it), and choose whether it loops or stops AT THE END. **[GLO]** closes.
- 5 Press **[PLAY]** to hear the whole song, then **[SAVE]**.

Record a loop

- 1 Press **[HOME]** + **[POLY]**: LOOPS. The cursor is on + **NEW LOOP**.
- 2 Pick a sound with **[PRESETS]**, then press **[REC]**.
- 3 Play: recording starts with your first note (or press **[PLAY]** to start it on the beat).
- 4 Press **[REC]** again: the loop closes at the next bar line and plays on. Its length is now every loop's length.
- 5 Pick another sound and press **[REC]** again: the next loop starts with the loops' next round.

Save

Everything you did is in the FM-1's working memory: the SAVE light is dim. Press **[SAVE]**. When the music plays, the save waits for a pause; press **[PLAY]** to pause and it is written: **SAVED**. Now your pattern and loops survive switching off.

6 | SONGS

SONGS lists every song, and below the list shows the picked song's **order**: the patterns it plays, one after another. The song at the cursor is the current song everywhere: PLAY plays it, and the EDITOR opens on its patterns. Open it with **HOME** + **OP1**.

The list

SONGS 3/18				.00	
NR	NAME	BPM	LEN	TIME	
00	PUNCH IN	124	6	01:33	
01	SPICE ROAD	96	6	02:00	
02	MIDNIGHT RUN	130	6	01:29	
03	CITY LIGHTS	120	6	01:36	
04	ACID TEST	138	6	01:23	
05	ADVENTURE	132	6	01:27	
06	TRANCE LOOP	140	1	00:14	
ORDER MIDNIGHT RUN				SEQ ONE PLAY	
00	0C	0D	0E	0F	10 11
F0:00 EL PIANO DX7 130 BPM 01:29					

SONGS: the list (number, name, BPM, positions, length) and, below, the current song's order, eight positions a line. The box marks where PLAY starts.

- **SELECT** picks a song: it becomes the current song.
- **PLAY** plays it, from the boxed position; again, pauses. The playing song has a play mark and its name turns green.
- **ALGORITHM** moves the box: the position PLAY will start from (**PLAY FROM POS 03** in the header). While the song plays, only the box moves; it waits for the next PLAY.
- The header counts the songs (**3/18**); the footer's right side shows the current song's BPM and length.
- A position whose pattern is missing shows its number in red.

When a song ends: the play modes

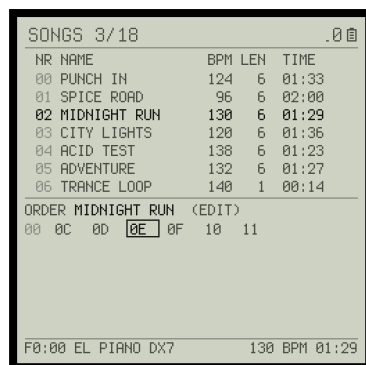
SEQ turns the play mode round (**ONE PLAY** , **REPEAT SONG** , **PLAY NEXT**). It decides how a song started here ends, if the song itself stops at its end:

- **ONE PLAY** (at first): it stops.
- **REPEAT SONG**: it plays again from its start.
- **PLAY NEXT**: the next song in the list plays at once, and the cursor follows it; after the last song, playing stops.

A song set to loop (AT THE END: LOOP) loops in every mode. The mode holds on every screen until something else plays (a pattern in the EDITOR, LOOPS, DJ), and it is not saved.

Changing a song's order

Press **EDIT** on a song: the cursor moves into its order, onto the boxed position, and EDIT lights.



Editing the order: the cursor on a position.

- **SELECT** moves a line (8 positions) up or down, **ALGORITHM** one position left or right.
- **K1** puts another pattern at the position (**K1 PATTERN 0A**); with SEL held, 8 at a time.
- **LFO** removes the position.
- **ENV** opens the pattern list; **ENV** again puts the highlighted pattern at the position.
- **SEL** opens the position's menu (below).
- **EDIT** leaves the order keeping the changes; **HOME** leaves dropping them (**CHANGES DROPPED**): a pattern made meanwhile is deleted again.

■ EDIT PATTERN

Opens the position's pattern in the EDITOR; **HOME** comes back here.

■ NEW PATTERN

An empty pattern at the first free number, put in after the position (**PATTERN 0C MADE**).

■ INSERT

A position before the cursor's, with the same pattern.

■ DELETE

Removes the position, as LFO does.

■ COPY, PASTE

COPY takes the position's pattern number (**PATTERN 03 COPIED**); PASTE puts it in after the position.

■ CLONE PATTERN

Copies the position's pattern to a new number and uses the copy here (**03 CLONED TO 0C**), so you can change it without changing the other places that play the original.

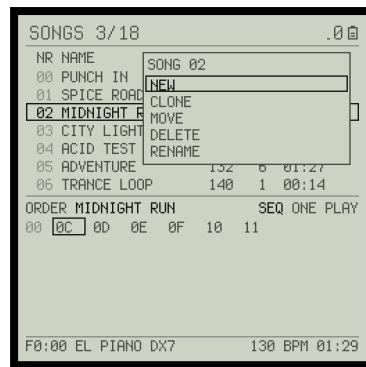
■ REVERT

The song as last saved (listed only while it has unsaved changes).

Your patterns are numbered 00 to EF (240 of them). With all used, NEW PATTERN and CLONE PATTERN say **NO FREE PATTERN**.

The song menu

SEL on the list opens the song's menu:



The song's menu (SEL on the list).

■ NEW

A new song. First pick the pattern it starts with from the list (NEW SONG STARTS WITH), or + **NEW PATTERN** for an empty one; HOME makes nothing. The song, NEW SONG, is added at the end of the list (tempo 120, LOOP). Past song FD:

NO FREE SONG NUMBER.

■ CLONE

A copy of the song, after it, named with " 2".

■ MOVE

Another place in the list: SELECT carries it, SEL puts it down (**SONG MOVED TO 02**), HOME takes it back (**NOT MOVED**).

■ DELETE

Asks first (DELETE SONG 00?). The line **ITS PATTERNS TOO** is **ticked at first**: the song's own patterns, those no other song and no FUSION instrument uses, are deleted with it (**SONG 00 DELETED, 4 PATTERNS TOO**), and the line says how many there are and how much room they free. To keep them, clear the tick with **K1**. Patterns other songs use always stay. **OCT+** deletes, **OCT-** keeps the song, **HOME** cancels.

■ RENAME

Type its name (up to 16 characters); EDIT is done.

■ UNLOAD SONG

Once a song, the EDITOR's pattern loop, the loops or DJ's decks have played, the keys go on sounding through that one's effects and tempo, even after it stops (chapter 15). UNLOAD SONG stops everything at once, forgets the song's place, and gives the keys back their own effects and tempo, THE KEYS', as at power-on (**SONG UNLOADED**). The loops and DJ's stand stay as they are. It is listed only when there is something to unload; PLAY afterwards plays the current song from its start.

■ REVERT

The song as last saved: its order, name, properties, mixer and effects (not its patterns), after a question (REVERT SONG 00 TO SAVED?).

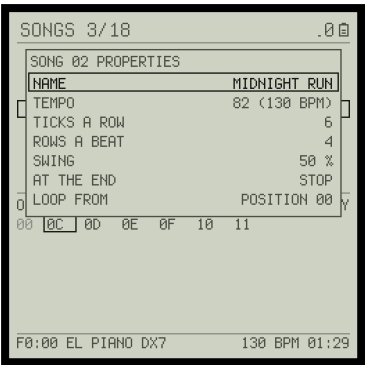
ENV on the list opens the pattern list; the pattern picked becomes the EDITOR's (**PATTERN 0A FOR THE EDITOR**); **PLAY** in the list hears the highlighted pattern.

A song's properties

GLO opens the song's properties. **SELECT** picks one, **K1** changes it at once (SEL held: TEMPO by 10, SWING by 5), **EDIT** on NAME types it; GLO or HOME closes.

How time works in a song: each row lasts a number of *ticks* (TICKS A ROW), and TEMPO sets how fast the ticks go (a tick lasts 2.5 seconds divided by TEMPO). Leave

TICKS A ROW at 6 and ROWS A BEAT at 4, as a new song has them, and TEMPO is the BPM: for 128 BPM, set TEMPO to 80 (hex for 128). Whatever the three are, the screen shows the BPM they make.



MIDNIGHT RUN's properties: TEMPO 82 hex, 6 ticks a row and 4 rows a beat make 130 BPM; it stops at its end.

■ **NAME**

Up to 16 characters.

■ **TEMPO**

How fast the song plays, with the BPM it makes: **8C (140 BPM)**.

□ 3-600 (hex 03-258)

■ **TICKS A ROW**

The ticks in a row: commands that act during a row (slides, arpeggios, retriggers) act on each tick.

□ 1-31

■ **ROWS A BEAT**

How many rows make a beat. Besides the BPM, it decides which row numbers the EDITOR colours as beats and bars, and how many rows DJ counts as a beat.

□ 1-16

■ **SWING**

Every second row played late.

□ 50-75 %

■ **AT THE END**

What the song does after its last position.

□ LOOP, STOP

■ **LOOP FROM**

The position a looping song goes back to.

□ POSITION 00 to the last

The BPM is $\text{TEMPO} \times 24 / (\text{TICKS A ROW} \times \text{ROWS A BEAT})$, rounded: a song at TEMPO 140, 6 ticks a row, 4 rows a beat plays at 140 BPM.

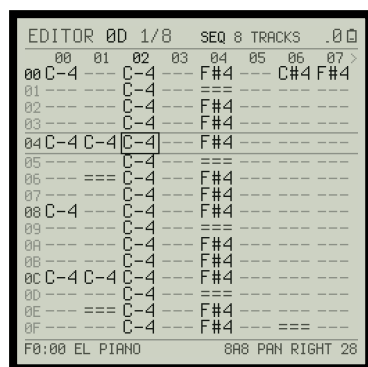
Keys on SONGS	KEY	ON THE LIST
	SELECT	Pick a song. In the order: a line (8 positions) up / down.
	ALGORITHM	Where PLAY starts (the box). In the order: a position left / right.
	SELECT ALGORITHM	In the order: move through the positions, a line or one at a time.

KEY	ON THE LIST
PLAY	Play / pause the song; in the pattern list, hear the highlighted pattern.
EDIT	Into the song's order; in the order, done, keeping the changes.
GLO	The song's properties: name, tempo, swing, loop or stop.
SEQ	The play mode: ONE PLAY, REPEAT SONG, PLAY NEXT.
SEL	The song's menu; in the order, the position's menu.
ENV	The pattern list (for the EDITOR); in the order, again puts the highlighted pattern at the position.
K1	In the order: another pattern at the position.
LFO	In the order: remove the position.
HOME	In the order: leave it, dropping the changes.
KEYS OCT- OCT+ PRESETS	Play, as on every screen.
ARP	The arpeggiator on / off.
KEYS held	With ARP on, the notes held take turns.
ARP held	With SELECT, ALGORITHM, K1: the rhythm, the order, the latch.

7 | EDITOR

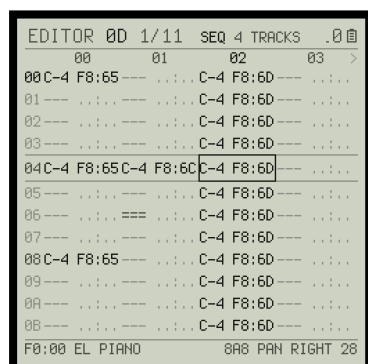
The EDITOR writes patterns: a grid of tracks across and rows down. Each cell holds a note, the instrument that plays it, a volume and up to four commands. Open it with **HOME** + **OP2**.

The grid

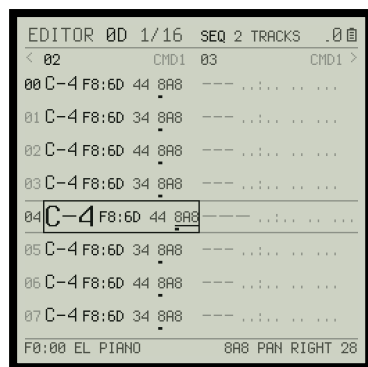


The EDITOR in its 8-track view: row numbers on the left, a track a column. The focus row is taller; the cursor's cell is boxed.

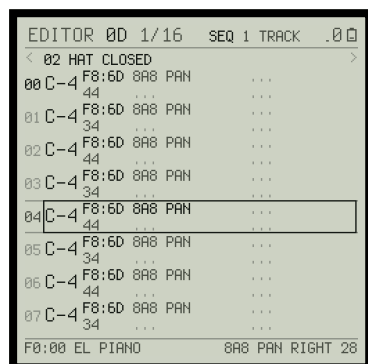
- **SELECT** moves up and down the rows, **ALGORITHM** across the tracks. Nothing wraps; past the last row of a page the next page shows.
- **SEQ** turns the view: 8, 4, 2 or 1 tracks at once (**8 TRACKS** ... **1 TRACK**). Fewer tracks show more of each cell: 8 tracks the notes only, 4 the instrument too, 2 a command as well, 1 the whole cell with all four commands.
- Row numbers are hexadecimal, 00 to 7F. Beat rows are cyan, each bar's first row light cyan. When this pattern plays, the playing row sits on a blue band; the view stays with the cursor.
- In a cell, --- is no note, === a note off, .. no volume (the instrument's own) and ... no instrument (the track's plays on).
- The footer's right side says the command (or volume) under the cursor in words: **A04 VOLUME -4**.



The 4-track view: each note with its instrument (cartridge/slot).



The 2-track view: the note, instrument, volume and the command in K1's slot; the pips under it count the cell's commands.



The 1-track view: the whole cell, its four commands each with a short name.

Which pattern you edit

The EDITOR edits one pattern at a time: its own, or a numbered one.

- **Its own pattern** (the header says just EDITOR): a sketch pad no song can play. SAVE keeps it after switching off. A fresh FM-1 opens on it.
- **A numbered pattern** (EDITOR 12): your edits go straight into pattern 12, and every song that plays it hears them.

From the cell's **SEL** menu (nothing marked):



The cell's menu (SEL): MARK and the pipette first, the block's actions, then the pattern's own: NEW, LOAD, STORE, RECORD PATTERN.

■ NEW PATTERN

Empties the EDITOR's own pattern (8 tracks × 64 rows) and opens it.

■ LOAD A PATTERN

Copies a numbered pattern into the EDITOR's own, to start from it (**PATTERN 1A LOADED**). The numbered one is not changed.

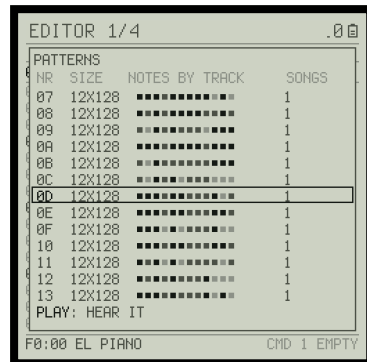
■ STORE IN A PATTERN

Gives what the EDITOR shows a number, so songs can play it: pick a pattern, or + **NEW PATTERN** for the first free number (**STORED IN PATTERN 1A**); the EDITOR

follows it there. Storing over a pattern that holds anything asks first
(**PATTERN 0C WILL BE REPLACED** , **DO YOU WANT TO CONTINUE?**).

NOTE

Opening another pattern empties the EDITOR's own. When it holds anything, a question asks first: **EDITOR CHANGES WILL BE LOST** , **DO YOU WANT TO CONTINUE?** . Store it in a pattern first if you want to keep it.



The pattern list (ENV): each pattern's number, its size (tracks × rows), a map of how many notes each track holds, and how many songs use it.

The pattern list: **ENV** opens it (PATTERNS: number, size, a map of notes by track, the songs using it; unused patterns dim). **ENV** again opens the highlighted pattern; **PLAY** hears it on its own, looped, and what played before pauses, keeping its place. Moving the highlight moves the preview; PLAY again stops it (**ARP** does what PLAY does here). Picking a pattern or leaving the list ends the preview, and the next PLAY resumes what played before. **HOME** closes. Its **SEL** menu:

■ NEW

An empty pattern, 8 tracks × 64 rows, at the first free number (**PATTERN 13 MADE**); with all 240 used, **ALL 240 PATTERNS USED** .

■ CLONE

A copy of the highlighted pattern at the first free number (**12 CLONED TO 13**).

■ MOVE

To another free number: SELECT carries it, SEL puts it down (**PATTERN 12 MOVED TO 20**); with none free, **NO FREE NUMBER** . Songs using it ask to follow (references).

■ DELETE

Deletes it (**PATTERN 12 DELETED**), asking first when something uses it.

Writing notes

REC switches writing. With REC off (**REC OFF: KEYS PLAY**) the keys only play the current instrument, so you can try sounds freely. With REC on (**REC ON: KEYS WRITE** , REC lit), the keys write:

- 1 Pick the sound with **PRESETS**: the note is written with the current instrument and SETTINGS' KEYS VOLUME.
- 2 Play a key: its note is written at the cursor and sounds; the cell's commands stay.
- 3 The cursor moves down by the edit step (GLO's EDIT STEP; 0 stays put). Keys pressed together (a chord) land on the same row, spreading to the next tracks.

- **LFO** clears the cell and moves on; on an empty cell it writes a note off (==).

- REC while a song plays pauses the song (**SONG PAUSED: WRITING**).
- REC while the EDITOR's loop plays: the loop plays on and the keys write step by step at the cursor; it plays what you write as it reaches it. **PLAY** then pauses the loop (**LOOP STOPPED: PLAY FOR A TAKE**), and the next PLAY starts a take.
- Every change is heard at once by whatever plays this pattern (the EDITOR's loop, a song, a DJ deck).
- K1-K4, LFO, the menu and the note editor change cells whether REC is on or off.
- A note written with no instrument (....) plays the track's last instrument.
- To change the sound of notes already written, change each cell's INSTR in the note editor (below); there is no change for many cells at once. On LOOPS, APPLY INSTRUMENT gives a whole loop another sound.

PLAY with REC off plays the pattern in a loop from the cursor's row.

Volume and commands: K1 to K4

The knobs change the cell at the cursor, without moving the cursor:

■ K1

Picks which part of the cell the other knobs change: the volume, or command 1 to 4 (one past the last, to add one) (**K1 VOLUME**, **K1 CMD 1 ACCENT**). The grid shows the command in that place.

■ K2

The command there, through every command there is (below); back to NO COMMAND removes it.

■ K3, K4

Its value, a digit each. On the volume, K3 steps by 16 and K4 by 1. For an instrument parameter (*), mixer value (=) or FX knob (#), K3 picks which and K4 sets it. SEL held: K4 by 16.

The volume runs from 00 (silent) to 7F, the instrument at its full level. Turned past 7F it becomes .., no volume: the note plays at the instrument's own default (for a sampler instrument, its VOLUME). The VOLUME command (Cxx) uses the trackers' smaller scale, 00 to 40, where 40 is as loud as a volume of 7F.

An example: to fade a note out, put the cursor on it, turn **K1** to CMD 1, **K2** to VOL SLIDE (Axy), and **K4** to 4: the cell shows A04, and the note's volume falls by 4 on every tick of the row. The footer says what the command at the cursor does, in words.

The note editor

EDIT on a cell opens it as a list of fields, a line each: NOTE, INSTR (its sound), VOLUME, CMD 1 to CMD 4, and + **COMMAND** to add one.

EDITOR 00 1/8	SEQ 8 TRACKS	.00
ROW 04	TRACK 02	PATTERN 00
NOTE	C-4	
INSTR	F8:6D HAT CLOSED	
VOLUME	44	54 %
CMD 1	PAN	A8
CMD 2	+ COMMAND	
CMD 3		
CMD 4		
K1 STEP	K2 NEXT GROUP	SEL CELLS
F8:00 EL PIANO	8A8 PAN RIGHT 28	

The note editor: the cell as a list. The footer says the field at the cursor in words.

- **SELECT** moves a line up or down, **ALGORITHM** across a command line (the command, its value).
- **K1** changes the part at the cursor a step; **K2** in big steps: an octave, a cartridge, 16, or the next group of commands (each command is explained below).
- **SEL** makes SELECT and ALGORITHM move to the neighbouring cells instead (**SELECT, ALG: CELLS**), without leaving; **SEL** again goes back to the fields (**SELECT, ALG: FIELDS**).
- The **KEYS** change the note; **LFO** clears the cell.
- **EDIT** closes it keeping the changes; **HOME** drops them.

Recording live: takes

With REC on and nothing playing, PLAY records a **take**: from the cursor's row round and round the pattern, adding on each pass, until PLAY or REC stops it.

- 1 Press **PLAY**: recording starts as you let go, after SETTINGS' COUNT-IN (1 or 2 bars of clicks, or none). With COUNT-IN set to KEY, your first note starts it.
- 2 Or hold **PLAY** and press a key: the take starts on that note at once. Hold PLAY alone to see both ways (LET GO: START THE TAKE, PRESS A KEY: START ON THAT NOTE).
- 3 Play. Notes land on SETTINGS' QUANTIZE grid (2, 3 or 4 rows, a row, or REAL TIME); letting go of a key writes a note off. A melody stays on the cursor's track; a chord spreads to the next tracks.
- 4 Press **PLAY** or **REC** to stop (**TAKE STOPPED**). REC stays on and the cursor goes back to the row the take started on.

During a count-in a box in the middle of the screen counts it: **COUNT-IN**, the beats left in big figures, and the bar (**BAR 1 OF 2**). With COUNT-IN set to KEY, the box says TAKE ARMED, PLAY A NOTE, until your first note.

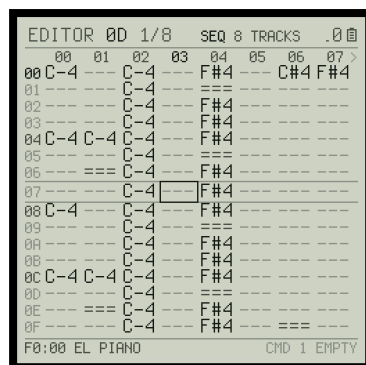
REC blinks during a take and its count-in. An armed take is cancelled with HOME, PLAY or REC (**TAKE CANCELLED**). A full edit memory ends a take, keeping what was written.

Listening to a row

ARP on the EDITOR repeats the cursor's row at the song's tempo, in SETTINGS' ARP RHYTHM (**ROW PREVIEW #___** ; again, **ROW PREVIEW OFF**). Whatever plays stops first, so the row is heard alone; moving the cursor moves the preview. **ARP** + **SELECT** changes the rhythm (**RHYTHM ##_**: # plays a row, _ rests one).

Blocks

- 1 **SEL**, MARK: then **SELECT** and **ALGORITHM** stretch a block over rows and tracks from the cursor. Or hold **SEL** and turn them.
- 2 **SEL** again opens the block's menu.



A block marked over four rows of two tracks, shaded.

■ COPY, CUT, PASTE

Through a clipboard kept until power-off (**COPIED 4 X 1** : rows × tracks). Over 2 KB:

BLOCK TOO BIG TO COPY ; an empty clipboard: **NOTHING COPIED** .

■ PASTE MIX

Pastes into empty cells only.

■ CLEAR

Empties the block.

■ MOVE, SWAP

Carry the block with the cursor; SEL puts it down. MOVE leaves its old place empty, SWAP puts what was there in its place; HOME cancels (**CANCELLED**).

■ INSERT ROW, DELETE ROW

Under ROWS. INSERT ROW puts an empty row at the cursor's row, the rows below moving down (the pattern's last row is lost); DELETE ROW takes the cursor's row out, the rows below moving up. With a block marked, it acts on the block's tracks; with nothing marked, on the cursor's track and every track to its right, so from the first track it is every track.

■ TRANSPOSE

Under TRANSFORM: K1 a semitone, SEL held an octave, SEL ends it (**TRANSPosed +02**).

■ INTERPOLATE

Under TRANSFORM: a sweep. A command on the block's first and last rows goes on every row between, its value stepping from one to the other; without one, the volumes step.

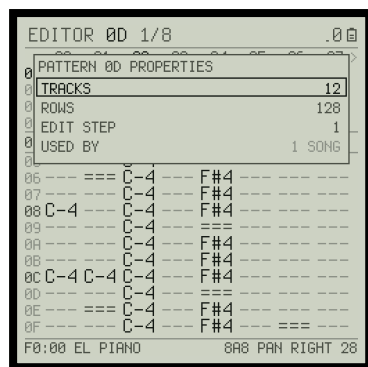
The pipette: **[SEL]**, TAKE ITS INSTRUMENT, or **[ENV]** held: the cursor's cell's instrument becomes the current one (the toast names it, **01:05 EL PIANO DX7**); none there: **NO INSTRUMENT HERE** .

RECORD PATTERN: steps on the white keys

[SEL], RECORD PATTERN opens a step sequencer: the white keys switch 16 steps on and off, and REC writes their notes into the cursor's track from the cursor's row (**PATTERN: 12 NOTES**). It is the same recorder LOOPS has; LOOPS explains its keys. Here **[K4]** picks **TO THE END** (the steps repeated down to the pattern's last row) or **ONCE**. Nothing already there is removed: a step off leaves its cell as it is.

The pattern's properties

[GLO] opens the pattern's properties: **[SELECT]** picks one, **[K1]** changes it, GLO or HOME closes them.



Pattern 0D's properties: 12 tracks of 128 rows, used by one song.

■ TRACKS

□ 1-16

■ ROWS

SEL held: by 16.

□ 1-128

■ EDIT STEP

How far the cursor moves after a note.

□ 0-16

■ USED BY

The songs that play it, and FUSION when a FUSION instrument does; not changeable.

Making the pattern smaller where notes would go asks first (**THIS DROPS 12 CELLS** , MAKE THE PATTERN SMALLER?).

The commands

A cell holds up to four commands, acting in their order. Each takes 3 characters in the grid: the command, then its value. Values are hexadecimal; x and y are one digit (0-F), xx two (00-FF).

Rows and ticks. Every row is cut into ticks: TICKS A ROW in the song's properties, 6 at first. A command works either **once**, as the row starts (the "fine" ones, a volume, a pan), or **on every tick after the first** (slides, vibratos, volume slides move a little each tick, so the same command is stronger with more ticks a row). In the slides, vibratos and volume slides, a value of **00 goes on with the last one** that track used.

[K2] turns through the commands in this order: the tracker effects (0-9, then A-Z), the volume-column ones (~), PT/FM's own, then *, = and #. Below they are grouped by what they change.

Pitch

GRID	NAME	DOES
0xy	ARPEGGIO	Plays the note, the note x semitones up and the note y semitones up in turn, a tick each, over and over for the row: a chord from one voice, the chip-music arpeggio. 037 is a minor chord, 047 a major one.
1xx, 2xx	SLIDE UP, SLIDE DOWN	The pitch slides up (or down) by xx sixteenths of a semitone every tick: 10 slides a semitone a tick. It keeps the new pitch until the next note.

GRID	NAME	DOES
3xx	SLIDE TO NOTE	Portamento: the cell's note is not started; instead the note playing glides toward it at speed xx (sixteenths of a semitone a tick) and stops there. Put 300 on the following rows to keep gliding.
4xy	VIBRATO	The pitch wobbles around the note: x is how fast, y how deep. 400 goes on with the last speed and depth.
5xy	SLIDE TO NOTE + VOL	Goes on gliding to the note as 300 does, and slides the volume as Axy does.
6xy	VIBRATO + VOL	Goes on with the vibrato as 400 does, and slides the volume as Axy does.
E1x, E2x	FINE SLIDE UP, DOWN	Moves the pitch up (or down) by x sixteenths of a semitone, once, as the row starts: a small correction rather than a slide.
X1x, X2x	EXTRA FINE UP, DOWN	As E1x and E2x, four times finer.
E3x	GLISSANDO	E31 makes slides to a note (3xx, 5xy, ~Mx) heard in semitone steps, as a glissando on a keyboard; E30 makes them smooth again.
E4x	VIBRATO WAVE	The shape of the vibrato's wobble: 0 sine, 1 saw, 2 square, 3 random.
E5x	FINETUNE	Tunes the note as it starts, by x - 8 eighths of a semitone: E50 is a semitone flat, E58 in tune, E5F nearly a semitone sharp.
Uxy	FINE VIBRATO	As 4xy, four times shallower: a gentle shimmer.
~Sx, ~Vx	VIBRATO SPEED, DEPTH	The volume column's vibrato: ~Sx sets its speed, ~Vx vibrates with depth x.
Volume ~Mx	SLIDE TO NOTE	The volume column's 3xx, at speed x × 16.
GRID	NAME	DOES
Cxx	VOLUME	Sets the note's volume on the trackers' scale, 00 (silent) to 40 (full, the same as a cell volume of 7F).
Axy	VOLUME SLIDE	The volume rises by x every tick (Ax0), or falls by y (A0y): a fade in or out within the row. AxF and AFy are fine slides: once, as the row starts.
EAx, EBx	FINE VOLUME UP, DOWN	Raises (or lowers) the volume by x, once, as the row starts.
7xy	TREMOLO	The volume wobbles: x is how fast, y how deep.
E7x	TREMOLO WAVE	The shape of the tremolo: 0 sine, 1 saw, 2 square, 3 random.
Txy	TREMOR	The note sounds for x ticks and is silent for y ticks, again and again: a hard, rhythmic chop. A 0 keeps the last value.
Gxx	GLOBAL VOLUME	The whole song's volume, 00 to 40 (full), from any track.
Hxy	GLOBAL VOL SLIDE	The whole song's volume rises by x (or falls by y) every tick: a fade of the whole song.

GRID	NAME	DOES
~-x, ~+x	VOL SLIDE DOWN, UP	The volume column's volume slide: down (or up) by x every tick.
~Dx, ~Ux	FINE VOL DOWN, UP	Down (or up) by x, once, as the row starts.

Pan

GRID	NAME	DOES
8xx	PAN	Places the track: 00 fully left, 80 in the middle, FF fully right. It is the track's pan, the same as the MIXER's PAN.
Pxy	PAN SLIDE	The pan moves right by x (or left by y) every tick.
Yxy	PANBRELLO	The pan swings around its place, left and right: x is how fast, y how wide.
~Px	PAN	The volume column's pan: 0 left, 8 the middle, F right.
~<x, ~>x	PAN SLIDE LEFT, RIGHT	The pan moves left (or right) by x every tick.

Notes and timing

GRID	NAME	DOES
EDx	NOTE DELAY	The note starts x ticks into the row instead of on it: a flam, a late hit, a swing feel on one note.
ECx	NOTE CUT	The note is silenced at tick x of the row: short, staccato notes.
Kxx	KEY OFF	Lets the note go at tick xx, as a key released: it fades by its own release instead of stopping dead.
E9x	RETRIGGER	Starts the note again every x ticks: a drum roll from one hit.
Rxy	MULTI RETRIGGER	Starts the note again every y ticks, changing the volume each time by x: 1 to 5 lower it by 1, 2, 4, 8, 16; 6 makes it 2/3 and 7 half; 9 to D raise it by 1, 2, 4, 8, 16; E makes it 1.5 times, F twice; 0 and 8 leave it. A roll that fades or builds.
9xx	SAMPLE OFFSET	Sampler instruments: the sample starts xx × 256 samples in, from its START, so a long sample can be started in its middle.
LEG	LEGATO	On a note: the note the track still holds moves to this one with no new attack, its envelope going on. Only with the same instrument; a TB-303 needs SLD on the note before; a FUSION instrument always starts a new note.
ACC	ACCENT	TB-303: the note accented, louder and with its filter opening further, as the 303's accent.
SLD	SLIDE	TB-303: this note glides into the next one, with no new attack, as the 303's slide.
A+S	ACCENT + SLIDE	Both on one note, in one place.

The song's flow and tempo (from any track)

GRID	NAME	DOES
Fxx	TICKS / TEMPO	F01 to F1F: that many ticks a row (fewer is faster, the tick staying as it is). F20 to FFF: the TEMPO (a tick's length; at 6 ticks and 4 rows a beat, the BPM). F00: back to the song's own TEMPO and ticks.
Bxx	JUMP	After this row, the song goes on at its position xx.
Dxx	BREAK	After this row, the song goes on at the next position, from its row xx (D00 from the start): a pattern cut short.
E6x	LOOP	E60 marks a row; a later E6x (x 1-F) goes back to the mark x more times: a few rows repeated without copying them.
EEx	PATTERN DELAY	Holds this row x rows longer, its notes not played again: a pause in the pattern.

PT/FM's own

GRID	NAME	DOES
*xx	PARAMETER	Turns a knob of the track's instrument, as on its edit page (a JUNO-106's VCF FREQ, a DX7's OP2 LEVEL, a TB-303's CUTOFF ...): K3 picks which, K4 sets it. The sound keeps it until changed, so a row of them turns the knob over time; another instrument on the track drops it.
=xx	MIXER	Sets the track's place in the mixer: K3 picks LEVEL, CHORUS SEND, DELAY SEND, REVERB SEND or DUCK AMOUNT, K4 the value.
#xx	FX	Turns any knob of the song's effects (K3 picks it, K4 sets it), or switches an effect on or off. It holds until the next song starts.
!xx	LOOP 1/4 ... VINYL STOP	A punch-in effect, as if its key were held for xx rows (!08: 8 rows), so a song can carry its own loops, sweeps and stops (FX).

- B, D, E6, EE, F, G, H, # and ! act on the whole song, from any track. In a FUSION pattern they are ignored, shown dim.
- A command for what you are editing right now (an effect on FX, the mixer, an instrument's edit page, a song's properties) is skipped while you edit it, so nothing jumps under your hands.
- **EDIT** (the note editor) says each command in words.

Keys on the EDITOR

KEY	DOES
SELECT	Up / down the rows; in the note editor, a line.
ALGORITHM	Across the tracks; in the note editor, a command or its value.
SEQ	8, 4, 2 or 1 tracks at once.
PRESETS	The sound the keys write.
KEYS	REC off: play. REC on: write at the cursor. In the note editor: change the note.
REC	Writing on / off. While the loop plays, it plays on and the keys write at the cursor.

KEY	DOES
PLAY	REC off: loop the pattern from the cursor's row. REC on: record a take (starts as you let go); stop the loop, then PLAY for a take; during a take, stop it.
PLAY held + KEYS	REC on: start a take on that note. PLAY held alone shows how.
PLAY REC	During a take: stop recording.
KEYS held	In a take, a note lasts as long as its key is held: letting go writes a note off.
K1	The slot: volume or command 1-4. In the note editor: change the part at the cursor.
K2	The command (slide, accent ...). In the note editor: big steps.
K3 K4	Its two digits, or the volume; in *, = and #, K3 picks which, K4 sets it.
K1 K2 K3 K4	Never move the cursor.
LFO	Clear the cell (and move on); on an empty cell, a note off.
EDIT	The note editor; in it, done (it says each command in words).
HOME	Close what is open (the note editor dropping its changes, a carried block, a mark); entered from another screen, back there.
GLO	The pattern's properties: tracks, rows, edit step.
ENV	The pattern list; again, open the one picked; in it, PLAY hears one.
ENV held	The pipette: take the cursor's sound.
SEL	The menu: MARK, TAKE ITS INSTRUMENT, the block's menu, NEW / LOAD / STORE A PATTERN, RECORD PATTERN, REVERT. In the note editor: move to other cells, again back. In the list: NEW, CLONE, MOVE, DELETE.
SEL held + SELECT SEL held + ALGORITHM	Mark a block: with SEL held, SELECT stretches it over rows, ALGORITHM over tracks.
ARP	Repeat the cursor's row (the row preview).
ARP held	With SELECT: the preview's rhythm.
SAVE	Keeps the EDITOR's own pattern after switching off.
white keys	In RECORD PATTERN: the steps.

KEY**HOME** + **white key****DOES**

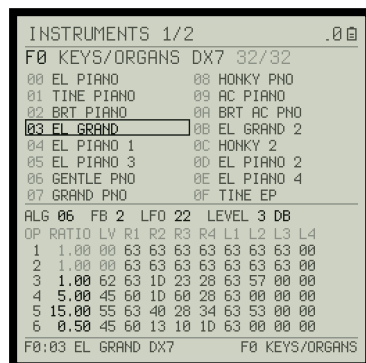
Mute a track; held, or after SEQ, solo.

8 | INSTRUMENTS

INSTRUMENTS picks, plays and edits the sounds. Sounds live in **cartridges**: a cartridge is a bank of up to 128 instruments of one type, each in a numbered slot (**01:05** is cartridge 01, slot 05). Open it with

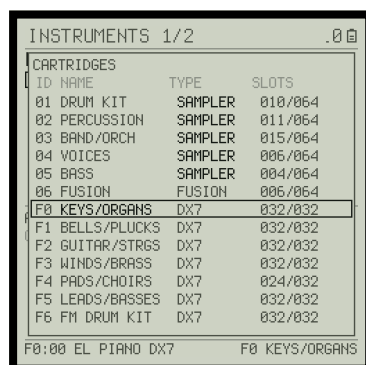
HOME + **OP3**.

Browsing and playing



INSTRUMENTS: the cartridge's slots at the top, the sound picked in detail below; the footer's right side names the cartridge.

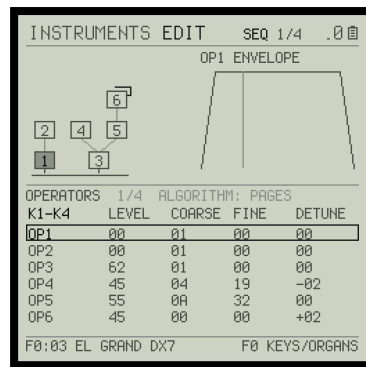
- The cursor is the current instrument: **SELECT** moves a slot at a time, **ALGORITHM** by 8 (a column).
- **PRESETS** steps to the next or previous sound there is, skipping empty slots, round.
- **K1** turns the cartridges, round.
- The **KEYS** play the sound picked; **ARP** arpeggiates it, so with ARP LATCH both hands are free for the knobs.
- The bottom half shows the sound: a DX7's operators, a JUNO-106's sliders, a TB-303's knobs, a CHIP sound's steps and tables, a sample's waveform, a FUSION's pattern as a little map.
- **GLO** shows the cartridge's name, type and slots used, and renames it.
- **ENV** lists all the cartridges (CARTRIDGES: ID, name, type, slots used); **ENV** again opens the highlighted one.



The cartridge list (ENV): the demo disk's 01-06, then the built-in F0-FA, each type in its colour.

Changing a sound: edit mode

Press **EDIT**: the list gives way to the sound's settings below and a picture of it above (the DX7's algorithm and envelope, the JUNO-106's envelope and filter, the sample's waveform ...).



Editing a DX7 sound: the algorithm and the selected operator's envelope above, a page of settings below, four to a row.

- The settings are a table, four to a row (a group). **[SELECT]** picks a row; **[K1]** to **[K4]** change its four values (**RELEASE 33 MS** in the header as you turn).
- **[ALGORITHM]** or **[SEQ]** turn the pages of settings (SEQ goes round).
- The **[KEYS]** play the sound as it changes; every change is heard at once, by everything that plays it.
- **[LFO]** puts the knob turned last back to its default (**LEVEL 0 DB (DEFAULT)**).
- **[PRESETS]** moves to another sound, still editing.
- **[SEL]** on NAME types the name; elsewhere it opens the menu: COPY, PASTE, INIT, RENAME, AUTO LEVEL, REVERT (FUSION: EDIT PATTERN too).
- SEL held + a knob: big steps (LEVEL by 6 dB, a value by 10).
- **[EDIT]** leaves, keeping the changes; **[HOME]** leaves, dropping them (**CHANGES DROPPED**).

An empty slot has nothing to edit: **EMPTY SLOT: SEL, INIT** (except FUSION, below).

■ LEVEL

Every instrument has one: how loud it is, in dB, half a dB a click. AUTO LEVEL (in the SEL menu) measures the sound and sets it as loud as the others

(**LEVEL SET TO -1.5 DB** ; a silent sound: **NO SOUND TO MEASURE**).

□ -64 to +63.5 dB

■ NAME

The sound's name; **[SEL]** on it types it.

DX7

The DX7 makes sound by FM: six sine-wave **operators**, each with its own envelope. Some (the carriers) are heard; the others (the modulators) bend their waves, which gives bells, electric pianos, basses and brass. Its four pages:

■ OPERATORS

The first page: a row for each operator.

■ OP1, OP2, OP3, OP4, OP5, OP6

The six rows, one an operator. Each has the same four knobs:

■ LEVEL

K1: how loud the operator is (a carrier), or how strongly it bends the others (a modulator).

□ 0-99

■ COARSE

K2: the operator's frequency as a multiple of the note's: 1 is the note, 2 an octave up, 3 an octave and a fifth; 0 is half. Whole multiples sound harmonic, the others

bell-like.

☐ 0-31

■ FINE

K3: adds to COARSE in small steps, up to almost twice its multiple.

☐ 0-99

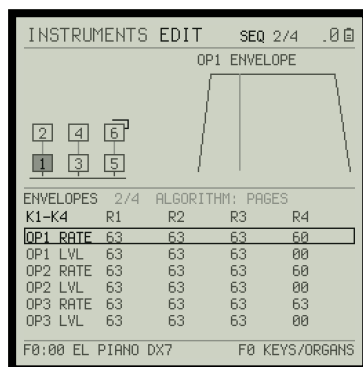
■ DETUNE

K4: a slight detune, for a slow beating between operators.

☐ -7 to +7

■ ENVELOPES

Two rows for each operator: how its volume moves over a note.



The DX7's ENVELOPES page.

■ OP1 RATE, OP2 RATE, OP3 RATE, OP4 RATE, OP5 RATE, OP6 RATE

An operator's four rates, R1 to R4 on K1 to K4.

■ OP1 LVL, OP2 LVL, OP3 LVL, OP4 LVL, OP5 LVL, OP6 LVL

Its four levels, L1 to L4 on K1 to K4.

■ R1, R2, R3, R4

How fast the envelope moves to each level: R1 to L1, R2 to L2, R3 to L3, and, once the key is let go, R4 to L4. 99 is the fastest, 0 the slowest.

☐ 0-99

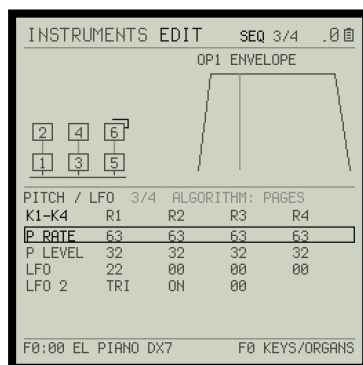
■ L1, L2, L3, L4

The levels it moves to: it rises to L1, goes on to L2, then to L3, where it stays while the key is held; let go, it moves to L4 (usually 0: silence).

☐ 0-99

■ PITCH / LFO

The pitch envelope and the LFO.



The DX7's PITCH / LFO page.

■ PRATE, PLEVEL

The pitch envelope: its rates R1-R4 and levels L1-L4 move as an operator's envelope does, but on the pitch of the whole voice. Level 50 is the note's own pitch; above it bends up, below it down.

☐ 0-99

■ LFO

The LFO's first row. The LFO is a slow wave that moves the pitch or the volume:

■ SPEED

K1: how fast the LFO's wave goes.

☐ 0-99

■ DELAY

K2: how long after the key the LFO fades in.

☐ 0-99

■ PM DEPTH

K3: how much it moves the pitch: vibrato.

☐ 0-99

■ AM DEPTH

K4: how much it moves the volume: tremolo, on the operators whose stored sensitivity lets it (below).

☐ 0-99

■ LFO 2

The LFO's second row:

■ WAVE

K1: the LFO's wave; S+H is random steps.

☐ TRI, SAW-, SAW+, SQR, SINE, S+H

■ SYNC

K2: ON, the LFO starts again with each key; OFF, it runs on freely.

☐ OFF, ON

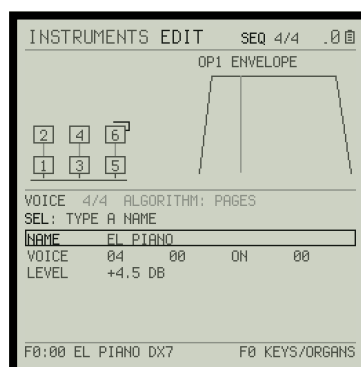
■ PSENS

K3: how strongly PM DEPTH acts on the pitch.

☐ 0-7

■ VOICE

The last page: NAME, LEVEL, and the row VOICE.



The DX7's VOICE page: name, algorithm, feedback, level.

■ ALGORITHM

K1: which of the 32 ways the six operators are wired, which are heard and which modulate which; the picture shows it.

☐ 00-1F

■ FEEDBACK

K2: the loop drawn in the algorithm's picture, an operator modulating itself: brighter, then noisy.

☐ 0-7

■ OSC SYNC

K3: ON, every operator's wave starts again from zero with each key, so every note starts alike.

☐ OFF, ON

■ TRANSPOSE

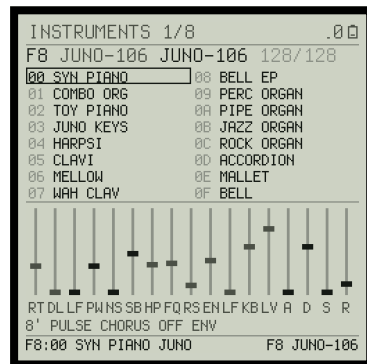
K4: shifts the whole voice, in semitones.

☐ -24 to +24

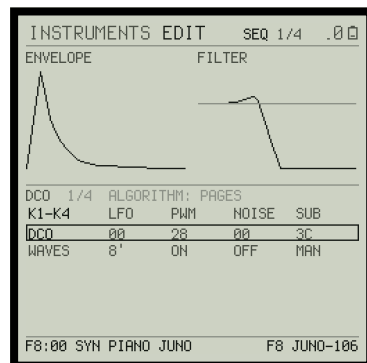
A DX7 voice also stores what its pages do not show: keyboard scaling (louder or softer towards the ends of the keyboard), the sensitivities to velocity and to the LFO's AM, and fixed frequencies. Voices from DX7 cartridge files keep them, and PT/FM plays them as they are.

JUNO-106

The JUNO-106 is an analogue polysynth: one oscillator (DCO) with a pulse, a saw, a sub-oscillator and noise, through a resonant low-pass filter (VCF) and a high-pass, shaped by one envelope, with a chorus. Browsing, its sound shows as the original's sliders.



F8 JUNO-106 browsed: its sliders below the slots.



Editing: the DCO page, under the envelope and the filter.

Its pages:

■ DCO

The first page, the oscillator. Its first row is named DCO too:

■ LFO

K1: vibrato, how much the LFO moves the pitch.

☐ 0-127

■ PWM

K2: the pulse's width: how far the LFO moves it (PWM BY LFO), or where it stands (PWM BY MAN).

☐ 0-127

■ NOISE

K3: how much noise is mixed in.

☐ 0-127

■ SUB

K4: the sub-oscillator, a square an octave down, mixed in.

☐ 0-127

■ WAVES

The second row:

■ RANGE

K1: the octave, 16' the lowest.

☐ 16', 8', 4'

■ PULSE

K2: the pulse wave on or off.

☐ OFF, ON

■ SAW

K3: the saw wave on or off; the two can sound together.

☐ OFF, ON

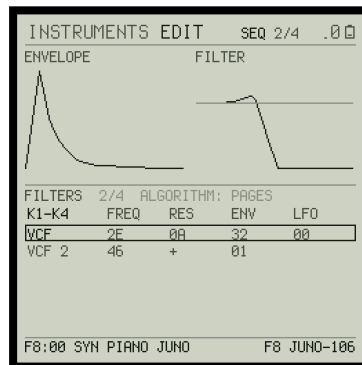
■ PWM BY

K4: LFO, the LFO moves the pulse's width; MAN, PWM sets a fixed width.

☐ LFO, MAN

■ FILTERS

The page of the filters.



The JUNO-106's FILTERS page.

■ VCF

The low-pass filter's row:

■ FREQ

K1: the cutoff: how bright the sound is.

☐ 0-127

■ RES

K2: resonance, a peak at the cutoff; turned high, the filter whistles.

☐ 0-127

■ ENV

K3: how far the envelope moves the cutoff over a note.

☐ 0-127

■ LFO

K4: how far the LFO sweeps the cutoff.

☐ 0-127

■ VCF 2

The second row:

■ **KYBD**

K1: how much the cutoff follows the note: higher notes brighter.

☐ 0-127

■ **ENV +/-**

K2: +, the envelope opens the filter; -, it closes it.

☐ +, -

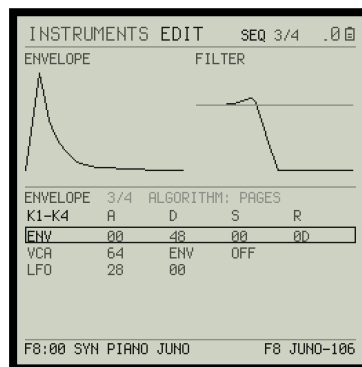
■ **HPF**

K3: the high-pass filter: 0 boosts the bass, 1 leaves it flat, 2 and 3 make the sound thinner.

☐ 0-3

■ **ENVELOPE**

The page of the envelope, the amplifier and the LFO.



The JUNO-106's ENVELOPE page.

■ **ENV**

The envelope's row. The envelope shapes the volume (with MODE at ENV) and the filter (by VCF's ENV):

■ **A**

K1: attack, how fast the sound rises.

☐ 0-127

■ **D**

K2: decay, how fast it falls to the sustain level.

☐ 0-127

■ **S**

K3: sustain, the level it holds while the key is down.

☐ 0-127

■ **R**

K4: release, how long it fades once the key is let go.

☐ 0-127

■ **VCA**

The amplifier's row:

■ **LEVEL**

K1: the amplifier's level, before the instrument's own LEVEL in dB.

☐ 0-127

■ **MODE**

K2: ENV, the volume follows the envelope; GATE, full while the key is held, silent at once when let go.

☐ ENV, GATE

■ CHORUS

K3: the JUNO's own chorus, II the deeper.

☐ OFF, I, II

■ LFO

The LFO's row: the slow wave that DCO's LFO and PWM and VCF's LFO use.

■ RATE

K1: the LFO's speed.

☐ 0-127

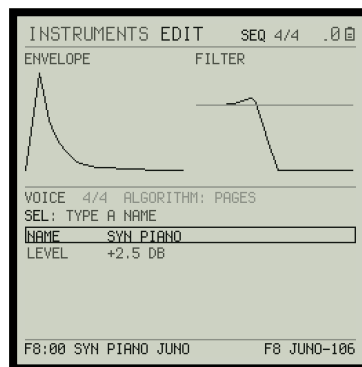
■ DELAY

K2: how long after the key the LFO fades in.

☐ 0-127

■ VOICE

The last page: NAME and LEVEL.



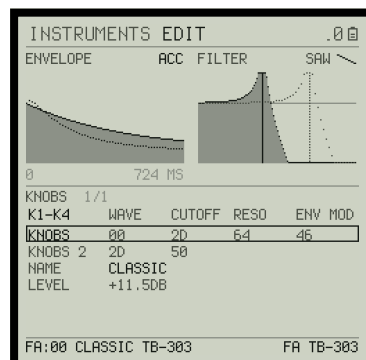
The JUNO-106's VOICE page.

TB-303

The TB-303 is the acid bass line: one oscillator through a squelchy resonant filter. In a pattern, the commands ACC (accent) and SLD (slide) play its two famous tricks (EDITOR). One page:



FA TB-303 browsed: its six knobs.



Editing a TB-303 sound: the filter's envelope over a note (an accented one dotted) and the filter, above its KNOBS page.

■ **KNOBS**

The page, and its first row, the original's knobs:

■ **WAVE**

K1: the oscillator's wave: saw at 0, square at 127, the two mixed between.

□ 0-127

■ **CUTOFF**

K2: the filter's cutoff: how bright the sound is.

□ 0-127

■ **RESO**

K3: resonance, the squelch: a peak at the cutoff.

□ 0-127

■ **ENV MOD**

K4: how far each note's envelope opens the filter.

□ 0-127

■ **KNOBS 2**

The second row:

■ **DECAY**

K1: how fast the filter closes again after each note.

□ 0-127

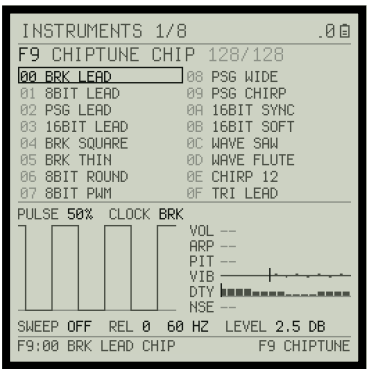
■ **ACCENT**

K2: how much an accented note stands out: louder, brighter, a sharper sweep.

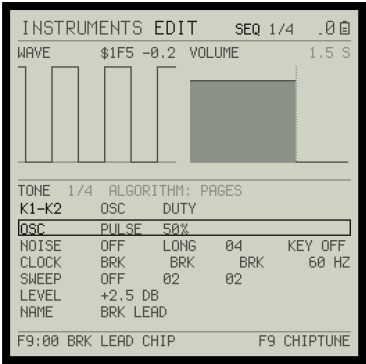
□ 0-127

CHIP

CHIP is a virtual sound chip: it makes the sounds of 8-bit computers and consoles the way their chips made them, square waves at a few widths, a stepped triangle, a drawn wave, noise, 16 volume steps moving 50 or 60 times a second. Its four families: **BRK** (the handheld), **8BIT** (the console), **PSG** (the computers' programmable sound generator) and **16BIT** (that chip's finer later version). Any part works on any voice.



F9 CHIPTUNE browsed: the oscillator's steps and the sound's tables.



Editing: the TONE page, the oscillator's wave above.



The VOLUME page, the volume over a note above.



The TABLES page, the table at the cursor above.



The WAVE page: the 16 waves, the one picked drawn large.

Its pages:

■ TONE

The first page: the oscillator, the noise, the clock and the sweep.

■ OSC

The oscillator's row. K1 picks the oscillator: PULSE, TRIANGLE, WAVE (one of 16 drawn waves), BUZZ (the PSG's envelope run fast enough to be a tone) or NOISE. The row's other knobs are that oscillator's own:

■ DUTY

PULSE's: the pulse's width; 50% is the hollow square, the narrow ones thinner. (A table can move it: below.)

☐ 12.5%, 25%, 50%, 75%

■ WAVE

WAVE's: which of the 16 waves it plays, by name (ORGAN ...); the WAVE page shows them.

■ SHAPE, STEPS, GATE

BUZZ's: SHAPE the envelope's shape (SAW DN, SAW UP, TRI), STEPS how many steps it has (16 or 32), GATE ON cuts it with a square at the same note (the "sync buzzer").

■ NOISE

The noise row. Its first knob, NOISE, ON mixes noise into the tone:

■ MODE

K2: LONG, a hiss; SHORT, a metallic, pitched noise.

☐ LONG, SHORT

■ RATE

K3: how high the noise sounds.

☐ 0-F

■ KEY

K4: KEY ON, the rate follows the note played; KEY OFF, it stays as set.

☐ KEY OFF, KEY ON

■ CLOCK

The row of the chip's own manners. Its first knob, CLOCK, is the chip it is tuned on (BRK, 8BIT, PSG 1.77, PSG 1.00, PSG 1.79, 16BIT), so high notes go out of tune as they did on that chip; EXACT is always in tune.

■ CURVE

K2: how its 16 volume steps sound, as on each chip.

☐ BRK, 8BIT, PSG, 16BIT

■ FILTER

K3: the chip's own output filter, or NONE.

☐ BRK, 8BIT, PSG, NONE

■ FRAMES

K4: how often its tables and envelopes step: 60 or 50 times a second, as the old machines' screens did.

☐ 60 HZ, 50 HZ

■ SWEEP

The sweep's row: the pitch slides by itself from each note's start. Its first knob, SWEEP, sets the way: OFF, DOWN or UP.

■ SHIFT

K2: how big each step of the slide is.

☐ 0-7

■ PACE

K3: how often it steps; 0, never.

☐ 0-7

■ VOLUME

The page of the volume. Its first row is named VOLUME too:

■ **VOL**

K1: the volume, in the chip's 16 steps.

□ 0-F

■ **ENV**

K2: NONE, the volume stays; DOWN or UP, it steps down or up by itself; PSG, the chip's own envelope (the next row).

□ NONE, DOWN, UP, PSG

■ **STEP**

K3: how often DOWN or UP takes a step.

□ 0-7

■ **RELEASE**

K4: how fast the sound fades once the key is let go; 0 stops it at once.

□ 0-F

■ **PSG ENV**

The PSG's envelope, used with ENV at PSG:

■ **SHAPE**

K1: one of the chip's 16 shapes, drawn beside its number: down, up, repeated, triangles.

□ 0-F

■ **PERIOD, FINE**

K2 and K3: the envelope's speed, a four-digit hex number: PERIOD sets its first two digits, FINE its last two. Bigger is slower.

■ **TABLES**

The page of the tables: built-in lists that change the sound a step a frame (FRAMES: 60 or 50 a second).

■ **VOL, ARP, PITCH, DUTY, NOISE**

A row for each table: VOL shapes the volume, ARP adds notes (chords, drum drops), PITCH bends the pitch, DUTY changes the pulse's width, NOISE the noise's rate. Each row has the same two knobs:

■ **TABLE**

K1: which table, by number and name, or -- for none.

■ **SPEED**

K2: how many frames each step of it lasts.

□ X1-X4

■ **VIBRATO**

The vibrato's row: DELAY (K1, how many frames after the note it starts, 0-62), SPEED (K2, X1-X4) and DEPTH (below).

■ **DEPTH**

K3: how far the pitch swings.

□ 0-62 cents

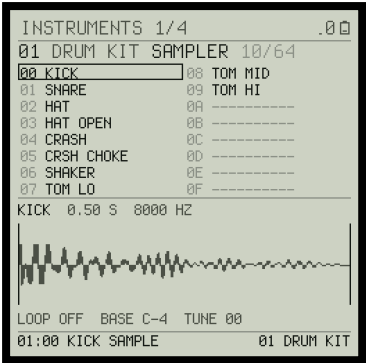
■ **WAVE page**

The row **TABLE**: the wave the WAVE oscillator plays (00 SAW ...), drawn large.

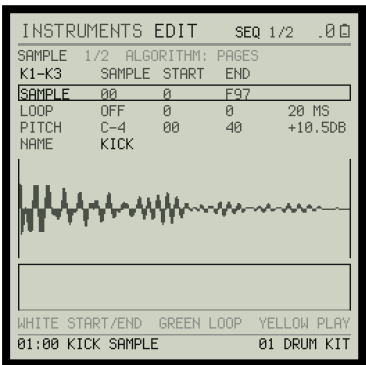
Sampler

A sampler cartridge holds samples (recorded sounds, uploaded from the computer: the FM-1 does not record audio) and up to 64 instruments that play them. One sample

can serve several instruments: a drum loop cut into hits, say. To bring your own sounds and make instruments for them, see chapter 17.



01 DRUM KIT browsed: the sound's waveform, its loop and base note below.



Editing a sampler instrument: the settings above, the sample's waveform below with its markers (white START and END, green the loop, yellow where voices play) and the envelope as heard.

■ SAMPLE

The first page. Its first row is named SAMPLE too:

■ SAMPLE

K1: which of the cartridge's samples it plays. **ENV** on it lists the samples (name, length, rate, waveform): the keys play the one highlighted, and **ENV** again picks it.

■ START, END

K2 and K3: the part of the sample that plays, a click moving 1/200 of the sample (SEL held: 10 clicks).

■ LOOP

The loop's row. Its first knob, LOOP, sets how the part from FROM to TO repeats while the key is held: OFF, it plays once; FWD, over and over; PING, forwards and backwards in turn.

■ FROM / LOOP START, TO / LOOP END

K2 and K3: where the loop starts and ends (the header says LOOP START and LOOP END), a click 1/200 of the sample.

■ RELEASE

K4: how long the sound fades once the key is let go; ENDLESS lets it ring.
☐ 4 MS ... 118 S, ENDLESS

■ PITCH

The pitch's row:

■ BASE NOTE

K1: the note at which the sample plays as it was recorded. Set it to the note the recording sounds, and the keys play it in tune.

■ TUNE

K2: finer tuning, in 1/128 of a semitone, up to almost a semitone either way.

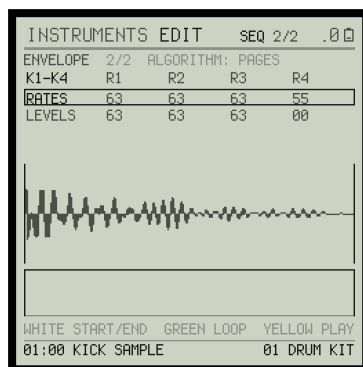
■ VOLUME

K3: the volume a note gets when its cell has none. Songs converted from MOD, S3M or XM files bring their samples' default volumes here; for your own sounds, leave it at 64.

□ 0-64

■ ENVELOPE

The second page, an envelope as a DX7 operator's.



The sampler's ENVELOPE page.

■ RATES, LEVELS

Two rows: RATES, R1 to R4 on K1 to K4, and LEVELS, L1 to L4. The volume rises to L1, goes on to L2, then L3, where it stays while the key is held; let go, it moves to L4. Each R sets how fast it moves to its L, 99 the fastest.

□ 0-99

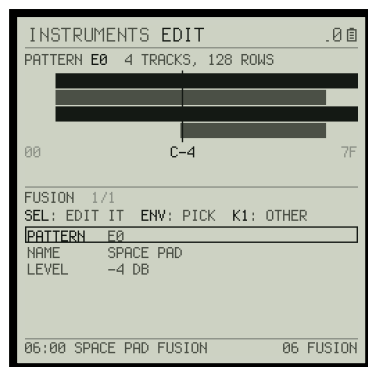
In the samples list, **SEL**, DELETE removes a sample. When instruments use it, it warns first (**DELETE SAMPLE?** , **3 INSTRUMENTS USE IT AND ARE DELETED TOO**), and they go with it; an unused one goes at once (**SAMPLE 03 DELETED**). Deleting an instrument never deletes its sample: SETTINGS' CLEAN UP removes samples nothing uses.

FUSION

A FUSION instrument is a sound made of a pattern. Each key plays its own row of the pattern, every note of that row at once: C-4 plays row 3C (its MIDI note number), and letting go stops them all. So one key can play a chord, a layered sound, or a different drum on every key (a kit).



06 FUSION browsed: SPACE PAD's pattern as a map, its rows across the keys' notes.



Editing a FUSION: PATTERN, NAME and LEVEL under the map.

■ FUSION

The one page: the pattern's map above.

■ PATTERN

Which pattern it plays. On it, **[K1]** or **[ENV]** pick another (in ENV's list the keys try each before you pick); **[SEL]** opens it in the EDITOR to write it.

- **Writing it:** SEL on PATTERN opens the EDITOR on the pattern, locked to it: with REC off the keys play this FUSION as you write it, its rows lighting green; with REC on they write. HOME comes back.
- **EDIT on an empty FUSION slot** makes a new pattern (128 rows, 4 tracks) and first asks (**A NEW PATTERN FOR THIS SLOT , FILL IT WITH 01:00 EL PIANO?**): **[K1]** or **[SELECT]** pick another sound (the keys hear it); **[OCT+]** (FILL) writes that sound's note on every row, so the slot plays as that sound, ready for layers; **[OCT-]** (EMPTY) leaves it empty.
- Rows the keys do not reach can keep ideas for later; SEL, MOVE puts one on a key.
- A FUSION inside a FUSION is silent: no chains, no loops. Voices are shared: rows with many notes take voices from other sounds.

The menus

[SEL] on a slot:

■ MARK

Several slots: SELECT (ALGORITHM by 8) stretches the mark; then SEL for their menu. COPY, INIT and DELETE act on all of them. SEL held + SELECT marks too.

■ COPY, PASTE

Copy a sound (4 at most) and paste it over a slot (**COPIED 3** ; nothing copied: **NOTHING COPIED**).

■ MOVE, SWAP

MOVE carries the sound to an empty slot (full cartridge:

NO EMPTY SLOT: SWAP INSTEAD); SWAP trades places. SELECT carries, SEL puts down, HOME takes back. Songs using it are asked about (references).

■ DELETE

Empties the slot.

■ INIT

A plain starting sound in the slot.

■ RENAME

Type its name.

■ AUTO LEVEL

As loud as the others.

■ REVERT

The sound as last saved (REVERT SLOT 01:00 TO SAVED?).

[SEL] in the cartridge list (**[ENV]**):

■ NEW

A new cartridge: pick its type (DX7, JUNO-106, TB-303, CHIP, SAMPLER, FUSION). It goes at the end of your cartridges (**CARTRIDGE 11 MADE**); all numbers used: **ALL CARTRIDGE NUMBERS USED** .

■ CLONE

A copy (**01 CLONED TO 11**). A sampler cartridge's samples are copied too, written at once (CLONING ITS SAMPLES); without room for them, **NO ROOM IN THE USER AREA** .

■ MOVE

To another free number; a sampler cartridge with unsaved changes must be saved first (**SAVE IT FIRST**).

■ DELETE, RENAME

As for a slot.

■ AUTO LEVEL ALL

Sets every sound's LEVEL at once, after a question (**AUTO LEVEL 32 SOUNDS?** , **EACH ONE'S LEVEL SET AGAIN**): **LEVELS SET** .

■ BACK TO BUILT-IN

On a changed built-in cartridge (brown number): your changes dropped, the firmware's own back.

■ REVERT

The whole cartridge as last saved.

Keys on INSTRUMENTS

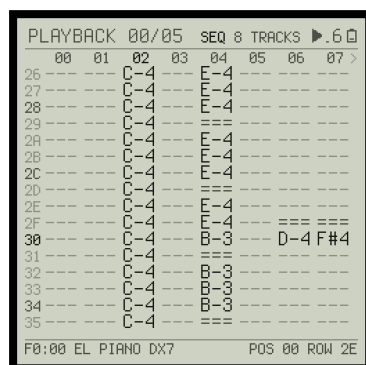
KEY	BROWSING A CARTRIDGE
[SELECT]	Moves to the next or previous slot: that sound becomes the current one.
[ALGORITHM]	Moves by 8 slots, a column at a time.
[PRESETS]	Goes to the next or previous sound, skipping empty slots.
[K1]	Turns to another cartridge.
[KEYS]	Play the sound picked.
[EDIT]	Opens the sound's settings to change it (edit mode). On an empty FUSION slot, makes a new pattern for it first.
[GLO]	Shows the cartridge's name, type and slots used, and renames it.
[ENV]	Lists all the cartridges; ENV again opens the one highlighted.
[ENV] , then [SEL]	In the cartridge list, SEL opens the cartridge's menu: NEW, CLONE, MOVE, DELETE, RENAME, AUTO LEVEL ALL, REVERT, BACK TO BUILT-IN.
[SEL]	Opens the slot's menu: MARK, COPY, PASTE, MOVE, SWAP, DELETE, INIT, RENAME, AUTO LEVEL, REVERT.

BROWSING A CARTRIDGE	
KEY	
ARP	Switches the arpeggiator on and off: it plays the sound picked while your hands are on the knobs.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.
IN EDIT MODE	
SELECT	Picks a row of settings.
K1 K2 K3 K4	Change the row's four values, one a knob.
ALGORITHM	Turns the pages of settings.
SEQ	Turns the pages too, round.
KEYS	Play the sound as it changes.
PRESETS	Moves to another sound, still editing.
LFO	Puts the knob turned last back to its default.
SEL	On NAME, types the name. Elsewhere, opens the menu: COPY, PASTE, INIT, RENAME, AUTO LEVEL, REVERT.
K4	On a sampler's LOOP row: RELEASE, how long the sound fades after the key is let go.
EDIT	Leaves edit mode, keeping the changes.
HOME	Leaves edit mode, dropping the changes.
SAMPLES AND FUSION	
ENV	On a sampler's SAMPLE: lists the cartridge's samples. On a FUSION's PATTERN: lists the patterns.
KEYS	In the samples list, play the sample highlighted. In the pattern list, try each pattern as this FUSION would play it. On a FUSION sound, each key plays its own row of the pattern.
ENV	Again: uses the sample, or the pattern, highlighted.
K1	On a FUSION's PATTERN: steps to another pattern.
SEL	In the samples list: DELETE (it asks when sounds use the sample). On a FUSION's PATTERN: opens the pattern in the EDITOR to write it.
REC	In the EDITOR opened for a FUSION: with REC off, the keys play the FUSION as you write it; with REC on, they write.
HOME	In that EDITOR: back to the FUSION's settings.
OCT+	A new FUSION pattern's question: FILL, every row with the sound offered.
OCT-	... or EMPTY, the pattern left empty.
K1 SELECT	In that question: offer another sound (K1 another cartridge's, SELECT the next sound).

9 | PLAYBACK

PLAYBACK follows what plays: the pattern playing now, scrolling with the music, in the EDITOR's grid. Nothing on it can be changed by accident, so it is the screen to perform from: jump between positions, change the song's speed and volume, play over it. Open it with **HOME** + **OP4**.

What it shows

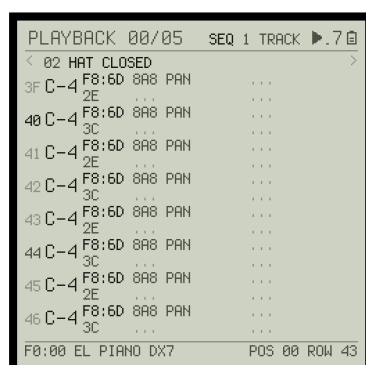


PLAYBACK following MIDNIGHT RUN: the playing row on a blue band, the header's page the song position of the last one, the footer the play position.

- The pattern playing now, scrolling with the play position. There is no cursor and no editing.
- The header shows the song position and the last one (**02/0B**); the footer's right side the position and row playing (**POS 02 ROW 1F**).
- While the EDITOR's pattern loop plays, the header says **PAT 0C** (or EDITOR for its own pattern) and the footer **PAT 0C ROW 1F**.
- While LOOPS' loops play, each loop is a track; the header says LOOPS. EDIT then goes to LOOPS.
- When nothing plays, it shows where playback paused, or the current song's start; with no song at all, **NOTHING HAS PLAYED: PLAY STARTS THE SONG**.

SEQ (or **K2**) shows 8, 4, 2 or 1 tracks at once, as in the EDITOR (**4 TRACKS**).

ALGORITHM moves the highlighted track across; the view scrolls sideways to keep it in sight.



The 1-track view: the whole cell of the highlighted track as it plays.

Playing the song live

- **PLAY** pauses and resumes what played last.
- **SELECT** steps through the song a row at a time: the first click pauses and plays the current row again; each click forward plays the next row, each click back the previous one. **PLAY** goes on from there.

- **[K1]** jumps to another position of the song (**K1 POSITION 03/0B PATTERN 05**). While playing, the jump comes as the current row ends, and it is a clean start: every note of the song is cut and the effects' tails emptied. Paused, **PLAY** resumes from that position.
- **[K3]** is the song's volume, from +6 dB down to -24 dB and OFF, a dB a click (**K3 VOLUME -6 DB**). It turns the song alone, not the keys, so you can play over a quieter song.
- **[K4]** is the song's speed, in BPM, from 3 to 600 (**K4 TEMPO 124.0 BPM -3.2%**: the BPM, and the change against the song's own tempo). Every tempo the song plays is scaled by it, its tempo commands too.
- **[LFO]** puts back the one of K3 and K4 turned last: the volume to 0 dB, the speed to 100 %.
- The keys play the current instrument over the song; **[ARP]** arpeggiates them.
- **[HOME]** + **(white key)** mutes and unmutes tracks.

MEMO

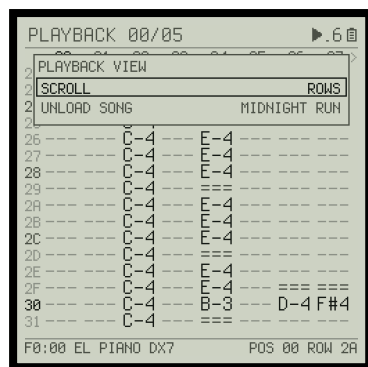
The speed and the volume are not saved. They stay for every song you play until something else plays (the EDITOR's pattern loop, LOOPS, DJ), and at power-off they go back to 100 % and 0 dB.

More from PLAYBACK

- **[EDIT]** opens the EDITOR on the pattern playing, with the cursor on the playing row; **[HOME]** comes back here.
- **[ENV]** opens the song list: **[PLAY]** there plays the highlighted song from its start, and **PLAYBACK** follows it; **[ENV]** again closes the list.
- **[GLO]** opens the view's options (PLAYBACK VIEW): **SCROLL** by ROWS (the playing row stays in the middle) or by PAGES (the highlight moves, the pages flip; also **SETTINGS' PLAYBACK SCROLL**), and **UNLOAD SONG**, listed once something has played: everything stops, and the keys get their own effects and tempo back, as at power-on (chapter 6).

PLAYBACK 00/05			
SONGS			
NR	NAME	BPM	TIME
00	PUNCH IN	124	01:33
01	SPICE ROAD	96	02:00
02	MIDNIGHT RUN	130	01:29
03	CITY LIGHTS	120	01:36
04	ACID TEST	138	01:23
05	ADVENTURE	132	01:27
06	TRANCE LOOP	140	00:14
07	BREAKS LOOP	124	00:15
08	TECHNO LOOP	126	00:30
09	ACID LOOP	128	00:30
0A	DISCO LOOP	120	00:32
0B	CHIP LOOP	125	00:31
0C	HIP-HOP LOOP	86	00:22
F0:00 EL PIANO DX7		POS 00 ROW 2A	

The song list (ENV): **PLAY** plays the highlighted song from its start.



The view's options (GLO).

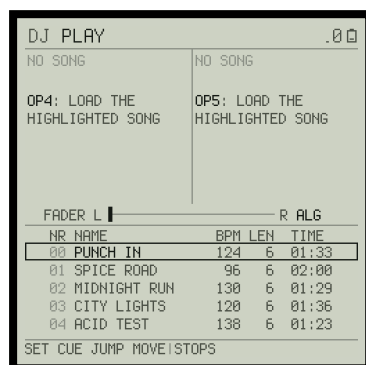
Keys on PLAYBACK

KEY	DOES
PLAY	Pauses and resumes what played last.
SEQ	Shows 8, 4, 2 or 1 tracks at once, round.
K2	Also changes the number of tracks shown: clockwise more.
ALGORITHM	Moves the highlighted track across.
SELECT	Pauses, then plays the song a row a click; PLAY goes on from there.
K1	Jumps to another position of the song.
K3	The song's volume (the keys stay as they are).
K4	The song's speed, in BPM.
LFO	Puts the volume or the speed, whichever you turned last, back to 0 dB or 100 %.
EDIT	Opens the EDITOR on the row playing; HOME comes back here.
HOME	Back from the EDITOR opened with EDIT.
ENV	Opens the song list; PLAY there plays a song from its start.
GLO	The view's options: scroll by rows or pages; UNLOAD SONG.
KEYS OCT- OCT+ PRESETS	Play the current instrument over the song, as on every screen.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.
HOME + white key	Mutes or unmutes a track; held, solos it.

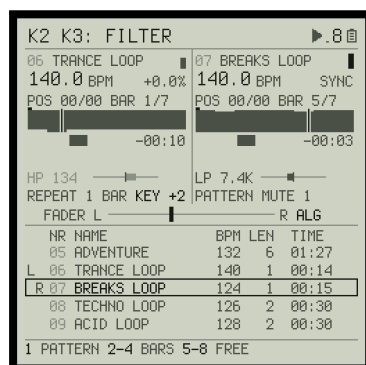
10 | DJ

DJ turns the FM-1 into a DJ stand: two songs on two decks, kept in time, mixed with a crossfader, with a filter, loops, cue points and stops on each deck. It is only for performing: nothing done on DJ changes a song. Open it with **HOME** + **OP5**.

The stand



DJ with both decks empty: the left deck, the right deck, the crossfader, and the song list below.



Two loops playing in sync: each deck's song, BPM and change, position and bar, its overview with the time left, its filter and its loop; the crossfader under them.

- **The left deck is the main:** its tempo is the set's tempo, and the right deck can follow it (SYNC).
- Each deck shows its song, its BPM and the change from the song's own tempo, its position and bar, an overview of the song with the time left, its filter, and its loop or repeat.
- **The crossfader** (**ALGORITHM**) blends the two: all the way left, only the main is heard (as at first).
- **The song list below:** **SELECT** moves its highlight; L, R or LR mark the songs on the decks.

MEMO

DJ stays apart until it plays. Opening DJ changes nothing of what plays: you can set up the decks in silence and leave. DJ's first start (a deck's PLAY key, say) stops what was playing and cuts its sound, so the decks start dry. PLAY on DJ while something else plays first pauses it (**PAUSED: PLAY AGAIN FOR DJ**); the next PLAY plays the decks. Once DJ plays, the decks play on outside DJ until a song, a pattern or the loops start.

Loading and playing

- 1 Turn **SELECT** to a song in the list.

- 2 Press **OP4** to load it on the left deck, or **OP5** on the right (**LEFT: CITY LIGHTS**). A song with no positions is refused (**SONG 0A IS EMPTY**).
- 3 Press **OP1** to play or pause the left deck, **OP6** the right. Held, the deck goes back to its song's start, paused (**LEFT: BACK TO THE START**).
- 4 **PLAY** plays or pauses both decks at once; held, both go back to their cue points (**BACK TO THE CUES**).

- **Loading onto a playing deck** waits for its next bar line (**LEFT: CITY LIGHTS AT THE BAR** ; the LOAD key blinks): the new song takes over at the bar, at the BPM the deck was playing, so the beat goes on. Hold the LOAD key instead to have it start at its own tempo (**LEFT: CITY LIGHTS AT ITS TEMPO**). Tap LOAD again before the bar line to cancel (**LEFT: LOAD CANCELLED**).
- The same song can be on both decks, to fade from one part of it to another.
- At a song's end it loops or stops, as the song says. Stopped, its PLAY has nothing more to play (**THE END: CUE GOES BACK**). Through the last 8 bars of a song that stops, the time left turns red and the deck's PLAY key blinks on the beat.
- An empty deck refuses PLAY, CUE, SYNC, HOLD and FILTER: **NO SONG ON THE DECK** .

SWAP: **SEQ** exchanges the decks (**DECKS SWAPPED** ; both empty: **NO SONGS TO SWAP**): songs, places, cue points, tempos, filters, loops and mutes. Nothing heard changes. The usual flow: the main plays; you load the next song on the right, start it in time and bring it in with the crossfader; SWAP; the right deck is free for the next one.

Tempo and SYNC

- **K1** is the left deck's tempo (the set's), **K4** the right's: shown as the BPM it plays and the change (**TEMPO L 124.0 BPM +3.2%**), 3 to 600 BPM in steps of 0.1 (SEL held: 1 BPM). The song's own tempo commands still act, scaled. **SEL** after a turn sets it back to the song's own (**TEMPO 120.0 BPM: THE SONG'S**).
- **MONO** is **SYNC** (on at first): the right deck follows the main's tempo (or its half or double, whichever is nearest its own song's) and its beats fall on the main's. A synced right deck starts on the main's next bar line; its tempo knob then does nothing (**SYNC: TEMPO ON THE MAIN DECK**). **SYNC ON** , **SYNC OFF** .
- With SETTINGS' SYNC set to EXTERNAL, an outside MIDI clock leads the main deck (**SYNC EXTERNAL: THE CLOCK'S TEMPO**); START plays it from its cue point, STOP pauses it.
- Two decks at one BPM never drift apart.

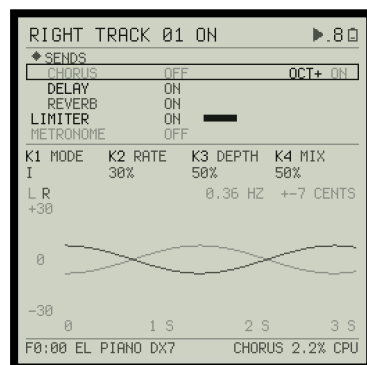
Filters, volumes and effects

- **K2** is the left deck's DJ FILTER, **K3** the right's: one way a low-pass (LP, darker), the other a high-pass (HP, thinner), OFF in the middle (**FILTER L LP 2.4K**).
- **OP3** (the left) and the black key **GLO** (the right) switch the filter off and back on, sliding there while the key is held (**FILTER L OFF** , **FILTER L ON LP 2.4K**). With the filter off, the knob sets the filter silently, ready for the key to bring it in on the beat.

- **ENV** switches K2 and K3 to the decks' **VOLUME** and back (**K2 K3: VOLUME** , **K2 K3: FILTER**): +6 dB down to -24 dB and OFF, a dB a click (**VOLUME L -3 DB**).
- **SEL** tapped puts the last knob turned back: a tempo to the song's own, a filter to OFF, the crossfader to the middle, a volume to 0 dB, a KEY to 0.
- Each deck plays its song's mixer and its own GATE, FILTER, DRIVE, LO-FI and DUCK. **CHORUS, DELAY and REVERB are DJ's own**, shared by both decks, with DJ's settings: **FX** on DJ edits them, with the LIMITER and the METRONOME, and FX again comes back to DJ.
- **FX** + **(white key)** held plays a punch-in over the mix, as everywhere.
- When all 16 voices are busy, the deck the crossfader favours less gives way.



FX on DJ: LIVE, the punch-ins and DJ's own shared effects.



FX on DJ: EDIT, the CHORUS's knobs and picture.

A hand on the record: HOLD

OP2 is the left deck's HOLD, **PIT** the right's:

- Held down, the deck stops where it is, as a hand on the record.
- Turn the deck's tempo knob meanwhile (**K1** left, **K4** right): it moves by hand, a row a click, heard. Its filter knob (**K2**, **K3**) moves it silently, a beat a click, for the long way.
- Let go: a deck that was playing plays on from there at once. So a tap holds a deck back by that much, to nudge it against the other.

The pads

The white keys are each deck's pads: keys 1-8 the left deck's, 9-16 the right's. The **BLANK** key turns their mode between PLAY pads and LOOP pads (**PADS: PLAY** , **PADS: LOOPS**); **LFO** brings in the LFO pads.

PAD (LEFT, RIGHT)

PLAY PADS

- 1

9

SET CUE: sets the cue point on the bar line nearest the tap, while the deck plays on (**CUE: POS 02 BAR 4**). Held a quarter second, on the beat instead.
- 2

10

CUE: as a DJ player's CUE. Paused, sets the cue point. Playing, plays from the cue point while held, and pauses there when let go. Press the deck's PLAY key while CUE is held, and it plays on when you let go.
- 3

11

JUMP: back to the cue point, playing on; held, the jump lands on the next beat.
- 4

12

MOVE: held, the deck's knobs move a cursor: **K1** (the left deck's; **K4** the right's) a bar a click, and **K2** (**K3**) a pattern a click (**MOVE L POS 03 BAR 2**); let go, the deck moves there on the next beat, in phase, playing on.
- 5

13

BRAKE: held, the deck slows and its pitch falls, a turntable's stop.
- 6

14

BACKSPIN: held, the record spun back by hand.
- 7

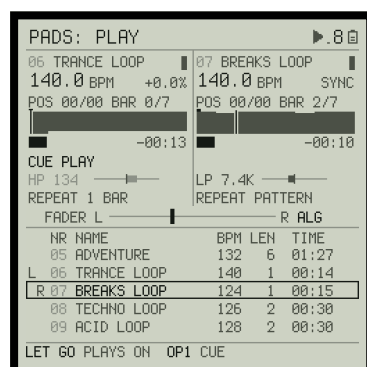
15

ECHO OUT: held, the deck's sound goes into the delay and stops on the next beat, the echoes ringing on.
- 8

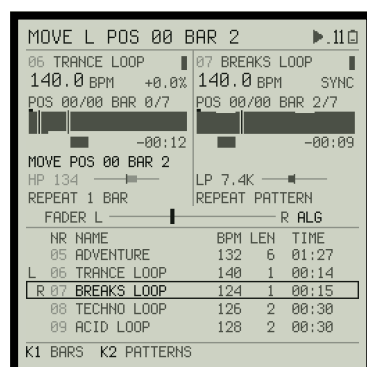
16

REVERB OUT: the same into the reverb.

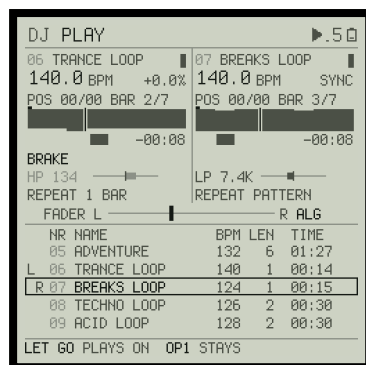
The stops (pads 5-8) work while held: let go, the deck plays on where it would have been, in time, as if it had never stopped; a tap is a dip. Press the deck's PLAY key while a stop is held and the deck stays stopped when you let go.



CUE held on the left deck, its PLAY key pressed: letting go plays on.



MOVE held, K1 turned: the cursor two bars on; let go, the deck moves there on the beat.



BRAKE held on the left deck.

PAD (LEFT, RIGHT)

LOOP PADS

① ⑨

PATTERN: the deck's current pattern over and over, on or off (**LEFT: REPEAT PATTERN ON**).

② ③ ④

REPEAT 4, 2, 1 BARS (the left deck; 10-12 the right's): the block of bars the deck is in, round and round until tapped again.

⑤ ⑥ ⑦ ⑧

A free LOOP of 2 bars, 1 bar, 1/2 bar, 1/4 bar from the last beat (13-16 the right's).

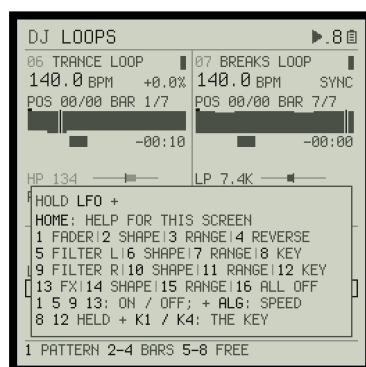
white key held

A ROLL: any loop pad held is a loop for as long as it is held; let go, the deck plays on from where the loop is.

A loop stays through a pause; a pad that cannot act (a stop on a paused deck, say) blinks fast.

The LFO pads

LFO brings in the LFO pads (**PADS: LFO**), and LFO again goes back. They make things swing by themselves, each at a note length of the tempo (1/2 at first). Hold LFO to see which pad does what.



LFO held: the map of the LFO pads.

PAD

LFO PADS

①

The crossfader's LFO on / off (**FADER LFO: TRIANGLE 1/2** , **FADER LFO OFF**).

②

Its shape: SINE, SQUARE, TRIANGLE, SAW UP, SAW DOWN, RANDOM.

③

Its range: MIRROR (through the middle), L TO HERE, L TO R, SWING.

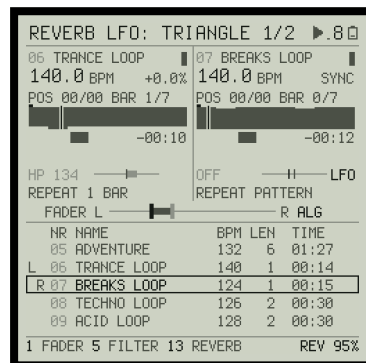
④

Reverse: HERE TO R, R TO L.

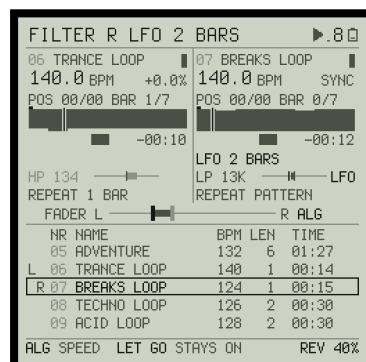
⑤ ⑥ ⑦

The left deck's filter LFO: on / off, shape, range (OFF TO HERE, OFF TO FULL, HERE TO FULL, SWING).

PAD	LFO PADS
8	Held: K1 turns the left deck's KEY a semitone a click, -6 to +6, its tempo kept (KEY L +1), to mix in key.
9 10 11	The right deck's filter LFO, the same.
12	Held: K4 turns the right deck's KEY.
13 14 15	The FX LFO, swinging DJ's REVERB MIX (or DELAY, CHORUS: GLO's FX LFO): on / off, shape, range.
16	Every LFO off (ALL LFOS OFF).
1 5 9 13 held	Hold an LFO's on / off pad and turn ALGORITHM : its speed, from 32 BARS to 1/8 (FADER LFO 1/4). SEL after: back to 1/2.



The LFO pads: the reverb and the right filter swinging.



An LFO's speed turned with ALGORITHM while its pad is held.

Mutes, the CUT, saving

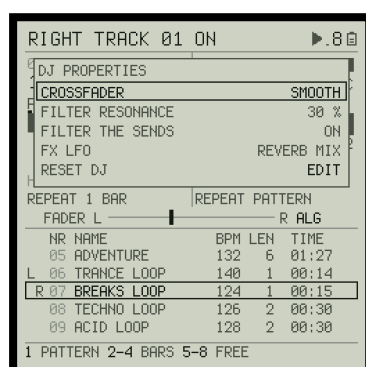
- **HOME** + **white key** mutes a deck's track: keys 1-8 the left deck's tracks 00-07, keys 9-16 the right deck's (**LEFT TRACK 02 MUTED**). SEQ first, or the key held: solo (**LEFT TRACK 02 SOLO**).
- **HOME** + **OCT+** takes those keys to tracks 08-0F (**MUTES: TRACKS 08-0F**); **HOME** + **OCT-** back (**MUTES: TRACKS 00-07**). Alone, OCT does nothing on DJ.
- **HOME** + **PLAY** takes both decks back to their cue points; **HOME** + **REC** cuts the sound while the decks play on.
- **SAVE** keeps the whole stand (the decks as they stand, the crossfader, SYNC, the LFOs): at power-on the decks are back, paused, and PLAY goes on from the same point.



HOME's combination on DJ: the white keys mute the decks' tracks.

DJ's properties

GLO opens DJ PROPERTIES:



DJ's properties.

■ CROSSFADER

SMOOTH (each deck at -3 dB in the middle, as loud through the blend) or SHARP (both full until the last 2 clicks at either end, for cuts).

■ FILTER RESONANCE

The DJ filters' resonance.

□ 0-100 %

■ FILTER THE SENDS

ON: a deck's filter also filters what it sends to the shared effects, so a sweep takes its echoes along. OFF saves some processor time.

□ ON, OFF

■ FX LFO

What the FX LFO swings.

□ REVERB MIX, DELAY MIX, CHORUS MIX

■ RESET DJ

EDIT, after a question (**RESET DJ?** , **BOTH DECKS EMPTIED, ALL AS AT FIRST**): both decks emptied, everything as at first (**DJ RESET**).

Keys on DJ

KEY	THE DECKS
OP1	Plays or pauses the left deck.
OP1 held	Takes the left deck back to its song's start, paused.
OP2 held	HOLD: the left deck stops while held; turn K1 to move it by hand, K2 to move it silently.
OP3	Switches the left deck's filter off and back on, sliding.

KEY	THE DECKS
OP4	Loads the highlighted song on the left deck.
OP5	Loads it on the right deck.
OP4 OP5	The two LOAD keys: on a playing deck the song comes in at the next bar line; held, at its own tempo.
OP6	Plays or pauses the right deck.
OP6 held	Takes the right deck back to its song's start, paused.
PIT held	HOLD: the right deck stops while held; turn K4 to move it by hand, K3 to move it silently.
GLO	Switches the right deck's filter off and back on, sliding.
OP3 GLO	The two FILTER keys: a quick press switches at once, a held one slides over up to half a second.
MONO	SYNC on / off: the right deck follows the left.
POLY	Nothing on DJ.
BLANK	Turns the pads between PLAY pads and LOOP pads.
OP1 OP6	The two decks' PLAY keys, each over its deck's pads: play or pause each deck on its own (PLAY plays both).
OP1 OP6 , with CUE or a stop held	The deck's PLAY key pressed while its CUE pad or a stop is held changes what letting go does: play on, or stay.
KEY	KNOBS AND BUTTONS
SELECT	Moves the song list's highlight.
ALGORITHM	The crossfader, left to right. With an LFO's on / off pad held: that LFO's speed.
K1	The left deck's tempo (the set's). With HOLD held: the deck by hand, a row a click. With MOVE held: a bar a click. With the KEY pad held: its key.
K4	The right deck's tempo (nothing while synced). With HOLD, MOVE or KEY held: as K1 for the right deck.
K2	The left deck's filter, or its volume (after ENV). With HOLD held: the deck silently, a beat a click. With MOVE held: a pattern a click.
K3	The same for the right deck.
K2 K3	The left and right filters, side by side.
PLAY	Plays or pauses both decks at once.
PLAY held	Both decks back to their cue points.
SEQ	SWAP: the decks exchanged.
ENV	Switches what K2 and K3 turn: the filters or the volumes.
SEL	Puts the last knob turned back: tempo, filter, crossfader, volume, KEY.
SEL held	With a knob: big steps.

KEY	THE DECKS
LFO	The LFO pads; again, back.
LFO held	Shows which LFO pad does what.
GLO	DJ's properties: crossfader, filter, FX LFO, RESET DJ.
FX	DJ's own CHORUS, DELAY, REVERB, LIMITER and METRONOME.
FX + white key held	A punch-in over the mix.
OCT- OCT+	Nothing alone on DJ.
HOME + OCT+ HOME + OCT-	HOME's mutes reach tracks 08-0F, or back to 00-07.
HOME + white key	Mutes a deck's track: 1-8 the left's, 9-16 the right's.
HOME + PLAY	Both decks back to their cue points.
HOME + REC	Sound off while the decks play on.
SAVE	Keeps the decks as they stand.
REC EDIT ARP PRESETS	Nothing on DJ: no key plays an instrument here.

11 | VISUAL

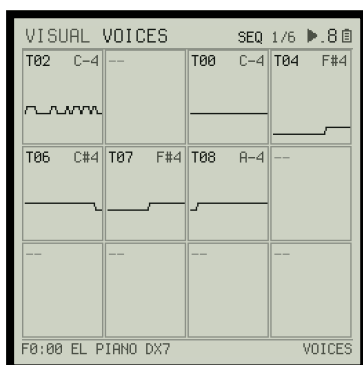
VISUAL shows the sound: each voice's wave, the output as an oscilloscope, a scrolling waveform, a spectrum, a meter for each track, and FOMA, PT/FM's mascot. Open it with **HOME** + **PIT**.

The views

SELECT turns the views a step at a time (it stops at both ends); **SEQ** goes to the next and round. The header names the view (VISUAL SCOPE).

■ VOICES

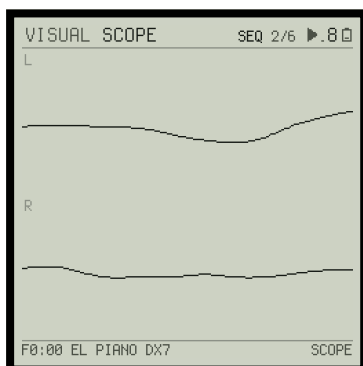
A small scope for each voice, labelled with what plays it (T03 a song's track, KEY the keys, L05 a loop) and its note.



VOICES: a scope for each voice, its track and note on top.

■ SCOPE

The output as an oscilloscope, left above, right below.



SCOPE: the output's left and right.

■ WAVE

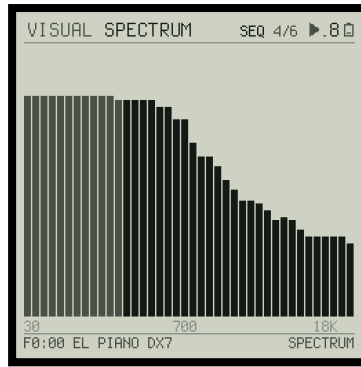
The output's waveform over the last seconds, scrolling.



WAVE: the last seconds of the output.

■ SPECTRUM

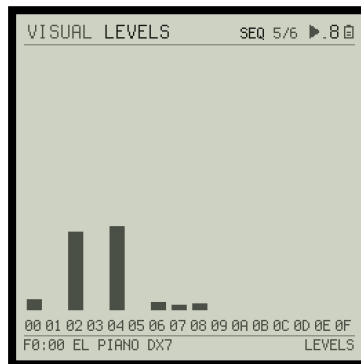
The output's spectrum: bass on the left, treble on the right (30 Hz to 18 kHz).



SPECTRUM: the sound's frequencies.

■ LEVELS

A meter for each track, 00 to 0F.



LEVELS: a meter a track.

■ FOMA

PT/FM's mascot: a little FM-1 with a cat's ears, flying into the stars, its rainbow tail waving with the sound.



FOMA, into the stars.

Zoom, gain and options

- **K1** zooms SCOPE in time, 1 to 6 (**K1 ZOOM 3**): from 128 to 1,024 samples across the screen.
- **K2** makes every view taller or flatter, x0.13 to x16 in doublings (**K2 GAIN X1**).
- **GLO** opens VISUAL OPTIONS: **VIEW** STEREO or MONO, and **FREEZE** OFF or ON, to hold the picture still (the footer then says FROZEN).



VISUAL OPTIONS (GLO).

VISUAL works from a copy of the sound, never slowing it down.

Keys on VISUAL

KEY	DOES
SELECT	Turns the views, a step at a time.
SEQ	The next view, round.
K1	Zooms SCOPE in time.
K2	Makes the view taller or flatter.
GLO	The options: stereo or mono view, freeze.
PLAY	Pauses and resumes what played last.
KEYS OCT- OCT+ PRESETS	Play the current instrument, as on every screen.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

12 | STATUS

STATUS is the start screen: the FM-1 opens on it (unless SETTINGS' POWER-ON SCREEN says otherwise). It shows PT/FM's version and how to get help, and the figures behind the header: how busy the sound keeps the processor, the voices, the storage and memory, the device. Open it with **HOME** + **GLO**.

The pages **SELECT** or **ALGORITHM** turns the pages:

■ **PT/FM**

The name, the version, PRESS HOME + LFO FOR HELP, and the figures a glance needs:

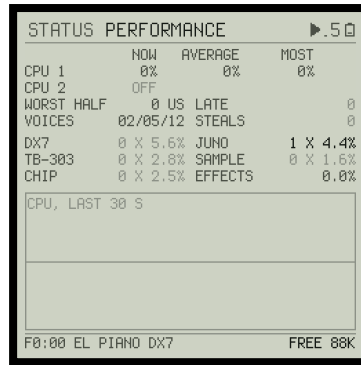


The first page: PT/FM, the version, the help line, the figures and the song.

CPU 1, MAX	How much of its time the first processor spends on the sound now, and the most since the last reset. Green up to 50 %, yellow to 80 %, red above.
CPU 2	The same for the second processor (effects and voices 11-16); OFF while it does not run.
HALF	The longest piece of sound work, in microseconds: over 5804 is too slow.
LATE	Pieces of sound not ready in time: each one is a click (dropout).
STEALS	Notes that gave their voice up to a new note because all were busy.
VOICES, MAX	Voices sounding now and the limit (01/12), and the most at once.
EDITS FREE	The memory left for unsaved edits.
FLASH FREE	The free storage, where saves go.
UNSAVED	How many things changed since the last SAVE.
BATTERY, UP	The battery, and the time since power-on.
SONG	The song playing, else the current song.

■ **PERFORMANCE**

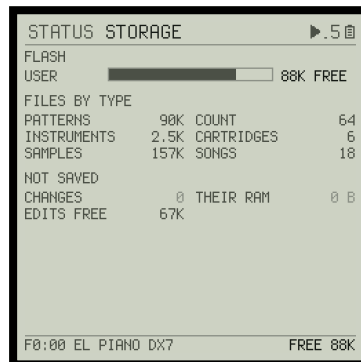
Each processor's load now, on average and at most; the worst sound piece, late pieces and steals; each engine's share; voices; the effects' cost; a graph of the last 30 seconds.



PERFORMANCE.

■ STORAGE

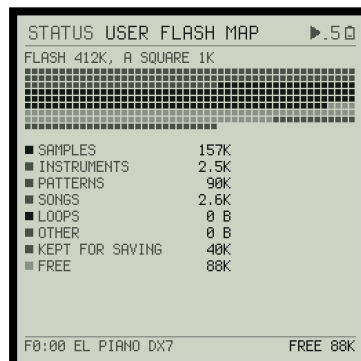
The user area (where everything you keep goes), used and free; what it holds by kind; unsaved changes and the memory they take.



STORAGE.

■ USER FLASH MAP

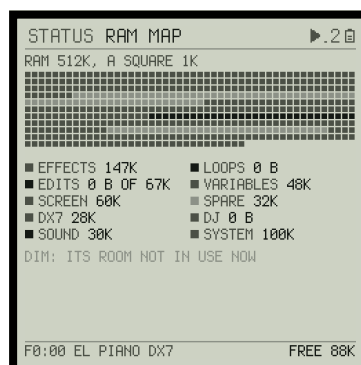
The user area as a map, a square a kilobyte, each in the colour of what it holds.



USER FLASH MAP.

■ RAM MAP

The FM-1's 512 KB of memory as a map, a square a kilobyte.



RAM MAP.

■ DEVICE

The battery, the firmware version, the output (stereo, mono, sync pulse), MASTER, the screen's frames a second, the time since power-on, VOICES, THEME and the second processor's state.



DEVICE.

SECOND CORE reads **STARTING** in the first two seconds, then **ON**; **OFF** when SETTINGS' SECOND CORE is off; or, in red, why it stopped until the next start: **STOPPED: NO ANSWER**, **STOPPED: MISREAD**, **STOPPED: STUCK**, **STOPPED: FAULT**, or **STOPPED: AFTER A CRASH** (after PT/FM crashed, the second processor stays off until the FM-1 is switched off and on). Without it, the FM-1 plays on with 12 voices at most. BATTERY reads 1, 2 or 3 bars, or **USB POWER**. The footer's right side shows the free storage (**FREE 237K**).

Keys on STATUS

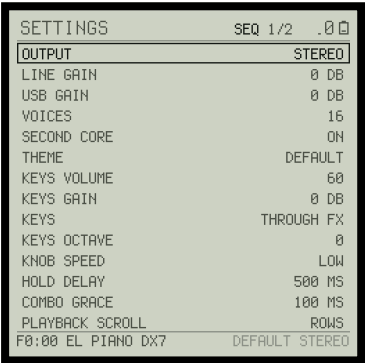
KEY	DOES
SELECT or ALGORITHM	Turns the pages, one a click.
PLAY	Pauses and resumes what played last; in the song list, plays the song highlighted.
LFO	Zeroes MAX, HALF, LATE and STEALS (COUNTS ZEROED).
ENV	Opens the song list: PLAY there plays the highlighted song from its start and goes to SONGS.
EDIT	Goes to SETTINGS.
HOME + LFO	The help: on STATUS it opens on the keys every screen shares.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

13 | SETTINGS

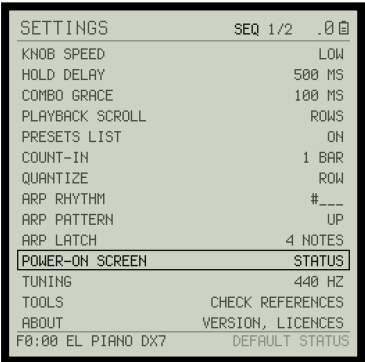
SETTINGS holds the FM-1's global settings and the tools that look after your storage. It has two pages: the list, and MIDI. Open it with **HOME** + **MONO** (or EDIT on STATUS).

Changing a setting

- 1 **SELECT** picks a setting; the footer shows its default (**DEFAULT STEREO**).
 - 2 **K1** changes it, a step a click. It applies at once.
 - 3 **LFO** puts it back to its default.
 - 4 **SAVE** keeps the settings after power-off, as every change.
- SEQ** or **ALGORITHM** turns to the MIDI page and back. **SEL**, REVERT takes the page back to what was saved, after a question (**REVERT THE SETTINGS TO SAVED?**); with nothing unsaved, **NOTHING TO REVERT** .



SETTINGS, the list's top.



The list's end: ARP, POWER-ON SCREEN, TUNING, TOOLS and ABOUT.

Sound and output

■ OUTPUT

What the jack and the speaker get. STEREO for headphones and a mixer. MONO for the FM-1's own speaker, which plays one channel only (and for a mono cable). SYNC PULSE L or R: a click on that side every half beat, for instruments that follow a sync pulse, the music in mono on the other side (with SYNC INTERNAL only; with SYNC EXTERNAL the output stays stereo, no clicks). A cable in the jack mutes the speaker, and the FM-1 cannot tell, so set this yourself.

☐ STEREO, MONO, SYNC PULSE L, SYNC PULSE R; STEREO at first

■ LINE GAIN

The level of the speaker and the jack, with MASTER.

☐ -24 to +12 dB, 0 dB at first

■ USB GAIN

The level of USB audio, the sound a computer records; MASTER does not touch it.

□ -24 to +12 dB, 0 dB at first

■ VOICES

How many notes are heard at once, everywhere. 16 needs the second processor (SECOND CORE); while it does not run, 16 counts as 12

(**16 VOICES: 12 WITHOUT CPU 2**). When all are busy, a new note takes the voice least missed: a ringing tail first, then the quietest held note; the keys' notes go last. A held note pushed out comes back when a voice frees.

□ 8, 12, 16; 16 at first

■ SECOND CORE

The FM-1's chip has two processors: ON works the effects and voices 11-16 out on the second. OFF: one does it all (12 voices at most).

□ ON, OFF; ON at first

■ TUNING

The pitch of A4.

□ 430-450 Hz, 440 at first

The keys, the knobs and the look

■ THEME

The screen's colours.

□ DEFAULT, EGA, PASTEL, NEON, SUNSET, ICE, CLEAR, GREEN, AMBER, WHITE, DAYLIGHT, PAPER, MANUAL, SILVER, LCD, COMMANDER; DEFAULT at first

■ KEYS VOLUME

The volume of the notes the keys play and write (the keys have no velocity).

□ 01-7F, 60 at first

■ KEYS GAIN

How loud you hear the keys while playing them (the FM-1's and MIDI's), not how they are recorded.

□ -24 to +12 dB, 0 dB at first

■ KEYS

THROUGH FX: the keys go through the effects as everything else. DRY: past every effect, straight to the output.

□ THROUGH FX, DRY; THROUGH FX at first

■ KEYS OCTAVE

The keys' octave at power-on.

□ -4 to +4, 0 at first

■ KNOB SPEED

Bigger steps when a knob is turned fast.

□ OFF, LOW, HIGH; LOW at first

■ HOLD DELAY

How long a button must be held to count as held.

□ 300-1500 ms, 500 at first

■ COMBO GRACE

How long a button let go still counts for a combination.

□ 0-250 ms, 100 at first

■ **PLAYBACK SCROLL**

PLAYBACK scrolls by ROWS (the playing row stays in the middle) or by PAGES.

☐ ROWS, PAGES; ROWS at first

■ **PRESETS LIST**

While PRESETS turns, the cartridge's instruments over the screen, gone a second after the last click; OFF, the footer alone names the instrument.

☐ ON, OFF; ON at first

Recording and the arpeggiator

■ **COUNT-IN**

Before an EDITOR take: 1 or 2 bars of clicks, none, or KEY (your first note starts the take). LOOPS has its own.

☐ OFF, 1 BAR, 2 BARS, KEY; 1 BAR at first

■ **QUANTIZE**

Where an EDITOR take puts a note: on the nearest line of 2, 3 or 4 rows, the nearest row, or REAL TIME (the row it falls in, its exact time kept with a note delay). The keys sound exactly as written.

☐ 2 ROWS, 3 ROWS, 4 ROWS, ROW, REAL TIME; ROW at first

■ **ARP RHYTHM**

The arpeggiator's rhythm and the EDITOR's row preview, a row a step: # plays, _ rests.

☐ #, #_, #__, #___, ##_, ###_, ##__, #_##_, and two slow ones; #___ at first

■ **ARP PATTERN**

The order the arpeggiator's notes take turns in.

☐ UP, DOWN, UP-DOWN, RANDOM, AS PLAYED; UP at first

■ **AR PLATCH**

How many notes go on playing after you let go of their keys.

☐ OFF, 1-8 NOTES; 4 NOTES at first

■ **POWER-ON SCREEN**

The screen the FM-1 starts on.

☐ STATUS, LAST, or any screen; STATUS at first

TOOLS and ABOUT

On TOOLS, **K1** picks a tool and **EDIT** runs it:

■ **TOOLS**

The line of tools below.

■ **CHECK REFERENCES**

Lists the references to things that are missing (a note's instrument gone, a song's pattern deleted): **MISSING REFERENCES: 3** , or **NO MISSING REFERENCES** .

■ **CHECK STORAGE**

Reads every saved record and checks it is whole (**CHECKING STORAGE**):

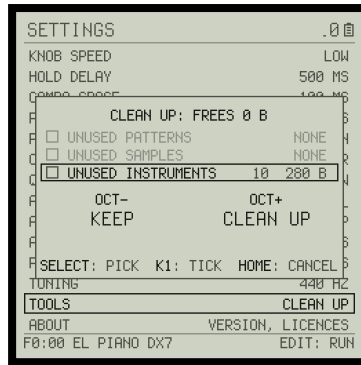
STORAGE OK , or a list of problems (**STORAGE PROBLEMS: 2**). It writes nothing.

■ **CLEAN UP**

Finds what nothing uses and asks what goes, as a checklist

(**CLEAN UP: FREES 1.3K**): UNUSED PATTERNS, UNUSED SAMPLES (ticked at first), UNUSED INSTRUMENTS (not: most of a bank is a library, not leftovers).

SELECT picks a line, K1 ticks it, OCT+ cleans up (**CLEANED UP: 4 DELETED** ; nothing to do: **NOTHING TO CLEAN UP**). Built-in things are never listed.



CLEAN UP's checklist.

■ AUTO LEVEL ALL

Measures every sound you have and sets its level, after a question; the built-in cartridges keep theirs.

■ REVERT ALL

Drops every unsaved change, after a question, as SAVE + OCT- does.

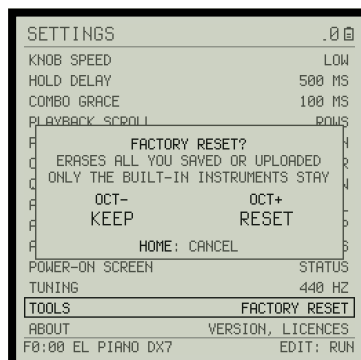
■ FACTORY RESET

Erases everything you saved or uploaded: songs, patterns, loops, your cartridges and samples, your edits of the built-in instruments, DJ's decks, the settings and the MIDI map. PT/FM itself and its built-in instruments stay, so the FM-1 is as it was after its first install, before the demo disk.

It asks twice. First **FACTORY RESET?** with **ERASES ALL YOU SAVED OR UPLOADED** and **ONLY THE BUILT-IN INSTRUMENTS STAY** : **OCT+** answers RESET. Then **ERASE IT ALL NOW?** with **THERE IS NO WAY BACK** , and, if you have changes not saved yet, how many go with the rest (**3 UNSAVED CHANGES LOST TOO**) : **OCT+** answers ERASE. **OCT-** (KEEP) or **HOME** at either question leaves everything as it was.

Then **ERASING** shows a bar for up to two seconds, the sound silent and every control waiting, and the FM-1 restarts on its power-on screen with the settings as they come.

To keep a copy first, read the FM-1 on the editor page and download a disk (chapter 17). The demo songs come back with the install page's **UPLOAD DEMO DISK** (chapter 2). A power cut while it erases leaves part of your work: run **FACTORY RESET** again.



FACTORY RESET's first question.

■ ABOUT

EDIT opens it: the version and the licences. EDIT closes it.



ABOUT.

The MIDI page

The second page (SEQ), the same kind of list (chapter 16 explains MIDI in full):



SETTINGS MIDI.

■ MIDI IN CHANNEL

The channel MIDI in listens to, on USB and the jack.

☐ ALL, 1-16; ALL at first

■ MIDI OUT

What goes out over USB: OFF, KEYS (the FM-1's keys as played) or ALL (the keys and everything that plays: track 0 on channel 1 ... track 15 on channel 16).

☐ OFF, KEYS, ALL; KEYS at first

■ MIDI OUT CHANNEL

The keys' channel out.

☐ 1-16; 1 at first

■ SYNC

INTERNAL: PT/FM's own tempo. EXTERNAL: an outside MIDI clock leads (USB or the jack).

☐ INTERNAL, EXTERNAL; INTERNAL at first

■ CLOCK OUT

Sends the clock, START / STOP / CONTINUE and the song position out, with SYNC INTERNAL.

☐ OFF, ON; OFF at first

■ MIDI CONTROLLER

EDIT turns the FM-1 into a MIDI controller for a computer until it is switched off and on, after a question (chapter 16).

■ LEARN

How many mappings of 64 (**3 OF 64**). **EDIT** learns one: touch an FM-1 control, then move the MIDI control that should drive it (**TOUCH AN FM-1 CONTROL** ,

MOVE THE MIDI CONTROL). The mappings are listed below; **LFO** deletes the one picked.

Keys on SETTINGS

KEY	DOES
SELECT	Picks a setting (on MIDI, then the mappings).
K1	Changes it, at once; on TOOLS, picks the tool.
LFO	Puts it back to its default; on a mapping, deletes it.
SEQ or ALGORITHM	Turns to the MIDI page and back.
EDIT	Runs the tool picked; opens and closes ABOUT; on MIDI CONTROLLER, switches; on LEARN, learns.
SEL	REVERT: the page's own back as saved (the settings; on MIDI, the mappings).
SAVE	Keeps the settings after power-off.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch (also set here: ARP RHYTHM, ARP PATTERN, ARP LATCH).

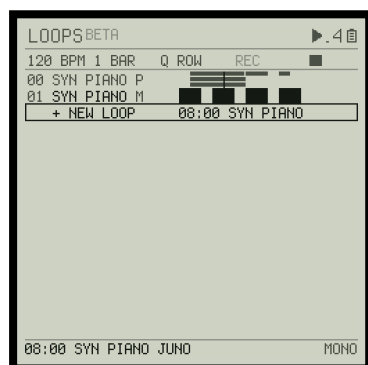
14 | LOOPS

LOOPS is a loop station: you record a layer in one pass, then the next over it, without stopping the music. You keep a stack of up to 16 loops, mute and solo them while playing over them, and can record the whole performance as a new song. Open it with **HOME** + **POLY**.

The loops



LOOPS with no loops yet: the top line (tempo, length, QUANTIZE, REC) and + NEW LOOP.



Two loops playing: each its number, instrument, POLY or MONO, and its notes across the length; the playing place a line.

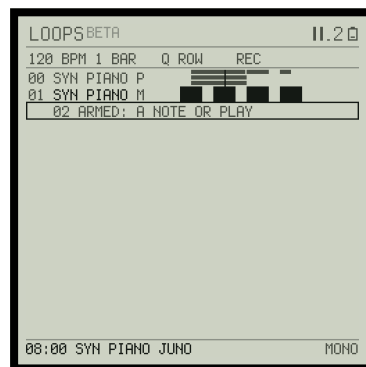
- **Up to 16 loops**, listed in the order they were made, the newest at the bottom, with + **NEW LOOP** under them. A loop's number is its place, 00 to 0F.
- **One length for all**, set by the first loop in whole bars (8 bars at most at 1/16). After that only the properties' LENGTH and the menu's DOUBLE change it.
- **A loop has one instrument** and a colour of its own. **PRESETS** (and **ENV**, the cartridges) pick the sound the keys play and the next loop takes, never a recorded loop's.
- **POLY or MONO**, chosen before recording (the black keys MONO and POLY in CONTROL mode; POLY at first): a POLY loop holds up to 4 notes at once, a MONO loop one, a note over a held one taking over as the properties' MONO LEGATO says.
- **A loop's mix**: **K1** to **K4** turn the selected loop's LEVEL, PAN, DELAY SEND and REVERB SEND (CHORUS and DUCK on FX's MIXER). On + NEW LOOP they set the next loop's mix.
- **ALGORITHM** turns the tempo, any time.
- LOOPS has its own effects (**FX** from LOOPS edits them) and metronome, so it sounds the same whatever song is current. SAVE keeps the loops like any change.

MEMO

What plays (a song, a pattern) plays on into LOOPS until the loops start. The loops play on outside LOOPS until a song or a pattern starts. Leaving LOOPS for any screen but FX ends a take.

Recording a loop

- 1 Pick a sound with **PRESETS**. Turn **SELECT** to + NEW LOOP (for a new loop) or to a loop (to record it again).
- 2 Press **REC**: the take is armed.
 - With the loops playing, it starts at their next start; the row counts down (**ARMED: STARTS IN 3 BARS**).
 - With nothing playing, your first note starts the loops and the take at once; or press **PLAY** to start them after the properties' COUNT-IN.
- 3 Play. A take is one pass of the length and stops by itself, the loops playing on. Press **REC** to stop it early; REC while armed cancels (**CANCELLED**).



A take armed: it starts with the loops' next round.

The first loop has no length to fill: it grows a bar at a time while you play. Press **REC** to close it on a bar line (**LOOP 00: 4 BARS**); its bars are the length. Played nothing: **NOTHING PLAYED: NO LOOP**. PLAY with no loops, nothing armed and nothing playing is refused: **REC, THEN PLAY: THE FIRST LOOP**.



The first loop recording: it grows a bar at a time.

- **What you hear is what is kept.** While recording, notes land on QUANTIZE's grid and sound there; a MONO loop plays one note at a time, a POLY one at most 4. Not recording, the keys play freely.
- **RE-RECORD:** **EDIT** (or REC on a loop) records the selected loop again; its old notes are gone the moment the take is armed (**LOOP 03 RE-RECORDING**). It keeps its place, colour, instrument and mix.

- **PEEL:** **LFO** removes the selected loop (on + NEW LOOP, the last) without asking (**LOOP 03 PEELED**); SEL's REVERT brings back what was saved.
- A full edit memory ends a take, keeping what was written (**MEMORY FOR EDITS IS FULL**).

QUANTIZE

Where a recorded note lands: the properties' QUANTIZE, or the black keys OP1-OP5 in CONTROL mode (**QUANTIZE: 2 ROWS**).

■ 2 ROWS, 3 ROWS, 4 ROWS

The nearest line of that many rows, from the loops' start.

■ ROW

The nearest row (at first).

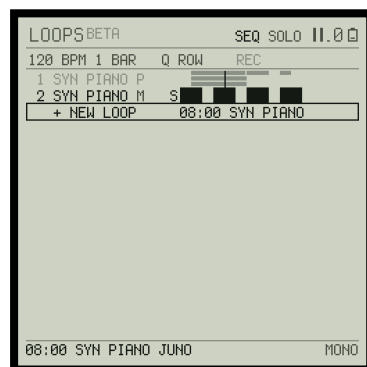
■ REAL TIME

The row it falls in, its exact time kept as a note delay, its end as a key off.

A note played a little early waits for its line; one just after it sounds at once and is written on the line.

CONTROL mode: mutes and solos

In CONTROL mode the keys stop playing notes and become a mixer for the loops. Each white key is a loop: white key 1 is the top loop, white key 16 the sixteenth.



LOOPS in CONTROL mode. The header shows **SEQ SOLO**: the white keys solo. Loop 2 is soloed (**S**), so loop 1 is silent.

- 1 Press **SEQ**. The FM-1 shows **KEYS: CONTROL** and the header reads **SEQ MUTE**.
- 2 Tap a white key: its loop mutes (**LOOP 02 MUTED**) or plays again (**LOOP 02 ON**) at once.
- 3 Press **SEQ** again to play notes: **KEYS: PLAY**.

Hold a white key a moment instead (longer than HOLD DELAY in SETTINGS) and the change waits for the next bar line (**LOOP 02 MUTED AT THE BAR**); the loop's row shows a yellow **M** while it waits.

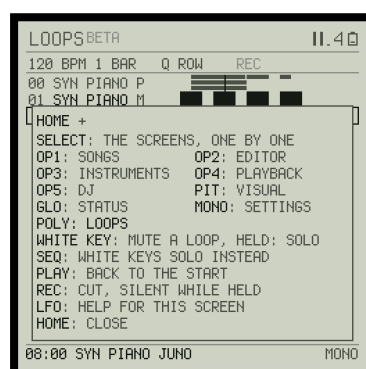
Press the black key **GLO** to make the white keys solo instead of mute (**SEQ: SOLO** ; again: **SEQ: MUTE**). One loop is soloed at a time: a white key solos its loop alone (**LOOP 02 SOLO**), and on the soloed loop it ends the solo (**LOOP 02 SOLO OFF**). Held, the solo waits for the bar line (a yellow **S**).

MEMO

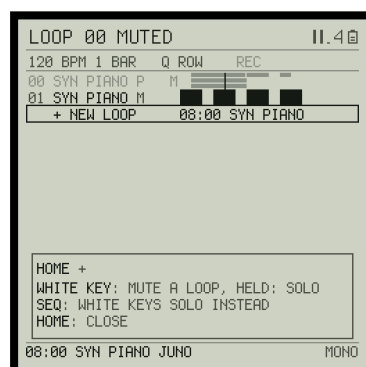
While a loop is soloed only it sounds, but the mutes are kept and come back when the solo ends. SAVE keeps the mutes with the loops; a solo is never saved, so after a power-on no loop is soloed.

KEY	IN CONTROL MODE
white key	Its loop: mute or unmute (in SOLO: solo, or end the solo) at once.
white key held	The same at the next bar line; held again, the wait is called off.
OP1 OP2 OP3	QUANTIZE 2, 3 or 4 rows.
OP4 OP5	QUANTIZE a row; REAL TIME.
PIT	Every loop back on: all mutes and the solo cleared (ALL LOOPS ON).
GLO	The white keys mute, or solo.
MONO POLY	How the next loops record: one note at a time, or up to 4 (NEXT LOOPS: MONO , NEXT LOOPS: POLY ; the footer shows it).
SEQ	Back to playing notes.

From any screen, **HOME** + **white key** mutes or unmutes that loop at once; hold the white key to solo it.



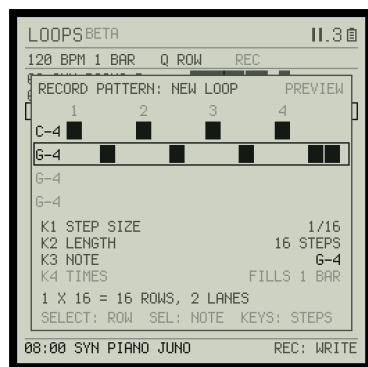
HOME's combination in LOOPS: the white keys are the loops.



Loop 00 muted from HOME's combination: its row dark.

The pattern recorder

ARP opens a step sequencer over the loops, which play on, so the pattern is heard in the mix while you build it. (The EDITOR's SEL, RECORD PATTERN is the same recorder.)



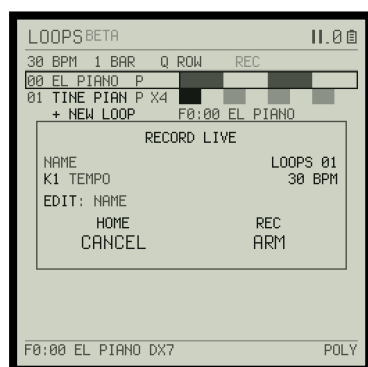
The pattern recorder: 4 rows of 16 steps, a note a row; the knobs' settings below.

- **4 rows of 16 steps**, a note a row (with a kit, each row a drum). **[SELECT]** picks the row; a **[white key]** switches its step on or off.
- **The row's note:** **[K3]** moves it a semitone a click; or tap **[SEL]**, then press a key: that key is the note (**KEYS: THE NOTE** , then **KEYS: THE STEPS**). SEL held + a key does it at once. **[OCT-]** / **[OCT+]** move the row's note with the octave (**NOTE C-5**).
- **[K1] STEP SIZE** (1/32 to 1/4, 1/16 at first), **[K2] LENGTH** (4, 8, 12 or 16 steps), **[K4] TIMES** (x1-x8, for the first loop only: how many times it fills the new length).
- **[GLO]**: the notes RING TO THE NEXT (at first) or last A STEP LONG (**NOTES RING TO THE NEXT** , **NOTES A STEP LONG**).
- The preview plays while the recorder is open; **[ARP]** switches it off and on.
- **[REC]** writes it and closes: on + **NEW LOOP** a new loop (**PATTERN: LOOP 06, 4 BARS**); opened on a loop, it replaces that loop's notes (**PATTERN INTO LOOP 03**). No step on: **NO STEPS ON** . **[HOME]** closes it, nothing written.

What you set stays for the next time until power-off.

RECORD LIVE: the performance as a song

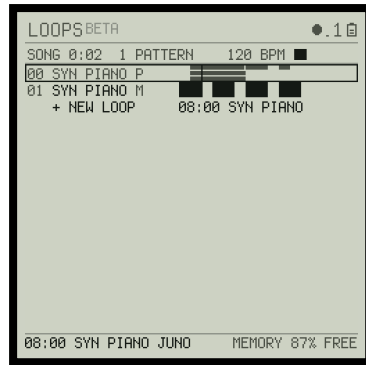
[SEL], RECORD LIVE records everything you do over the loops into a new song: the loops as they play, mutes and solos, the keys, effects, punch-ins, tempo changes and the mix.



RECORD LIVE's panel: the new song's NAME and TEMPO; REC arms, HOME cancels.

- 1 **[SEL]**, RECORD LIVE opens its panel: the song's **NAME** (**[EDIT]** types it) and **K1 TEMPO**.
- 2 **[REC]** arms it (REC blinks; the top line's REC reads SONG). **[HOME]** cancels.
- 3 It starts with your next REC, a note, or PLAY.
- 4 Perform. PLAY drops the loops out and brings them back; PLAY held takes them to their start; the keys play on their own tracks.

5 **REC** ends it (**SONG 12 RECORDED: 1:23, 5 PATTERNS**). **SAVE** keeps the song.

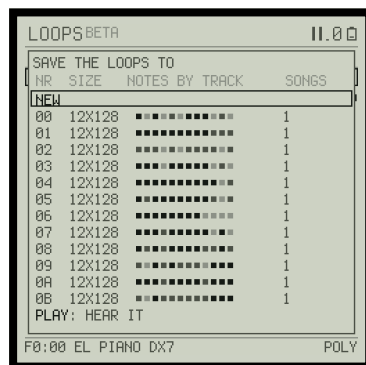


A song recording: the top line shows its time and patterns.

- While a song records, nothing changes the loops themselves: takes, PEEL, DOUBLE and the like are refused (**RECORDING A SONG**).
- Leaving LOOPS (but for FX) ends it, keeping what was written.
- Notes that do not fit the song's 16 tracks are left out and counted (**SONG 12: 3 NOTES LEFT OUT**). It stops by itself when the memory, the pattern numbers or 256 positions run out (**SONG 12 STOPPED: MEMORY FOR EDITS IS FULL**); with no song number free it is refused (**NO SONG NUMBER FREE**).

Loops to a pattern and back

LOOPS has no precise editing; for that, store the loops in a pattern and edit it in the EDITOR.



SAVE TO PATTERN: the pattern list, NEW first.

■ SAVE TO PATTERN

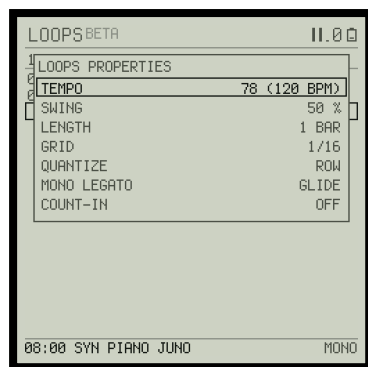
Writes one pattern of the loops' length: every loop's notes, repeats written out, each with its instrument, and each loop's mix (**LOOPS STORED IN PATTERN 2A**). Pick NEW or a pattern; a pattern that is not empty asks first.

■ LOAD FROM PATTERN

Turns a pattern into loops, a loop an instrument, replacing the loops after a question (**PATTERN 2A IN LOOPS: 3 LOOPS**). The length is the pattern's, in whole bars; what does not fit 16 loops of 4 notes is left out and said.

The properties and the menu

GLO opens LOOPS PROPERTIES:



LOOPS PROPERTIES.

■ TEMPO

As a song's, with its BPM (ALGORITHM turns it too).

□ 3-600

■ SWING

□ 50-75 %

■ LENGTH

A bar more or less: longer adds silence at the end, shorter cuts bars off (asking first when notes would go). Before the first loop: THE FIRST LOOP SETS IT.

■ GRID

1/16, 1/16T or 1/32: 4, 6 or 8 rows a beat. Only before the first loop
(GRID: ONLY BEFORE THE FIRST LOOP).

■ QUANTIZE

Where a recorded note lands (above): on every 2, 3 or 4 rows, on the nearest row, or where you played it (REAL TIME).

□ 2 ROWS, 3 ROWS, 4 ROWS, ROW, REAL TIME; ROW at first

■ MONO LEGATO

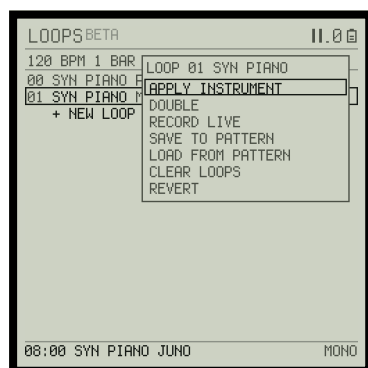
On a MONO loop, a note over a held one: GLIDE (a short glide; a TB-303's slide), LEGATO (the held note moves to the new one, no new attack) or JUMP (a plain new note).

■ COUNT-IN

Before a take PLAY starts: OFF, 1 BAR, 2 BARS. A key always starts at once.

□ OFF at first

[SEL] opens the menu:



The menu on a loop.

■ APPLY INSTRUMENT

The selected loop takes the current instrument (LOOP 03: 01:04 BRASS).

■ DOUBLE

The length x2, every loop playing twice what it played (**DOUBLED: 8 BARS** ; past 8 bars: **DOUBLE: AT MOST 8 BARS**).

■ **RECORD LIVE**

Its panel (above); while armed, CANCEL RECORD LIVE.

■ **SAVE TO PATTERN, LOAD FROM PATTERN**

Above.

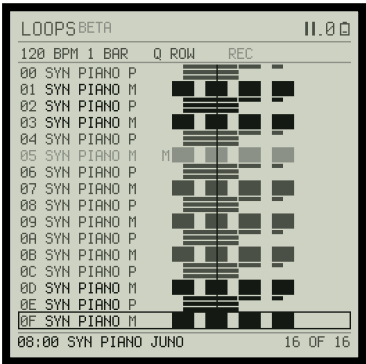
■ **CLEAR LOOPS**

Every loop goes, after a question; the next loop sets a new length (**LOOPS CLEARED**).

■ **REVERT**

LOOPS as last saved, after a question.

With no loops, EDIT, LFO and the menu's loop items say **NO LOOPS YET** .



All 16 loops.



Loops that repeat: X3, X4 after their names.

Keys on LOOPS

KEY	IN PLAY MODE
SELECT	Picks a loop, or + NEW LOOP below them.
REC	Records where the selection is: a new loop, or the loop again; while the loops play it arms; again, stops the take early (the first loop: closes it on a bar line).
REC PLAY	With no loops: REC, then a note or PLAY, starts the first loop; REC again closes it on a bar.
PLAY	Plays and pauses the loops.
PLAY held	Stops: the loops go back to their start.
EDIT	Records the selected loop again (RE-RECORD).
LFO	PEEL: the selected loop goes.
KEYS	Play the current instrument; while recording, write into the take.

KEY	IN PLAY MODE
PRESETS	The sound you play, which the next loop takes.
ENV	The cartridge list: the next loop's sound from another cartridge.
ALGORITHM	The tempo, any time.
K1 K2 K3 K4	The selected loop's LEVEL, PAN, DELAY and REVERB; on + NEW LOOP, the next loop's.
SEQ	Switches the keys between playing notes and CONTROL mode.
ARP	Opens the pattern recorder.
GLO	The properties: tempo, swing, length, grid, quantize, mono legato, count-in.
SEL	The menu: APPLY INSTRUMENT, DOUBLE, RECORD LIVE, SAVE TO / LOAD FROM PATTERN, CLEAR LOOPS, REVERT.
FX	LOOPS' own effects; FX again comes back.
OCT- OCT+	The keys' octave.
HOME + (white key)	Mutes a loop at once.
HOME + (white key) held	Solos it.
KEY	IN CONTROL MODE (SEQ)
(white key)	Mutes or unmutes its loop; in SOLO, solos it or ends the solo.
(white key) held	The same at the next bar line.
OP1 OP2 OP3	QUANTIZE 2, 3 or 4 rows.
OP4 OP5	QUANTIZE a row; REAL TIME.
PIT	Every loop back on.
GLO	The white keys mute, or solo.
MONO POLY	How the next loops record.
KEY	IN THE PATTERN RECORDER
SELECT	Picks the row.
(white key)	Switches a step on or off.
K3	The row's note, a semitone a click.
SEL	Then a key: that key is the row's note.
K1	STEP SIZE.
K2	LENGTH.
K4	TIMES: the first loop's length.
GLO	Notes ring to the next, or last a step.
ARP	The preview off and on.
REC	Writes the loop and closes.
HOME	Closes, nothing written.

15 | FX

FX holds the effects on the whole mix, the mixer, the metronome and the punch-in effects. Press **[FX]** on any screen to open it, and **[FX]** again to go back where you were. **[SEQ]** turns its three pages: LIVE, EDIT and MIXER.

Whose effects

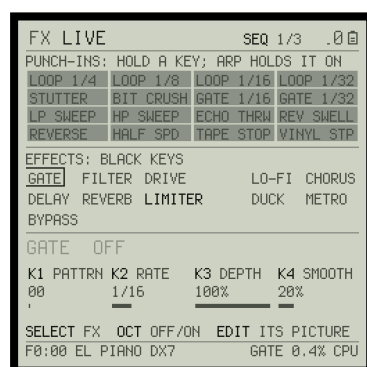
Every song has its own effects (its **FX setup**: the chain's order, routing, each effect's knobs and on/off, the mixer and the metronome). LOOPS and DJ have their own. FX always edits what you hear:

- the song playing (or the one played last); a pattern from the EDITOR uses the current song's;
- in LOOPS, the loops'; on DJ, DJ's (FX from LOOPS or DJ does not leave them);
- before anything has played, **THE KEYS'** the keys' own setup, with the reverb on, so the FM-1 sounds round as a synth from its keys alone.

A new song starts with only the LIMITER on. THE KEYS' setup, which the keys play through at power-on, also has the REVERB on. While what FX edits plays, nothing but your hand changes the effect under the cursor: the song's own commands for it are skipped.

The keys keep the last song's effects. Once a song has played, the keys go on playing through its effects and at its tempo after it stops or pauses, until something else plays. THE KEYS' own setup comes back at the next power-on, or at once with UNLOAD SONG (SONGS' **[SEL]** menu, chapter 6). With LOOPS on the screen and nothing playing, the keys play through the loops' setup.

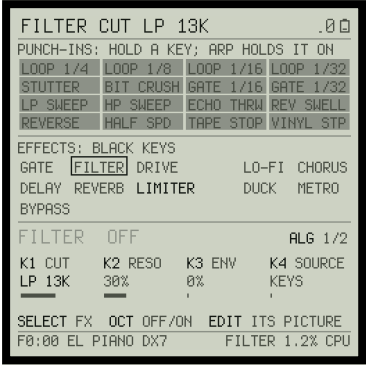
LIVE: playing the effects



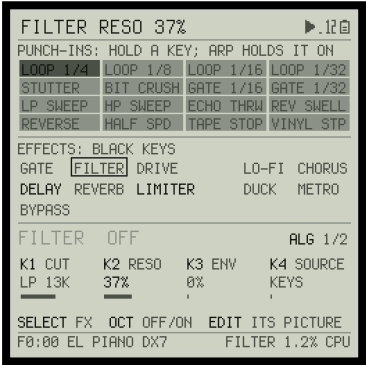
FX LIVE: the 16 punch-ins on the white keys, the effects on the black keys, the picked effect's knobs below.

- The **(white keys)** are the 16 punch-in effects, each while its key is held (below); the keys play no notes on LIVE.
- The **(black keys)** pick an effect, a fixed key each: **OP1** GATE, **OP2** FILTER, **OP3** DRIVE, **OP4** LO-FI, **OP5** CHORUS, **OP6** DELAY, **PIT** REVERB, **GLO** LIMITER, **MONO** DUCK, **POLY** METRONOME.
- The **(BLANK)** key is BYPASS: every effect off while held (the metronome clicks on).
- **[SELECT]** picks the effect too. **[OCT+]** switches it on, **[OCT-]** off (**GATE ON** , **GATE OFF**).

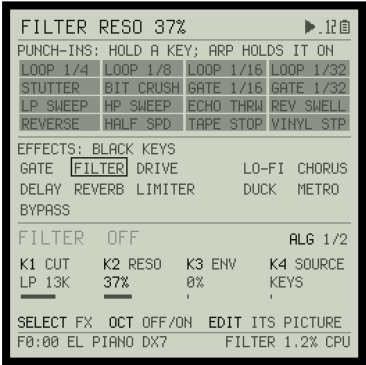
- **K1** to **K4** turn its knobs (SEL held: steps of 10); **ALGORITHM** shows its next knobs (FILTER has 8, DELAY 5). **LFO** resets the knob turned last.
- **EDIT** shows the effect on the EDIT page; **SEL** opens its menu (RESET, REVERT).
- **ARP** on LIVE plays the last note you played, hands free (with SETTINGS' ARP LATCH not OFF), so you can play the effects over an arpeggio: the keys stay punch-ins.



FILTER picked on LIVE: its knobs, the cutoff turned.

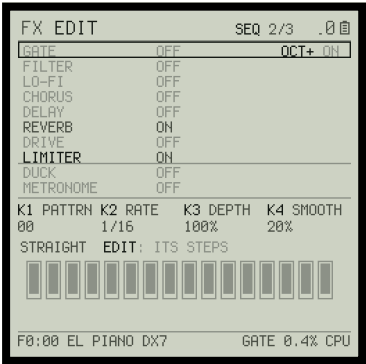


A punch-in held (LOOP 1/4).



BYPASS held.

EDIT: the chain



FX EDIT: the chain as a list, the sound going top to bottom; the picked effect's knobs and its picture below.

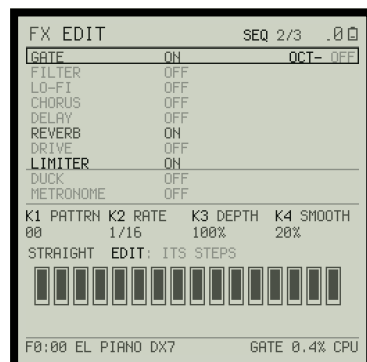
- The chain is a list: the sound goes from top to bottom. The LIMITER is always last; DUCK and the METRONOME sit apart, outside the chain.
- **SELECT** picks an effect; **K1**-**K4** its knobs; **ALGORITHM** its next knobs.
- **OCT+** / **OCT-** switch it on and off, so you can set it first and switch it on after. The keys play notes on EDIT, to hear the effect; **SEL** + **OCT+** and **SEL** + **OCT-** change their octave.
- **SEL** opens the menu: **MOVE** (SELECT moves the effect through the chain, heard as it goes; SEL puts it down, **MOVED** ; HOME puts it back, **NOT MOVED** ; the LIMITER, DUCK and the metronome stay: **LIMITER DOES NOT MOVE**), **RESET** (the effect as at first), **REVERT** (every effect as last saved).
- Each effect's picture shows what it does: the filter's curve, the echoes, the reverb's decay. The footer shows what the effect costs the processor (**GATE 0.4% CPU**). Each effect, its picture and its knobs are below.

The effects

Ten effects, each in a section of its own below, in the order FX EDIT lists them, with all its knobs. On EDIT, **SELECT** picks the effect, **K1**-**K4** turn its first four knobs and **ALGORITHM** shows the next four (FILTER and DELAY have more than four); **LFO** puts the last knob turned back to its default. A knob with no range given runs 0-100 %. A new song starts with only the LIMITER on (THE KEYS' setup has the REVERB on too); **OCT+** switches the picked effect on.

GATE

Chops the sound on and off in a rhythm, locked to the song's bars: a trance gate on whatever passes through it. Its rhythm is a pattern of 16 steps; each step is OFF (closed), ON (open for the first three quarters of the step) or a ratchet, X2, X3 or X4 (two, three or four short hits within the step).



GATE on EDIT: its knobs and its pattern's 16 steps.

■ PATTERN

Which rhythm. 00-0F are built in (the table below); 10-1F are yours, MY GATE 10 to MY GATE 1F, written on the white keys (below).

□ 00-1F; 00 STRAIGHT at first

■ RATE

How long a step is: at 1/16 the 16 steps make one bar of 4 beats, at 1/8 two bars, at 1/32 half a bar; 1/8T and 1/16T are triplet steps (3 and 6 to a beat). At 1/16, step 1 falls on the bar's first beat.

□ 1/8, 1/16, 1/32, 1/8T, 1/16T; 1/16 at first

■ DEPTH

How far a closed step closes: 100 % is silence, 50 % only dips the sound, 0 % leaves it as it is.

☐ 100 % at first

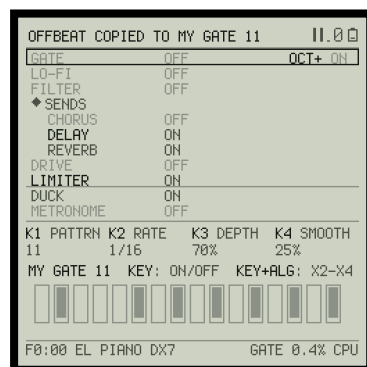
■ SMOOTH

How soft the edges are: low, a hard click-on, click-off chop (0.5 ms); high, a soft pulse that swells in and out (up to 20 ms).

☐ 20 % at first

NO.	PATTERN	ITS 16 STEPS (# OPEN, . CLOSED, 2 / 3 RATCHETS)
00	STRAIGHT	#####: every step, a steady chop
01	OFFBEAT	.#.#.#.#.#.#.: only the steps between
02	TRANCE	#####: the classic trance gate
03	HALF	##...##...##...: two open, two closed
04	GALLOP	###.###.###.###.: a galloping rhythm
05	SKIP	###.###.###.###.: threes skipping across the beats
06	SPARSE	#...#...#...#...: one hit a beat
07	ROLL	####2222####3333: a roll building up
08	STUTTER	2.2.2.2.2.2.2.2.: double hits, every other step
09	DOTTED	#..#..#..#..#..#..#.: every third step, dotted eighths
0A	SYNCOPE	#..#..#..#..#..#..#.: syncopated
0B	PULSE	###.###.###.###.: three open, one closed
0C	RAMP	###.###.###.###.: denser across the bar
0D	BREAK	#####.....: the bar's first half, then silence
0E	TRIPS	3.3.3.3.3.3.3.3.: triple hits, every other step
0F	CHOP	##..#.#.###..#.#.: a chopped break

Writing your own steps: on EDIT with GATE picked, **EDIT** puts its 16 steps on the white keys: a key switches its step on or off; held, **ALGORITHM** gives it ratchets (X2, X3, X4). A built-in pattern is copied into yours first (**STRAIGHT COPIED TO MY GATE 11**). EDIT keeps the changes, HOME drops them. **ENV** on GATE lists the patterns.

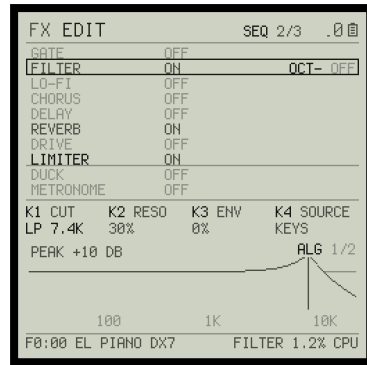


GATE's steps on the white keys.

FILTER

One filter on the whole mix: a low-pass (darker, the top taken away) or a high-pass (thinner, the bass taken away), with an envelope that can open it on every note or beat,

as a synth's filter envelope does. Its eight knobs are on two pages (**ALGORITHM** turns to the second).



FILTER on EDIT: CUT at LP 7.4K, the response around the cutoff.

■ CUT

Where the filter cuts, and which kind: turned left of the middle it is a low-pass closing from LP 20K down to LP 100 (Hz); turned right, a high-pass opening from HP 20 up to HP 8.0K; in the middle, OFF. Turned by hand it glides, so no step is heard. With the envelope on, CUT is where the filter rests between notes.

□ LP 100 ... LP 20K, OFF, HP 20 ... HP 8.0K; OFF at first

■ RESO

Resonance: a peak at the cutoff. Low is smooth; high makes the cutoff ring and whistle, the acid squelch when the cutoff moves.

□ 30 % at first

■ ENV

How far each note (or beat) opens the filter, as a part of the way from CUT to fully open: a low-pass opens upward, a high-pass downward. 0 % switches the envelope off.

□ 0 % at first

■ SOURCE

What opens it. KEYS: every note the keys play (the FM-1's, MIDI's, the arpeggiator's), held as long as the key. TRACK 00 ... TRACK 0F: every note that track starts, muted or not, so a silent track can carry a rhythm for the filter. 4 BEATS, 2 BEATS, BEAT, 1/2 BEAT, 1/4 BEAT: the beat itself, every so many beats, each hit held half its length.

□ KEYS at first

■ ATTACK

How long the filter takes to open from where it is.

□ 2 ms-3 s; 2.0 MS at first

■ DECAY

How long it then takes to close down to SUSTAIN.

□ 5 ms-5 s; 296 MS at first

■ SUSTAIN

How open it stays while the note is held, as a part of ENV's opening; 0 % closes it fully after DECAY, a pluck.

□ 0 % at first

■ RELEASE

How long it takes to close back to CUT once the note ends.

□ 5 ms-5 s; 296 MS at first

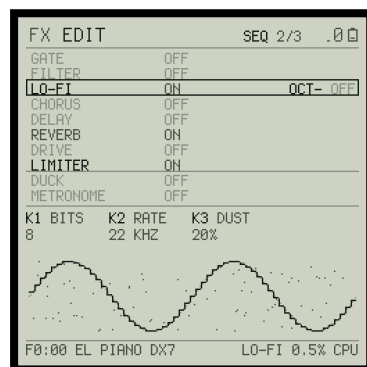
There is one envelope for the whole mix, not one a note: each new note starts it again from wherever it is, and it holds while any note of the source is held.



FILTER's second page: its envelope.

LO-FI

The sound of an old sampler: fewer bits, a lower sample rate and record crackle.



LO-FI on EDIT: a sine wave as it comes out, stepped and speckled.

■ BITS

How finely the level is measured: 16 is clean, 8 grainy, 4 and under harsh and noisy, 2 a broken buzz.

□ 2-16; 8 at first

■ RATE

The sample rate it imitates: lower takes the top away and adds the metallic ring of aliasing; 44 kHz leaves the rate as it is.

□ 1-44 kHz; 22 at first

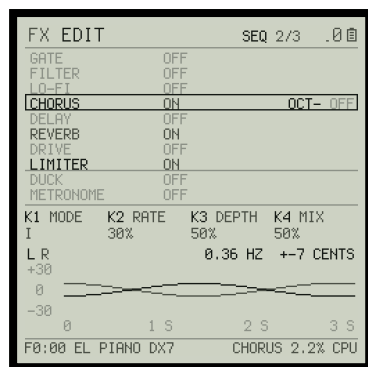
■ DUST

Crackles and specks, as from a record. They are a sound of their own: heard even when nothing plays.

□ 20 % at first

CHORUS

A JUNO-style chorus: two short delays, swaying in opposite ways left and right, mixed with the sound, so it widens, thickens and gently detunes.



CHORUS on EDIT: the pitch each side gets as it sways.

■ MODE

The JUNO-106's three chorus settings. I: slow (0.5 Hz) and gentle. II: a little faster (0.83 Hz) and deeper, a lush swirl. I+II: fast (9 Hz) and shallow, a shimmering vibrato.

☐ I, II, I+II; I at first

■ RATE

The sway's speed, around the mode's own: 50 % is the JUNO's, 0 % about a third of it, 100 % about 1.7 times.

☐ 30 % at first

■ DEPTH

How far it sways, around the mode's own in the same way: more is a stronger pitch wobble.

☐ 50 % at first

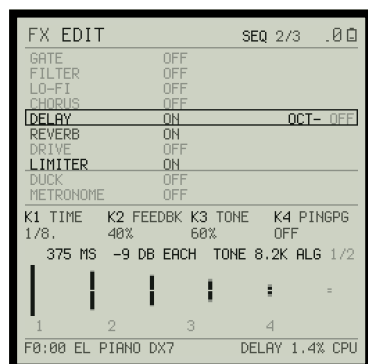
■ MIX

How much of the chorus is heard against the sound itself. With ROUTING SENDS (below) it is the chorus's return level instead, and each track sends to it by its MIXER send.

☐ 50 % at first

DELAY

Echoes locked to the song's tempo. The echoes are mono; PING-PONG puts them left and right in turn.



DELAY on EDIT: the echoes on a bar's beats, each quieter.

■ TIME

The time between echoes, as a note value; T marks triplets, a dot dotted values (1/8. is three sixteenths). Up to 1 s (0.5 s with PING-PONG): a value longer than that at a slow tempo plays the longest that fits.

☐ 1/32, 1/16T, 1/16, 1/8T, 1/16., 1/8, 1/4T, 1/8., 1/4, 1/2T, 1/4., 1/2; 1/8. at first

■ FEEDBACK

How much of each echo comes back as the next: low, one or two echoes; high, a long trail.

☐ 40 % at first

■ TONE

How bright each echo is: every repeat passes through a low-pass, so lower makes the echoes darker and softer as they go, as a tape or analogue delay; 100 % keeps them bright (up to about 13 kHz).

☐ 60 % at first

■ PING-PONG

ON: the echoes bounce between left and right. OFF: they stay in the middle.

☐ OFF, ON; OFF at first

■ MIX

How loud the echoes are against the sound. With ROUTING SENDS, the delay's return level instead.

☐ 30 % at first

REVERB

A plate reverb: the sound in a large, smooth, bright space.



REVERB on EDIT: its decay, bright frequencies dying first.

■ SIZE

How long the reverb rings: from about 1.3 s, a room, to about 11 s, a cathedral (the time it takes to die away).

☐ 60 % at first

■ DAMP

How dark the tail gets: more damping takes the highs out of the tail as it rings, warmer and less hissy; none leaves it bright.

☐ 40 % at first

■ PRE-DELAY

A gap before the reverb starts, so the sound's attack stays clear in front of it.

☐ 0-100 ms; 10 at first

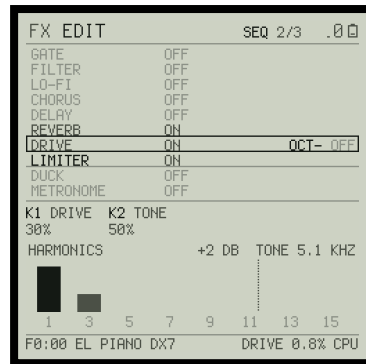
■ MIX

How loud the reverb is against the sound. With ROUTING SENDS, the reverb's return level instead.

☐ 25 % at first

DRIVE

Warm distortion: the mix pushed into a soft clipper, adding harmonics as an overdriven amplifier or tape does. The deep bass (under about 55 Hz) is kept out of it, so it stays clean; the level is evened out as the drive rises.



DRIVE on EDIT: the harmonics it adds.

■ DRIVE

How hard it is pushed: low, a little warmth and grit; high (up to about nine times the level), heavy saturation.

□ 30 % at first

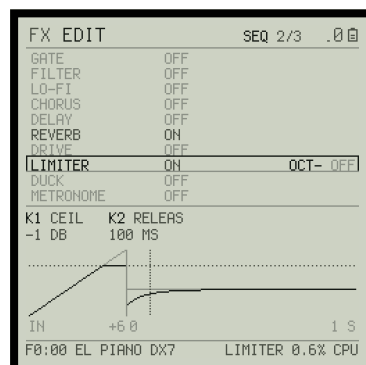
■ TONE

The brightness after the distortion: low is dark and smooth, high bright and edgy.

□ 50 % at first

LIMITER

Keeps the mix from going over a ceiling, catching its peaks so the sound never clips. Always last in the chain, and on in every new song.



LIMITER on EDIT: its curve and its release.

■ CEILING

The most the mix may reach. Lower catches more of the peaks, and the mix comes out quieter.

□ -12 to 0 dB; -1 at first

■ RELEASE

How fast the level comes back after a peak: short keeps it loud but can pump; long is smoother.

□ 10-1000 ms; 100 at first

DUCK

One track pushes the others down while it plays, as a kick making room for itself in the bass and the pads (sidechain). It sits outside the chain. Which tracks duck, and how much, is set in the MIXER's DCK row, none at first: **raise DCK on the tracks that should duck** (MIXER). The source never ducks itself.



DUCK on EDIT: the dip and its release; no track ducks yet.

■ SOURCE

The track that pushes the others down, or KEYS: every note the keys play, so the song can make room for a part played live.

□ 00-0F, KEYS; 00 at first

■ DEPTH

How far the others go down when the source hits (each also by its own DCK).

□ 60 % at first

■ RELEASE

How long they take to come back up after it: short, a quick dip; long, a slow breathing pump.

□ 20-1000 ms; 150 at first

METRONOME

A click on the beats, to play or record in time. It is mixed after the effects, takes no voice, and stays off USB audio. It sits outside the chain. The count-in before a take is not the METRONOME's: SETTINGS' COUNT-IN (chapter 13).



The METRONOME on EDIT: the bar's beats.

■ TEMPO

FOLLOW: the tempo of what plays (on THE KEYS, their own TEMPO). A number: its own tempo, so it clicks with nothing playing.

□ FOLLOW, 30-300 BPM; FOLLOW at first

■ BEATS A BAR

How many beats a bar; the first is accented, louder and higher. In LOOPS it is also the loops' bar.

□ 1-16; 4 at first

■ SOUND

CLICK: a short tick of noise. BEEP: a clean tone (higher on the accent). WOOD: a woodblock knock, its pitch falling. COWBELL: the classic drum machine's two-tone

cowbell.

□ CLICK, BEEP, WOOD, COWBELL; BEEP at first

■ LEVEL

How loud it clicks.

□ 60 % at first

Routing and the keys

GLO opens FX PROPERTIES, titled whose setup it is (a song's name, THE LOOPS, DJ or THE KEYS):



FX PROPERTIES for THE KEYS: their tempo and swing, routing, the keys.

■ ROUTING

GLOBAL: one chain on the whole mix. SENDS: CHORUS, DELAY and REVERB leave the chain and become shared sends, each track sending its own amount (the MIXER's CHO, DLY, REV); their returns join the chain at the SENDS line (marked with a diamond): effects above it work on the dry sound only, below it on everything (**ROUTING SENDS** , **ROUTING GLOBAL**).

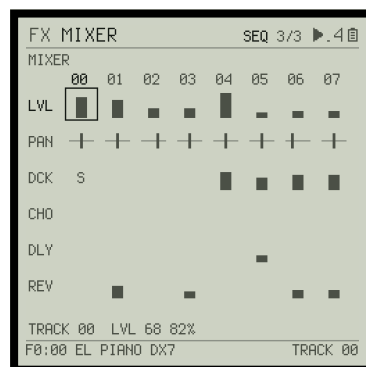
■ KEYS, EVERYWHERE

THROUGH FX, or DRY: the keys skip every effect (as SETTINGS' KEYS) (**KEYS DRY** , **KEYS THROUGH FX**).

■ TEMPO, SWING

For THE KEYS: their own tempo and swing.

MIXER



The MIXER: a column a track, the KEYS column last.

- A column for each of the 16 tracks (8 at a time), a row for each value: **LVL** (level), **PAN**, **DCK** (how much it ducks, shown while DUCK is on), and with ROUTING SENDS **CHO**, **DLY**, **REV** (its sends).
- **ALGORITHM** picks the track, **SELECT** the value, **K1** changes it (SEL held: by 16), **LFO** resets it.

- **KEYS**, the last column, is the keys' own strip, the same in every song (its LVL is SETTINGS' KEYS GAIN).
- In **LOOPS** the columns are the loops (MIXER: THE LOOPS).
- A value a song's command moved shows white, **BY THE SONG**; muted tracks are dark.

Punch-in effects

Hold **[FX]** and press a **(white key)**, on any screen: that effect plays on the whole mix for as long as the key is held, locked to the tempo. On **LIVE** the white keys alone do it. Let go, it fades back into the mix.



FX held: the map of the 16 punch-ins.

KEY	PUNCH-IN
(1) (2) (3) (4)	Loops: LOOP 1/4, LOOP 1/8, LOOP 1/16, LOOP 1/32.
(5) (6) (7) (8)	Chops: STUTTER 1/16T, BIT CRUSH, GATE 1/16, GATE 1/32.
(9) (10) (11) (12)	Filters and space: LOW-PASS SWEEP, HIGH-PASS SWEEP, ECHO THROW, REVERB SWELL.
(13) (14) (15) (16)	Tape moves: REVERSE, HALF SPEED, TAPE STOP, VINYL STOP.
[FX] + (white key) held	A punch-in on any screen.
[ARP] , with a punch-in's key held	Holds the punch-in on after you let go of its key (LOOP 1/4 HELD ON: ITS KEY STOPS IT), so your hands are free; FX lights full meanwhile. Its key again (or another punch-in's) stops it, as does HOME + REC .

The song goes on underneath every punch-in, in time: let go, and you hear it where it is now, faded back in over 80 ms (**VINYL STOP** spins back up instead). **FX LIVE**'s map shows short names (**LP SWEEP**, **ECHO THRW**, **HALF SPD** ...); **FX held**'s list and the toasts, the full ones below.

■ LOOP 1/4, LOOP 1/8, LOOP 1/16, LOOP 1/32

Catch the last quarter, eighth, sixteenth or thirty-second note of the mix, just before the key, and repeat it for as long as the key is held: **LOOP 1/4** repeats the last beat, as a DJ's loop does; **LOOP 1/32** repeats so fast it becomes a buzzing roll.

■ STUTTER 1/16T

The same with a sixteenth-note triplet (a sixth of a beat): the fast, off-grid stutter of a glitch edit.

■ BIT CRUSH

The live mix ground down to a handful of levels (8 each way from silence, about 4 bits) at a sixth of the sample rate: gritty, aliased, old-sampler noise.

■ **GATE 1/16, GATE 1/32**

The live mix chopped on and off in time: sound for the first half of every sixteenth (or thirty-second) note, silence for the second, with soft edges. A trance gate on the whole song.

■ **LOW-PASS SWEEP**

A resonant low-pass filter closes over one bar, from 18 kHz down to 200 Hz, and stays closed while held: the song sinks under water.

■ **HIGH-PASS SWEEP**

A resonant high-pass filter rises over one bar, from 30 Hz up to 6 kHz: the bass and the kick fall away and the song thins to its top, the classic build-up before a drop.

■ **ECHO THROW**

Throws the mix into the delay while held: dotted-eighth echoes bouncing left and right, with 65 % feedback. Let go, nothing more goes in, and the echoes ring on for about 2.4 s over the song. It borrows the DELAY's line, so the song's own DELAY is not heard meanwhile.

■ **REVERB SWELL**

The mix rises into a huge reverb over two beats, the dry sound falling to half under it: a wash. Let go, its tail rings on in the song's own REVERB (with REVERB off, it fades out over 80 ms). It borrows the REVERB, so the song's own is not heard meanwhile.

■ **REVERSE**

The last beat played backwards, again and again while held.

■ **HALF SPEED**

The mix from the moment pressed, played at half speed: an octave down, dragging behind the song. It falls further behind the longer it is held, and every second it jumps back to the present, so each second held plays the half second that began it.

■ **TAPE STOP**

The sound slows down and stops over one beat, pitch falling with it, as a tape machine switched off. Stopped, it is silent until you let go.

■ **VINYL STOP**

A turntable's stop button: the record brakes to a standstill in half a second. Stopped, it is silent. Let go, it spins back up in a tenth of a second, straight into the song, landing on the beat.

NOTE

TAPE STOP or VINYL STOP? Both slow the sound to a stop and stay silent while held. TAPE STOP follows the song: it takes one beat (half a second at 120 BPM, a whole second at 60), so it is slower than VINYL STOP in slow songs and faster in fast ones, and it simply fades back into the song when let go. VINYL STOP always takes half a second, whatever the tempo, and when let go it spins back up audibly, a DJ starting the record again.

MEMO

The loops, the stutter, reverse, half speed and both stops play back the last half second of the mix, which the FM-1 keeps for them. In songs slower than about 120 BPM a whole beat does not fit in it, so LOOP 1/4 repeats an eighth note instead and REVERSE plays the last eighth backwards. The others (bit crush, the gates, the sweeps, the echo throw and the reverb swell) work on the live mix.

A pattern can hold punch-ins as commands (!08: as if its key were held for 8 rows), so songs can carry them. In LOOPS a punch-in is heard, and written only by RECORD LIVE.

Keys on FX

KEY	DOES
FX	Opens FX; again, back to where you were.
SEQ	The next page: LIVE, EDIT, MIXER.
SELECT	Picks an effect (on MIXER, the value).
K1 K2 K3 K4	The effect's knobs (on MIXER, K1 changes the value).
ALGORITHM	The effect's next knobs (on MIXER, the track).
OCT+ OCT-	Switch the effect on or off.
SEL held + OCT+ SEL held + OCT-	On EDIT: the keys' octave.
LFO	Puts the knob turned last back to its default.
SEL	The menu: MOVE, RESET, REVERT.
EDIT	On LIVE: the effect on EDIT. On EDIT with GATE picked: its steps on the white keys; again, keep them.
white key held, ALGORITHM	On GATE's steps: the held key's step gets ratchets, X2, X3, X4.
HOME	Drops GATE's step changes; during MOVE, puts the chain back.
ENV	On GATE: the gate patterns.
GLO	FX PROPERTIES: routing, the keys, THE KEYS' tempo and swing.
white keys	On LIVE: the punch-ins. On EDIT and MIXER: play notes.
black key	On LIVE: picks an effect.
BLANK	On LIVE: BYPASS while held.
KEYS	On LIVE no notes, only effects; on EDIT and MIXER they play.
ARP	The arpeggiator; with a punch-in's key held, holds the punch-in on.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

KEY**HOME** + **white key****DOES**

Mutes a track (also on MIXER).

16 | MIDI AND USB

Connected by USB, the FM-1 is a sound card and a MIDI device for a computer or a phone, with nothing to install. The TRS MIDI IN jack takes a keyboard. SETTINGS' MIDI page (chapter 13) sets it all.

Playing PT/FM from MIDI

MIDI comes in over USB and through the MIDI IN jack (a TRS-to-DIN adapter, type A or B, for a keyboard's DIN cable); both behave the same.

- **Notes play as the FM-1's keys do**, on every screen: they play the current instrument, write in the EDITOR with REC on, record into LOOPS, feed the arpeggiator. Velocity sets the note's volume. Every note plays, not only the keys' range.
- **MIDI IN CHANNEL** picks the channel listened to (ALL at first).
- **Program change** picks the instrument in the current cartridge, as PRESETS does: program n is the cartridge's n -th sound, counted from 0 and skipping empty slots, so it is not always slot n . **Bank select** (CC 0) picks the cartridge, as **SEL** + **PRESETS** does: bank n is the n -th cartridge in the cartridge list, counted from 0, not cartridge number n . With the demo disk, bank 0 is 01 DRUM KIT and bank 6 is F0.
- **Pitch bend** bends the keys' notes, plus or minus 2 semitones. **The sustain pedal** (CC 64) holds the notes played from MIDI.
- Every other controller does nothing until you **learn** it onto an FM-1 control (below).

MIDI learn

An outside controller's knobs and pads can work the FM-1's own controls: its 7 knobs, MASTER, every button but HOME (HOME cancels learning, so it cannot be learned) and the 27 keys. A learned control works exactly as the FM-1's, on every screen, with its combinations and holds.

- 1 **SETTINGS**, the MIDI page (**SEQ**), turn **SELECT** to LEARN and press **EDIT**.
- 2 **TOUCH AN FM-1 CONTROL** : turn the knob or press the button or key to learn (it does nothing else then).
- 3 **MOVE THE MIDI CONTROL** : turn the outside knob, or press and let go the pad. The FM-1 works out what kind it is (an absolute knob, an endless encoder, a momentary or a toggle pad) and says what it learned (**K1: CC 74, CH 1**).

HOME cancels at either step. Up to 64 mappings; the list below LEARN shows them, and **LFO** deletes the one picked. **SAVE** keeps them.

MIDI out and the clock

- **MIDI OUT** goes over USB only (the FM-1 has no MIDI OUT jack): OFF, KEYS (the FM-1's keys as played, on MIDI OUT CHANNEL) or ALL (also everything that plays: track 0 on channel 1 ... track 15 on channel 16). Notes that came in over MIDI are never sent back.
- **SYNC EXTERNAL** follows an outside MIDI clock, from USB or the jack: its tempo, START, STOP, CONTINUE and the song position (a sequencer can start PT/FM from any bar). PT/FM locks to the clock itself, not only its tempo, so

nothing drifts. In LOOPS the clock drives the loops; on DJ, the main deck. Lost for half a second, PT/FM plays on at the last tempo (**CLOCK LOST**).

- **CLOCK OUT ON** sends the clock, START / STOP / CONTINUE and the song position, timed to the sound as heard.
- **SYNC PULSE:** for instruments that follow a sync pulse through an audio cable, set SETTINGS' OUTPUT to SYNC PULSE L or R and use a stereo-split cable: a click on that side every half beat, the music in mono on the other. MASTER sets the clicks' level too. It works with SYNC INTERNAL only: while PT/FM follows a clock (SYNC EXTERNAL), the output stays stereo and sends no clicks.

USB audio

- The FM-1 is a class-compliant USB audio input: no driver on Windows, macOS, Linux or a phone. Record it like any microphone or interface.
- 16-bit stereo at 44.1 or 48 kHz, whichever the computer picks, kept in step with the computer's clock, so a recording never drifts or clicks.
- It carries the mix after the effects, always stereo, at SETTINGS' USB GAIN (MASTER does not touch it). The metronome and the count-in's clicks stay off it.
- No audio goes back from the computer to the FM-1.

MIDI CONTROLLER

The FM-1 can become a USB-MIDI controller for a computer: its keys, knobs and buttons send MIDI to a synth or a music program, and its screen shows what it sends.

- 1 SETTINGS, the MIDI page, **SELECT** to MIDI CONTROLLER, **EDIT**. It asks first (**SWITCH TO MIDI CONTROLLER?** , **PT/FM STOPS UNTIL THE FM-1 IS SWITCHED OFF AND ON**), then whether to save unsaved changes (**SAVE BEFORE SWITCHING?**).
- 2 PT/FM stops. The screen asks for the mode: **REC** for MIRROR (channel 16), **HOME** for GENERAL (channel 1); **SELECT** first picks another channel.
- 3 Play. Switch the FM-1 off and on to get PT/FM back.

■ GENERAL

A keyboard controller: the keys send notes (OCT- and OCT+ shift them, -3 to +3, both together back to 0); K1-K4 send CC 74, 71, 73, 72 (cutoff, resonance, attack, release); SELECT CC 1 (modulation); ALGORITHM CC 21; PRESETS program change; MASTER CC 7 (volume); PLAY starts and stops a music program (MIDI Machine Control, and CC 114); the other buttons CC 102 and up.

■ MIRROR

Every control sends one fixed message, for working the virtual FM-1 of PT/FM's web pages from the real panel; the page lights the FM-1's LEDs back.

Nothing is saved in controller mode, and nothing is written to the FM-1's memory.

17 | THE EDITOR PAGE

The EDITOR page, **editor.html**, is PT/FM's page for the computer (Chrome or Edge, offline). It comes with PT/FM, as **install.html** does: get it from PT/FM's home, hitosu.github.io/ptfm. It backs up the FM-1, brings new content to it (tracker modules, MIDI files, DX7 cartridges, sounds), and edits it with the FM-1's own pictures. It is a beta: its two panels are finished, its edit tabs work with plain controls.

Two panels

- **TABLE** (left): everything you drop on the page, kept in the browser. Its items have no numbers, so it holds any number of songs, patterns and cartridges, and two imported modules never clash.
- **FM-1** (right): an image of what an FM-1 holds, with its numbers.
- Drag items between the panels (or use the arrows): an item moves with everything it uses (a song with its patterns, their instruments, their samples), and numbers are given as it lands on the FM-1 panel. DELETE removes items; UNDO takes back any step.
- Both panels group their items by kind: SONGS, PATTERNS, CARTRIDGES, SAMPLERS, SAMPLES and SYSTEM (the settings, the MIDI map, the loops, DJ's setup, the EDITOR's own pattern and the keys' song). A click on a group's header folds or opens it. Each panel shows its items as DETAILS (a row each, with sizes and what uses them), LIST or ICONS.
- Picking works as in a file manager: a click picks one item, Ctrl adds one, Shift a range, Ctrl+A all. A double-click (or Enter) opens the item's tab, Space plays it, Delete deletes it, F2 renames it; the right-click menu has the rest.
- **The space bar** under the FM-1 panel shows the FM-1's room: 103 blocks of 4 KB, as data, audio and free. Keep at least 16 blocks free for the FM-1's own saves: with fewer than 10 free, the FM-1 cannot save new things (it can still delete), and with fewer than 3 it cannot save at all until a WRITE frees room.

An item's tab

Every item opens in a tab of its own: double-click it, or EDIT IN A TAB in its menu. The tab edits a copy: **SAVE** puts the changes into the item, on its panel, and closes the tab; closing a tab with changes not saved asks SAVE, DISCARD or KEEP EDITING. A change saved on the FM-1 panel reaches the FM-1 only with WRITE. The pictures in a tab are the FM-1's own, drawn by PT/FM's own code exactly as the FM-1's screen shows them, and they follow the controls as you move them.

■ Song

Its properties (NAME, TEMPO, TICKS A ROW, ROWS A BEAT, SWING, AT THE END), its order (each position's pattern from a list, moved, removed or added), TRIM (tick the positions to keep), the MIXER (each track's LEVEL, PAN, DUCK and SENDS) and the FX setup (the chain's order by dragging, each effect on or off, its knobs).

■ Pattern

The grid, made for the mouse and the finger: a click picks a cell, a drag marks a block. The cell's panel has a keyboard of the FM-1's 27 keys with NOTE OFF and NO NOTE, the instrument picked from a list of the cartridges by name, the volume, and up to four commands, each with its meaning in words. On the computer's keyboard,

the arrows, Page Up / Page Down, Home, End and Tab move; the letter keys write notes as the FM-1's keys play them (Z S X D C F V ... from F-3); = writes a note off; Delete clears; Ctrl+C, Ctrl+X and Ctrl+V copy, cut and paste; Space plays.

■ Instrument

Its NAME, LEVEL (AUTO LEVEL measures it as the FM-1 does) and its engine's parameters, each page beside the FM-1's picture of it. Every instrument page has a keyboard of the FM-1's 27 keys, played by mouse, touch, the computer's keys, or a MIDI keyboard picked from the computer's inputs. With VIRTUAL MIDI KEYBOARD picked, the computer's keys play anywhere in the tab (Z S X D C ... from F-3 as the FM-1's keys; [and] change the octave).

■ Sample

Its waveform with START and END to drag (or drag across it for a new cut), PLAY THE CUT, CHANNELS (both mixed, left or right of a stereo sound), RATE, DEPTH (8 or 16 bits), TRIM SILENCE, WHOLE SAMPLE, the sizes before and after, and the instruments that play it. Their START, END and loop points follow a cut when you SAVE. OPTIMIZE (below) makes it smaller.

■ SETTINGS, MIDI MAP, LOOPS, DJ SETUP

Every setting (and your 16 GATE patterns as rows of steps), each MIDI mapping, each loop's instrument and notes, and DJ's crossfader, filter, decks and effects.

Your own sounds

A sound dropped on the page becomes a *sample*, a recording. To play it from the FM-1's keys it also needs an *instrument* that plays it: the instrument sets its note, loop and envelope. The page does not make one for you. On the page:

- 1 Drop the sound (WAV, FLAC, MP3, OGG ...) on the TABLE.
- 2 Drag it onto a sampler cartridge of the FM-1 panel: it joins that cartridge. (Dragged onto the panel anywhere else, it gets a new sampler cartridge of its own.)
- 3 Open the sampler cartridge's tab: beside the sample, **NEW INSTRUMENT FOR IT** makes the instrument. Set its BASE NOTE (the note the recording plays at its own pitch) and its loop, then SAVE.
- 4 WRITE.

Or make the instrument on the FM-1, after the WRITE: INSTRUMENTS, the sampler cartridge, an empty slot; **SEL**, INIT makes a plain instrument there; **EDIT**, and on its SAMPLE row **ENV** lists the cartridge's samples (the keys play the one highlighted, **ENV** picks it). Set its BASE NOTE and loop, then **SAVE** (chapter 8).

Making room

Samples take most of the FM-1's room. The page can make them smaller: in a sample's tab, **OPTIMIZE** offers three levels, each with its size and what it saves, heard before you SAVE:

■ LOSSLESS

Changes nothing you hear: it cuts what no instrument plays (before the first START, after the last END or LOOP END) and the silent tail.

■ SMALLER

Adds the rate the page proposes for the sound (the lowest that loses nothing heard).

■ SMALLEST

Adds 8 bits, a softer top, and a level 6 dB lower, made up by the instruments' LEVEL.

On the TABLE, **OPTIMIZE SAMPLES** does the same to every sample picked (and every sample of a picked sampler) at once, listing each level's size before and after. UNDO takes it back.

Reading, writing and backing up

Connect the FM-1 by USB with PT/FM running. Nothing stays connected: each action finds the FM-1, does its work and lets go.

■ READ

Reads what the FM-1 holds into the FM-1 panel (after the first time, only what changed).

■ WRITE

Makes the FM-1 hold exactly the panel. Before writing it shows what it writes and what it removes (in red), warns when the FM-1 saved something since the last READ (READ FIRST, WRITE ANYWAY or CANCEL) and when fewer than the 16 advised blocks would stay free, and offers to back up first: what the write would replace goes onto the TABLE (BACKUP and the time). When the panel does not fit around what the FM-1 keeps but fits the FM-1 emptied, it writes the whole user area anew and says so first (it takes longer). The FM-1's sound stops while it writes. With unsaved edits on the FM-1 it is refused: SAVE OR REVERT FIRST.

■ REVERT

Puts back what the panel showed after the last READ or WRITE.

■ DOWNLOAD DISK

Saves the FM-1 panel as a disk file (ptfm-2026-10-26.ptfmdsk). **This is the backup:** READ, then DOWNLOAD DISK.

■ UPLOAD DISK

Puts a disk file in the FM-1 panel, numbers kept; WRITE then puts it on the FM-1. A backup put back is exactly as it was.

NOTE

Before installing another FM-1 firmware, READ and DOWNLOAD DISK: other firmwares erase PT/FM's memory.

Bringing content in

Drop files on the TABLE (or + **ADD FILES**):

■ Disks

.ptfmdsk files: their items as they are.

■ Tracker modules

MOD, S3M and XM: the song, its patterns (a channel a track, 16 at most), a sampler cartridge with every instrument and sample. IT is not read; XM's envelopes are not kept.

■ MIDI files

A song: each channel's notes become tracks, notes on the nearest row, the tempo kept, patterns of 4 bars; each channel's instrument mapped onto a built-in sound (all 128 General MIDI programs have one), the drums onto FM DRUM KIT. Pitch bend and controllers are left out.

■ DX7 cartridges

.syx, the 32-voice dump: a DX7 cartridge, exactly; a single voice's dump: a cartridge of one.

■ **Sounds**

WAV, FLAC, MP3, OGG and the rest: a sample, at the lowest rate that loses nothing heard.

Take only a part (some patterns, a cut of a sound) in the item's tab, then move it to the FM-1 panel and WRITE.

A | EVERY SHORTCUT

Every key, combination and hold, screen by screen: the key tables of the chapters, gathered in one place. On the web page, point at a row and its keys light on the FM-1.

On every screen

KEY	DOES
KEYS	The keys play the current instrument, unless the screen gives them another job (on LOOPS' CONTROL mode, DJ and FX's LIVE page, for example).
PRESETS	Picks the current instrument: the sound the keys play. It goes round within its cartridge.
SEL + PRESETS	Picks another cartridge (a bank of sounds): the cartridge list opens, and each click shows the next one. Hold SEL, or tap it first.
OCT- OCT+	Shift the keys an octave down or up, from -4 to +4.
SEL + OCT- SEL + OCT+	On FX's EDIT page, where OCT alone switches the effect off and on, these change the octave instead.
PLAY	Plays, or pauses, what the screen plays (or what played last).
PLAY held	Stops: what plays goes back to its start.
PLAY REC KEYS	These act the moment you press them, for timing. Every other button acts when you let it go.
SAVE	Saves all your changes. Its light is dim while something is not saved. While music plays, the save waits for a pause.
SAVE + OCT+	Saves too: use it when you held SAVE so long that letting go no longer counts as a tap.
SAVE held + OCT-	REVERT ALL: throws away every change since the last save, after asking.
FX	Opens the FX screen; press it again to go back.
FX + white key held	Plays a punch-in effect for as long as the white key is held (FX).
HOME	Backs out of whatever is open. At the top of a screen, opens HOME's combination.
HOME held	Opens HOME's combination at once, for as long as it is held.
HOME + OP1	Opens SONGS.
HOME + OP2	Opens the EDITOR.
HOME + OP3	Opens INSTRUMENTS.
HOME + OP4	Opens PLAYBACK.
HOME + OP5	Opens DJ.
HOME + PIT	Opens VISUAL.
HOME + GLO	Opens STATUS.

KEY	DOES
HOME + MONO	Opens SETTINGS.
HOME + POLY	Opens LOOPS.
HOME + SELECT	Turns through all the screens, one a click, round and round.
HOME + white key	Mutes or unmutes a track: white key 1 is track 00. In LOOPS it mutes a loop.
HOME + white key held	Solos the track instead.
HOME + SEQ + white key	SEQ first switches the white keys to solo: then a tap solos the track.
HOME + PLAY	Rewinds what plays to its start.
HOME + REC	The CUT: all sound off at once.
HOME + REC held	Silent for as long as REC is held; held for 2 seconds, it also switches every effect off.
HOME + LFO	Opens the help for this screen, LOOK FOR ANSWERS.
SELECT	Moves the cursor up and down.
ALGORITHM	Moves the cursor left and right; when typing a name, along the name.
K1 K2 K3 K4	Change the values at the cursor. The footer says what each one turns.
SEL held + K1	With SEL held, any of K1-K4 takes big steps: an octave for a note, 10 for a value.
SEL	Opens the menu of what is at the cursor, its last choice ready. During a MOVE, it puts the thing down. In most menus, REVERT takes the thing back to what was saved.
LFO	Clears, or resets a value to its default. When typing a name, deletes a letter.
ARP	Switches the arpeggiator on and off.
ARP + SELECT	Changes the arpeggiator's rhythm.
ARP + ALGORITHM	Changes the order its notes take turns in.
ARP + K1	Changes how many notes it keeps playing after you let go (the latch).
ARP + LFO	Lets the latched notes go.

SONGS

KEY	ON THE LIST
SELECT	Pick a song. In the order: a line (8 positions) up / down.
ALGORITHM	Where PLAY starts (the box). In the order: a position left / right.
SELECT ALGORITHM	In the order: move through the positions, a line or one at a time.
PLAY	Play / pause the song; in the pattern list, hear the highlighted pattern.

KEY	ON THE LIST
EDIT	Into the song's order; in the order, done, keeping the changes.
GLO	The song's properties: name, tempo, swing, loop or stop.
SEQ	The play mode: ONE PLAY, REPEAT SONG, PLAY NEXT.
SEL	The song's menu; in the order, the position's menu.
ENV	The pattern list (for the EDITOR); in the order, again puts the highlighted pattern at the position.
K1	In the order: another pattern at the position.
LFO	In the order: remove the position.
HOME	In the order: leave it, dropping the changes.
KEYS OCT- OCT+ PRESETS	Play, as on every screen.
ARP	The arpeggiator on / off.
KEYS held	With ARP on, the notes held take turns.
ARP held	With SELECT, ALGORITHM, K1: the rhythm, the order, the latch.

EDITOR

KEY	DOES
SELECT	Up / down the rows; in the note editor, a line.
ALGORITHM	Across the tracks; in the note editor, a command or its value.
SEQ	8, 4, 2 or 1 tracks at once.
PRESETS	The sound the keys write.
KEYS	REC off: play. REC on: write at the cursor. In the note editor: change the note.
REC	Writing on / off. While the loop plays, it plays on and the keys write at the cursor.
PLAY	REC off: loop the pattern from the cursor's row. REC on: record a take (starts as you let go); stop the loop, then PLAY for a take; during a take, stop it.
PLAY held + KEYS	REC on: start a take on that note. PLAY held alone shows how.
PLAY REC	During a take: stop recording.
KEYS held	In a take, a note lasts as long as its key is held: letting go writes a note off.
K1	The slot: volume or command 1-4. In the note editor: change the part at the cursor.
K2	The command (slide, accent ...). In the note editor: big steps.

KEY	DOES
K3 K4	Its two digits, or the volume; in *, = and #, K3 picks which, K4 sets it.
K1 K2 K3 K4	Never move the cursor.
LFO	Clear the cell (and move on); on an empty cell, a note off.
EDIT	The note editor; in it, done (it says each command in words).
HOME	Close what is open (the note editor dropping its changes, a carried block, a mark); entered from another screen, back there.
GLO	The pattern's properties: tracks, rows, edit step.
ENV	The pattern list; again, open the one picked; in it, PLAY hears one.
ENV held	The pipette: take the cursor's sound.
SEL	The menu: MARK, TAKE ITS INSTRUMENT, the block's menu, NEW / LOAD / STORE A PATTERN, RECORD PATTERN, REVERT. In the note editor: move to other cells, again back. In the list: NEW, CLONE, MOVE, DELETE.
SEL held + SELECT SEL held + ALGORITHM	Mark a block: with SEL held, SELECT stretches it over rows, ALGORITHM over tracks.
ARP	Repeat the cursor's row (the row preview).
ARP held	With SELECT: the preview's rhythm.
SAVE	Keeps the EDITOR's own pattern after switching off.
white keys	In RECORD PATTERN: the steps.
HOME + white key	Mute a track; held, or after SEQ, solo.

INSTRUMENTS

KEY	BROWSING A CARTRIDGE
SELECT	Moves to the next or previous slot: that sound becomes the current one.
ALGORITHM	Moves by 8 slots, a column at a time.
PRESETS	Goes to the next or previous sound, skipping empty slots.
K1	Turns to another cartridge.
KEYS	Play the sound picked.
EDIT	Opens the sound's settings to change it (edit mode). On an empty FUSION slot, makes a new pattern for it first.
GLO	Shows the cartridge's name, type and slots used, and renames it.

KEY	BROWSING A CARTRIDGE
ENV	Lists all the cartridges; ENV again opens the one highlighted.
ENV , then SEL	In the cartridge list, SEL opens the cartridge's menu: NEW, CLONE, MOVE, DELETE, RENAME, AUTO LEVEL ALL, REVERT, BACK TO BUILT-IN.
SEL	Opens the slot's menu: MARK, COPY, PASTE, MOVE, SWAP, DELETE, INIT, RENAME, AUTO LEVEL, REVERT.
ARP	Switches the arpeggiator on and off: it plays the sound picked while your hands are on the knobs.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.
KEY	IN EDIT MODE
SELECT	Picks a row of settings.
K1 K2 K3 K4	Change the row's four values, one a knob.
ALGORITHM	Turns the pages of settings.
SEQ	Turns the pages too, round.
KEYS	Play the sound as it changes.
PRESETS	Moves to another sound, still editing.
LFO	Puts the knob turned last back to its default.
SEL	On NAME, types the name. Elsewhere, opens the menu: COPY, PASTE, INIT, RENAME, AUTO LEVEL, REVERT.
K4	On a sampler's LOOP row: RELEASE, how long the sound fades after the key is let go.
EDIT	Leaves edit mode, keeping the changes.
HOME	Leaves edit mode, dropping the changes.
KEY	SAMPLES AND FUSION
ENV	On a sampler's SAMPLE: lists the cartridge's samples. On a FUSION's PATTERN: lists the patterns.
KEYS	In the samples list, play the sample highlighted. In the pattern list, try each pattern as this FUSION would play it. On a FUSION sound, each key plays its own row of the pattern.
ENV	Again: uses the sample, or the pattern, highlighted.
K1	On a FUSION's PATTERN: steps to another pattern.
SEL	In the samples list: DELETE (it asks when sounds use the sample). On a FUSION's PATTERN: opens the pattern in the EDITOR to write it.
REC	In the EDITOR opened for a FUSION: with REC off, the keys play the FUSION as you write it; with REC on, they write.
HOME	In that EDITOR: back to the FUSION's settings.
OCT+	A new FUSION pattern's question: FILL, every row with the sound offered.
OCT-	... or EMPTY, the pattern left empty.

KEY**BROWSING A CARTRIDGE****K1** **SELECT**

In that question: offer another sound (K1 another cartridge's, SELECT the next sound).

PLAYBACK**KEY****DOES****PLAY**

Pauses and resumes what played last.

SEQ

Shows 8, 4, 2 or 1 tracks at once, round.

K2

Also changes the number of tracks shown: clockwise more.

ALGORITHM

Moves the highlighted track across.

SELECT

Pauses, then plays the song a row a click; PLAY goes on from there.

K1

Jumps to another position of the song.

K3

The song's volume (the keys stay as they are).

K4

The song's speed, in BPM.

LFO

Puts the volume or the speed, whichever you turned last, back to 0 dB or 100 %.

EDIT

Opens the EDITOR on the row playing; HOME comes back here.

HOME

Back from the EDITOR opened with EDIT.

ENV

Opens the song list; PLAY there plays a song from its start.

GLO

The view's options: scroll by rows or pages; UNLOAD SONG.

KEYS **OCT-** **OCT+** **PRESETS**

Play the current instrument over the song, as on every screen.

ARP

Switches the arpeggiator on and off.

ARP held

With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

HOME + **white key**

Mutes or unmutes a track; held, solos it.

DJ**KEY****THE DECKS****OP1**

Plays or pauses the left deck.

OP1 held

Takes the left deck back to its song's start, paused.

OP2 held

HOLD: the left deck stops while held; turn K1 to move it by hand, K2 to move it silently.

OP3

Switches the left deck's filter off and back on, sliding.

OP4

Loads the highlighted song on the left deck.

OP5

Loads it on the right deck.

OP4 **OP5**

The two LOAD keys: on a playing deck the song comes in at the next bar line; held, at its own tempo.

KEY	THE DECKS
OP6	Plays or pauses the right deck.
OP6 held	Takes the right deck back to its song's start, paused.
PIT held	HOLD: the right deck stops while held; turn K4 to move it by hand, K3 to move it silently.
GLO	Switches the right deck's filter off and back on, sliding.
OP3 GLO	The two FILTER keys: a quick press switches at once, a held one slides over up to half a second.
MONO	SYNC on / off: the right deck follows the left.
POLY	Nothing on DJ.
BLANK	Turns the pads between PLAY pads and LOOP pads.
OP1 OP6	The two decks' PLAY keys, each over its deck's pads: play or pause each deck on its own (PLAY plays both).
OP1 OP6 , with CUE or a stop held	The deck's PLAY key pressed while its CUE pad or a stop is held changes what letting go does: play on, or stay.
KEY	KNOBS AND BUTTONS
SELECT	Moves the song list's highlight.
ALGORITHM	The crossfader, left to right. With an LFO's on / off pad held: that LFO's speed.
K1	The left deck's tempo (the set's). With HOLD held: the deck by hand, a row a click. With MOVE held: a bar a click. With the KEY pad held: its key.
K4	The right deck's tempo (nothing while synced). With HOLD, MOVE or KEY held: as K1 for the right deck.
K2	The left deck's filter, or its volume (after ENV). With HOLD held: the deck silently, a beat a click. With MOVE held: a pattern a click.
K3	The same for the right deck.
K2 K3	The left and right filters, side by side.
PLAY	Plays or pauses both decks at once.
PLAY held	Both decks back to their cue points.
SEQ	SWAP: the decks exchanged.
ENV	Switches what K2 and K3 turn: the filters or the volumes.
SEL	Puts the last knob turned back: tempo, filter, crossfader, volume, KEY.
SEL held	With a knob: big steps.
LFO	The LFO pads; again, back.
LFO held	Shows which LFO pad does what.
GLO	DJ's properties: crossfader, filter, FX LFO, RESET DJ.

KEY	THE DECKS
FX	DJ's own CHORUS, DELAY, REVERB, LIMITER and METRONOME.
FX + white key held	A punch-in over the mix.
OCT- OCT+	Nothing alone on DJ.
HOME + OCT+ HOME + OCT-	HOME's mutes reach tracks 08-0F, or back to 00-07.
HOME + white key	Mutes a deck's track: 1-8 the left's, 9-16 the right's.
HOME + PLAY	Both decks back to their cue points.
HOME + REC	Sound off while the decks play on.
SAVE	Keeps the decks as they stand.
REC EDIT ARP PRESETS	Nothing on DJ: no key plays an instrument here.

VISUAL

KEY	DOES
SELECT	Turns the views, a step at a time.
SEQ	The next view, round.
K1	Zooms SCOPE in time.
K2	Makes the view taller or flatter.
GLO	The options: stereo or mono view, freeze.
PLAY	Pauses and resumes what played last.
KEYS OCT- OCT+ PRESETS	Play the current instrument, as on every screen.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

STATUS

KEY	DOES
SELECT or ALGORITHM	Turns the pages, one a click.
PLAY	Pauses and resumes what played last; in the song list, plays the song highlighted.
LFO	Zeroes MAX, HALF, LATE and STEALS (COUNTS ZEROED).
ENV	Opens the song list: PLAY there plays the highlighted song from its start and goes to SONGS.
EDIT	Goes to SETTINGS.
HOME + LFO	The help: on STATUS it opens on the keys every screen shares.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.

SETTINGS

KEY	DOES
SELECT	Picks a setting (on MIDI, then the mappings).
K1	Changes it, at once; on TOOLS, picks the tool.
LFO	Puts it back to its default; on a mapping, deletes it.
SEQ or ALGORITHM	Turns to the MIDI page and back.
EDIT	Runs the tool picked; opens and closes ABOUT; on MIDI CONTROLLER, switches; on LEARN, learns.
SEL	REVERT: the page's own back as saved (the settings; on MIDI, the mappings).
SAVE	Keeps the settings after power-off.
ARP	Switches the arpeggiator on and off.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch (also set here: ARP RHYTHM, ARP PATTERN, ARP LATCH).

LOOPS

KEY	IN PLAY MODE
SELECT	Picks a loop, or + NEW LOOP below them.
REC	Records where the selection is: a new loop, or the loop again; while the loops play it arms; again, stops the take early (the first loop: closes it on a bar line).
REC PLAY	With no loops: REC, then a note or PLAY, starts the first loop; REC again closes it on a bar.
PLAY	Plays and pauses the loops.
PLAY held	Stops: the loops go back to their start.
EDIT	Records the selected loop again (RE-RECORD).
LFO	PEEL: the selected loop goes.
KEYS	Play the current instrument; while recording, write into the take.
PRESETS	The sound you play, which the next loop takes.
ENV	The cartridge list: the next loop's sound from another cartridge.
ALGORITHM	The tempo, any time.
K1 K2 K3 K4	The selected loop's LEVEL, PAN, DELAY and REVERB; on + NEW LOOP, the next loop's.
SEQ	Switches the keys between playing notes and CONTROL mode.
ARP	Opens the pattern recorder.
GLO	The properties: tempo, swing, length, grid, quantize, mono legato, count-in.
SEL	The menu: APPLY INSTRUMENT, DOUBLE, RECORD LIVE, SAVE TO / LOAD FROM PATTERN, CLEAR LOOPS, REVERT.
FX	LOOPS' own effects; FX again comes back.
OCT- OCT+	The keys' octave.

KEY	IN PLAY MODE
HOME + white key	Mutes a loop at once.
HOME + white key held	Solos it.
KEY	IN CONTROL MODE (SEQ)
white key	Mutes or unmutes its loop; in SOLO, solos it or ends the solo.
white key held	The same at the next bar line.
OP1 OP2 OP3	QUANTIZE 2, 3 or 4 rows.
OP4 OP5	QUANTIZE a row; REAL TIME.
PIT	Every loop back on.
GLO	The white keys mute, or solo.
MONO POLY	How the next loops record.
KEY	IN THE PATTERN RECORDER
SELECT	Picks the row.
white key	Switches a step on or off.
K3	The row's note, a semitone a click.
SEL	Then a key: that key is the row's note.
K1	STEP SIZE.
K2	LENGTH.
K4	TIMES: the first loop's length.
GLO	Notes ring to the next, or last a step.
ARP	The preview off and on.
REC	Writes the loop and closes.
HOME	Closes, nothing written.

FX

KEY	DOES
FX	Opens FX; again, back to where you were.
SEQ	The next page: LIVE, EDIT, MIXER.
SELECT	Picks an effect (on MIXER, the value).
K1 K2 K3 K4	The effect's knobs (on MIXER, K1 changes the value).
ALGORITHM	The effect's next knobs (on MIXER, the track).
OCT+ OCT-	Switch the effect on or off.
SEL held + OCT+ SEL held + OCT-	On EDIT: the keys' octave.
LFO	Puts the knob turned last back to its default.
SEL	The menu: MOVE, RESET, REVERT.
EDIT	On LIVE: the effect on EDIT. On EDIT with GATE picked: its steps on the white keys; again, keep them.

KEY	DOES
white key held, ALGORITHM	On GATE's steps: the held key's step gets ratchets, X2, X3, X4.
HOME	Drops GATE's step changes; during MOVE, puts the chain back.
ENV	On GATE: the gate patterns.
GLO	FX PROPERTIES: routing, the keys, THE KEYS' tempo and swing.
white keys	On LIVE: the punch-ins. On EDIT and MIXER: play notes.
black key	On LIVE: picks an effect.
BLANK	On LIVE: BYPASS while held.
KEYS	On LIVE no notes, only effects; on EDIT and MIXER they play.
ARP	The arpeggiator; with a punch-in's key held, holds the punch-in on.
ARP held	With SELECT, ALGORITHM or K1: the arpeggiator's rhythm, order and latch.
HOME + white key	Mutes a track (also on MIXER).

B | EVERY MESSAGE

The messages the FM-1 shows, in the header for two seconds (toasts) or in a question, grouped by where they come up, with what each means and what to do. Numbers and names in them change with the case.

On every screen

MESSAGE	MEANS
OCT +3	The keys' octave changed (OCT- / OCT+).
TRACK 02 MUTED	HOME + a white key muted that track.
TRACK 02 ON	... and unmuted it.
TRACK 02 SOLO	The track is soloed (HOME + white key held, or SEQ first).
SOLO OFF	The solo ended: every track plays again.
BACK TO THE START	HOME + PLAY, or PLAY held: back to the start.
NO SONG TO PLAY	PLAY with no song (or a song with no positions): make one on SONGS, or upload the demo disk.
SOUND CUT: LET GO OF REC	HOME + REC: all sound is off while REC is held.
SOUND CUT, EFFECTS OFF	REC held 2 s: every effect of what plays switched off (SAVE keeps it, REVERT undoes it).
ALL SOUND OFF	Every note and effect tail stopped at once.
CHANGES DROPPED	HOME left an edit, throwing its changes away.
SELECT MOVES IT, SEL PUTS IT DOWN	A MOVE started: carry the thing with SELECT, put it down with SEL, HOME takes it back.
NOT MOVED	HOME during a MOVE: it is back where it was.
SELECT, ALG: MARK SEL: ITS MENU	MARK started: stretch the mark with SELECT and ALGORITHM, then SEL for its menu.
OCT+ OCT-	Over a question's answers: the key that gives that answer (OCT+ yes, OCT- no).
ARP UP C-4	The arpeggiator on, with its pattern (and, on FX LIVE, the note it plays hands free).
ARP OFF	The arpeggiator off.
LATCH 4 NOTES	ARP held + K1: how many notes go on after you let go.
LATCHED NOTES LET GO	ARP held + LFO: the latched notes stopped.
SECOND CORE STOPPED	The second processor stopped and one core does it all (VOICES 16 counts as 12). It comes back at the next power-on; STATUS' DEVICE says why.
NOT NOW: THE FLASH IS BUSY	The FM-1 is writing its memory: try again in a moment.
TOO BIG FOR ONE RECORD	The thing would be too big to keep in one piece: make it smaller (fewer tracks or rows).

Saving and reverting

MESSAGE	MEANS
SAVING 3 CHANGES	A save is being written.
SAVED	Everything is saved.
NOTHING TO SAVE	SAVE with nothing changed.
SAVE WAITS FOR A PAUSE	SAVE while playing: it is written when the music pauses (SAVE blinks meanwhile). Pause, or it is lost at power-off.
SAVE FAILED	The save could not be written: try again; if it keeps failing, run SETTINGS' CHECK STORAGE.
SAVE: THE STORE IS BUSY	Something else is being written: SAVE again in a moment.
A SAVE IS UNDER WAY	A save is still running: wait for it.
MEMORY FOR EDITS IS FULL SAVE BEFORE MAKING MORE EDITS 23 UNSAVED CHANGES	The memory for unsaved edits is full: OCT+ (SAVE NOW) saves, then make the edit again; OCT- goes back.
SAVE CHANGES TO FREE MEMORY	The memory for unsaved edits is three quarters full: a SAVE empties it. Shown at most once a minute.
NOT ENOUGH STORAGE TO SAVE 12 KB MORE NEEDED CLEAN UP FREES 30 KB	The save does not fit: OCT+ runs CLEAN UP; or delete something and save again. Nothing is lost meanwhile.
REVERT TO SAVED? DROP 3 UNSAVED CHANGES AND RELOAD FROM FLASH	REVERT ALL asks: OCT+ drops every change since the last save.
REVERTED TO SAVED	REVERT ALL done.
NOTHING TO REVERT	Nothing has changed since the last save.
FACTORY RESET? ERASES ALL YOU SAVED OR UPLOADED ONLY THE BUILT-IN INSTRUMENTS STAY	SETTINGS' FACTORY RESET asks first: OCT+ (RESET) goes on to the second question, OCT- keeps everything.
ERASE IT ALL NOW? THERE IS NO WAY BACK 3 UNSAVED CHANGES LOST TOO	FACTORY RESET's last question (the third line only with changes not saved): OCT+ (ERASE) erases everything you saved or uploaded and restarts the FM-1.
ERASING	FACTORY RESET is erasing: up to two seconds, then the FM-1 restarts.
REVERT PATTERN 0A TO SAVED?	A screen's REVERT asks (also for a slot, a cartridge, a song, the loops, the settings): OCT+ REVERT, OCT- KEEP.

MESSAGE	MEANS
REVERT THE EFFECTS TO SAVED? FOR CITY LIGHTS	FX's REVERT asks, naming whose effects.
REVERTED	The thing is back as saved.
PATTERN 1A IS USED 3 TIMES UPDATE REFERENCES?	You move or delete something in use: YES makes what uses it follow (and saves everything), NO leaves the old numbers, HOME cancels.
UPDATING 3 REFERENCES	The references are being updated and saved.
REFERENCES UPDATED, SAVED	Done: everything that used it follows, all saved.
CARTRIDGE F0 BUILT-IN AGAIN	BACK TO BUILT-IN: your changes to a built-in cartridge are gone.

SONGS, patterns and the EDITOR

MESSAGE	MEANS
ONE PLAY REPEAT SONG PLAY NEXT	SONGS' play mode (SEQ).
SONG MOVED TO 02	A song put down at its new place.
SONG 00 DELETED, 4 PATTERNS TOO SONG 00 DELETED, 1 PATTERN TOO	The song is deleted with the patterns only it used.
NO FREE SONG NUMBER	No song number left (00-FD): delete a song first.
SONG UNLOADED	Everything stopped, as at power-on.
PATTERN 0A FOR THE EDITOR	The pattern picked in SONGS' list opens in the EDITOR.
PATTERN 03 COPIED	A position's pattern number copied.
PATTERN 13 MADE PATTERN 13 MADE	A new empty pattern.
12 CLONED TO 13 12 CLONED TO 13	A copy at a new number.
PATTERN 12 MOVED TO 20	A pattern moved to another number.
PATTERN 12 DELETED	A pattern deleted.
ALL 240 PATTERNS USED NO FREE PATTERN NO FREE NUMBER	All 240 pattern numbers (00-EF) are used: delete or CLEAN UP some.
PATTERN 1A LOADED	A pattern copied into the EDITOR's own.
STORED IN PATTERN 1A	The EDITOR's pattern given a number.
8 TRACKS 1 TRACK	The EDITOR's or PLAYBACK's view (SEQ).

MESSAGE	MEANS
REC ON: KEYS WRITE REC OFF: KEYS PLAY	The EDITOR's writing switched on or off.
SONG PAUSED: WRITING	REC while a song plays: the song pauses.
LOOP STOPPED: PLAY FOR A TAKE	PLAY with REC on paused the pattern loop; the next PLAY records a take.
TAKE STOPPED TAKE CANCELLED	A take ended; an armed take called off.
ROW PREVIEW #___ ROW PREVIEW OFF	ARP's row preview on (with its rhythm) or off.
COPIED 4 X 1	A block copied: rows x tracks.
NOTHING COPIED	PASTE with nothing copied yet.
BLOCK TOO BIG TO COPY	The block is bigger than the clipboard (2 KB): copy a smaller one.
MOVE: SEL PUTS IT DOWN SWAP: SEL PUTS IT DOWN	A block is carried: SEL puts it down, HOME cancels.
CANCELLED	Called off (a carried block, an armed loop take, a count-in).
K1: TRANSPOSE, SEL: DONE	TRANSPOSE: turn K1, SEL ends it.
TRANSPPOSED +02	The block moved by that many semitones.
NO INSTRUMENT HERE	The pipette found no instrument on the cell or its track.
SELECT, ALG: CELLS SELECT, ALG: FIELDS	The note editor: the knobs move to other cells, or back to the fields.
PATTERN: 12 NOTES PATTERN: 1 NOTE	RECORD PATTERN wrote that many notes.
KEYS: THE NOTE KEYS: THE STEPS	The pattern recorder: the next key sets the row's note, or the keys switch steps again.
NOTE C-5 NOTE C-5	The pattern recorder's row note, moved with OCT.
NO STEPS ON	REC in the pattern recorder with no step on: switch some on first.
THIS: NOT IN THIS FIRMWARE YET EDITOR: NOT IN THIS FIRMWARE YET FX: NOT IN THIS FIRMWARE YET	That part is not in this version of PT/FM.

INSTRUMENTS

MESSAGE	MEANS
COPIED 3	That many sounds copied.

MESSAGE	MEANS
SAMPLE 0C DELETED	A sampler's sample deleted: its audio gone, its place in the list kept, empty, and the instruments that played it emptied.
COPIED FROM DX7: NOT HERE	The copied sound is of another type than this cartridge: paste it into a cartridge of its own type.
NO EMPTY SLOT: SWAP INSTEAD	MOVE in a full cartridge: use SWAP.
EMPTY SLOT: SEL, INIT	EDIT on an empty slot: SEL, INIT makes a sound to start from.
LEVEL SET TO -1.5 DB	AUTO LEVEL set the sound's level.
NO SOUND TO MEASURE	AUTO LEVEL on a silent sound: its level is kept.
LEVELS SET	AUTO LEVEL ALL done.
CARTRIDGE 11 MADE	A new cartridge.
ALL CARTRIDGE NUMBERS USED	No cartridge number left: delete one first.
SAVE IT FIRST	MOVE of a sampler cartridge with unsaved changes: SAVE, then move it.
NO ROOM IN THE USER AREA	No room for a copy of the cartridge's samples: free some storage first.
CLONE FAILED: FLASH ERROR	Copying the samples failed; nothing changed. Run CHECK STORAGE.

LOOPS

MESSAGE	MEANS
LOOP 00: 4 BARS	The first loop closed: its length.
NOTHING PLAYED: NO LOOP	The first loop closed with no notes: play something next time.
REC, THEN PLAY: THE FIRST LOOP	PLAY with no loops: press REC first.
LOOP 03 RE-RECORDING	The loop is being recorded again; its old notes are gone.
LOOP 03 PEELED	LFO removed the loop.
KEYS: CONTROL KEYS: PLAY	SEQ: the keys mute and solo loops, or play notes.
LOOP 03 MUTED LOOP 03 ON	A loop muted or back on.
LOOP 03 MUTED AT THE BAR LOOP 03 ON AT THE BAR	... at the next bar line (the key was held).
LOOP 03 SOLO LOOP 03 SOLO OFF	A loop soloed, or its solo ended.
LOOP 03 SOLO AT THE BAR LOOP 03 SOLO OFF AT THE BAR	... at the next bar line.

MESSAGE	MEANS
ALL LOOPS ON	Every mute and the solo cleared.
SEQ: MUTE SEQ: SOLO	CONTROL mode's white keys mute, or solo.
QUANTIZE: 2 ROWS	Where the next notes land.
NEXT LOOPS: MONO NEXT LOOPS: POLY	How the next loops record.
NO LOOPS YET	The action needs a loop: record one first.
GRID: ONLY BEFORE THE FIRST LOOP	GRID can change only with no loops (CLEAR LOOPS first).
DOUBLED: 8 BARS	The length doubled.
DOUBLE: AT MOST 8 BARS	The length cannot double further (128 rows at most).
LOOPS CLEARED	Every loop gone.
NOTES RING TO THE NEXT NOTES A STEP LONG	The pattern recorder's note length.
PATTERN: LOOP 06, 4 BARS	The pattern recorder made a new loop.
PATTERN INTO LOOP 03	... or replaced a loop's notes.
RECORDING A SONG	RECORD LIVE runs: the loops cannot change until it ends (REC).
SONG 12 RECORDED: 1:23, 5 PATTERNS	RECORD LIVE wrote the song (SAVE keeps it).
SONG 12: 3 NOTES LEFT OUT	Notes that did not fit 16 tracks were left out.
SONG 12 STOPPED: MEMORY FOR EDITS IS FULL SONG 12 STOPPED: ALL 240 PATTERNS USED SONG 12 STOPPED: 256 POSITIONS	RECORD LIVE stopped by itself, keeping what was written: SAVE, or free patterns.
NO SONG NUMBER FREE	RECORD LIVE needs a free song number.
LOOPS STORED IN PATTERN 2A PATTERN 2A: 3 NOTES LEFT OUT	SAVE TO PATTERN done (notes past 16 tracks left out).

MESSAGE	MEANS
PATTERN 2A IN LOOPS: 3 LOOPS PATTERN 2A IN LOOPS: 3 INSTRUMENTS LEFT OUT PATTERN 2A IN LOOPS: 12 COMMANDS LEFT OUT	LOAD FROM PATTERN done, and what did not fit.
CARTRIDGE 0A IS EMPTY	ENV picked a cartridge with no sounds.

DJ

MESSAGE	MEANS
PAUSED: PLAY AGAIN FOR DJ	PLAY on DJ paused what was playing; PLAY again plays the decks.
LEFT: CITY LIGHTS AT THE BAR LEFT: CITY LIGHTS AT ITS TEMPO	A load waits for the playing deck's next bar line (held: at the song's own tempo).
LEFT: LOAD CANCELLED	LOAD again before the bar line.
SONG 0A IS EMPTY	The song has no positions: it cannot be loaded.
NO SONG ON THE DECK	The deck is empty: load a song first.
LEFT: BACK TO THE START	A deck's PLAY key held.
BACK TO THE CUES	PLAY held (or HOME + PLAY): both decks at their cue points.
THE END: CUE GOES BACK	The deck stopped at its song's end: CUE takes it back.
CUE: POS 02 BAR 0 CUE: POS 02 BAR 4 BEAT 2	The cue point set there.
DECKS SWAPPED NO SONGS TO SWAP	SEQ swapped the decks (both empty: nothing to swap).
SYNC ON SYNC OFF	The right deck follows the main, or not.
SYNC: TEMPO ON THE MAIN DECK	K4 does nothing while synced: turn K1.
SYNC EXTERNAL: THE CLOCK'S TEMPO	An outside clock leads the main deck.
TEMPO 120.0 BPM: THE SONG'S	SEL put the tempo back to the song's own.
FILTER L ON LP 2.4K FILTER L OFF	A deck's FILTER key.
K2 K3: VOLUME K2 K3: FILTER	ENV: what K2 and K3 turn.
KEY 0	SEL put a deck's KEY back to 0.
PADS: LOOPS	The pads' mode: PLAY, LOOPS or LFO.
LEFT: REPEAT PATTERN ON	LOOPS' PATTERN pad.
LEFT TRACK 02 MUTED LEFT TRACK 02 SOLO	A deck's track muted or soloed (HOME + white key).
MUTES: TRACKS 08-0F MUTES: TRACKS 00-07	HOME + OCT: which tracks the white keys mute.

MESSAGE	MEANS
FADER LFO: TRIANGLE 1/2 FADER LFO OFF	An LFO pad: on (its shape and speed) or off.
FILTER L: OFF TO HERE	A filter LFO's range pad.
SINE SQUARE TRIANGLE SAW UP SAW DOWN RANDOM	An LFO's shape pad (after the LFO's name: FADER: SINE).
FILTER L LFO: ITS FILTER IS OFF REVERB LFO: REVERB IS OFF	The LFO runs, but what it moves is off: switch the filter (or the effect on FX) on.
ALL LFOS OFF	Pad 16: every LFO off.
DJ RESET	GLO's RESET DJ: both decks emptied, everything as at first.

FX

MESSAGE	MEANS
GATE ON GATE OFF GATE OFF	OCT+ / OCT- switched the effect.
LOOP 1/4 HELD ON: ITS KEY STOPS IT	ARP holds the punch-in on: press its key again to stop it.
ROUTING GLOBAL ROUTING SENDS	GLO's ROUTING changed.
KEYS THROUGH FX KEYS DRY	The keys through the effects, or dry.
MOVED	The effect put down at its new place in the chain.
LIMITER DOES NOT MOVE	That effect has a fixed place.
STRAIGHT COPIED TO MY GATE 11	A built-in gate pattern copied into yours to edit.

SETTINGS, MIDI and data

MESSAGE	MEANS
16 VOICES: 12 WITHOUT CPU 2	VOICES 16 picked while the second processor does not run: 12 sound until it does.
COUNTS ZEROED	STATUS: MAX, HALF, LATE and STEALS back to zero.
NO MISSING REFERENCES	CHECK REFERENCES found nothing missing.
STORAGE OK	CHECK STORAGE found every record whole.
CLEANED UP: 4 DELETED NOTHING TO CLEAN UP	CLEAN UP's result.
64 MAPPINGS: DELETE ONE FIRST	LEARN is full: delete a mapping (LFO) first.
K1: CC 74, CH 1 (PLAY: NOTE 36, CH 10)	MIDI learn done: the FM-1 control, and the MIDI control now working it.
K1: CC 74 CH 1 DELETED	LFO on the MIDI page deleted that mapping.
CLOCK LOST	SYNC EXTERNAL: the outside clock stopped; PT/FM plays on at the last tempo.
MIRROR ON MIRROR OFF	A PT/FM web page took the panel over MIDI, or let it go.

MESSAGE	MEANS
DATA RECEIVED: 52 RECORDS	An upload (the install page, the EDITOR page) arrived whole.
DATA RECEIVED, 2 BAD RECORDS	Some records arrived damaged and were left out: upload again.
DATA NOT RECEIVED: TRY AGAIN	The upload failed; what was there is whole. Upload again.

C | WHEN SOMETHING IS WRONG

What to look at first when the FM-1 does not do what you expect, from the sound to the flash. Each answer points to the chapter that tells the whole story.

The sound	WHAT HAPPENS	WHAT TO DO
	No sound at all.	Turn MASTER up. A cable in the output jack mutes the speaker: unplug it to hear the speaker. SETTINGS' LINE GAIN sets the level of both (chapter 13).
	On the speaker, some parts are missing.	The speaker plays one channel only, so a part panned to the other side is not heard. Set SETTINGS' OUTPUT to MONO while you use the speaker, back to STEREO for headphones (chapter 13).
	A track is silent.	It may be muted, or another track soloed: HOME + white key switches a track's mute. While HOME's combination is open the white keys show the tracks: dim while a track plays, dark while it is muted, bright while it is soloed (chapter 4).
	A note or a whole part plays nothing, and its instrument or pattern is drawn in red.	It refers to something that is gone (an instrument, a pattern, a sample deleted or moved). SETTINGS, TOOLS, CHECK REFERENCES lists every such place (chapter 4).
	The keys are too quiet or too loud against a song.	SETTINGS' KEYS GAIN sets how loud the keys sound; KEYS VOLUME sets the volume of the notes they write (chapter 13).
	Crackles or clicks in a busy part.	Too much is asked of the FM-1 at once: many notes on heavy instruments with several effects on. Set SETTINGS' VOICES to 12 or 8, keep SECOND CORE on, or switch off an effect you do not need (chapter 13). STATUS shows how busy each processor is (chapter 12).
	A computer records the FM-1 too quietly or too loud.	SETTINGS' USB GAIN sets USB audio's level; MASTER does not touch it (chapter 16).

Starting and installing	WHAT HAPPENS	WHAT TO DO
	The screen says PT/FM CRASH .	PT/FM stopped on an error. The FM-1 restarts by itself after a few seconds; what was saved is kept, edits not saved are lost. Until you switch the FM-1 off and on, it runs on one processor (VOICES 16 plays 12 voices at most; STATUS' DEVICE says STOPPED: AFTER A CRASH). If it happens again, note the numbers on the red screen.
	The FM-1 does not start, or starts in USB RESCUE .	After two failed starts in a row the FM-1 waits in USB RESCUE for an install. Install the firmware again from the install page (chapter 2). To reach USB RESCUE yourself, hold OCT- while switching on.
	An install was cut short (a cable pulled, the power lost).	It does not go on by itself. Press INSTALL FIRMWARE again, from USB RESCUE if need be (chapter 2).

WHAT HAPPENS	WHAT TO DO
The install page finds no FM-1.	Close whatever else uses its MIDI port (a music program, another installer, another browser tab) and try again; use a USB cable that carries data (chapter 2).
An upload is refused with SAVE OR REVERT FIRST .	The FM-1 has edits not saved: press SAVE (or revert them), then upload again (chapter 2).
The FM-1 shows DATA NOT RECEIVED: TRY AGAIN after an upload.	The upload stopped half way. What was there before is whole, unless a nearly full FM-1's library was being replaced; either way, upload again.

Saving and storage

WHAT HAPPENS	WHAT TO DO
Work is gone after switching off.	Only what SAVE wrote survives power-off. The SAVE light is dim while something is not saved (chapter 4).
MEMORY FOR EDITS IS FULL	The working memory for changes is full. Answer SAVE NOW (OCT+), then make the edit again. STATUS' EDITS FREE shows the room left (chapter 12).
NOT ENOUGH STORAGE TO SAVE	The flash is full. Answer CLEAN UP (OCT+) to delete what nothing uses, or delete songs, patterns or samples yourself, then save again; nothing is lost meanwhile. STATUS' FLASH FREE shows the room left (chapter 13).
SAVE FAILED	Save again. If it keeps failing, run SETTINGS, TOOLS, CHECK STORAGE, which lists anything damaged (chapter 13).
You want to start from nothing.	SETTINGS, TOOLS, FACTORY RESET erases everything you saved or uploaded; the built-in instruments stay. Download a disk first on the editor page to keep a copy (chapter 13, chapter 17).

MIDI and sync

WHAT HAPPENS	WHAT TO DO
A keyboard plays nothing.	Check SETTINGS' MIDI IN CHANNEL: ALL hears every channel, a number only that one. A keyboard's DIN cable goes into the MIDI IN jack through a TRS-to-DIN adapter, of type A or B (chapter 16).
An outside knob does nothing.	Only notes, program change, bank select, pitch bend and the sustain pedal work by themselves; learn any other control onto an FM-1 control first (chapter 16).
PT/FM does not follow a sequencer's clock.	Set SETTINGS' SYNC to EXTERNAL, and let the sequencer send its clock to the FM-1, over USB or the jack (chapter 16).
CLOCK LOST	The outside clock stopped for half a second; PT/FM plays on at the last tempo. Start the clock again (chapter 16).
A computer gets no notes from the FM-1.	Set SETTINGS' MIDI OUT to KEYS or ALL; MIDI out goes over USB only (chapter 16).

D | THE INSTRUMENTS AND THE DEMO DISK

What PT/FM brings: the built-in instruments, always there, and the demo disk, which the install page uploads (chapter 2). Cartridges and songs are listed by the numbers they show on the FM-1.

The built-in instruments

Eleven synth cartridges are part of PT/FM itself, numbered F0 to FA. They are there after every install, after CLEAN INSTALL and after FACTORY RESET. Your edits of them are saved apart, and BACK TO BUILT-IN drops them (chapter 4).

NO.	CARTRIDGE	ENGINE	INSTRUMENTS	WHAT
F0	KEYS/ORGANS	DX7	32	Pianos, electric pianos, clavinet and harpsichords, organs, an accordion.
F1	BELLS/PLUCKS	DX7	32	Marimbas, vibraphones, glockenspiels, celestas, bells and chimes, plucks.
F2	GUITAR/STRGS	DX7	32	Guitars, harps, kotos, a sitar, a banjo; strings, solo and in sections.
F3	WINDS/BRASS	DX7	32	Brass, flutes and pipes, reeds and saxophones, bagpipes.
F4	PADS/CHOIRS	DX7	24	Choirs and voices, pads, an orchestra hit.
F5	LEADS/BASSES	DX7	32	Saw, square, sync and sine leads; FM, synth and acoustic basses.
F6	FM DRUM KIT	DX7	32	Kicks, snares, claps, hats, cymbals, toms and hand drums.
F7	PERC/FX	DX7	32	Percussion (triangles, whistles, agogo, surdos) and effects.
F8	JUNO-106	JUNO-106	128	Keys, organs, mallets, plucks, strings, choirs, brass, pads, stabs, leads, basses, drums, effects.
F9	CHIPTUNE	CHIP	128	The sound chips of the 8-bit era in four families (BRK, 8BIT, PSG, 16BIT): leads, echoes and keys, arpeggios and chords, basses, pads and bells, kicks and snares, hats and percussion, effects.
FA	TB-303	TB-303	64	Acid: saws, squares, squelches, basses, plucks, sweeps.

Drums, chip sounds, pads and effects all come from these engines. The demo disk's samples are only what the engines cannot make: natural instruments and real voices.

The demo disk's cartridges

NO.	CARTRIDGE	ENGINE	INSTRUMENTS	WHAT
01	DRUM KIT	sampler	10	An acoustic kit: kick, snare, hats, crash, shaker, three toms.
02	PERCUSSION	sampler	11	Wind chimes, darbuka, three congas, bongo, tabla, timpani.
03	BAND/ORCH	sampler	15	Piano, vibraphone, guitars, violins, tenor sax, flute, upright bass, and muted or short strokes of them.
04	VOICES	sampler	6	Dance shouts, a warning, a count-in.
05	BASS	sampler	4	Dubstep basses (a wobble, a "yoi" and a growl), a drum and bass bass.
06	FUSION	FUSION	6	Layered instruments, below.

The FUSION cartridge's six instruments are layers of the others (chapter 8); their patterns are E0 to E5.

■ SPACE PAD

Two pads and a deep bass on every key, a bell from C-4 up.

■ DUB CHORDS

A minor 9 chord, rolled, with a sub bass, on every key.

■ SPLIT

A held bass under C-4, a space lead from C-4 up.

■ CHIPIN

A chip arpeggio on any key in C minor pentatonic, its echo, a triangle bass on C, a blip.

■ COIN

A game's coin on any key: a square a fourth under the key for a moment, then the key's note ringing out.

■ DRUM KIT

A drum on every key from F-2 to G-8, made of the synth cartridges' drums and the DRUM KIT and PERCUSSION samplers. The kick is on C-4, with the General MIDI drum kit's order from B-3 to G-5 and hand percussion on the six keys under it; fills, rolls, a flam and a drag on the octave under; the DRUM KIT sampler's drums alone on the octave over (C the kick, D the snare, F# and A# the hats, the toms between); the TB-303's drums above that, then hand drums and chimes. Each drum rings out however short the tap.

The demo songs

Six songs, each showing one part of PT/FM in one style: six patterns of 8 bars played once (about a minute and a quarter to two minutes), then they stop.

NO.	SONG	SHOWS	STYLE
00	PUNCH IN	The effects	Dub techno into progressive house, F minor, 124 BPM: DUCK, FILTER, GATE, the punch-ins, a VINYL STOP ending.
01	SPICE ROAD	The samplers	A band in D Dorian turning to D Hijaz: tablas, flute, a tenor sax solo.

NO.	SONG	SHOWS	STYLE
02	MIDNIGHT RUN	The JUNO-106	Outrun synthwave, F# minor, 130 BPM: a galloping bass, the filter, chorus and pulse width turned by commands, a lead solo.
03	CITY LIGHTS	The DX7 cartridges	80s synthpop, D minor, 120 BPM: a sequenced FM bass, a staccato hook, brass stabs, orchestra hits.
04	ACID TEST	The TB-303	Acid techno into acid trance, A minor, 138 BPM: accents, slides, the knobs turned by commands, the DRIVE.
05	ADVENTURE	CHIPTUNE	Game music through time, 132 to 160 BPM: one theme through the eras of the sound chips, a time machine between them, coins, home again.

The DJ loops

Twelve loops for DJ's decks (chapter 10): each an 8-bar pattern that loops (DNB, ROCK, METAL and CHIP LOOP two: a verse and a bridge). All are in A minor, so any two mix in key (WORLD LOOP's flute aside: its B flat and C sharp go with the others' drums and bass, not their hooks), and at the same loudness. Each track plays one instrument, so LOOPS can load a pattern of them as loops, a loop a track (chapter 14), and every loop keeps the same tracks: 1 the kick, 2 the hats, 3 the bass, 4 the hook, then the rest. TECHNO, ACID, DISCO, DNB, ROCK and METAL LOOP start with an intro of 8 bars, played once, to mix in over the other deck.

NO.	SONG	SHOWS	STYLE
06	TRANCE LOOP	The JUNO-106	Psytrance, 140 BPM: a rolling bass after each kick, a squelching pluck.
07	BREAKS LOOP	The samplers	Breakbeat, 124 BPM: the DRUM KIT's break, a walking upright bass, a vibraphone riff.
08	TECHNO LOOP	The DX7	Techno, 126 BPM: the FM DRUM KIT, an FM bass after the kick, a pluck brightening and darkening.
09	ACID LOOP	The TB-303	Acid house, 128 BPM: a 303 line with accents and slides, its cutoff opening over four bars and closing over four.
10	DISCO LOOP	The DRUM KIT and the JUNO-106	Disco, 120 BPM: four on the floor, a funk bass in octaves, a wah clavinet.
11	CHIP LOOP	CHIPTUNE	Chiptune, 125 BPM: a verse and a bridge, chords arpeggiated on one voice.
12	HIP-HOP LOOP	SWING and LO-FI	Boom bap, 86 BPM, SWING 58 %: the DRUM KIT, an acoustic bass, an electric piano, all through the LO-FI.
13	DNB LOOP	The BASS and VOICES samplers	Drum and bass, 172 BPM: a two-step break, the DNB bass, a pad; then a bridge with the WOBBLE bass.
14	ROCK LOOP	The guitars	Rock, 126 BPM: power chords and palm mutes, a lead with bends; then a half-time bridge.
15	METAL LOOP	The guitars	Metal, 128 BPM: a double kick, a galloping riff, a tremolo-picked line; then a breakdown.

NO.	SONG	SHOWS	STYLE
16	ELECTRO LOOP	The JUNO-106's 808 sounds	Electro, 126 BPM: a broken 808 kick, a sequenced bass, a timpani figure answered by a robotic lead.
17	WORLD LOOP	The PERCUSSION sampler	World house, 120 BPM: darbuka and tabla, an upright bass, a flute melody.

Nine are at 120 to 128 BPM and TRANCE LOOP at 140. HIP-HOP LOOP at 86 BPM and DNB LOOP at 172 make a pair that SYNC matches at half or double (chapter 10).

E | SPECIFICATIONS

PT/FM on the FM-1, in figures.

Sound

Engines	DX7 (6-operator FM, 32 algorithms), JUNO-106, TB-303, CHIP (8-bit and 16-bit era sound chips), sampler, FUSION (layers of the others, played from a pattern)
Voices	16 at most (SETTINGS' VOICES: 8, 12 or 16), shared by the songs, the loops, DJ's decks and the keys; 16 with the second processor running, else 12
Instruments	Cartridges of up to 32 (DX7), 128 (JUNO-106, TB-303, CHIP) or 64 (sampler, FUSION) instruments; 11 built in (F0-FA, 568 instruments), yours numbered 00-EF
Samples	8-bit or 16-bit, stored losslessly compressed; up to 64 a sampler cartridge
Effects	GATE, FILTER, DRIVE, LO-FI, CHORUS, DELAY, REVERB, LIMITER, DUCK and the METRONOME, in a chain you order; 16 punch-in effects; a mixer of 16 tracks with three sends
Sample rate	44.1 kHz
Tuning	A4 = 430-450 Hz

Songs, patterns and loops

Patterns	Up to 240 (00-EF), each of 1-16 tracks and 1-128 rows
Songs	Up to 254 (00-FD), each of 1-256 positions
Loops	Up to 16 at once in LOOPS
DJ	Two decks, each a song
Tempo	TEMPO 3-600 (at 6 ticks a row and 4 rows a beat, the BPM)
Storage	412 KB of flash for your work and uploads (a part kept free for saving); unsaved edits in working memory until SAVE

Connections and controls

USB	MIDI in and out, class compliant; audio to the computer (UAC1, 16-bit stereo, 44.1 or 48 kHz); installs and uploads from a Chrome or Edge page
MIDI IN	TRS jack (a TRS-to-DIN adapter, type A or B, for a DIN cable)
Output	Stereo output jack (a cable in it mutes the speaker); the built-in speaker (one channel)
Display	240 x 240 colour LCD
Controls	27 keys (F to G, two octaves and a bit), 14 buttons, 7 endless knobs, MASTER
Firmware	PT/FM, installed over the FM-1's own update path; USB RESCUE (OCT- held at power-on) always there

F | MIDI IMPLEMENTATION CHART

What PT/FM sends and what it answers to. Transmitted: over USB only (the FM-1 has no MIDI OUT jack). Recognized: over USB and the MIDI IN jack alike. O yes, X no. Chapter 16 explains it all.

The chart

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS
Basic channel: default	1	ALL	Sent: MIDI OUT CHANNEL; received: MIDI IN CHANNEL
Basic channel: changed	1-16	ALL, 1-16	With MIDI OUT ALL, track 00-0F on channels 1-16 besides
Mode	Mode 3	Mode 1 (ALL), mode 3 (1-16)	
Note number	12-127	0-127	C-0 to G-9 sent. Notes past the keys' range play the current instrument
Velocity: note on	O	O	The keys send KEYS VOLUME; a track's note its volume
Velocity: note off	X	X	Sent as 8n, velocity 0
After touch: keys, channel	X	X	
Pitch bend	X	O	The keys' notes, plus or minus 2 semitones
Control change 0	X	O	Bank select: the n-th cartridge in the list, from 0
Control change 64	X	O	Sustain: holds the notes played from MIDI
Control change, others	X	O	Only once learned onto an FM-1 control
Program change	X	O	0-127: the current cartridge's n-th sound, from 0, empty slots skipped
System exclusive	O	O	PT/FM's own (manufacturer ID 7D), for its pages
Song position	O	O	Sent with CLOCK OUT ON; followed with SYNC EXTERNAL
Song select, tune request	X	X	
Clock	O	O	Sent with CLOCK OUT ON; followed with SYNC EXTERNAL
Start, stop, continue	O	O	As the clock
Local on / off, all notes off	X	X	
Active sensing, reset	X	X	

Mode 1: OMNI ON, POLY. Mode 3: OMNI OFF, POLY. Notes that came in over MIDI are never sent back out.

G | GLOSSARY

The words this manual uses, each in a line, with where it is explained.

The words

■ BPM

Beats a minute: how fast a song goes. The screens show it beside TEMPO (chapter 6).

■ Built-in

What PT/FM itself carries: the eleven synth cartridges F0 to FA. They are there after every install; your changes to them are kept apart, and BACK TO BUILT-IN drops them (chapter 4).

■ Cartridge

A bank of instruments of one kind (DX7, JUNO-106, TB-303, CHIP, sampler or FUSION), numbered 00 to FF. **[SEL]** + **[PRESETS]** picks one (chapter 8).

■ Cell

One track's place on one row: a note, its instrument, its volume and up to four commands (chapter 7).

■ Command

An instruction in a cell that changes how a note plays (a slide, a vibrato, a volume) or how the song goes (a jump, a tempo), written as a letter or sign and two digits, A04 (chapter 7).

■ Count-in

One or two bars of clicks before a take starts (chapter 7).

■ Cue point

Where a DJ deck starts from and goes back to (chapter 10).

■ Current instrument

The instrument the keys play, shown at the footer's left: PRESETS picks it (chapter 4).

■ Current song

The song at SONGS' cursor: PLAY plays it, and the EDITOR's loop plays at its tempo (chapter 6).

■ Deck

One of DJ's two players, each with a song of its own (chapter 10).

■ Edit memory

Where every change waits until SAVE writes it; switching off loses it (chapter 4).

■ FUSION

An instrument made of a pattern: each key plays one row of it, every note of that row at once (chapter 8).

■ FX setup

A song's effects: the chain's order, each effect's knobs and on/off, the mixer and the metronome. LOOPS, DJ and THE KEYS have their own (chapter 15).

■ Hex

Counting in sixteens, the way trackers number things: 00 to 09, then 0A to 0F, then 10; 7F is 127 (the conventions).

■ **Instrument**

A sound in a cartridge's slot, written 01:05 (cartridge 01, slot 05) (chapter 8).

■ **Loop**

On LOOPS, a recorded line of notes that repeats; up to 16 play together (chapter 14).

■ **Order**

The list of patterns a song plays, one after another (chapter 6).

■ **Pattern**

A grid of notes: up to 16 tracks across and 128 rows down, played from top to bottom. Songs are made of patterns (chapter 7).

■ **Position**

A place in a song's order, numbered from 00; each position plays one pattern (chapter 6).

■ **Punch-in**

An effect played live while a white key is held with FX: a stutter, a tape stop, a filter sweep (chapter 15).

■ **Row**

One step in time of a pattern, numbered in hex from 00. With 4 rows a beat, a row is a sixteenth note (chapter 6).

■ **Sample**

A recorded sound, kept in a sampler cartridge. An instrument plays it (chapter 8, chapter 17).

■ **Slot**

A cartridge's place for one instrument, numbered from 00 (chapter 8).

■ **Song**

An order of patterns with its own tempo, mixer and effects (chapter 6).

■ **Take**

A live recording in the EDITOR: the pattern plays round and round while what you play is written (chapter 7).

■ **THE KEYS**

The keys' own effects and tempo, used before anything has played and after UNLOAD SONG (chapter 15).

■ **Tick**

A row's smaller step: a row lasts TICKS A ROW ticks (6 at first), and commands such as slides act on every tick (chapter 6).

■ **Toast**

A short message in the header, for two seconds (chapter 3).

■ **Track**

A column of a pattern, numbered 00 to 0F; each plays one line of notes, and HOME's combination mutes it (chapter 4).

■ **User area**

The FM-1's memory for what you save and upload. An install never writes it (chapter 2).

■ **Voice**

One sounding note. PT/FM plays up to 16 at once (SETTINGS' VOICES, chapter 13).

LICENCES

PT/FM is free software. What it is made of, and under which licences.

PT/FM

■ PT/FM

GPL-3.0-only, copyright (C) 2026 hitosu. You may use, study, change and pass it on under the GNU General Public License, version 3; its source is public, at github.com/hitosu/ptfm. SETTINGS' ABOUT shows the same on the FM-1 (chapter 13).

■ The sound engines

Parts of the DX7 engine are under the Apache License 2.0, parts of the TB-303 engine under the MIT licence, and the JUNO-106 engine under GPL-3.0. The replay, which plays the patterns' commands, is under the BSD 3-Clause licence; its notice is below, as that licence asks.

■ The installer's update files

Three files of the chip maker JieLi's SDK go into every firmware package: Apache License 2.0.

■ Fonts

Terminus, the FM-1's screen font, and Archivo, this manual's printed font: SIL Open Font License 1.1.

The replay's notice

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The demo disk

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