Poor Man's Drum Machine Owners Manual

Firmware Users Guide
v4.1.0

Congratulations on building your own Poor Man's Drum Machine! We hope that you will enjoy it and that you will spend many musical hours with it. This Owners Manual will guide you on how to use all of the features of the firmware.

1 Main Keys

There are 16 main keys numbered 1 to 16. They have several functions:

a) They represent the sixteen steps in a pattern and are used for programming rhythms (see: 1.1 Programming notes).
b) They represent the different drum voices in the Voice Mute Mode (see 3.3 VOICE Menu), in the Tap Write Mode (see 3.4 MODE Menu), and when the SELECT Function Key is pressed (See: 2.1 Selecting a Drum Voice).
c) The main keys are used to enter numbers (see: 1.2 Entering a number using the Main Keys)

1.1 ***Programming notes***

Press a Main Key once for a note without accent. The LED will light up weak.
Press the Main Key again for a note with accent. The LED will light up bright.
Press the Main Key again to delete the note. The LED will extinguish.

1.2 Entering a number using the Main Keys

In several menu options, you will be asked to input a number. If the number you need is between 1 and 16, you can use one of the Main Keys. If the number is higher than 10, you can use two of the Main Keys (e.g. press 1 and 4 if you need 14). If you need a zero as the second digit, you can use Main Key 10 (e.g. press 2 and 10 if you need 20). Press ENTER to confirm the value you have typed.

2 Function Keys

There are eight Function Keys:

ENTER	Used to select menu items, to confirm certain actions or to enter a value.
ESC	Used to exit certain modes or menu's, or to cancel certain actions.
UP	Used to increase a value or to go to the next voice.
DOWN	Used to decrease a value or to go to the previous voice.
PATTERN UP	Go to the next pattern (if it exists). When in track editing mode: Insert a pattern.
PATTERN DOWN	Go to the previous pattern. When in track editing mode: Delete a pattern.
SELECT	a) Used to select a drum voice (see: 2.1 Selecting a drum voice). b) SELECT can be used to bypass menu items (see 3, MENU Keys) c) In the Tempo menu, SELECT can be used to switch from the "buttons adjust mode" to the "potmeter adjust mode" (see 3.4, MODE Menu). d) In the Tap Write Mode, SELECT can be used to erase (a part of) a drum voice (see 3.4,
MODE	Menu).
Start/Stop	Start or Stop the sequencer.

2.1 Selecting a drum voice

1) Press SELECT,
2) Press the desired Main Key (key 1 for bass drum, key 2 for snare drum, etc). The order and the names of the drum voices are defined in the PMDS-config.h file.
3) Alternatively, press UP or DOWN to step to the next or to the previous voice.

3 Menu keys

There are four Menu Keys that can be pressed one or more times and that will bring up four different menus. You can exit a menu by pressing ESCAPE. Press ENTER to activate a menu item, to confirm a certain action or to enter a certain value. If you are browsing in one menu and press another menu key, you will immediately go the new menu.

Table 1: different menu's and options

TRACK Menu	PATTERN Menu	VOICE Menu	Mode Menu
1) Play Track	1) Copy Pattern	1) Shuffle	1) Tempo
2) Load Track	2) Pattern Play	2) Flam	2) MIDI In
3) Clear Track	3) Shift Pattern	3) Mute Voice Mode	3) MIDI Out
4) Save Track	4) Last Step	4) Accent Lo	4) Clock Source
5) Write Track	5) Delete Pattern	5) Accent Hi	5) Tap Mode
6) Edit Track	6) Insert Pattern		6) Erase EEPROM
7) Random Track	7) Improvise		

Bypassing menu items:

In order to speed up navigating the menu's, it is possible to bypass the first three menu items of a menu. By first pressing SELECT and then pressing a Menu Key, the menu is entered at the 4th menu item. E.g. if you want to save a track, instead of pressing TRACK four times, press SELECT and then press TRACK once.

3.1 TRACK Menu

Play a track

1) Press TRACK once and press ENTER.
2) If a track has been written, the track will start to play from the beginning. When the track is finished, it will start again from the beginning.
3) You can reset a track at any moment by stopping the sequencer (START/STOP), and then pressing ENTER.

Loading a track

1) Press TRACK two times and press ENTER.
2) Enter the track number using the Main Keys,
3) Press ENTER.

Clear a track

1) Press TRACK three times and press ENTER.

Saving a track

1) Press TRACK four times (or press SELECT and press TRACK once) and press ENTER
2) Press the desired Main Key,
3) Press ENTER,
4) When asked "Overwrite File?" press the ENTER to confirm, or press ESCAPE to cancel.

Write a track

1) Press TRACK five times (or press SELECT and press TRACK two times) and press ENTER to enter the Write Track mode.
2) Using the Main Keys, select the pattern number for the first step and press ENTER.
   NB: If you pressed the wrong pattern number, press ESCAPE and correct it.
   After pressing ENTER, the step can not be changed. You have to go to Edit Track in order to edit the step.
3) Repeat step 2 until you are done.
4) Press ESCAPE and then ENTER to exit the Write Track mode.

NB if you want to add an empty pattern to a track, the only empty pattern you can add is the first unused pattern.

Edit a track

1) Press TRACK six times (or press SELECT and press TRACK three times) and press ENTER to enter the Edit Track mode.
2) Using the UP and DOWN keys, go to the step that you want to edit.
3) Using the Main Keys, select the correct pattern number and press ENTER.
4) If you want to insert a step (pattern) at a certain position, press PTRN UP and then press ENTER.
5) If you want to delete a certain step (pattern), press PTRN DOWN and then press ENTER.
6) Press ESCAPE and then press ENTER to exit the Edit Track mode.

NB if you want to change a step (pattern) into an empty pattern, the only empty pattern you can use is the first unused pattern.

Create a random track

1) Press TRACK seven times (or press SELECT and press TRACK four times) and press ENTER.
2) Using the Main Keys, enter a number between 2 and 32.
   if a low number is entered, the drum track will have many notes for all the voices.
   If a higher number is entered, there will be fewer notes and the patterns will be more easy going.
3) Press ENTER. 48 different patterns will be generated. There will be no coherence between the patterns.

NB1: Patterns are generated in a completely random way. Most of the patterns will not sound very good.

NB2: if a nice pattern is found, but it does not start at the first step of a measure, you can use “Shift Pattern” to shift the pattern up or down so that it will start at the first step.

3.2 PATTERN Menu

Copy a pattern

1) Using the PTRN UP and PTRN DOWN keys, go to the pattern that you want to copy.
2) Press PATTERN once and press ENTER.
3) Using the Main Keys, select the destination the pattern should be copied to.
4) Press ENTER.

Pattern Play

The Pattern Play mode allows you to create an improvised drum track by selecting different patterns on the fly.

1) Press PATTERN twice and press ENTER to go into Pattern Play mode
2) Using the Main Keys, select the pattern that has to be played after the current pattern and press ENTER.
   The new pattern will be played after the current patterns has finished
3) Alternatively, PTRN UP and PTRN DOWN can be used to switch to the next or to the previous patterns.
   The new patterns will be played instantly.
4) To exit Pattern Play mode, press ESCAPE and press ENTER.

NB if you want to play an empty pattern during Pattern Play, the only empty pattern you can play is the first unused pattern.

Shift Pattern

Shifting one or more patterns can be needed if random patterns have been created. Sometimes, a nice rhythm can be heard in a random pattern, but it does not start at the first step of the measure. In these cases, all the notes in a pattern can be shifted up or down one or more steps.

1) Listen carefully to the pattern and look at the LEDs. Determine how much steps the pattern has to be shifted up or down.
2) If there are no notes in the currently selected voice, select another voice that has one or more notes (necessary for step 4).
3) Press PATTERN three times and press ENTER
4) By looking at the LEDs and using the UP or DOWN keys, shift the pattern up or down one or more steps.
5) When done, press ESCAPE and then press ENTER.

Last Step

1) Press PATTERN four times (or press SELECT and press PATTERN once) and press ENTER.
2) Using the Main Keys, select the desired pattern length and press ENTER.

NB: alle the patterns higher than the deleted pattern will be shifted downwards.

Insert Pattern

1) Using the UP and DOWN keys, go to the position where you want to insert a new pattern.
2) Press PATTERN five times (or press SELECT and press PATTERN two times) and press ENTER.

A new empty pattern will be created. All the existing patterns from that position and up will be shifted up. The 48th pattern (if it existed) will disappear.

Delete Pattern

1) Using the UP and DOWN keys, go to the pattern that you want to delete.
2) Press PATTERN six times (or press SELECT and press PATTERN three times) and press ENTER.

Improvise

Improvise allows you to randomly add or remove notes from a certain pattern. The result might not always be desired.

1) Using UP and DOWN, go to the desired pattern.
2) press PATTERN seven times (or press SELECT and press PATTERN four times) and press ENTER.
3) Using the Main Keys, enter a number between 2 and 32.
   if a low number is entered, many notes will be added to / removed from the pattern
   If a higher number is entered, fewer notes will be added / removed, keeping the changes small.
4) Press ENTER.

3.3 VOICE Menu

Shuffle

1) Select the voice for which you want to adjust shuffle.
2) Press VOICE once.
3) Using UP or DOWN, select the desired amount of shuffle.

NB: When shuffle is set to maximal (10), all the even notes are postponed a 32th note.

Flam

1) Select the voice for which you want to adjust flam.
2) Press VOICE twice.
3) Using UP or DOWN, select the desired amount of flam.
4) Press ENTER to enter the Add Flam mode. Now you can add flam to certain notes of the selected voice by pressing the Main Keys. When done, press escape to return to the normal rhythm programming mode. If you want to remove flam from a note, you can do it here.

NB: When flam is set to maximal (10), a flammed note is repeated after a 32th note.

Voice Mute Mode

Voice Mute mode allows you to mute and unmute voices on the fly, making it possible to add variation and improvisation as you go.

1) Press VOICE three times and press ENTER. The "=> " indicator (left top of the LCD screen) will change to "m>" to indicate that the Voice Mute Mode is activated. In this mode, the sixteen LEDs on the main keys are no longer used to indicate the drum notes of the different voices, nor the step position of the sequencer. Instead, the LEDs are used to indicate which voices are muted or un-muted. If 11 voices are defined in the PMDS-config.h file, the first 11 LEDs will light up, the rest of the LEDs will be off.
2) Press a voice number to mute or unmute it. If the corresponding LED is on, the voice is un-muted. If the LED is off, the voice is muted.
3) To exit Voice Mute Mode, press VOICE once and press ENTER.

NB: Most menu items are accessible in the Voice Mute Mode, however, it is not possible to edit rhytm patterns. Upon exiting the Voice Mute Mode, the settings remain active (e.g. mutes voices remain muted). When a new track is started (using TRACK > Clear) or when a new track is loaded, all the voices will be un-muted.

Low Accent

1) Select the voice for which you want to adjust Low Accent.
2) Press VOICE four times (or press SELECT and press VOICE once).
3) Using UP or DOWN, select the desired amount of Low Accent.

The Low Accent for a voice can not be higher or equal to the High Accent for that voice.

High Accent

1) Select the voice for which you want to adjust High Accent.
2) Press VOICE five times (or press SELECT and press VOICE two times).
3) Using UP or DOWN, select the desired amount of High Accent.

The High Accent for a voice can not be lower or equal to the Low Accentf or that voice.

NB: If you are in the VOICE menu adjusting a certain value for a certain voice, you can switch to another voice (using SELECT) while staying in the VOICE menu.

3.4 MODE Menu

Tempo

There are two ways to adjust the tempo when using the Internal Clock source:

a) with the UP and DOWN buttons, b) with the Tempo potmeter.

1) Press MODE once. The tempo will be indicated in BPM.
2) Using UP or DOWN, increase or decrease the tempo. Using the buttons, the tempo can be adjusted from 15 BPM to 500 BPM.
3) Press SELECT to switch to the "potmeter adjust mode". A "@" sign will appear in the LCD screen to indicate that the speed can now be adjusted with the Tempo potmeter (UP and DOWN will not work in this mode). Using the potmeter, the tempo can be adjusted from ~80 BPM to ~200 BPM. If desired, press SELECT again to return to the "buttons adjust mode".

In the "potmeter adjust mode", the tempo can be adjusted any time during the operation of the PMDS, in the "buttons adjust mode", the tempo can only be adjusted in the MODE menu. When switching to "potmeter adjust mode", the tempo will instantly change to the tempo dictated by the potmeter. When switching back to the "buttons adjust mode" the tempo remains at the tempo dictated by the potmeter until the buttons are pressed. When a track is saved, the tempo settings are also saved. When a new track is loaded, it's tempo settings are also loaded, provided that the Internal Clock is used, and that the "buttons adjust mode" is used. By default, new tracks will have a tempo of 120 BPM.

MIDI In (only tested with Ableton Live)

1: Syncing the PMDS to a DAW

Connect the MIDI In on the PMDS to the MIDI Out on your audio interface using a MIDI cable. As the clock source, select MIDI/LFO (see below).

2: Play a rhythm track that was programmed in a DAW

Connect the MIDI In on the PMDS to the MIDI Out on your audio interface using a MIDI cable. See the documentation of your DAW on how to set up your sound interface to process MIDI. In your DAW, send the MIDI drum data to channel 1. As the clock source, select MIDI/LFO (see below). Press MODE two times and press ENTER. Press the 'play' button in your DAW and the PMDS will start to play the MIDI drum track from your DAW.
NB: The MIDI file has to follow the general MIDI percussion key map (see Table 2).
Press ESCAPE and ENTER to exit the MIDI in mode.

MIDI out (only tested with Ableton Live)

1: Using the PMDS as a master

Connect the MIDI Out on the PMDS to the MIDI In on your audio interface using a MIDI cable. See the documentation of your DAW on how to set it up to receive an external MIDI clock.

2: Exporting a drum track as a MIDI file

Before a drum track can be exported, a drum track has to be written (see: Write Track).

1) Connect the MIDI Out on the PMDS to the MIDI In on your audio interface using a MIDI cable. See the documentation of your DAW on how to set up your sound interface to process MIDI. Open a new project, create a MIDI track and set MIDI channel to 1.
2) Set the tempo in your DAW to the same tempo of the PMDS (BPM value)
3) On the PMDS, use the Internal Clock as the clock source
4) Stop the PMDS from running by pressing START/STOP
5) Press MODE three times and press ENTER (to enter MIDI Out mode)
6) Start recording in your DAW. Use the metronome, and listen carefully.
7) Start the PMDS by pressing START/STOP at the right moment (at the beginning of a measure).
8) The track will be played and will appear in your DAW as a MIDI track (you will hear no sound). When the track is finished, it will start over again (watch the LCD screen of the PMDS to monitor the track). Stop recording in your DAW when you are finished. Press ESCAPE and ENTER to exit MIDI Out mode.

NB: The track will not be perfectly in sync with the MIDI clock from your DAW. It might be needed to manipulate the track by hand to achieve this (a.o. shift the track to the left or right).

Select Clock Source

1) Press MODE four times (or press SELECT and press MODE once) and press ENTER.
2) Using UP or DOWN, select between either LFO/MIDI or Internal Clock
3) Press ENTER to confirm

Erase EEPROM

1) Press MODE five times (or press SELECT and press MODE two times) and press ENTER.
2) Press ENTER again to confirm

NB: only the first 64 bytes of the EEPROM will be erased.
NB2: If you accidentally erased the EEPROM, you can 'un-erase' the EEPROM by editing the firmware. Look for the section "Erase EEPROM" in the firmware and follow the instructions. Edit the code, upload it to the Arduino, choose "Erase EEPROM" again, and the tracks will be un-erased. Be sure to not save new tracks to the EEPROM before you do so. Change the code back to the original if desired.

Tap Write

1) Press MODE five times (or press SELECT and press MODE two times) and press ENTER. The "=> " indicator (left top of the LCD screen) will change to "t>" to indicate that the Tap Write Mode is activated.
2) a metronome sound (Rim Shot) will sound on step 1, 5, 9 and 13.
3) Tap a rhythm by pressing the different voice buttons at the right moment. Press the first main button for a bass

drum sound, press the second button for a snare drum sound, and so on.

4) In the Tap Write Mode, some or all of the notes of a specific voice can be erased. Press SELECT to enter the voice erasing mode, and then press the voice button from wich you want to erase notes. Keep on pressing the voice button until all the notes are erased. Press ESCAPE to exit the voice erasing mode.
5) if the Tap Write Mode is used in combination with an external clock, the external clock signal should have a duty cycle of ~50%.

4 Other features

Clock the PMDS with an LFO

The PMDS can be clocked with an external LFO by plugging a LFO to the External Clock input. As the Clock Source, select: LFO / MIDI.

NB: When using an external LFO as the clock source and when increasing or decreasing the speed, flam and shuffle will not sound accurate for one or two measures. Flam and shuffle timings are dependend on the clock speed, and just after altering the external clock speed, the sequencer has no way of knowing what the timing should be.

External Reset

The PMDS can be reset with an external gate signal / LFO. If you are using the PMDS as a MIDI master, the slave devices will be reset also.

Table 2: general MIDI percussion key map

Voice nr	Voice	Note	Key nr
1	Bass drum	C1	36
2	Snare drum	D1	38
3	Low tom	A1	45
4	Mid tom	B1	47
5	High tom	D2	50
6	Rim shot	A0	33
7	Hand clap	D#1	39
8	Open hihat	A#1	46
9	Closed hihat	F#1	42
10	Ride cymbal	D#2	51
11	Crash cymbal	C#2	49
12	Cow bell	G#2	56
13	Clave	D#4	75
14	Tambourine	F#2	54
15	Guiro	C#4	73
16	Maracas	A#3	70

NB: If desired, this map can be edited in the firmware. Be sure to edit the MIDI keys numbers in both the General_MIDI_Drum_Map() function and in the MIDI_Out() function.