

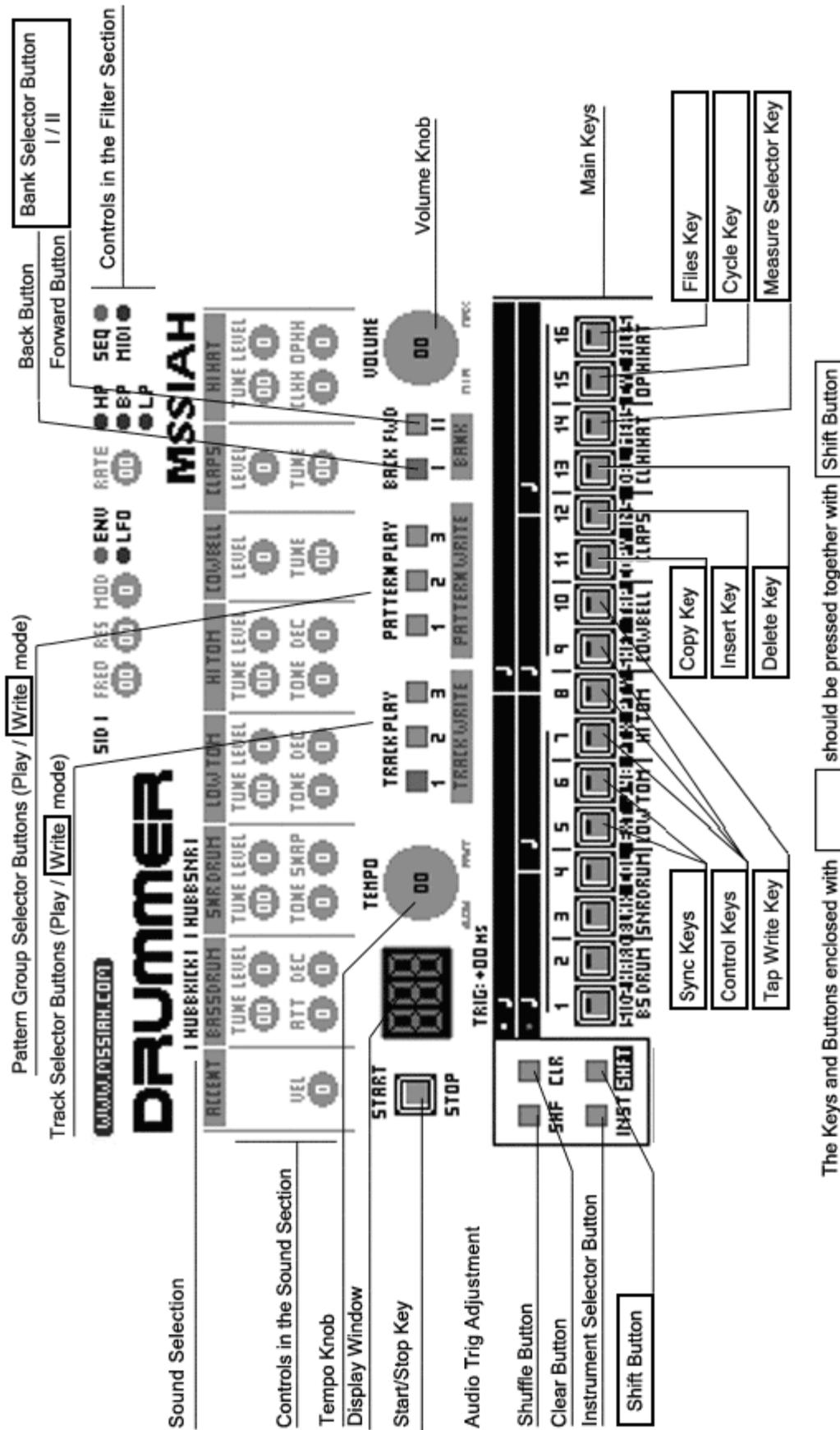
MSSIAH

MIDI SID SOFTWARE

Drummer

Panel Description.....	4
Introduction.....	5
Using the Drummer.....	6
Starting Up.....	6
User Controls.....	6
Controls in the Sound Section.....	7
Select Bass Drum / Snare Drum.....	7
Filter Mode.....	8
Voice Mapping.....	8
Track vs. Pattern Modes.....	8
Manual Play.....	9
MIDI Playing.....	9
Saving Sound Control Settings.....	9
MIDI Mode.....	10
MIDI Channel.....	10
Velocity Sensitivity.....	10
Pre-trig Audio.....	10
External Sync.....	10
Voice and Filter Mapping in MIDI.....	10
Playing MIDI Notes.....	11
Initialize Envelopes.....	11
Using the Filter via MIDI.....	11
Using the Filter.....	12
Activating the Filter.....	12
Filter Map.....	12
Filter Settings.....	13
Trig Envelope.....	13
Pattern Write and Play.....	14
Step Write.....	14
Selecting Sound Source.....	14
Rhythm Chart.....	15
How the Main Keys work in writing.....	15
Some more useful information for Pattern Write.....	16
Memory Map.....	16
Selecting Bank.....	16
Tap Write.....	16
Pattern Play.....	17
Clear Pattern.....	17
Copy Pattern.....	17
Track Program and Play.....	18
Track Program.....	18
Track Play.....	18
Cycle.....	18
Jump to Measure.....	19
Editing Rhythm Tracks.....	19
Delete Measure.....	19
Insert Measure.....	20
Clear Track.....	20
Files.....	21

Media.....	21
Opening the Demo Files.....	22
Save Project.....	23
Open Project.....	24
Export Pattern.....	25
Import Pattern.....	26
Other Functions.....	28
Shuffle.....	28
Synchronization.....	28
48 tics.....	29
Trig Delay.....	29
SID #2.....	31
Voice / Filter Map.....	31
Hard Restart.....	32
Blank Screen.....	32
Change Background Color.....	33
New (Initialize).....	33
Quit.....	33
Keyboard Overlay.....	35
Key Map.....	36
MIDI Implementation Chart.....	39
MIDI Controller List.....	41



Introduction

The MSSIAH Drummer is a software drum machine for the Commodore 64. It aims to bring back the unforgettable wave-table drums from the C64 heydays.

Wrapped up in a user environment that closely resembles the famous Roland TR-909 drum machine MSSIAH Drummer provides easy access to the old sounds and a way of tweaking them in a familiar environment.

You can use the internal sequencer and hammer away some pumping beats with *that* Commodore sound in a matter of minutes, or hook it up to a MIDI sequencer or keyboard and fire away the drum sounds in your MIDI studio.

What is a Wave-Table Sound?

Wave-table sounds are generated by rapid changes of waveform and frequency about every 20 milliseconds. The changes are loaded from a predefined list (aka table) and produce a quite unique result that does not really compare to any other synthesized sound.

During the first years of game music the drum sounds, if any, were simple snare drums created by a noise waveform. In 1986-87 wave-table sounds began to emerge and titles such as *Ace 2* and *Mega Apocalypse* featured music (both composed by Mr. Rob Hubbard) that set a new standard with a much more authentic drum sound. And ever since, wave-table techniques were used for chords, drums and sound effects in C64 music.

However, the classic art of creating synthesized drums does not involve wave-tables. The “real” way of getting the correct timbres is by combining multiple oscillators with different waveforms and separate filters. Having a glance in the service manuals for some of the old classic drum machines one quickly understands why C64 sounds could not have been made the same way. Game music back in the day was limited to the three oscillators of the SID chip and musicians just had to find another way. You couldn’t very likely occupy the whole chip with drums playing polyphonic music at the same time so wave-tables became somewhat of a compromise.

Though MSSIAH Drummer uses the same technique to create the drum sounds, it does not compromise with polyphony. Each sound occupies one oscillator only and the rest are free for other drum sounds. In practice that makes a three (or six) voice polyphonic SID drum machine! To top it off a little more Drummer also utilizes filters whether you want a low pass envelope on a bass drum or slowly sweep the hihats in time with the music.

This manual covers all the things you need to know to operate the MSSIAH Drummer.

Using the Drummer

Starting Up

To start the Drummer, select *Drummer* in the startup menu and press return. The program loads from the cartridge and starts up within 5 seconds.



Note:

The user is strongly advised to carefully read the instructions on how to properly handle the cartridge in the booklet *MSSIAH - Getting Started* available for download on our site at <http://www.mssiah.com>

User Controls

The Drummer has a set of tone control knobs in the upper part of the screen. Those are accessed via direct keys all assigned to a specific knob.

On the lower part of the screen there are sixteen buttons called the *Main Keys* that are used for creating and editing patterns as well as selecting/playing each of the eight instruments.

To control the Drummer you can use either a joystick (default) or a potentiometer plugged into controller port #2. You will need to manually change this main control as the software cannot auto-detect the device that is currently connected.

- Press and hold the Shift button (**LEFT SHIFT** key on C64)
- Press Main Key 7 (**6** key) to select potentiometer X or
- Press Main Key 8 (**7** key) to select potentiometer Y

There are two potentiometer connections for each port named X and Y.

To revert to joystick control, deselect any potentiometer options with Main Key 7 or 8.

If you wish to protect the knobs from unintentional turning you can make the **RIGHT SHIFT** key operate as a trigger when potentiometer is the active control.

- Press and hold the Shift button (**LEFT SHIFT** key)
- Press Main Key 9 (**8** key).

Now the potentiometer does not have any effect until the **RIGHT SHIFT** key is depressed.

Note: Potentiometers do not work in MIDI mode.

Controls in the Sound Section

Each drum sound (*instrument*) has a set of controls to shape its sound and to set the level, tuning and decay. The controls are accessed via quick keys on the C64's keyboard:

CTRL	Accent level
Q W A S	Sound controls for the Bass drum
E R D F	Sound controls for the Snare drum
T Y G H	Sound controls for the Low Tom
U I J K	Sound controls for the Hi Tom
O L	Sound controls for the Cowbell
P :	Sound controls for the Hand Clap
@ * ; =	Sound controls for the Hi hat
↑	Main volume level
C	Tempo (Internal Clock)
V	Switch to Filter keys

Level controls are provided for every instrument to control tune and volume.

[BASS DRUM]

- **Attack**
controls the attack sound.
- **Decay**
adjusts the decay time.

[SNARE DRUM]

- **Tone**
changes the timbre of the sound.
- **Snap**
sets the amount of snappiness for the snare drum.

[LOW TOM/HI TOM]

- **Tone**
sets the timbre of the tom sound.
- **Decay**
adjusts the decay time.

[HI-HAT]

- **CLHH / OPHH**
sets the decay for closed and open hihat respectively.

Select Bass Drum / Snare Drum

To further enhance your SID drum-kit you can change the bass drum and snare drum to any of eight sounds.

- Use **F1 / F2** key to select bass drum.
- Use **F3 / F4** key to select snare drum.

The sounds available are:

Bass drums	Snare drums
HubbKick1	HubbSnare1
HubbKick2	HubbSnare2
GrayKick1	GraySnare1
GrayKick2	GraySnare2
PopKick	PopSnare
HardKick	HardSnare
SoftKick1	SoftSnare1
SoftKick2	SoftSnare2

Filter Mode

Drummer has a set of controls that affects filter settings and filter modulations to further shape the drum sound.

Q	Select SID1 SID2 or BOTH for edits
W	Cutoff Frequency
E	Resonance
R	Modulation
T	Modulation Source ENV / LFO
Y	Rate
U	High pass filter
I	Band pass filter
O	Low pass filter
V	Switch back to Sound Controls

Voice Mapping

When using MIDI or a second SID to enhance the polyphony Drummer uses a voice map where each instrument is mapped to its own oscillator. That way you can decide for yourself which sounds that share the same ‘voice’.

Playing the Drummer’s internal sequencer or keyboard without a second SID handles polyphony automatically thus ignores the voice map.

Track vs. Pattern Modes

The MSSIAH Drummer sequencer works pretty much in the same way as the Roland TR-909. There are two (four actually) modes in which to operate: Pattern Write/Play mode and Track Write/Play mode.

Patterns are the building blocks of a song. Created and edited in Pattern Write mode, they are later assembled to a full song in Track Write mode and played back in the Track Play mode. You are not forced to work this way though, you can put the Drummer in Pattern Play mode and manually change the patterns live.

Pattern Play mode also utilizes block play (i.e., *Chain Play* in Mono Synthesizer/Bassline applications) to play consecutive sequences of patterns.

Manual Play

Hitting the Main Keys in Track Play mode triggers the instruments in real time. You can play three at a time polyphonically even as the track is being played back. Manual play works in Track Play mode only (default at startup).

The Main Keys are accessed with the 16 keys at the top of the C64 keyboard, that is: ←, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, +, -, £, CLR/HOME, INST/DEL.

Note:

Tips! The key **1** on the C64 keyboard is not the same as Main Key **1** so things can get a bit tricky when editing. To overcome this, check out the keyboard overlay found in the back of this manual.

Place it on top of the C64 keyboard and you will get a quick overview of the Main Key functions. That will prevent confusion and errors when accessing functions or selecting patterns and instruments.

MIDI Playing

Drummer has a MIDI mode that blanks out the screen and dedicates itself completely to MIDI input. That way you can play the sounds from a MIDI keyboard and send controller messages to alter all the sound and filter controls.

Polyphony in MIDI mode is handled by the voice map so before playing the Drummer via MIDI you need to set it up.

To enter MIDI mode, press **RIGHT SHIFT** key and then **F5**. You can only enter MIDI mode while in Track Play mode.

Saving Sound Control Settings

Drummer, like the Mono Synthesizer application, is capable of saving all the sound controls in between sessions and even when the computer is turned off.

To save your data when turning off the C64 you must use the startup menu and select to *Shut Down Computer*. Answer *Yes* if you wish to save your changes and the sound controls for Drummer and Mono Synthesizer as well as MIDI receive channels and pitch bend ranges are saved in the MSSIAH Cartridge's internal memory.

If you haven't made any changes or wish not to save, simply answer *No*.

MIDI Mode

MIDI mode runs with SID2 settings only regardless if you have a second SID installed or not. That means you will need to define the voice map before entering MIDI mode.

MIDI mode is activated by pressing **RIGHT SHIFT** key and then **F5** key. To exit MIDI mode press the **RUN/STOP** key. You cannot enter MIDI mode while in Track Write, Pattern Write or Pattern Play mode.

The settings for MIDI mode reside on the Setup/Files screen:



MIDI Channel

Select MIDI channel 1-16. You can also turn it off (displayed with two dashes - -) but you will not need it since MIDI is not activated when not running in MIDI mode anyway.

The MIDI receive channel that you define here is also the same channel used when synchronization is set to MIDI+PSEL (more on that in the *Other Functions* chapter).

Velocity Sensitivity

This setting controls the velocity sensitivity when playing the Drummer via MIDI. If you don't want to play instruments at different volumes simply turn it off by setting sensitivity to zero.

This parameter is the same one as the *Accent* setting on the Main Screen, changing one will also change the other. Of course Accent is a feature on the internal sequencer only.

Pre-trig Audio

Here is the flipside of triggering wave-table sounds via MIDI. Later in this manual you will learn about pre-trig settings for the internal sequencer. That is because wave-table sounds often starts with a noise waveform that messes up the SID oscillators. If you intend to play the sounds from the Drummer live on a MIDI keyboard you will most likely need the pre-trig audio setting set to *ON*. It's important to know that this will delay the sound with a couple of milliseconds. When playing live it's easy to correct that delay, frankly you will probably not even notice it. Your body and musical senses will automatically take care of it.

When playing the Drummer from a MIDI sequencer you will immediately see that the sound is off beat when pre-trig is present.

You have two choices from here: Either you leave pre-trig on and adjust the drummer sequences to start some milliseconds ahead of the others, or you turn it off and rely on envelope init (hard restarts) instead.

Try playing with and without this setting and you will both see and hear the difference yourself.

External Sync

This setting controls the synchronization source for Drummer's external synchronization mode. Read more about external synchronization in the *Other Functions* chapter.

Voice and Filter Mapping in MIDI

The Voice and Filter map is fully covered in the *Other Functions* chapter later in this manual. It's important to know that Drummer has several ways of handling polyphony:

- Internal playing, 1 SID = Automatic voice assignment
- Internal playing, 2 SIDs = Voice map
- MIDI playing, 1 or 2 SIDs = Voice map

So when using MIDI you really need to set the voice map so that each instrument is assigned a SID oscillator manually. If you have only got one SID in your C64 then assign the instruments to oscillators on SID #1 only.

Playing MIDI Notes

Drummer responds to a key map of MIDI notes in between C_1 and $A\#_1$.

This means that note number 36 corresponds to the bass drum, note number 38 is the snare drum etc. In the MIDI implementation in the back of this manual you will find a graphic overview of the key map used.

Initialize Envelopes

MIDI mode has a very convenient way of handling envelope init (aka “hard restarts”).

Playing the Drummer via MIDI one octave up triggers the instruments initialization procedure instead of the sound itself. This makes it really simple to sequence envelope init for Drummer beats.

One great idea is to copy all of the sequences that play Drummer MIDI note data (not controller data) onto new tracks as alias sequences or “ghosts” or whatever your Sequencer calls it. Then transpose the whole block one octave up and make sure the Sequencer plays it 33 milliseconds ahead of the real Drummer sequencer blocks!

The reason to use “alias” or “ghost” copies is that when you make a change in the original sequences the ghosts will follow too.

It is quite possible to play an init live on a MIDI keyboard too but you would have to be pretty fast to cut it... (Some people actually take that as a challenge...)

Using the Filter via MIDI

The filter will follow the normal settings even when playing MIDI data except for triggering envelopes. If you have set the filter envelope trigger to “EXT” then the key A_1 will trigger the filter envelope for SID #1 and the key B_1 will trigger the filter envelope for SID #2.

That way you can fully control the envelope triggers without sacrificing an instrument.

Using the Filter

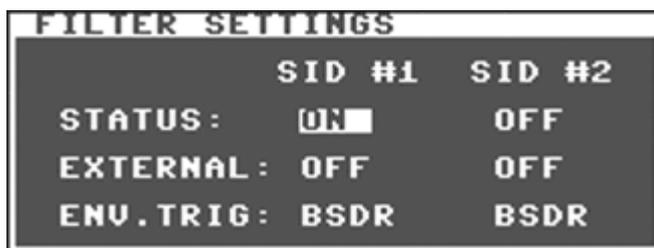
The filter section on top of the screen controls the filter settings.

Filter effects are applied to each SID separately. That means you can have different settings for voice 1-3 and 4-6. If you do not want the filter at all or only on one SID you simply turn off the one(s) you don't want to use.

Activating the Filter

First thing to do is to activate the filter. This is done for SID #1 and SID #2 separately in the filter menu.

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key) to enter the Files screen.
- Select the *Filter* item in the *SETTINGS* menu.



Use the **RETURN** key to turn the filter On or Off with the *Status* parameter.

The second parameter, *External*, lets you enable an external input signal to the SID filter. If you do not want to feed the SID with an external signal simply leave it Off.

Filter Map

If you are using two SID chips or intend to run MIDI you will need to set the filter map. The filter map is right below the voice map.

- Enter the Files screen
- Select the Voice Map item in the SETTINGS menu



Use the **SPACE** key to toggle the filter on/off for each voice. The number in the bottom indicates which SID the voice belongs to.

The filter map is only applied when SID2 is activated. With only one SID, all voices get filtered.

Filter Settings

The filter controls on top of the screen are as follows, from the left:



Control to edit

Select if you want your edits to affect the filter settings for SID1, SID2 or both. For example, if you select SID1 and turn the cutoff knob only SID1's cutoff setting is affected. If you select Both, both the cutoff settings for SID1 and SID2 will change accordingly.

Cutoff frequency

Alter the cutoff frequency. This parameter also serves as reference point for filter modulation.

Resonance

The filter resonance

Modulation

Set the depth for filter modulation, i.e., output from LFO or Envelope.

Modulation source

Select whether to use Envelope or LFO for modulation.

Modulation rate

If you chose ENV for modulation this parameter shows the envelope decay rate (higher values equal faster decay). If LFO is chosen it shows the LFO rate instead. LFO rate is synchronized to the clock signal (internal or MIDI) and shows the time period for a full LFO cycle.

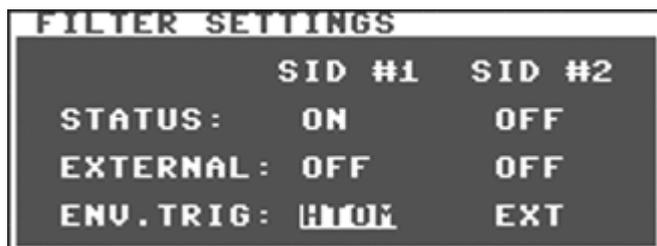
Filter type

Select whether to use High pass, Band pass, Low pass or a mix of the three options.

Trig Envelope

When using filter envelope you need a trig source. That means you define an instrument that as soon as it is being played also triggers the filter envelope. If using the envelope to add tonal shape to a specific drum sound it's probably a good idea to use the same instrument as envelope trigger. If not, using different instruments can bring out cool rhythmic filter effects. You can even set a pre-defined MIDI key to trigger the envelope.

The envelope trig setting is on the same window as the filter on/off settings.



Use **RETURN** key to advance the value for Env.Trig on each SID separately. You can choose any of the instruments or *EXT* that means external MIDI key (see *MIDI implementation*)

Pattern Write and Play

The following three chapters explain how to use the Drummer's internal sequencer. If you are only interested in using the program with MIDI you can skip these chapters.

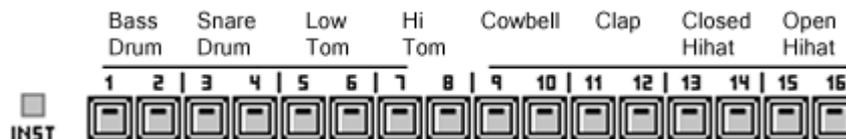
There are two methods of writing: Step Write and Tap Write.

Step Write

To write a pattern Drummer must be in Pattern Write mode.

- To enter Pattern Write mode, press the Shift Button (**LEFT SHIFT** key) together with any of the Pattern Group Selector buttons (, / keys) that represent the group with the pattern to edit (users familiar with the TR-909 might notice that Pattern Write mode is immediately entered without flashing any Pattern Group Selector).
The latest pattern or block of patterns is always preselected (Pattern number 1 at startup).
- If the wrong pattern is selected, press the corresponding Main Key for the correct pattern, e.g. to edit pattern 5, press Main Key 5.
- Press Start/Stop key (**RUN/STOP** key) to start playing. The Main Key indicators flash from left to right (1 to 16) and Drummer is ready to accept pattern data. (Patterns can only be written when Drummer is running)
- Select a sound source (read below).
- Enter the instrument's notes in the correct positions within the pattern according to the rhythm chart (read below).

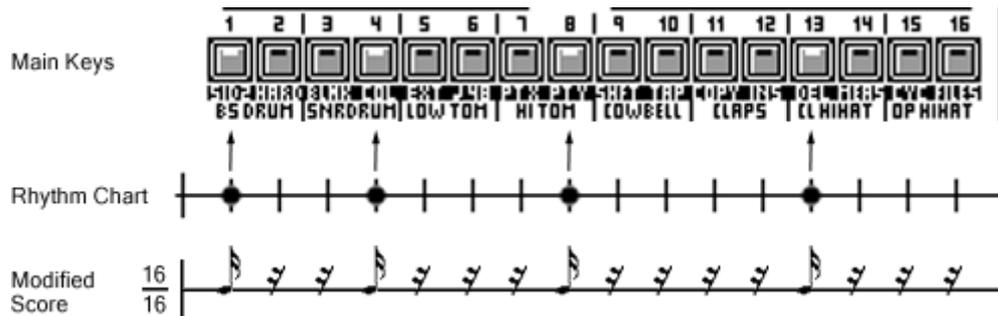
Selecting Sound Source



Pattern data is entered one instrument at a time.

- To select instrument press the Inst button (**COMMODORE** key).
The indicator flashing from left to right pauses and Drummer shows the currently selected instrument.
- To change instrument, keep Inst button down and press the Main Key for the new instrument.
Any of the two keys for an instrument can be used to select it even though they display different colors (While this mattered on the TR-909, it does not on the Drummer).

Rhythm Chart



As illustrated in the chart above, each Main Key represents a sixteenth note in the pattern. For example:

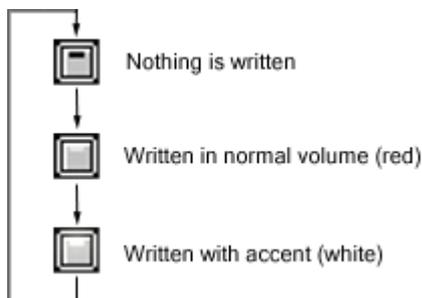
- To make the bass drum play every beat, press Main Key 1, 5, 9 and 13 (←, 4, 8, - keys).
- To make the snare drum play every other beat, press Main Key 5 and 13 (4, - keys)

Drummer stores all the instruments entered into a pattern. When playing though, the number of simultaneously played instruments depends on whether you have one or two SIDs present in the computer. One SID only provides three-voice polyphony whereas a second SID adds another three voices allowing six instruments to play at the same time.

Priority is given the leftmost sound on the main keys when running only one SID. Using two SIDs, every instrument is locked to a dedicated oscillator on the Voice Map. You can customize the Voice Map yourself.

How the Main Keys work in writing

Press a Main Key and the indicator changes as shown below.

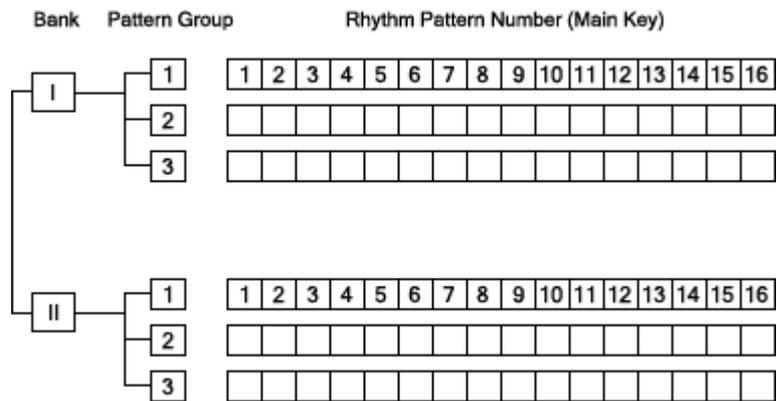


- To enter an instrument's note without accent, press the Main Key once.
- To enter an instrument's note with accent, press the Main Key twice.
- To cancel an instrument's note press the Main Key until the indicator goes out.

All notes for the selected instrument within a pattern can be deleted at once by pressing the Clear button (X key) while Drummer is running in Pattern Write mode.

Some more useful information for Pattern Write

Memory Map



Each bank holds 3 pattern groups with 16 patterns and 3 tracks giving a total of 48x2 patterns and 6 tracks.

Selecting Bank

As opposed to the TR-909 you can switch banks in Pattern Mode. However, Drummer tracks will not accept patterns from bank II if the track reside in bank I and vice versa.

Tap Write

Instead of step writing notes into a pattern it is possible to play it real time on the Main Keys while Drummer is running in Pattern Write mode:

- Press Shift button together with Main Key 10 (9 key) to activate Tap Write mode. With a SID 6581 installed you will hear a guiding metronome sound in quarter note intervals. The 8580 SID is incapable of reproducing this metronome sound.
- Play along the guiding sound using the Main Keys. The instrument's left Main Key records the sound with an accent whereas the right one does not.
- To cancel accidentally written data, hold the Clear button (X key) while playing the note at the same position once again.
- Selecting and viewing instruments does not affect the tap writing.
- Tapping multiple sounds by holding down several Main Keys at the same time is not possible.

Pattern Play

In Pattern Play mode you can play patterns one after the other or any number of consecutive patterns automatically (block play).

- Press any of the Pattern Group selector buttons (, . / keys) to enter Pattern Play mode.
- Press the desired pattern's Main Key and then start the sequencer with the Start / Stop button (**RUN/STOP** key) or start the external sequencer if Drummer is in external clock mode. The indicator flashes from left to right as the pattern plays.
- Press a Main Key to switch pattern. Drummer plays the new pattern when the current one is finished, i.e., in the following measure.
- To play several patterns in a row (*Block Play*), press the Main Key for the first and last pattern at the same time. The selected patterns are indicated with red color and the active pattern currently playing, in white color.
- Block Play works in Pattern Write mode also (select the patterns when not running). The current pattern playing is always the one being edited. Drummer automatically updates the visual Main Key rhythm chart.

Clear Pattern

Simultaneously pressing the Clear button (**X** key) and a Main Key erase the pattern from memory (both in Pattern Play and Pattern Write mode).

Note:

Caution! There is no yes/no confirmation when clearing patterns!

Copy Pattern

You can copy a pattern from one to another even if they are not in the same bank:

- Select the destination pattern (current pattern selected).
- Press and hold the Shift button (**LEFT SHIFT** key).
Do not release the Shift button until the whole copy is finished unless you want to cancel the operation.
- Press the Copy key, Main Key 11 (**0** key). Copy mode is now active.
- Use the Bank buttons (**CRSR** keys), the Pattern Group selector buttons (, . - keys) and the Main Keys to select a source pattern.
- Press **RETURN** key to confirm the copy or release the Shift button at any time to cancel.

Track Program and Play

Track Program

A track (song) is a sequence of patterns put together. The track and its patterns must be in the same bank.

If you are familiar with the Roland TR-909 you will notice that the process of track writing on the Drummer is slightly different.

- To edit a track, enter Track Write mode by pressing Shift button (**LEFT SHIFT** key) and any of the Track Selector buttons (**B N M** keys)
- Use Main Keys and Pattern Group Selector buttons (, . / key) to select the current measure's pattern. At start up, all the tracks consist of 1 measure containing pattern 1 from group 1.
- To advance measure, press the **RETURN** key. This adds a new measure to the track. You will see this in the display window showing the current measure.
- Press Start / Stop key (**RUN/STOP** key) at any time to listen to the pattern. The track does not advance measure from here. It just keeps playing the same one. This simplifies hearing the edits or identifying the pattern you just wrote into the measure.
- To exit Pattern Write mode, first stop the sequencer if it's running and then press any of the Track Selector buttons (**B N M** keys) to enter Track Play mode. It is not possible to directly jump to Pattern Write or Pattern Play mode from here.

Note:

Important! MSSIAH Drummer does not store a pattern into the track's current measure until you change or advance the current position in some way. On the last measure, use **CRSR LEFT** key to step backwards before exiting Track Write mode. If not, the default pattern will be stored in that position.

A Drummer track can have a total of 255 measures numbered 1 to 256.

Track Play

Tracks are played back in Track Play mode. Any of the Track Selector buttons (**B N M** keys) will enter Track Play mode and set the current position to measure no. 1. Playing always starts at the current position. To play from the beginning, press the Track Selector button again to reset the track's position to 1.

Cycle

When a track is done playing it either starts over from the first measure or stops playing completely. Default is to loop (*Cycle*). Pressing Shift button and Main Key 15 (**CLR/HOME** key) toggles Cycle mode on/off.

Jump to Measure

Instead of browsing through a long series of measures with the **CRSR** keys, you can jump directly to a certain position in the track by entering its number with the Main Keys.

- Press and hold the Shift button.
- Press Main Key 14 (£ key).
- The display window now shows three dashes and awaits input.



- Still holding the Shift button, enter the measure's number with Main Keys 1 - 10 (10 being zero).
- When done, press **RETURN** key to confirm the jump or release Shift to cancel.

Editing Rhythm Tracks

Going back into a track to edit it is no different from the procedure explained in the section *Track Program*. Just remember that:

- **RETURN** key advances pattern. If used at the track's last position, a new measure is added to the track.
- **CRSR**-keys are better for track-browsing as they do not add new measures.
- A pattern entered into a measure is not stored until leaving that position either with **CRSR** keys or **RETURN** key (in other words, exiting Track Write mode won't store the current pattern).
- Entering Track Play/Write mode sets the current measure to 1.
Use the *Jump to Measure* function to swiftly recall a position within that track.

Delete Measure

The Delete function works much like the delete key in any ordinary PC-text editor. It shortens the entire song by one measure and removes the pattern at the current position.

Though the real TR-909 was capable of deleting big blocks ("from / to") of measures, Drummer only deletes one at a time.

- Go to the measure within the track where a pattern is to be deleted.
- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 13 (- key)
- Delete is carried out at once.

Insert Measure

The Insert function works opposite the Delete function, expanding the track with one measure at a time and inserting the current position's pattern.

- Jump to the measure within the track where the new pattern is to be inserted.
- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 12 (+ key).
- Insert is carried out at once.
- Use Main Keys and Pattern Group Selector buttons to enter a new pattern at the current position.

Clear Track

To clear a track completely:

- Press and hold the track's selector button (**B N M** keys)
- Press the Clear button (**X** key)
- Press **RETURN** key to confirm or **RUN/STOP** key to cancel (No other keys will work until this choice is made).
- Remember: though the track now is completely free of pattern information the actual patterns are not erased.

Files

The file operations in the MSSIAH Drummer have a separate screen window. To access it:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key).

In the Files/Setup screen, use **CRSR** keys and **RIGHT SHIFT** to navigate and **RETURN** key to execute a function/select file etc. Use ← key to cancel/step back.

Media

The Drummer supports loading and saving on disk or tape.

Disk

All disk operations start by asking you to choose device number:



Unless you have changed your disk drive's device number, 8 is default, use **CRSR** keys to change device number.

Loading from disk means that a directory window opens with a list of valid files on your floppy. You then select the file you wish to load.

The directory window shows the amount of free blocks in the upper right corner.



The file operations for the floppy drive make use of the operating system's basic disk functionality. There are no delete-functions and no replace-and-save options built in. If you try to save the file onto disk using an existing name the save is interrupted and the drive light flashes.

When reading the directory the correct type of files is automatically collected. If there are no files of that particular type on the disk you will get a *No Files* error. It does not necessarily mean that the disk is empty rather than empty of that type of files.

The file type depends on the file operation you selected, whether it's a full project load or a specific import.

MSSIAH Drummer File Types:

File suffix	Disk space	Tape no.		
.909	19 blocks	≈ 36	< 5 Kb	Drummer project
.DRP	1 block	≈ 6	< 1Kb	Single pattern export

Tape

The tape functions are standard C64 and not turbo tape.

A small modification bypasses the regular start and record button sensitivity so that it's up to the user to initiate the start of a tape load or save.

This opens up the possibility to modify a digital audio source to replace the standard 1530 datasette unit.



Whenever loading and saving you will have to press **SPACE** key on the C64 to make the computer start the load/save.

When loading MSSIAH Drummer checks the type of the file found. If the file suffix does not match the correct one, loading is interrupted and you are notified.

If the file type is correct, loading automatically continues and the screen color turns green to confirm that the file is ok.

Note:

The tape motor is shut off at all times until you request a load or save. As the dialog box asks you to start recording or playing it is finally switched back on. You probably need to rewind or forward the tape to the right position before loading or saving so now is the time to do so. Since the datasette buttons are not being sensed, pressing rew/ffw will not trigger the load/save. Only the **SPACE** key does.

Opening the Demo Files

The demo files for MSSIAH Drummer consist of a set of drum kits and some patterns that are a good starting point when programming patterns. The kits are different settings made up from the available drum sounds and parameters.

To open the demo files:

- Select *Open* in the *FILE* menu.



- Navigate with the **CRSR** keys to the menu item *DEMO*.



- Select any of the kits or patterns.



- Press **Y** key or **RETURN** key to confirm. The **N** key or **←** key cancels.
- When the demo track is opened (takes a split second) press **←** to return to the Main Screen.

Save Project

A project save includes all data, patterns, tracks, tone controls and settings. Make sure to save often to avoid losing your work!!

To save a Drummer project:

Disk:

- Select *Save* in the *FILE* menu.



- Use **CRSR** keys and select *Disk* as media source and press **RETURN** key.
- Enter a non-existing filename in the filename dialog.



You can use all letters from *a-z* and *0-9* as well as some additional characters. Use **INST/DEL** key with and without the **LEFT SHIFT** key to insert/delete text.

Press **RETURN** when ready or ← to cancel and go back.

- Select device (8 is default)
- File saves onto disk. After saving is done press ← key to return to the Main Screen.
- If the disk already contains a project file with the same filename the drive light flashes and you are notified with a *Save Error* message box.

Tape:

- Select *Save* in the *FILE* menu.
- User **CRSR** keys to select *Tape* as media source and press **RETURN** key.
- Enter a filename in the dialog and press **RETURN** when ready or ← to cancel.
- A dialog asks you to press **REC+PLAY** on your tape recorder and then press **SPACE** key to start the save. The tape motor is now unlocked for you to first rewind or forward the tape to the correct position.
- Press **SPACE** key to start saving.
- Screen goes blank while saving.
- When saving is done press ← key to return to the Main Screen.
- You can break the save operation anytime during saving by pressing the **RUN/STOP** key.

Open Project

To open a Sequencer project:

Disk:

- Select *Open* in the *FILE* menu.



- Insert the disk with the project file you wish to open.
- Use the **CRSR** keys to select *Disk* as media source and press **RETURN** key.
- Select device (8 is default)
- In the directory window use **CRSR** keys to navigate to the file you wish to load and press **RETURN** key to start loading. If you wish to cancel press ← key to go back one step. If there are no files on the disk you will be notified by a message box saying *No files*. In that case press ← key to go back, insert a new disk and try again.
- When the file is loaded you press the ← key to exit to the Main Screen.

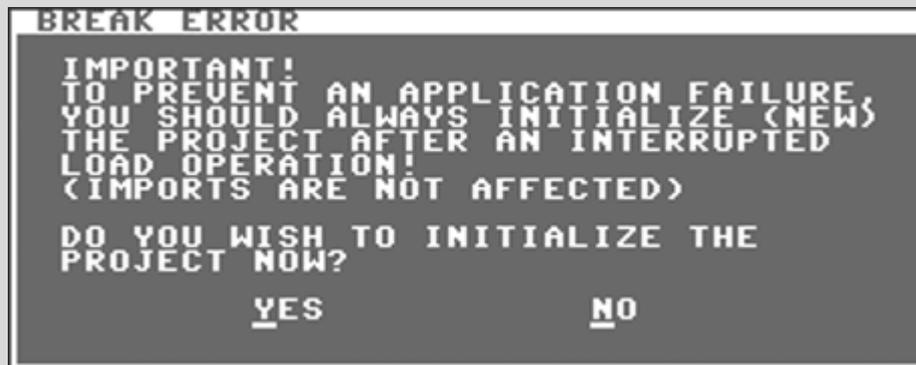
Tape:

- Select *Open* in the *FILE* menu.
- Use the **CRSR** keys to select *Tape* as media source and press **RETURN** key.

- A dialog asks you to press PLAY on your tape recorder and then press SPACE key to start loading. The tape motor is now unlocked for you to first rewind or forward the tape to the correct position.
- Press SPACE key to start loading and the screen goes blank.
- When a project file (.909) is found the screen color turns green and the file continues to load. If a different file type is found the operation is halted.
- When loading is done press ← key to return to the Main Screen.
- You can break the load operation anytime during the load process by pressing the RUN/STOP key.
However, this opens the initialize screen asking you to clear the memory.

Note:

Important! If you interrupt a load process of a Drummer project you are warned that the application could suffer from an unrecoverable failure. While this is a major case for the MSSIAH Sequencer (all MSSIAH applications share file functionality) it is of lesser importance for the MSSIAH Drummer. To not cause program failure you are advised to initialize memory if you for any reason interrupted a load operation.



Press Y key or RETURN key to go through and initialize the memory.

If you do not carry out this initialization now you can do it later at any time with the *New* function in the *FILE* menu.

This message pops up if you interrupt an import also. However, imports cannot do any harm whatsoever so you can just ignore it.

Export Pattern

You can export a drum pattern onto disk or tape.

To export a pattern:

- Select *Export* in the *FILE* menu.



- Use Group Selector buttons, Bank Selector buttons and Main Keys to select the pattern you wish to export. Press **RETURN** key when ready.



- Continue to read the section for your media choice below:

Disk:

- Use **CRSR** keys to select *Disk* as media source and then press **RETURN** key.
- Enter a non-existing filename in the filename dialog. You can use all letters from *a-z* and *0-9* as well as some additional characters. Use **INST/DEL** key with or without the **LEFT SHIFT** key to insert/delete text.
- Press **RETURN** key to start saving or ← to cancel.
- Select device (8 is default)
- When done saving, press ← key to return to the Main Screen.
- If the disk you have inserted already contains a pattern file with the same name the drive light flashes and you are notified with a *Save Error* message box.

Tape:

- User **CRSR** keys to select *Tape* as media source and press **RETURN** key.
- Enter a filename in the dialog and press **RETURN** when ready or ← to cancel.
- A dialog asks you to press **REC+PLAY** on your tape recorder and then press **SPACE** key to start the save. The tape motor is now unlocked for you to first rewind or forward the tape to the correct position.
- Press **SPACE** key to start saving.
- Screen goes blank while saving.
- When saving is done press ← key to return to the Main Screen.
- You can break the save operation anytime during saving by pressing the **RUN/STOP** key.

Import Pattern

Exported patterns can be imported back into the Drummer.

To import a pattern:

- Select *Import* in the *FILE* menu.



- Use Group Selector buttons, Bank Selector buttons and the Main Keys to select where to store the imported pattern. Press **RETURN** key when ready.
- Continue to read the section for your media choice below:

Disk:

- Use **CRSR** keys to select *Disk* as media source and then press **RETURN** key.
- Select device (8 is default)
- Select a file in the directory list.
(If the disk you have inserted does not contain any pattern files you are notified with the *No files* message box.)
- Press **RETURN** key to start loading.
- When done loading, press ← key to return to the Main Screen.

Tape:

- Use the **CRSR** keys to select *Tape* as media source and press **RETURN** key.
- A dialog asks you to press **PLAY** on your tape recorder and then press **SPACE** key to start loading. The tape motor is now unlocked for you to first rewind or forward the tape to the correct position.
- Press **SPACE** key to start loading and the screen goes blank.
- When a pattern file (*.DRP*) is found the screen color turns green and the file continues to load. If a different file type is found the operation is halted.
- When loading is done press ← key to return to the Main Screen.
- You can break the load operation anytime during the load process by pressing the **RUN/STOP** key.
However, this opens the initialize screen asking you to clear the memory. Read more about it in the *Open Project* section.

Other Functions

Shuffle

Shuffle means to get the music to swing. This is achieved by delaying every second note instead of playing straight sixteenths. The more delay, the more it swings. Generally, higher tempo requires less swing, lower tempo can add more.

To set the amount of shuffle:

- Press the Shuffle button (**Z** key).
- The indicator on Main Keys 1 - 7 will display the current Shuffle setting where 1 is no shuffle at all and 7 is the extreme setting. Be aware of that higher settings might cause drop-outs at different speeds.



- Change shuffle setting by pressing the corresponding Main Key.
- Release Shuffle button to exit.

Only every second value has any effect. To get a full detailed shuffle resolution you need to set sync resolution to 48 tics.

Synchronization

MSSIAH Drummer can be synchronized to a MIDI clock fed through the MSSIAH Cartridge's MIDI input. It can also be a Sync24 signal fed to the user port.

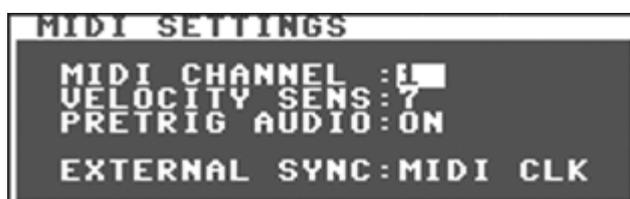
To activate external synchronization:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 5 (**4** key).

Press the Shift button (**LEFT SHIFT** key) at any time to see the current status of the sync mode. If slaved to an external clock, Drummer will not respond to the **RUN/STOP** key starting the internal sequencer.

As default, Drummer synchronizes to MIDI clock. You can change this in the MIDI window:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key) to enter the Files screen.
- Select the *MIDI* item in the *SETTINGS* menu.



The last parameter, *External Sync*, gives you three options:

MIDI CLK

Use MIDI clock to synchronize the internal sequencer when slaved to an external clock. If you activate MIDI mode, MIDI clock is the clock source for the LFO.

MIDI+PSEL

MIDI clock is still the external clock source but Drummer will now listen to the receive channel for any of 16 'white' keys between C₁ and D₃ and change the current pattern playing to the same number. *PSEL* is short for Pattern Select.

SYNC24

External sync signal is now switched to input signals from two pins on the user port. You can find specs for the user port pins to build a Sync24 interface to the C64 yourself in the booklet *MSSIAH - Getting Started* available for download on our site at www.mssiah.com.

48 tics

You can double the amount of sync pulses it takes to play one measure from 24 to 48. In practice this will make the Drummer play at half speed so you need to double the tempo also. The idea of using 48 tics instead of 24 is that shuffle resolution gets higher and all the seven shuffle settings work. Read more about Shuffle in the top of this chapter.

To activate 48 tics:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 6 (**5** key).

Trig Delay

The trig setting gives you control of when the sound should retrigger to optimize timing when running on an external clock.

The Drummer reads ahead of the current pattern being played and triggers the sound at a given time. This time is user defined and shows right below the display window.

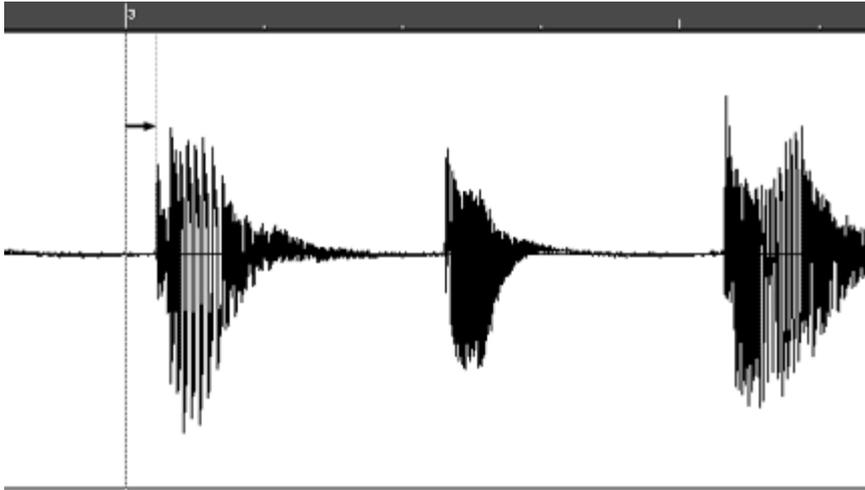
TRIG: +00ms

The available settings range from 0 to 60 and increments in steps of 2.

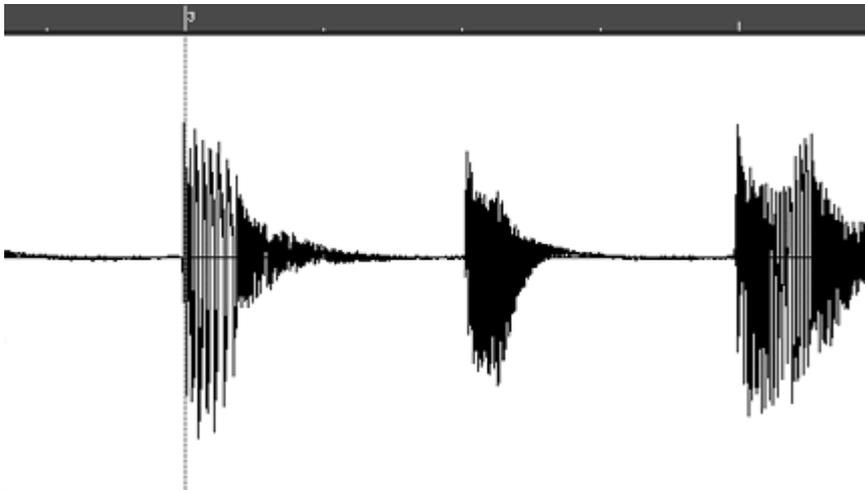
The more you add, the earlier the sound triggers.

The trig delay can be used to compensate high shuffle settings at moderate tempos that cause drop-outs or unwanted clicks and pops.

To get a better understanding of what trig delay really does, take a look at these images:



This first image shows a trig delay setting of 00. That creates a small delay before the sound actually triggers (notice the distance between the beat's position and the waveform start). In this case the delay is about 20 milliseconds (it varies depending on the song's tempo).



Now we have adjusted the trig time to about +20 milliseconds and gotten rid of the delay. By tweaking the trig time it's thereby possible to get the sound to trig dead on.

One could argue that this is of lesser importance when using the Drummer in the studio recording onto a hard drive.

Delay settings could then be easily adjusted afterwards and timing is no longer an issue.

Nonetheless, if you tweak the trig delay you can listen to the Drummer playing in sync during the whole recording and not only afterwards.



To adjust the trig delay setting:

- Press **F7** / **F8** keys to increase/decrease.

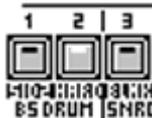
Trig delay has no effect in MIDI mode.

Note:

Tips! You do not need a second SID installed to make use of the Voice Map feature. By using only voices 1-3 in your Voice Map, you can activate SID #2 still with nothing but a single SID in your machine. That way you override the automatic polyphonic assignment. When using the Drummer in MIDI mode the SID2 Voice map automatically gets activated even if you did not activate the SID2.

Hard Restart

Hard restart is a technique that initializes the SID oscillator's envelope a certain amount of time before the sound is about to trigger. Doing this ensures an overall better triggering. Drummer uses a slightly different technique that does not initialize but preloads the SID envelope registers instead (we call it *Soft Restart* in the MSSIAH Sequencer). It proves to work well when triggering multiple sounds with different volume levels as well as keeping the envelopes tight. You can select to change soft restart to a classic hard restart:



- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 2 (**1** key).

Note that MSSIAH Drummer does not use neither soft nor hard restart when you play it live on the C64 keyboard or with a MIDI keyboard (without pre-trig). This is due to the restart that takes place before the sound actually is being produced. Only a sequencer can read ahead of this time, there is no way to predict your key strokes! MIDI mode has a specific MIDI key map to initialize each instrument.

Blank Screen

Blank screen is an option that blanks the screen whenever Drummer is playing. This will bring the audio noise level down since it inactivates the noisy graphic circuit (the *VIC*) in the Commodore 64.

The blank screen function turns the screen blank as soon as the Drummer starts playing and brings it back when playing stops. You can blank it out manually too, by pressing the **SPACE** key at any time either when Drummer is playing or not. The space key works as a toggle, pressing it twice brings the screen back. Using the Blank Screen feature is much more convenient as you won't have to remember to blank the screen out manually whenever recording the Drummer in your studio.

To activate Blank Screen:



- Press and hold the Shift button (**LEFT SHIFT** key).

- Press Main Key 3 (2 key).

Track Write and Pattern Write modes are not affected by Blank Screen. MIDI mode blanks out the screen regardless of this setting.

Change Background Color

You can define an alternative color and activate it with Main Key 4 (3 key). This is useful if your graphics chip or your screen fails to properly render too much white color so that the text becomes hard to read.

To select the alt. color:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key) to enter the Files screen.
- Select the *Color* item in the *SETTINGS* menu.
- Select which color you want as alternative color. Then use ← key multiple times to close the window and exit the Files screen.
- Now press Main Key 4 (3 key) and the alternative color is applied to the background. Press Main Key 4 again to return the white default color.

New (Initialize)

You can fully initialize the MSSIAH Drummer and restore its initial state. Tracks, patterns, tone controls and settings are cleared.

To initialize the Drummer:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key) to enter the file menu.
- In the *FILE* menu, select *New* and press the **RETURN** key.
- A dialog box asks you to confirm using either **Y** key or **RETURN** key or cancel with the **N** key or **RUN/STOP** key.
- The Drummer is now initialized. Press ← to get back to the Main Screen.

Quit

To quit the Drummer and return to the MSSIAH Cartridge startup menu:

- Press and hold the Shift button (**LEFT SHIFT** key).
- Press Main Key 16 (**INST/DEL** key) to enter the file menu.
- In the *QUIT* menu, select *Reboot* and press the **RETURN** key.

- A dialog box asks you to confirm using either **Y** key or **RETURN** key or cancel with the **N** key or **RUN/STOP** key.
- The Drummer exits and you are returned to the MSSIAH Cartridge startup menu.

Keyboard Overlay

Old C64

1	2	3	4	5	6	7	8	9	10
SID 2	HARD	BLANK	COL	EXT	J48	POT X	POT Y	SHIFT	TAP
BASS DRUM	SNARE DRUM	SNARE DRUM	LOW TOM	LOW TOM	HI TOM	HI TOM	COWBELL		

11	12	13	14	15	16
COPY	INS	DEL	MEAS	CYCLE	FILES
CLAPS	CLOSED HH	CLOSED HH	OPEN HH	OPEN HH	

MSSIAH
MIDI SID SOFTWARE

- Print this page out in full size
- Cut out the keyboard overlay with a hobby knife or a pair of scissors.
- Place the two pieces side by side on top of the C64's keyboard



- Put tape on the sides to keep it in place (optional)

Key Map

A full overview of keys used in the MSSIAH Drummer (US/English keyboard)

General Keys:

RUN/STOP	Start/Stop Playing
SPACE	Manually blank the screen
RIGHT SHIFT + F5	MIDI Mode (RUN/STOP to quit)
F7 / F8	Trig Setting
C	Tempo
↑	Volume
Z	Shuffle
LEFT SHIFT	Shift Button

Tone Controls:

F1 / F2	Select Bass Drum
F3 / F4	Select Snare Drum
CTRL	Accent Level
Q	Bass Drum Tune
W	Bass Drum Level
A	Bass Drum Attack
S	Bass Drum Decay
E	Snare Drum Tune
R	Snare Drum Level
D	Snare Drum Tone
F	Snare Drum Snap
T	Low Tom Tune
Y	Low Tom Level
G	Low Tom Tone
H	Low Tom Decay
U	Hi Tom Tune
I	Hi Tom Level
J	Hi Tom Tone
K	Hi Tom Decay
O	Cowbell Level
L	Cowbell Tune
P	Hand Claps Level
:	Hand Claps Tune
@	Hihats Tune
*	Hihats Level
;	Closed Hihat Decay
=	Open Hihat Decay
V	Toggle Filter Control Edit

Filter Controls

Q	Select SID for editing
W	Cutoff Frequency
E	Resonance
R	Modulation Depth
T	Modulation Source (ENV/LFO)
Y	Modulation Rate
U	High pass filter
I	Band pass filter
O	Low pass filter
V	Switch back to tone controls

Track Play/Write:

B	Track Group 1
N	Track Group 2
M	Track Group 3
CRSR Up/Down	Bank I
CRSR Left/Right	Bank II
X	Clear

Pattern Play/Write:

,	Pattern Group 1
.	Pattern Group 2
/	Pattern Group 3
CRSR Up/Down	Bank I
CRSR Left/Right	Bank II
COMMODORE (C=)	Instrument Selector
X	Clear

Main Keys

←	Main Key 1
1	Main Key 2
2	Main Key 3
3	Main Key 4
4	Main Key 5

5	Main Key 6
6	Main Key 7
7	Main Key 8
8	Main Key 9
9	Main Key 10
0	Main Key 11
+	Main Key 12
-	Main Key 13
£	Main Key 14
CLR/HOME	Main Key 15
INST/DEL	Main Key 16

MIDI Implementation Chart

MSSIAH Wave-Player		MIDI Implementation Chart		Version: 1.00
Function		Transmitted *1	Recognized	Remarks
Basic Channel	Default	X	1-16, off	Memorized
	Changed	X	1-16, off	Memorized
Mode	Default	X	Mode 3	
	Messages	X	X	
Note Number:		X	36 - 47 (C ₁ - A# ₁)	Play sounds *2
		X	48 - 58 (C ₂ - A# ₂)	Init sounds *2
		X	45 (A ₁)	Trig env SID #1
		X	47 (B ₁)	Trig env SID #2
Velocity	Note On	X	9nH, v=1-127	
	Note Off	X	X	
After Touch	Key's	X	X	
	Channel's	X	X	
Pitch Bend		X	X	
Control Change:	1	X	o	
	64-119	X	o	
	120	X	o	
	123	X	o	
Program Change:		X	X	
System Exclusive		X	X	
System Common:	Song pos	X	X	
	Song sel	X	X	
	Tune	X	X	
System Real Time:	Clock	X	o	
	Commands	X	o	
Aux Messages:	All Sound OFF	X	(120) o	
	Reset Cntrl	X	X	
	Local ON/OFF	X	X	
	All Notes OFF	X	(123) o	
	Active Sens	X	X	
	System Res	X	X	
Notes		*1 MSSIAH Cartridge does not transmit MIDI. *2 Key map		

Mode 1: OMNI ON, POLY
Mode 3: OMNI OFF, POLY

Mode 2: OMNI ON, MONO
Mode 4: OMNI OFF, MONO

o : Yes
X : No

Keyboard	Function	MIDI note
	Init Open HH	A# ₂ 58
	Init Cowbell	G# ₂ 56
	Init Hi Tom	G ₂ 55
	Init Closed HH	F# ₂ 54
	Init Low Tom	F ₂ 53
	Init Claps	D# ₂ 51
	Init Snare Drum	D ₂ 50
	Init Bass Drum	C ₂ 48
	Trig Envelope SID #2	B ₁ 47
	Play Open HH	A# ₁ 46
	Trig Envelope SID #1	A ₁ 45
	Play Cowbell	G# ₁ 44
	Play Hi Tom	G ₁ 43
	Play Closed HH	F# ₁ 42
	Play Low Tom	F ₁ 41
	Play Claps	D# ₁ 39
	Play Snare Drum	D ₁ 38
	Play Bass Drum	C ₁ 36

MIDI Controller List

No.	Function	Limit	Remarks
7	Main Volume	0-15	
65	Init Envelope Type	0-7	0 = ADSR=0000, Trig=0 1 = ADSR=0000, Trig=8 2 = ADSR=0F00, Trig=8 3 = ADSR=00FF, Trig=8 4 = ADSR=FFFF, Trig=8 5 = ADSR=0F0F, Trig=8 6 = ADSR=0000, Trig=9 7 = ADSR=0000, Trig=1
66	Select Bass Drum	1-8	
67	Select Snare Drum	1-8	
68	Bass Drum Tune	0-15	
69	Bass Drum Level	0-7	
70	Bass Drum Attack	0-7	
71	Bass Drum Decay	0-7	
72	Snare Drum Tune	0-15	
73	Snare Drum Level	0-7	
74	Snare Drum Tone	0-7	
75	Snare Drum Snap	0-3	
76	Low Tom Tune	0-15	
77	Low Tom Level	0-7	
78	Low Tom Tone	0-7	
79	Low Tom Decay	0-7	
80	Hi Tom Tune	0-15	
81	Hi Tom Level	0-7	
82	Hi Tom Tone	0-7	
83	Hi Tom Decay	0-7	
84	Cowbell Level	0-7	
85	Cowbell Tune	0-15	
86	Claps Level	0-7	
87	Claps Tune	0-15	
88	Hihat Tune	0-15	
89	Hihat Level	0-7	
90	Closed Hihat Decay	0-7	
91	Open Hihat Decay	0-7	
92	SID #1 Cutoff Frequency	0-63	
93	SID #1 Resonance	0-15	
94	SID #1 Modulation Depth	0-7	
95	SID #1 Filter Modulation Type	0-1	0 = ENV, 1 = LFO

96	SID #1 Modulation Rate	0-15	0-13 if mod type is LFO
97	SID #1 Filter Type	0-15	0 = Off 1 = Low Pass 2 = Band Pass 3 = High Pass 4 = LP + BP 5 = LP + HP 6 = BP + HP 7 = LP + BP + HP 8 = LP + EXT 9 = BP + EXT 10 = HP + EXT 11 = LP + BP + EXT 12 = LP + HP + EXT 13 = BP + HP + EXT 14 = LP + BP + HP + EXT 15 = EXT
98	SID #2 Cutoff Frequency	0-63	
99	SID #2 Resonance	0-15	
100	SID #2 Modulation Depth	0-7	
101	SID #2 Filter Modulation Type	0-1	0 = ENV, 1 = LFO
102	SID #2 Modulation Rate	0-15	0-13 if mod type is LFO
103	SID #2 Filter Type	0-15	See cc #97
104	Filter On/Off Voice #1	0-1	0 = Off, 1 = On
105	Filter On/Off Voice #2	0-1	0 = Off, 1 = On
106	Filter On/Off Voice #3	0-1	0 = Off, 1 = On
107	Filter On/Off Voice #4	0-1	0 = Off, 1 = On
108	Filter On/Off Voice #5	0-1	0 = Off, 1 = On
109	Filter On/Off Voice #6	0-1	0 = Off, 1 = On
110	Filter Control	0-3	0 = All Off 1 = SID #1 On 2 = SID #2 On 3 = All On
111	Env Trig Source SID #1	0-8	0 = Bass Drum 1 = Snare Drum 2 = Low Tom 3 = Hi Tom 4 = Cowbell 5 = Clap 6 = Closed Hihat 7 = Open Hihat 8 = External Trig (MIDI NOTE 45 A ₀)
112	Env Trig Source SID #2	0-8	Same as cc #111 except: 8 = External Trig (MIDI NOTE 47 B ₀)
113	Voice Map Bass Drum	1-6	True #
114	Voice Map Snare Drum	1-6	-
115	Voice Map Low Tom	1-6	-
116	Voice Map Hi Tom	1-6	-
117	Voice Map Cowbell	1-6	-

118	Voice Map Clap	1-6	-
119	Voice Map Hihats	1-6	-
120	All Sound Off	-	
123	All Notes Off	-	