

ADVANCED STUDIES
MSEQ PLATFORM PROJECT

TITLE
MSEQ multimedia file format

ABSTRACT : Specification of the MSEQ multimedia file format. This format is suited for 2.5 and 3G platforms.

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1 ASSOCIATED DOCUMENTS

1.1 External

[1] - 3GPP TSGT2#8(00)100 – Change request 23.040 on SMS specification (28/01/2000)

[2] – The complete MIDI 1.0 detailed specification (version 96.1)

[3] – General MIDI specification

[4] – General MIDI 2 enhancements

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2 INTRODUCTION

1.2 Scope of document

The MSEQ defines a multimedia file format. This format is compact, provides multimedia events synchronisation and adaptive time bases, in order to easily play different media synchronously.

The sounds and text capabilities of this format is particularly suited for specific constraints of mobile equipments.

This format is open to others format inclusion (JPEG, MPEG, ...).

It is EMS upward compatible, and includes all Imelody capabilities.

It has been designed in order to provide simple and homogeneous multimedia format for the 2G, 2.5G and 3G generations; so this format principle has been presented to the 3GPP forum.

➔ **This document describes the MSEQ file format.**

*Note : Some paragraphs are shown in pink colour : “ **To be completed** ”. These parts have no influence in MSEQ format definition. They are only :*

- reserved upgrades
- or pictures and/or examples to be added.

1.3 Glossary / Terms

Terms	Definition
ME	Mobile Equipment.
MSEQ	Multimedia Sequential Event Quantification (Alcatel proposal)
MIDI	Musical Interface for Digital Instruments standard
GM	General MIDI standard
XG	eXtended General Midi (Yamaha proprietary)
GS	General System (Roland proprietary)
SMS	Small Message Service (on mobile phones platforms)
EMS	Enhanced Message Service (multiple-SMS message on mobile phones platforms)
IMELODY	Musical standard for transmitting very simple melodies via EMS

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3 MSEQ STRUCTURE AND FORMAT

3.1 Global format

3.1.1 Basic global structure

A MSEQ file is made of :
 - a header
 - multiple tracks.

Each track is played Sequentially, in parallel with other tracks (Figure 1). So each track begins to be played at the same time.

Each track contains a header, and commands (Events) that are executed Sequentially.

Each track plays a different type of data : image, sound, video... and all tracks are synchronized together. So the MSEQ format allows for example to play a music synchronized with little pictures, and/or synchronized with text (Karaoke), etc...

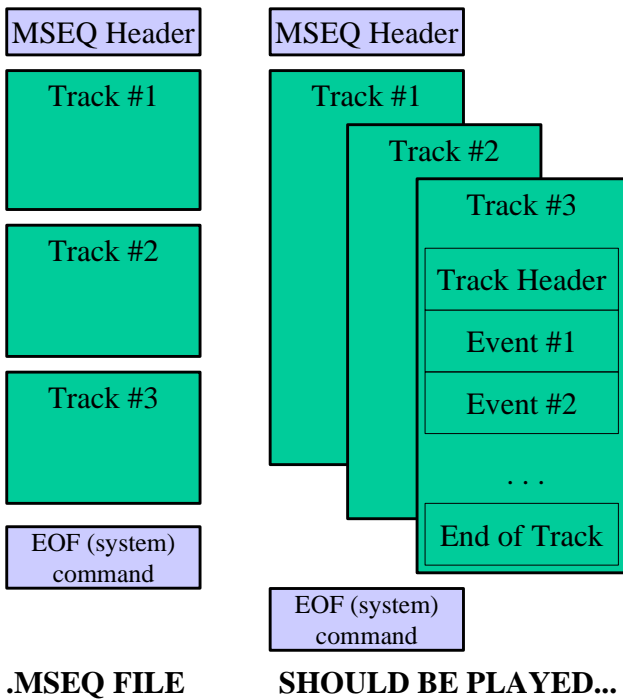


Figure 1 : global MSEQ format

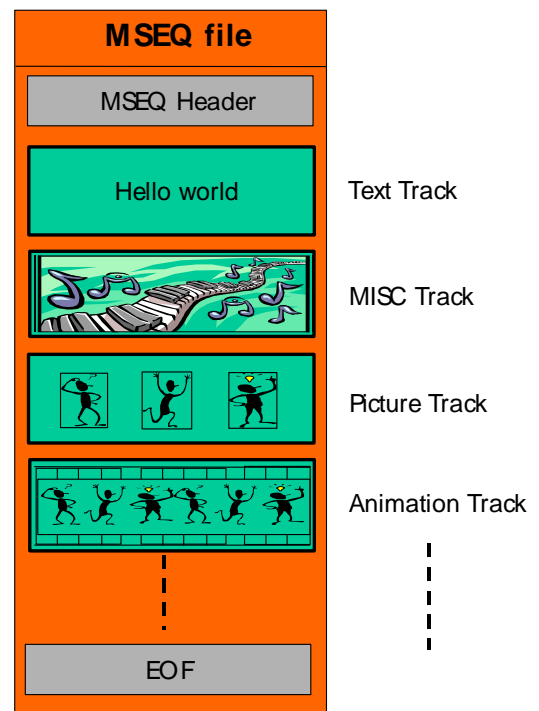


Figure 2 : MSEQ file example

The MSEQ format is particularly adapted to multi-processors platforms (PDA, mobile phones, ...), because each type of data can be played by a different processor (ex : text by screen monitor, image by DSP, etc...), the only requirement is that processors must be evenly synchronized by some MSEQ synchronisation commands.

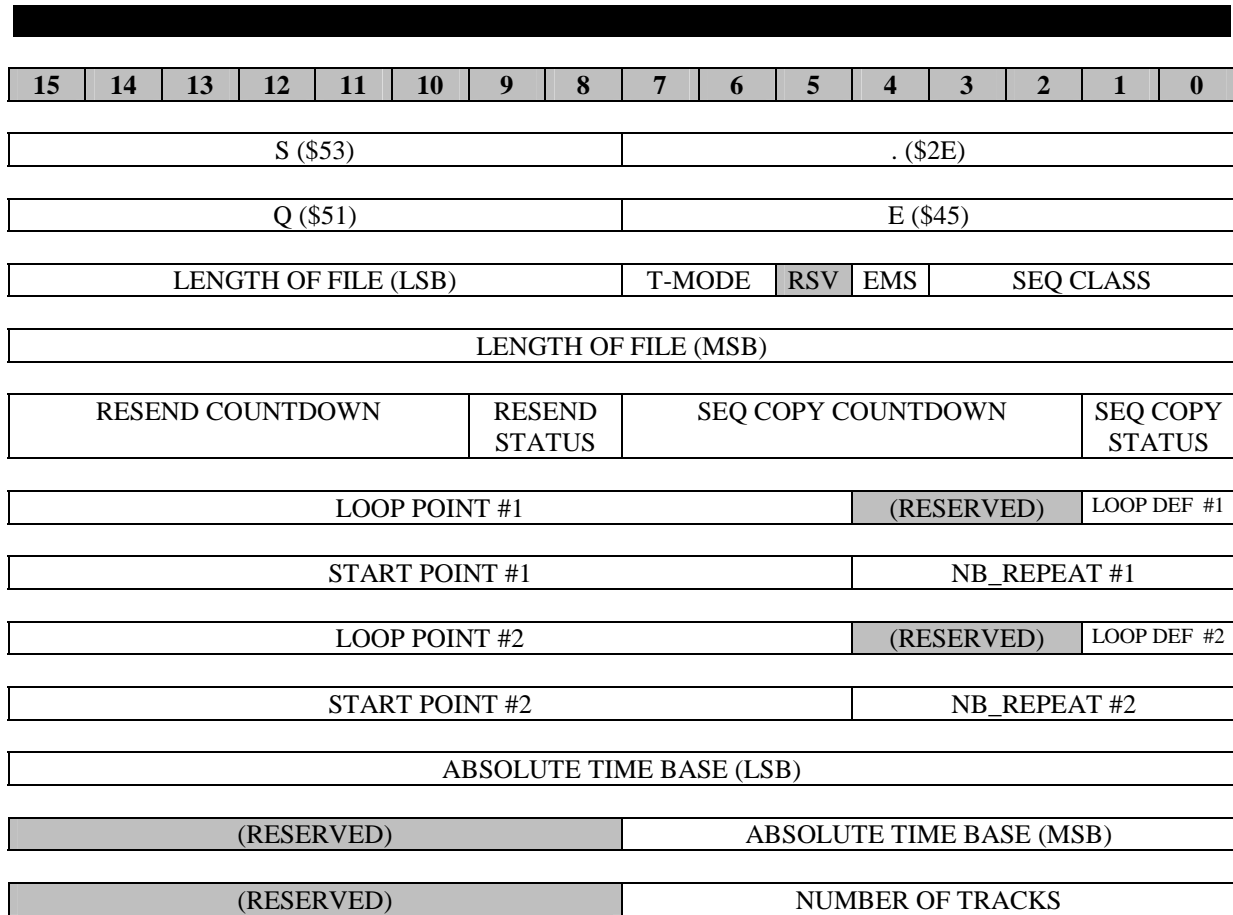
The file format is 16 bits wide, and LSB-first with a 8-bit compatibility. That means, the MSEQ file can be stored in a 8-bit memory, without significant reading difference.

Important note : In this document, Each bit of reserved parameters is set to 1 (excepted if opposite specification).

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3.1.2 SEQ Header format

Figure 3 shows the MSEQ file Header format. Each header parameter applies to all tracks.
Each bit of reserved parameters is set to 1.



« .SEQ » type-file identifier (the format is LSB first and 8-bit compatible)

SEQ CLASS allows to identify the MSEQ level implemented in this file. As there is only one CLASS defined for the moment, MSEQ CLASS=1. Other values are reserved.

EMS EMS compatibility. If set to 1, all music and video included in this file are EMS and IMelody compatible. So this kind of file can be exported as an EMS-formatted file. For example, synthetic music is monophonic and monotimbral (even if a particular instrument is defined for all music restitution). Some track types can not be included in a MSEQ EMS-compatible file (as this type is not defined in the EMS standard) : for example, proprietary tracks.

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T-MODE Transport-mode. This field indicates how the file is structured.
See also § 3.1.4 and § 3.1.5.

T-MODE	FILE STRUCTURE DESCRIPTION
%00	multiprocessors oriented, no streaming (default) : tracks are Sequentially defined
%01	streaming oriented : only one multi-purpose track is defined
%10	packet oriented (streaming + multiprocessors) : tracks are Sequentially defined within packets
%11	reserved for future use

LENGTH OF FILE number of 16-bit words in file. It includes the header from COPY byte, up to the EOF word (itself included). The total length of file is maximum 16,8 Mwords.

SEQ COPY STATUS sets the copying permission of the global content

COPY STATUS	DESCRIPTION
%00	global copy prohibited. None of the contents can be copied. (in definition of each track, TRK_COPY_STATUS = %10)
%01	global copy restricted to copy countdown.
%10	global copy can not be defined. See each « track copy status » for track-content copy permission.
%11	all-tracks copy free. (in definition of each track, TRK_COPY_STATUS = %10)

SEQCOPY COUNTDOWN contains the number of copy that can be done. Each copy of any content of the file decrements this number (the maximum number of copies allowed is then 64). If this number is 0, any new copy is prohibited.

Note : number decrease must be applied before the copy, so the file copied contains (SEQCOPY COUNTDOWN - 1).

This number is taken into account only if COPY_STATUS = %01. If COPY_STATUS <> %01, then COPY_COUNTDOWN = 0x00.

RESEND STATUS *definition similar to COPY STATUS, for RESEND STATUS.*

RESEND COUNTDOWN contains the number of message-forward that can be done (sequential copies on same support, eg. mobile phones). Decrease must be applied before the file sending.

To be completed.

LOOP DEF #1 loop #1 definition (see table below)

LOOP POINT #1 synchro point number that ends the loop #1

NB_REPEAT #1 number of repetitions of loop #1

START POINT #1 synchro point number that starts the loop #1. Note : if the MSEQ file contains more than 2047 synchro commands (modulo 2047), then the START_POINT synchro number is the last known when LOOP_POINT occurs.

LOOP DEF	DESCRIPTION
%00	Loop not defined. LOOP_POINT, START_POINT, NB_REPEAT is not significant.
%01	Loop defined, NB_REPEAT defines the number of repetitions
%10	(reserved)
%11	Infinite loop. NB_REPEAT is not significant.

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LOOP_DEF #2 loop #2 definition
LOOP POINT #2 synchro point number that ends the loop #2
NB_REPEAT #2 number of repetitions of loop #2
START POINT #2 synchro point number that starts the loop #2

ATB Absolute Time Base. Defines the time base used in all tracks, by most of the MSEQ commands (see MSEQ commands figure). This time base is in microseconds.

For example, if ATB=200, none of the MSEQ events could be shorter than 200 µS. This field also gives indication of required speed granularity to the target platform.

NUMBER OF TRACKS Number of tracks in MSEQ file. value 0 defines an empty-file.

Figure 3 : header format

1.3.1 MSEQ EMS compatibility

MSEQ includes MSEQ “compatible commands”. These commands are replacement for EMS features.

The EMS command numbers are nearly the same MSEQ command numbers.

The parameters between EMS commands and MSEQ commands are bit-to-bit compatible. So, if a mobile phone already implement EMS drivers, these drivers can be very easily managed by a MSEQ player.

More over, if EMS bit is set in MSEQ header, then MSEQ file (after a very light translation) can be resent as EMS in concatenated SMS.

It is recommended that if EMS message is received, it should be stored within the mobile phone as a MSEQ file, in order to be exchanged as a MSEQ or resent as EMS.

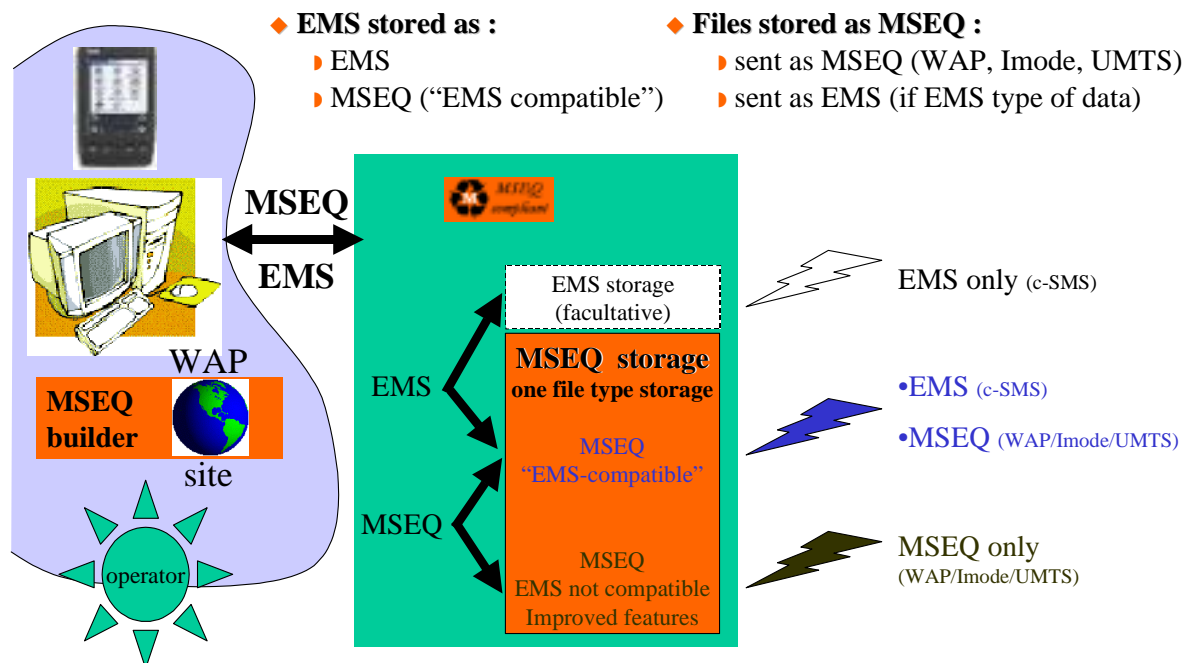


Figure 4 : EMS and MSEQ translation and compatibility

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3.1.3 LOOP POINT definition

Each track player, when reaches LOOP_POINT, must loop to the START_POINT. It must be done NB_REPEAT times. Then, the player can continue after the LOOP_POINT.

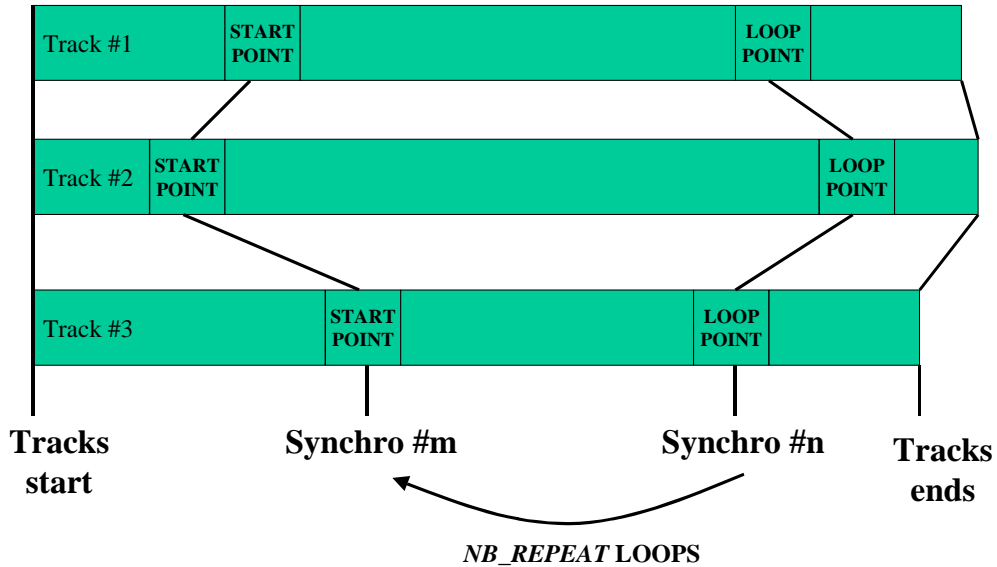


Figure 5 : repeat point principle

There are 2 general loops defined in MSEQ format. These loops can not be imbricated. An example of use is shown Figure 6.

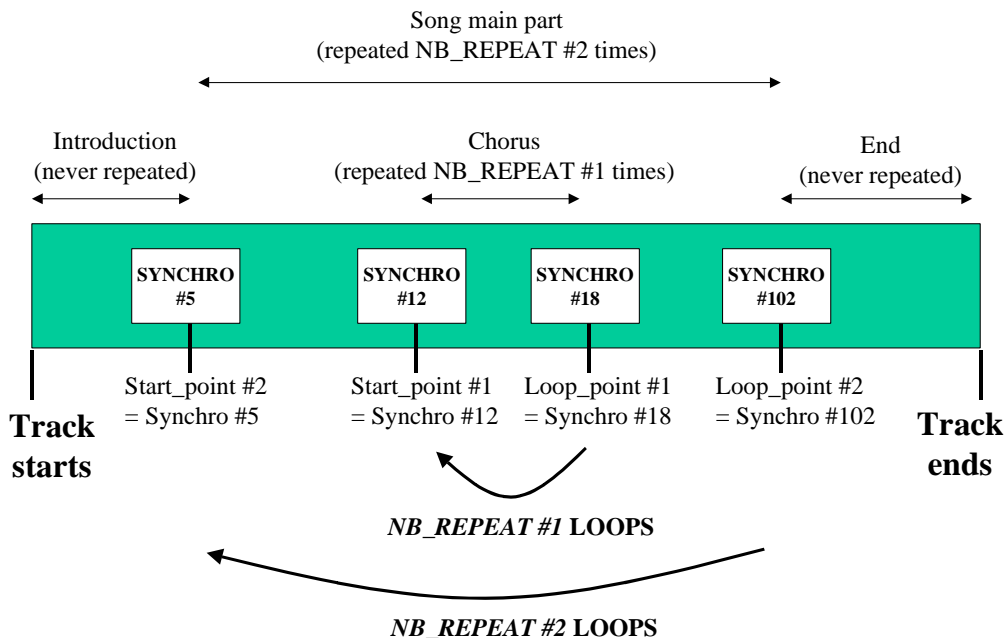
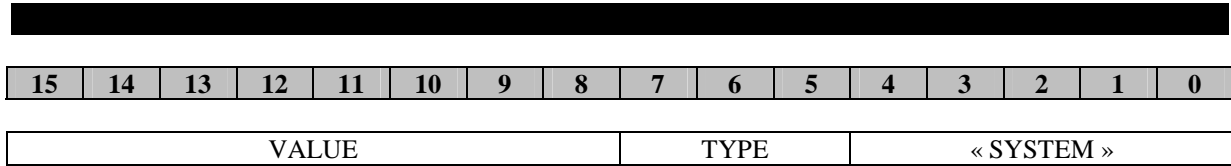


Figure 6 : example of LOOPS use

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3.1.4 SYSTEM command

Some special MSEQ features can be applied with this general command.



Where :

« SYSTEM » SYSTEM command

TYPE specifies which SYSTEM command is to be applied (see Figure 8).

VALUE parameter, depends on the command TYPE.

Figure 7 : system command

TYPE	SYSTEM COMMAND	VALUE	DESCRIPTION
0	End-Of-File	always set to 0x00	This word is the last of the MSEQ file. It is put after the « Track (close) » command of the last defined track.
1	Start of Packet	packet number	Used in packed mode (T-MODE=2). The packet number are sequential and are modulo 256 (value 0 is reserved).
2	End of Packet	packet number	Used in packed mode (T-MODE=2). Within a packet, the packet number is the same for STARTing command and ENDing command (value 0 is reserved).
others	NOT DEFINED		

Figure 8 : system sub-commands

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3.1.5 FILE structure in different T-MODEs

Depending on T-MODE parameter (included in MSEQ file header), the file structure is different.

- In multiprocessors mode (T-MODE=0, default), the file structure is a basic file structure organised in tracks (one track = one media type). All tracks are played simultaneously. This mode can not support streaming (at least n-1 tracks have to be loaded before playing the file). **This mode should be considered as the basic mode, and the best way to store MSEQ files.**
- In streaming mode (T-MODE=1), there is only one track that have to be played Sequentially. All data (of any types) are included and mixed.
Caution : RTB bases should be recalculated if different tracks are merged !

This mode is not multiprocessors oriented : each processor must read and decode every command, even if it is not relevant to this processor.

In most cases, this format is not recommended.

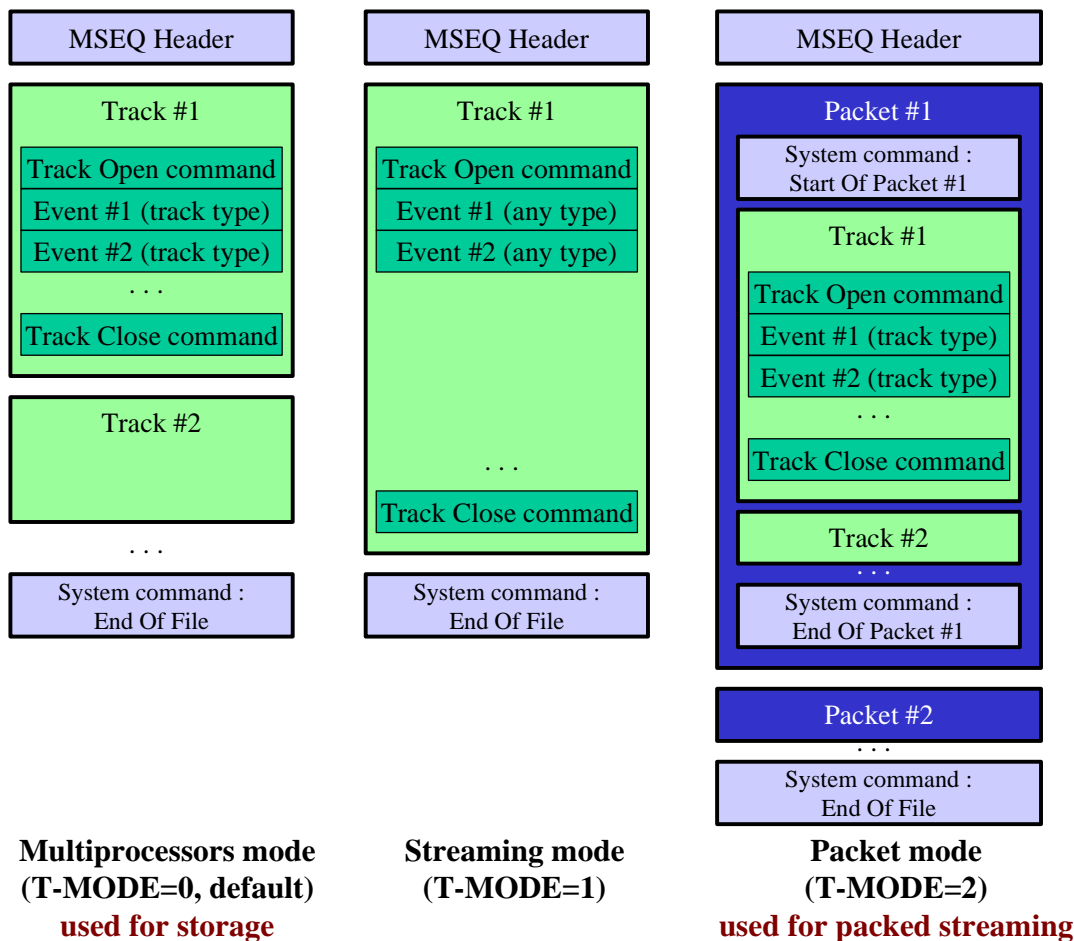


Figure 9 : T-MODE file structures

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- In packed mode (T-MODE=2), tracks are split. The structure is the same as in T-MODE=0, but file is fractionated into packets. Each packets contains the same tracks structure (and contains every track). The order of tracks is the same in every packet (e.g. track n°1 is always the first track, coded in first position in every packet). A “Start of Packet” command starts the packet, and the “End of Packet” command ends it.

This structure mode is particularly suited to perform streaming.

Note : the bijective conversion between T-MODE=0 and T-MODE=2 is trivial and could be implemented within a mobile equipment.

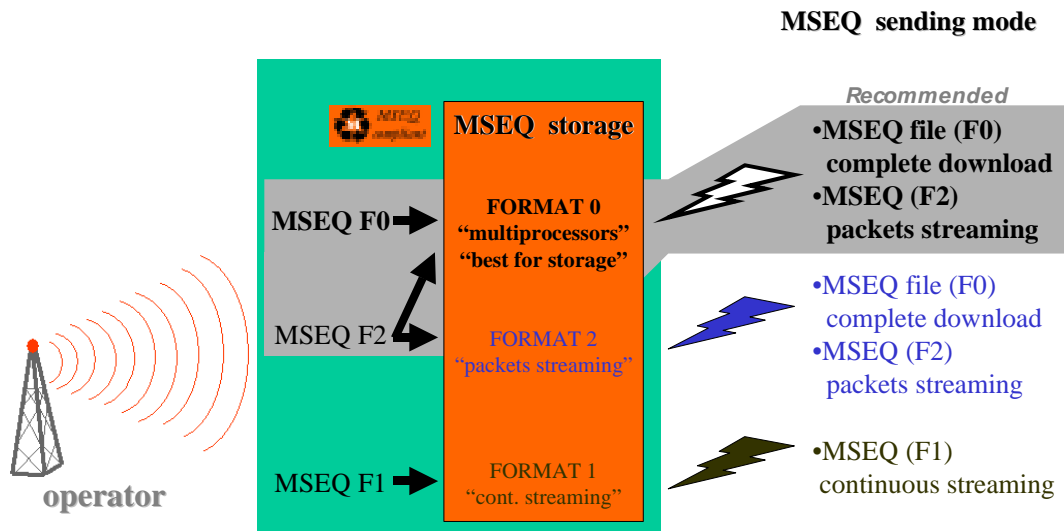


Figure 10 : MSEQ T-MODE easy-to-implement translations

Conclusion : It is strongly recommended that the MSEQ file should be stored in multiprocessors mode format (T-MODE=0). Then, the MSEQ file can be easily transmitted in packed mode (T-MODE=2) if packets streaming is necessary (recommended if file length is important).

Important note : the MSEQ builder can be forced to add regular synchronisation points in order to better split MSEQ format 0 files into packets (example : one synchronisation point every second).

3.1.6 Time bases

Time length in MSEQ commands is coded relatively to a Time base.

Some of MSEQ commands are based on the ATB (Absolute Time Base) defined in the MSEQ file header. So a MSEQ command with a time length of 150 will run $150 \times 15 = 2250 \mu\text{S}$, if $\text{ATB}=15$.

Some others are based on RTB (Relative Time base), defined in each Track. Then the RTB defines the time base of some events in the Track. The RTB is defined relatively to the ATB.

Example : $\text{ATB}=15$ (for the MSEQ file), $\text{RTB}=23$ (for a particular track). A MSEQ command based on RTB with a time length of 13 will run $13 \times 23 \times 15 \mu\text{S} = 4.14 \text{ mS}$.

The RTB is a MSEQ command, that can occur everywhere in a Track. The RTB-time-based MSEQ commands that follows RTB must apply to the last RTB found. So, the RTB can be an in-track evolutive time base.

The time base applied for each MSEQ command is detailed in MSEQ commands figures (see §5).

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3.1.7 Tracks synchronisation

In each track, MSEQ «synchronisation command» (see MSEQ commands figure) can occur. This synchronisation command has a unique synchronisation number.

All tracks players should reach a similar command (with the same synchronisation number) in each track at the same time. If not, then a synchronisation point occurs, where the players (or processors) must resynchronise.

Important note : the MSEQ builder can be forced to add regular synchronisation points in order to better split MSEQ format 0 files into packets (example : one synchronisation point every second).

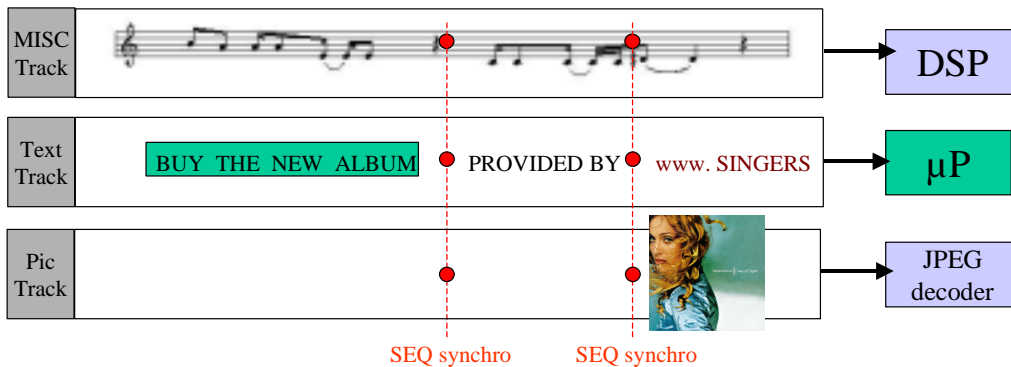


Figure 11 : MSEQ file synchronisation example

The means used for resynchronising within MSEQ player are free of implementation, but each MSEQ player software should take into account the Real-time conditions and then decide if a track type must be executed in real time without any interruption. Otherwise, with a best-effort consideration, first arrived track players could wait for the all-processors synchronisation (with a short service interruption).

We recommend the choice of a “master track”, witch contains the most “real-time sensible” media. If a synchronisation command occurs in this track, then the player send this synchronisation number to other processors. Other processors (playing other tracks) must then resynchronise.

Important note : if a “minor (or slave) track” playing is late compared to master track playing, then processor that plays this minor track can ignore running time of some MSEQ commands (inserted between slave track playing cursor and master track synchronisation point to reach). The processor can even ignore these MSEQ commands, but must not ignore some commands that could affect presentation after the synchronisation point (example : text formatting).

The MSEQ «synchronisation commands» are put into all MSEQ tracks according to events :

- in tracks TXT : each Carriage Return generates a synchronisation command in all tracks
- in tracks IMG : each bulk beginning (e.g. a new picture) generates a synchronisation command in all tracks
- usually, in tracks that contains bulk : immediately before each bulk beginning, there must be a synchronisation command.
-

These commands are put in MSEQ file by the MSEQ builder. Most of these synchronisation points can be automatically added.

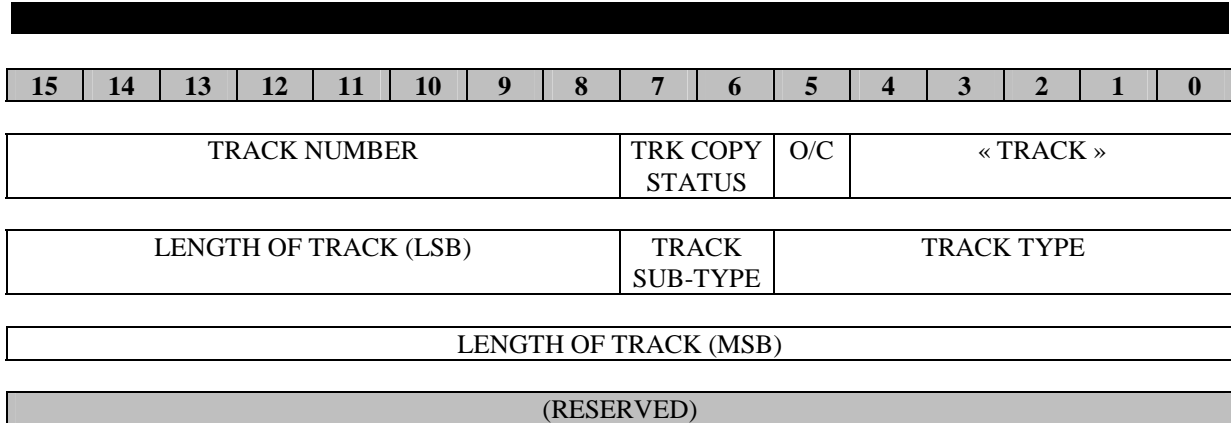
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3.2 Track structure

3.2.1 Track Header format

Figure 12 shows the Track Header format. In fact, the track header is the « Track » MSEQ command. So a track always begins with the « Track » command. Each header parameter only applies to that track.

Each bit of reserved parameters is set to 1.



« **TRACK** » SEQ command « Track ». This command opens and closes a track content.

O/C value 0 means that this track command is applied for track opening. Value 1 is used for closing a track.

Important note : an « opening » track command is always 3 words-long. A « closing » track command is only made with the first word. Thus, TRK_COPY_STATUS, TRACK_TYPE, TRACK_SUB_TYPE and LENGTH_OF_TRACK parameters are not included in a « closing » track command.

TRK COPY STATUS sets the copying permission of the track content.

Only valid if TRK_COPY_STATUS=%10 in MSEQ header. If not, refer to global permission set in MSEQ header.

COPY STATUS	DESCRIPTION
%00	track copy prohibited. The track content can not be copied.
%01	(reserved)
%10	no specific information about this track. The global MSEQ_COPY_STATUS sets the copy permission for this track
%11	track copy free.

TRACK NUMBER number that identifies the track (track ID). The Track numbers are attributed by the MSEQ builder software, from track 1 to track n (maximum 255 tracks in one MSEQ file). *Value 0 is reserved (see §3.2.5)*. If this command is used for closing a track, then the ID of the track is mentioned.

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TRACK TYPE this indicates which type of data is included in that track. So if a player or processor is not involved in that type of content, it can read the length of track and jump to read the type of the next track. See Figure 59 for predefined Track types.

TRACK SUB-TYPE defines, for a track type, a particular implementation of this format. This indication is for information only, and must not be used for format decoding. This information is not used for the moment.

LENGTH OF TRACK number of 16-bit words in track. It includes the « opening » TRACK command (3 words) and the « closing » track command (1 word).



Figure 12 : open TRACK command

3.2.2 End of Track format

The end of a Track is always made with a « closing » track command :

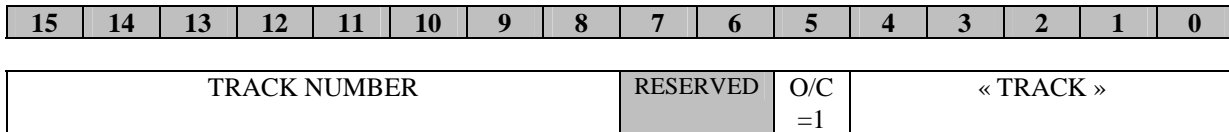
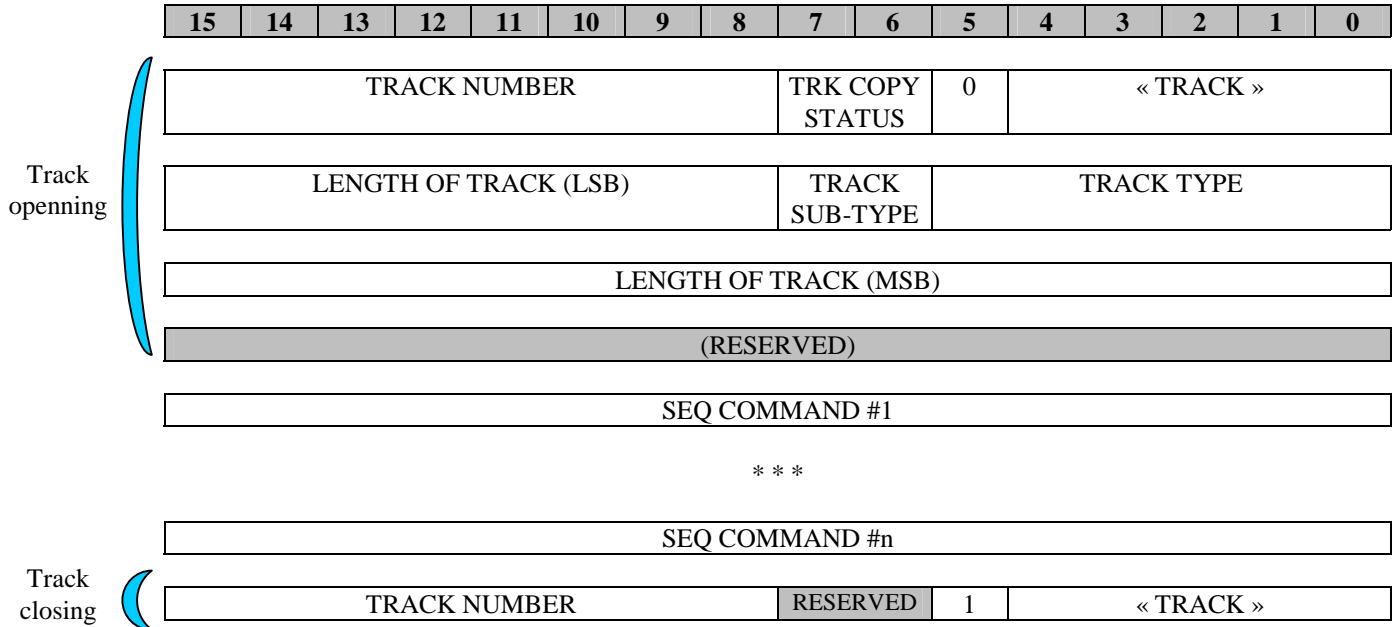


Figure 13 : close TRACK command

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3.2.3 Track structure

So, the structure of any track will be :



3.2.4 Track advantages

To be completed (pictures, text & MIDI synchronisation, in a multiprocessors data dispatch).

3.2.5 Copyright management in MSEQ files

Contents copyright protection is managed in MSEQ files, through global protection bits (copy countdown and resend countdown) and/or local protection bits (for each media). So every media can be protected separately (for example, in a same MSEQ file, pictures are public domain but music is protected, so music track can not be exported).

If same kind of media (example : JPEG pictures) have different copy rights (some are protected, others not), then 2 tracks should be open : a first one containing protected JPEG pictures, an other one containing non-protected JPEG pictures. This should be managed by the MSEQ builder.

Anyway, these copyright bits can easily be hacked, as they are very simply coded.

It is considered that no software protection is perfect, as nowadays, every software protected contents have already been cracked.

Considering that software protections must evolve at least as much as hacking means and practices, track number #0 has been reserved in order to incorporate contents copyright management.

This track will also include a track naming management, that will be defined in next release of this document.

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3.3 Bulk structure

3.3.1 Bulk including

In order to include any new format or specific format, any track can include bulks definitions.
 A bulk is a break in the MSEQ commands, allowing to include other type of data in a MSEQ file.

Examples : JPEG file, MPEG file, mp3 file (with or without copy protection), ...

A defined bulk is an object containing non-native MSEQ format. This object can be played anytime in any MSEQ track (see 1.4 : Objects management).

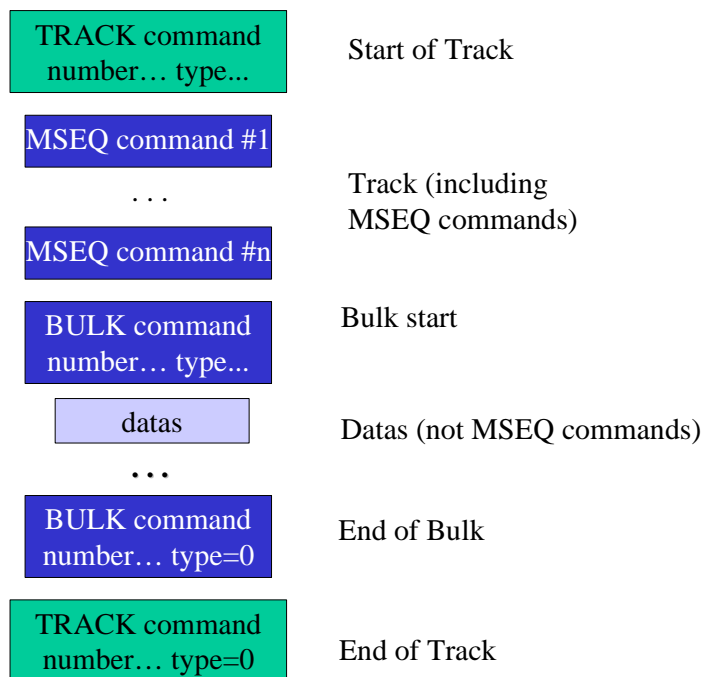


Figure 14 : Bulk structure in a track

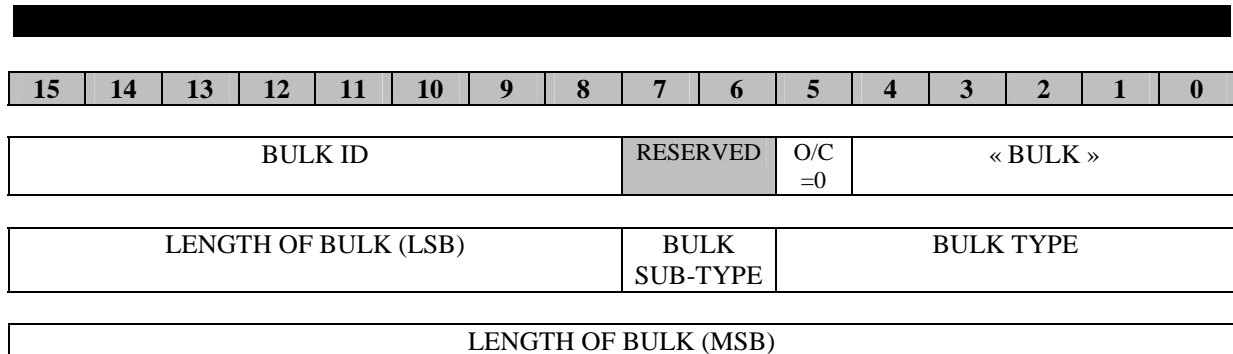
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3.3.2 OPEN Bulk command

External objects (eg. non-native MSEQ objects) are considered in MSEQ as “streaming oriented”. Because most of time, they are much bigger than native MSEQ objects.

So, within a MSEQ file, when they are received in a Bulk definition, they could be played immediately (if an USE OBJECT command with RE-USE=0 is following immediately the bulk definition), but they should also be stored as objects in receiver memory if they are played again later (using several USE OBJECT commands).

This functionality allows to manage efficiently a data objects cache in receiver.



Important note : a bulk definition contains no individual COPY STATUS. That means, if at least one of the bulk data must be protected, the entire track will have to be protected. If it is really necessary to provide to the user the ability of exporting non-protected data, then the MSEQ builder software have to build 2 tracks : one for the protected data, and one other for non-protected data, with delays alternance.

« **BULK** » SEQ command « Bulk ». This command opens and closes a bulk content.

O/C value 0 means that this Bulk command is applied for bulk opening. Value 1 is used for closing a bulk (see next paragraph).

BULK ID number that identifies the bulk. The Bulk ID are attributed by the MSEQ builder software, from bulk 1 to bulk n (maximum 255 bulks of same BULK TYPE in MSEQ file). The first bulk ID for each BULK TYPE is 1. **Value 0 is reserved.**

If this command is used for closing a bulk, then the ID and TYPE of the bulk is mentioned.

BULK TYPE this indicates which type of data is included in that bulk. So if a MSEQ player doesn't know the BULK type or can not read it, it can jump it (not executing it), but it must respect the running time of this bulk (BULK_RUNNING_TIME).

The bulk types are the same as Track types. See Figure 59 for predefined Bulk types.

BULK SUB-TYPE defines, for a bulk type, a particular implementation of this format. This indication is for information only, and must not be used for format decoding.

This information is not used for the moment (set to 0).

LENGTH OF BULK number of 16-bit words in bulk. It includes the « opening » BULK command (3 words) and the « closing » bulk command (1 word).

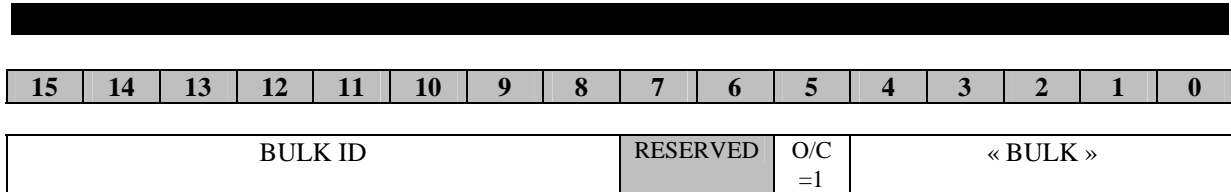
Figure 15 : OPEN BULK command

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Important note : the BULK ID + BULK TYPE defines the complete ID reference for this bulk object. Because OBJECT ID varies from 1 to 255 within any object type, 16320 objects can be defined at same time, and 16320 more objects can be predefined in MSEQ specification.

A specific complete object ID defines an object that can be re-used later in any track (using USE OBJECT command, and while RE-USE=1). That means, any object must be defined in any appropriate track temporally before it is used with USE OBJECT command (in most cases, one bulk is defined and used within the same track).

3.3.3 CLOSE Bulk command



« BULK » SEQ command « Bulk ». This command opens and closes a bulk content.

O/C Value 1 is used for closing a bulk.

BULK ID number that identifies the bulk. The Bulk ID are attributed by the MSEQ builder software, from bulk 1 to bulk n (maximum 255 bulks of same BULK TYPE in MSEQ file). The first bulk ID for each BULK TYPE is 1. **Value 0 is reserved.**

If this command is used for closing a bulk, then the ID and TYPE of the bulk is mentioned.

Important note : the BULK ID + BULK TYPE defines the complete ID reference for the bulk object that is being closed. BULK TYPE is not specified, but this CLOSE BULK command refers to the last OPEN BULK command in this track. BULK ID is only for verification.

Figure 16 : CLOSE BULK command

3.3.4 Bulk advantages

The interesting thing, with encapsulating data in a MSEQ Bulk structure, is that any beginning of bulk can be synchronized with other events in other tracks.

The MSEQ builder software can also split original data in multiple bulks, in order to synchronize a specific part of the data with other tracks events.

To be completed (MPEG animation split for a text & sound synchronisation).

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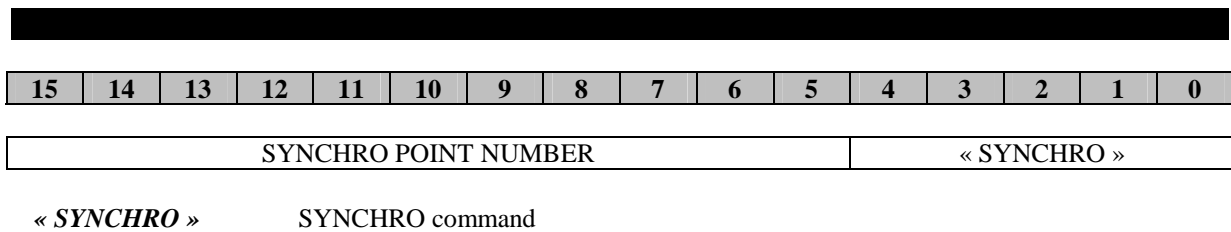
3.4 Other general MSEQ commands (available in all track types)

3.4.1 SYNCHRO command

The synchronisation between the tracks is made with SYNCHRO commands. A synchro command has a number. Each player or processor that is executing a MSEQ track must resynchronize with others at each SYNCHRO command. (See 3.1.7 : Tracks synchronisation).

The « synchronisation point number » gives the ID of the synchronisation point. So the track #1 at synchro #3 must be synchronized with the track #2 at synchro #3 and the track #3 at synchro #3...

If a track is shorter than others, then it does probably not have all the synchronisation points. If there are more than 2047 synchro points, then the next one will be 1 again (modulo 2047).



« SYNCHRO » SYNCHRO command

SYNCHRO POINT NUMBER synchronisation point number. **Value 0 is reserved.**

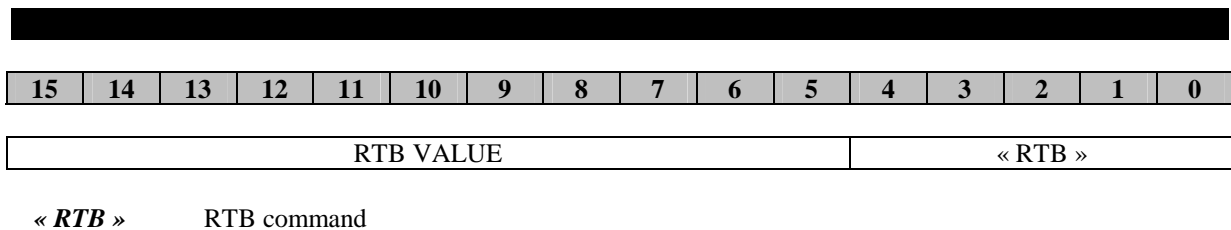
Figure 17 : SYNCHRO command

Note : It is strongly recommended that the first synchronisation point should be inserted at the beginning of each track (as a “start point”). It allows multi-processors platforms to start exactly at the same time.

3.4.2 RTB command

This command defines the (new) Relative Time Base. So the new value for RTB applies to any command (based on RTB) following.

It can be included anywhere in a track. At least one RTB command should be inserted in a track before any command that is based upon it. If no RTB is inserted, it is assumed to be RTB=1 as default (so events are based on ATB until one RTB is defined).



« RTB » RTB command

RTB VALUE New value for Relative Time Base. **Value 0 is prohibited.**

Figure 18 : RTB command

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3.4.3 DELAY command

This command is used in order to wait before executing the next command.

So, before the mentioned delay is run out, the MSEQ Sequencer has nothing new to do in this track.

When the DELAY command occurs, some other actions (playing a MIDI note, viewing a picture, ...) could be in their running time. The DELAY command doesn't stop the running actions.

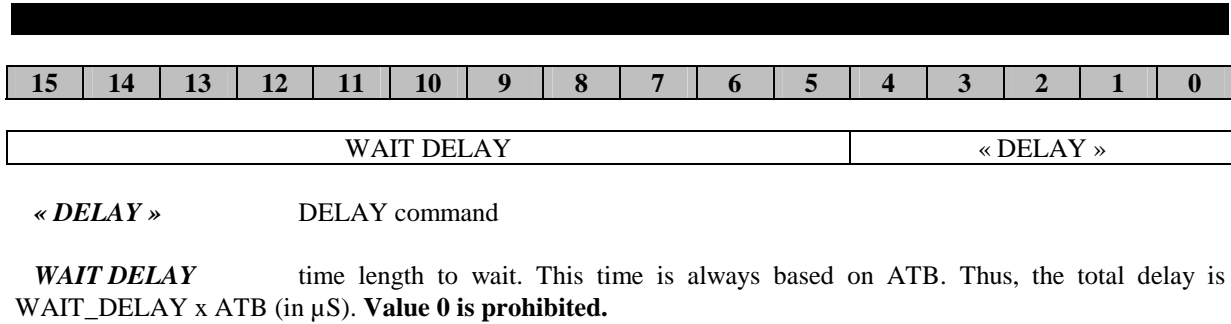


Figure 19 : DELAY command

Important note : This MSEQ delay command runs like DELTA_TIME in MIDI. But if WAIT_DELAY=0, this command is not included.

3.4.4 EXTENDED DELAY command

As the DELAY command, this command is used in order to wait before executing the next command.

It is used each time the WAIT DELAY excess 11 bits of coding (2048 x ATB).

If it's possible, the MSEQ builder software uses the simple DELAY command, because it uses only 1 16-bit word.

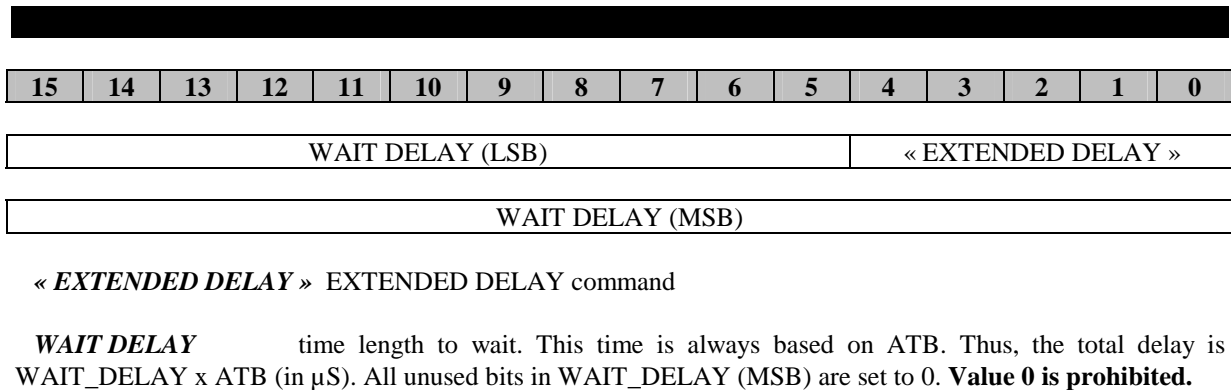


Figure 20 : EXTENDED DELAY command

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3.4.5 R-DELAY (RTB-based DELAY) command

This command is used in order to wait before executing the next command.

It works like DELAY command, excepting it is based on ATB x RTB (the DELAY and EXTENDED DELAY are based on ATB only).

This command is used for special tracks that needs delays and events to be played on exactly the same relative time base. For example, one Compressed-MIDI track where only one RTB is defined as Tempo of the entire track : if RTB is modified, the note running times AND delays between notes must be modified. So R-DELAYS are used.

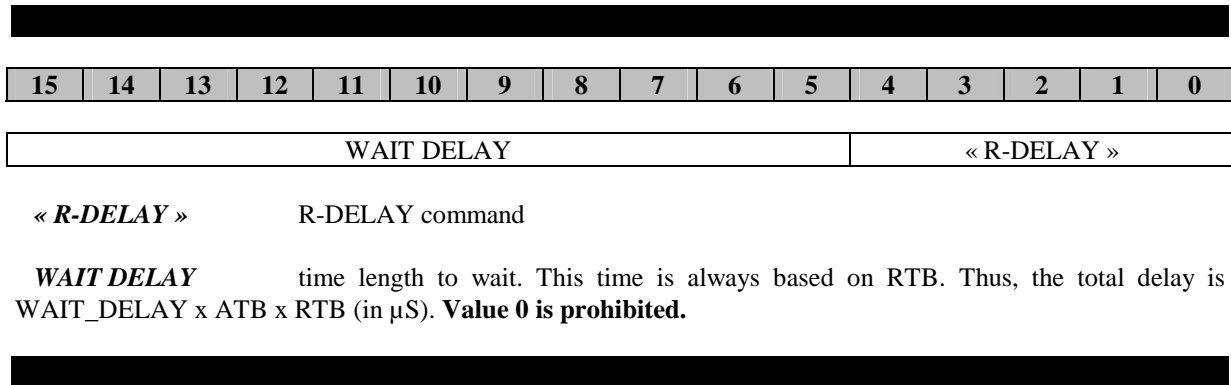


Figure 21 : R-DELAY command

Important note : This MSEQ delay command runs like DELTA_TIME in MIDI. But if WAIT_DELAY=0, this command is not included.

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1.4 Objects management

In order to display a picture, an animation or to play a sampled sound, native MSEQ formats have been specified, and to extend MSEQ capabilities, external formats can be included within a Bulk definition.

All these "in MSEQ defined" objects can be played anywhere in MSEQ tracks using "USE OBJECT" command. The only condition is that object must have been (temporally) previously defined in an appropriate track before using it.

So, we can distinguish 3 objects categories :

- native MSEQ objects that are defined using MSEQ commands (Animation, Picture);
- external format objects that are included in MSEQ file through Bulk definition;
- EMS-style Predifined objects (Sounds, Animations).

When played with USE OBJECT command, the process of these 3 types of objects is the same.

1.4.1 Objects identification

Any object is identified by :

- its type (see Figure 22 : OBJECT TYPES)
- its ID number
- whether this object is Predefined (PRD=1 in USE OBJECT command) in this specification or defined within the MSEQ file (PRD=0 in USE OBJECT command).

MSEQ builder allows ID numbers from 1 to 255 for any OBJECT TYPE.

For example, if :

- 2 JPEG pictures
- 1 MSEQ picture

are defined within a MSEQ file, this file will contain :

- 1 JPEG bulk definition (OBJECT TYPE=0x24, OBJECT ID=1, PRD=0)
- 1 JPEG bulk definition (OBJECT TYPE=0x24, OBJECT ID=2, PRD=0)
- 1 Picture definition (OBJECT TYPE=0x20, OBJECT ID=1, PRD=0).

Predefined objects already have attributed ID numbers. The ID field indicates the predefined object that must be played (see Figure 23 and Figure 24).

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1.4.2 Object types

OBJECT TYPE	OBJECT DESCRIPTION (PRD=0 in USE OBJECT command) (see Figure 59 : Track and Bulk types, object types)	OBJECT DESCRIPTION (PRD=1 in USE OBJECT command)
0x00	-	
0x01 to 0x0F	<i>synthetic sounds (synthetic sounds channels)</i>	
0x01	Compressed MIDI	
0x02	Original MIDI	
0x03 to 0x07	(reserved)	
0x08 to 0x0F	<i>sampled sounds (sampled sounds channels)</i>	
0x08	EMS-style & native-MSEQ predefined sounds	EMS-compatible Predefined sounds (see Figure 23)
0x09	WAV	
0x0A	AU	
0x0B	MP3	
0x0C	(reserved)	
0x0D	AMR	
0x0E to 0x0F	(reserved)	
0x10 to 0x1F	<i>Text (video channels)</i>	
0x10	simple text	
0x11	(reserved)	
0x12	advertisement text	
0x13	(reserved)	
0x14	information text	
0x15	priority information text	
0x16 to 0x1F	(reserved)	
0x20 to 0x2F	<i>static pictures (video channels)</i>	
0x20	EMS-style & native-MSEQ variable size pictures	
0x21	(reserved)	
0x22	GIF (up to 256 colors)	
0x23	(reserved)	
0x24	JPEG	
0x25	(reserved)	
0x26	PNG	
0x27 to 0x2F	(reserved)	
0x30 to 0x3E	<i>animated pictures (video channels)</i>	
0x30	EMS-style & native-MSEQ animated pictures	EMS-compatible Predefined Animations (see Figure 24)
0x31	(reserved)	
0x32	AVI	
0x33	Animated GIF	
0x34	(reserved)	
0x35	MPEG 2	
0x36	MPEG 4	
0x37	(reserved)	
0x38	Real Media	
0x39 to 0x3D	(reserved)	
0x3E - 0x3F	-	

 These objects are defined through a previous bulk.

Figure 22 : OBJECT TYPES

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SOUND NUMBER (OBJECT ID)	SOUND GENERATED
0	Chimes high
1	Chimes low
2	Ding
3	TaDa
4	Notify
5	Drum
6	Claps
7	FanFar
8	Chord high
9	Chord low

SOUND NUMBER defines sound to be played.

The predefined sounds are EMS compatible. The presentations of these sounds are manufacturer specific.

Note : in EMS standard, 256 sounds could be generated, even if only 10 are already defined.

Figure 23 : EMS-compatible Predefined Sounds (PRD=1, OBJECT TYPE=0x08)

ANIMATION NUMBER (OBJECT ID)	ANIMATION DISPLAYED
0	I am ironic, flirty
1	I am glad
2	I am septic
3	I am sad
4	WOW !
5	I am crying

ANIMATION NUMBER defines Animation to be played.

The predefined animations are EMS compatible. The presentations of these animations are manufacturer specific.

Note : in EMS standard, 256 animations could be generated, even if only 5 are already defined.

Figure 24 : EMS-compatible Predefined Animations (PRD=1, OBJECT TYPE=0x30)

1.4.3 Receiver data cache management

When they are received, any "in MSEQ defined" object is stored in an object data cache by the MSEQ player.

This object will be used by the USE OBJECT command. In this command, the filed RE-USE specifies whether or not this object must be kept in data cache.

This MSEQ file functionality allows to manage cleverly this object data cache.

1.4.4 Play channels

The "Channels" where an object can be played are :

- up to 16 video channels (video zones defined by MSEQ relative windowing, see §3.5).
- up to 16 synthetic sounds channels (with MISC commands, see §4.1) : one channel plays a music instrument.
- up to 16 sampled sounds channels (one channel plays one sample)

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3.4.6 USE OBJECT command

This command is used to play “already defined” objects :

- a picture predefined using PICTURE DEFINITION command
- an animation predefined using ANIMATION DEFINITION command
- a bulk predefined using OPEN/CLOSE BULK commands (external format object)
- EMS-style & native-MSEQ predefined sounds
- EMS-style & native-MSEQ predefined animations

A running time is added. So the object is played during RUNNING_TIME x RTB x ATB. After this timeout, for example with a displayed object, the picture/animation/bulk content is stopped and cleared.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RE-USE	0	LOOP REV	LOOP	FREE	0	0	CHANNEL				« USE OBJECT »				
0	PRD	OBJECT TYPE					OBJECT ID								
RUNNING TIME															

« **OBJECT USE** » object use command

CHANNEL video / sound /... channel where the object must be played.

FREE if set to 1, the object is played once. The running time is set by object length (it is 0 for picture display). After playing once, the object is cleared (picture, animation) or stopped (sound). **In this case, RUNNING_TIME, LOOP and LOOP_REV must be set to 0**, and have no effect.

If set to 0, RUNNING_TIME and LOOP parameters applies.

If FREE=0 :

LOOP if set to 1, the object is played continuously (loop from the end to the beginning), until the RUNNING_TIME is out.

LOOP REV if set to 0, the object is played : beginning to end, then loop to the beginning.
 If set to 1 (Loop Reverse), the object is played : beginning to end, then end to beginning, then beginning to end, etc... This last feature is particularly adapted to animation display, and its implementation is facultative for some objects (eg sampled sounds).

Only active if LOOP=1. If LOOP=0, value must be 0.

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RUNNING TIME defines the length of time the object has to be played. The play will run during $RUNNING_TIME \times RTB \times ATB$ (in μS). **Value 0 is prohibited.**

- If LOOP=0 and the predefined object is shorter than RUNNING_TIME, then the last state of object (eg. last picture for animation) is displayed until end of RUNNING TIME.
- If the predefined object is longer than RUNNING_TIME, then it ends after RUNNING_TIME (the object play is cut).

For example, with ATB=115 and RTB=121, a picture with a RUNNING_TIME=201 will be displayed $201 \times 121 \times 115 \mu S \supset 1.6 S$ to the user. After this timeout, the picture will be cleared. If the DELAY command following the bulk is :

- greater than 1.6 S : the image will be erased and nothing will happen oh this track until the end of the DELAY command
- shorter than 1.6 S :
 - + if the display can only show one picture : the image will be replaced by the next one after 1.6 S, if a new image is following the DELAY command. In this particular context, the DELAY command is prior to the BULK_RUNNING_TIME.
 - + if the display can show multiple pictures : the second image will be shown before the first disappears.

This kind of functionality is the same as in Compressed MIDI, but for other types of data.

RU object Re-Use. This field indicates whether or not this object will be *reused later*. Thus, it is not necessary to store it *anymore* in memory when receiving MSEQ file in streaming modes.

MSEQ thus defines the reusability of external objects. It could be particularly used in streaming modes, in order to manage a data cache with efficient memory use.

If RU=0, this object will no more be used after this command. Thus, it is not necessary to store it anymore in memory (especially when receiving MSEQ file in streaming modes).

If RU=1, the content of this bulk will be called back later in MSEQ file, using again USE OBJECT command and this OBJECT ID+ONJECT TYPE. The content of this object must be stored temporally in streaming modes.

OBJECT ID object to be played (object ID within same OBJECT TYPE). **Value 0 is reserved.**

OBJECT TYPE specifies the object type (see Figure 59 : Track and Bulk types)

This object type field allows :

- to define up to 255 different objects per object type;
- when encountering USE OBJECT command, to remind to the MSEQ player the object type, even the bulk type if it is a bulk object.

PRD specifies a predefined object. If set to 1, the object type and object ID refers to a predefined object (this object must be predefined in this specification). For example, it could refer to "EMS-compatible Predefined sounds".

If set to 0, it refers to an object that has been previously defined in the MSEQ file.

Important note : the complete word OBJECT ID + OBJECT TYPE + PRD defines the complete ID reference to an object. Because OBJECT ID varies from 1 to 255 within any object type, 16320 objects can be defined at same time, and 16320 more objects can be predefined in MSEQ specification.

A specific complete object ID defines an object that can be re-used later in any track (using USE OBJECT command, and while RE-USE=1). That means, any object must be defined in any track temporally before it is used with USE OBJECT command.



Figure 25 : USE OBJECT command

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3.5 Video MSEQ commands (available in all text, pictures or video track types)

3.5.1 Video channel principle

A video channel is a defined zone on screen (eg. a text or graphical window). Each text, pictures or video command refers to a video channel, in order to be displayed in that zone.

Each new video channel position is defined relatively to others. Its size is defined in pixels or in number of objects it must contain. This definition is made with VIDEO CHANNEL ZONE command.

The video channel number #0 is the entire screen (background) and can not be defined.

3.5.2 VIDEO CHANNEL ZONE command

This command defines a new video channel.

- If this video channel has already be defined and is not yet closed, then the last definition of this video channel is replaced with new one. This allows video channel moving or characteristics changing.
- If this video channel has already been used but is now closed, or has never been used, then a new video channel is opened. The video channel contains no data (is cleared).
- To close a video channel : set SIZE_TYPE=POS_TYPE=0.
- Absolute positioning on screen is possible with REF VIDEO CHANNEL = 0 (positioning relative to screen).
- If SIZE_TYPE = 1 (size definition in number of objects), then this command is used to reserve the video channel ; the definitive size of this channel will be later opened with the first command using this channel (see below SIZE_TYPE definition).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

SIZE TYPE	POS TYPE	NEW VIDEO CHANNEL	« VIDEO CHANNEL ZONE »
POSITIONNING DEFINITION (see below)			
SIZE DEFINITION (see below)			

« VIDEO CHANNEL ZONE » VIDEO CHANNEL ZONE command

NEW VIDEO CHANNEL index of video channel to be defined. **Value 0 is prohibited.**

POS TYPE positioning definition type.

POS TYPE	MEANNING
0	close window.
1	the new video channel positioning is relative to current cursor position in the ref video channel (see Figure 28 and Figure 31).
2	the new video channel positioning is relative to the ref video channel (see Figure 28). More precisely, the new video channel part is positioned relatively to the ref video channel part (see Figure 29 and Figure 30).
3	left-up of video channel defined in pixels, relatively to left-up of REF_VIDEO_CHANNEL. (if REF_VIDEO_CHANNEL=0, screen-based absolute pixels ; this mode is not recommended for multi-platform destination.)
4..7	Reserved

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SIZE TYPE size definition type.

SIZE TYPE	MEANNING
0	close window.
1	size defined in number of objects. The first object put inside this video channel defines the objects size that are inside : - text (then X_SIZE defines the max. number of characters that must be displayed per line, and Y_SIZE the max. number of lines, in the format defined by TEXT_EFFECT command). - image (then X_SIZE defines the max. number of pictures that must be presented in line, and Y_SIZE the max. number of pictures that must be displayed in a row). In two cases, the first object displayed in the video channel defines the display size reserved for any object that will be put in this video channel.
2	Reserved
3	size defined in pixels. This mode is not recommended for multi-platform destination, until this size is standard (EMS, ...).
4..7	Reserved

POSITIONNING DEFINITION

- POS_TYPE=0 : positioning definition does not exist.
- POS_TYPE=1,2 :

PART REF	PART NEW	POS NEW-REF	REF VIDEO CHANNEL
----------	----------	-------------	-------------------

REF VIDEO CHANNEL reference video channel (index of) for positioning new video channel.

POS NEW-REF new video channel positioning relatively to ref video channel. Value 5 is for « HTML like » positioning (at the cursor point).

PART NEW part of the new video channel to be positioned (see Figure 27).

PART REF part of the ref video channel to be positioned (see Figure 27).

Must be set to 0 if POS TYPE=1.

These 3 parameters defines a « Relative Global Positioning » (RGP). The Figure 29 and Figure 31 shows some combinations. Some combinations are equivalent (see Figure 30).

- POS_TYPE=3 :

X_POS	REF VIDEO CHANNEL
Y_POS	(RESERVED)

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SIZE DEFINITION

- SIZE_TYPE=0 : size definition does not exist.
- SIZE_TYPE=1 :

Y_SIZE (number of objects on Y axis)	X_SIZE (number of objects on X axis)
--------------------------------------	--------------------------------------

- SIZE_TYPE=3 :

X_POS	(RESERVED)
Y_POS	(RESERVED)



Figure 26 : VIDEO CHANNEL ZONE command

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The screen (channel video #0) is split in 9 parts identified as follows :

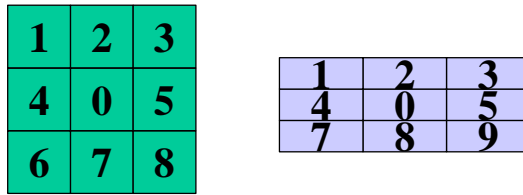


Figure 27 : video channel parts (example on two different screens)

The NEW-REF positioning is defined as follows :

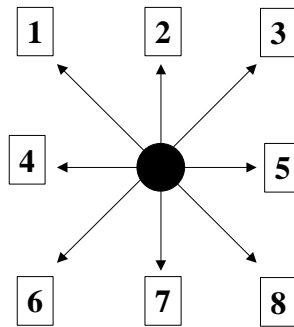


Figure 28 : video channel positionning

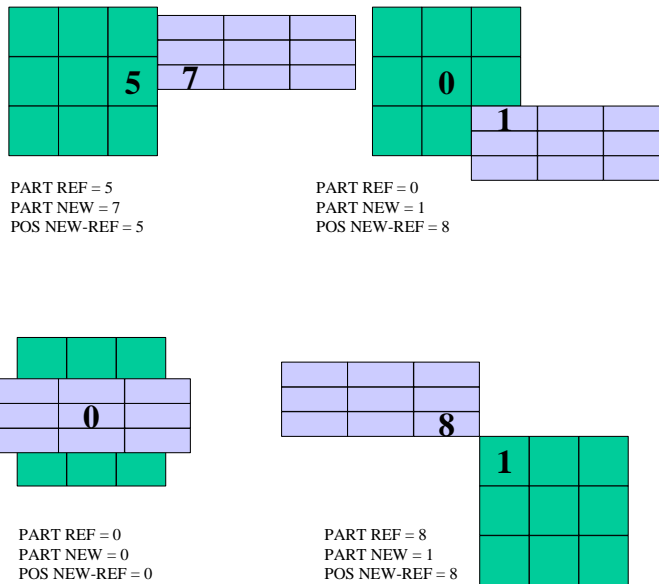
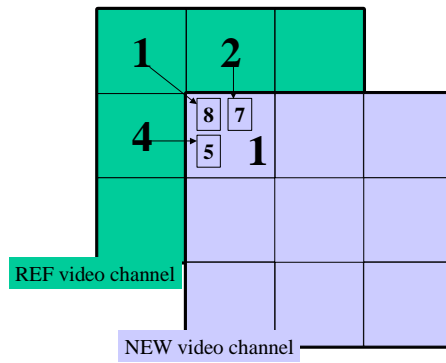


Figure 29 : examples of video channel positionning (relatively to ref video channel)

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is similar to : PART REF =1 ; POS NEW-REF =8 ; PART NEW =1
 is similar to : PART REF =2 ; POS NEW-REF =7 ; PART NEW = 1
 is similar to : PART REF =4 ; POS NEW-REF =5 ; PART NEW = 1
equivalent positionings only if the 2 video zones are the same size.

Figure 30 : some equivalent positionnings

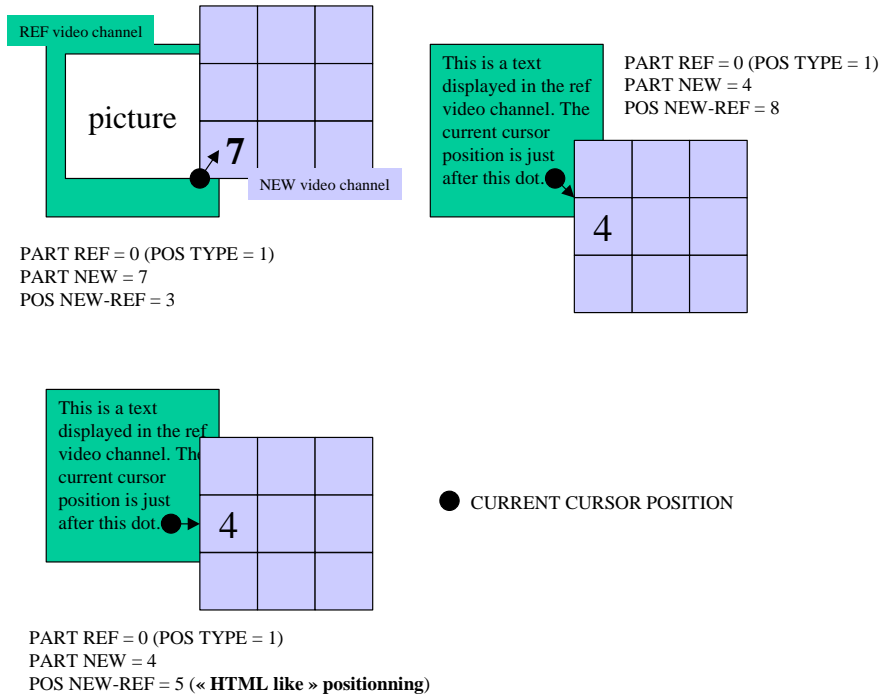


Figure 31 : examples of video channel positioning

(relatively to current cursor position in ref video channel)

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15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

0	0	0	0	0	0	VIDEO CHANNEL	« VIDEO CHANNEL ZONE »
---	---	---	---	---	---	---------------	------------------------

« VIDEO CHANNEL ZONE » VIDEO CHANNEL ZONE command

VIDEO CHANNEL Index of video channel that must be closed



Figure 32 : close video channel (VIDEO CHANNEL ZONE command)

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3.5.3 VIDEO CHANNEL PROPERTIES command

This command defines special properties of video channel.

- These properties 1 be applied immediately. On low-level implementation, these properties should be defined before VIDEO_CHANNEL_ZONE command, and not be changed before video channel closing. On best implementations of MSEQ format, this command changes dynamically display of all objects and pixels that are inside the video channel zone.
- « Cross-zones » defines zones that are already defined in others pre-defined video zone, and are included in the concerned video channel (eg. intersections).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PREDEF	PROPERTY	VIDEO CHANNEL	« VIDEO CHANNEL PROPERTIES »												
PARAMETERS (according to TYPE)															

« VIDEO CHANNEL PROPERTIES » VIDEO CHANNEL PROPERTIES command

VIDEO CHANNEL index of video channel on which new properties must be applied.

PROPERTY video channel property concerned :

PREDEF basic parameters definition :

PROPERTY	MEANNING	PREDEF	DEFAULT (without properties definition)
0	Level compared to others video channel zones	reserved (set to %111)	the new defined video channel is « upper » all other existing video channels
1	Transparency	0 = no transparency used. Use background color 1 = objects in zone are INV-AND-displayed with cross-zones 2 = objects in zone are AND-displayed with cross-zones 3 = objects in zone are INV-OR-displayed with cross-zones 4 = objects in zone are OR-displayed with cross-zones (merged) 5 = objects in zone are XOR-displayed with cross-zones 5 .. 7 = reserved	the new defined video channel has no transparency defined with none of video channels
2	Background	1 = background color 0, 2 .. 7 = reserved	white (0xFFFF)
3	Border	0 = no border displayed 1 = square border, small size 2 = square border, medium size 3 = square border, large size 4 = rounded border, small size 5 = rounded border, medium size 6 = rounded border, large size 7 = reserved	no border displayed
4	Alignment (of all objects put in video channel)	0 = left 1 = center 2 = right 3 = justify	Left
5..7	Reserved	***	***

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PARAMETERS

PROPERTY=0 (level) :

- bit 0 is always set to 1.
- bit 1 represents position of described video channel regarding to video channel 1...
 - + if bit=1, the described video channel is « upper » the video channel 1 ; then all objects contained in described video channel are displayed in all cross-zones with video channel 1.
 - + if bit=0, the described video channel is « lower » the video channel 1 ; then all objects contained in video channel 1 are displayed in all cross-zones with described video channel.
- bit 2 represents position of described video channel regarding to video channel 2, etc...

PROPERTY=1 (transparency) :

- bit 0 represents transparency regarding to background objects
- bit 1 represents transparency regarding to video channel 1 objects, etc...
 - + if bit=0, the PREDEF transparency must not be considered (is not applied) between described video channel and video channel 1. So this command has no effect regarding to video channel 1.
 - + if bit=1, the described video channel transparency is defined as PREDEF with the video channel 1.
- bit 2 represents transparency regarding to video channel 2 objects, etc...

PROPERTY=2 (background) and PREDEF=1 (background color) :

RED COLOR	GREEN COLOR	BLUE COLOR	(RESERVED)
-----------	-------------	------------	-------------------

RED / GREEN / BLUE COLOR color used for the text. It is not indexed, but directly defined (16 levels per color, so 4096 can be used). So color 0x000 is black, and color 0xFFFF is white.

For HTML pages translating (256 levels per color), ignore the 4 LSB bits (color #0F1C23 is 0x012 in MSEQ format).

PROPERTY=3 (border) : no PARAMETERS value.

PROPERTY=4 (alignment) : no PARAMETERS value.



Figure 33 : VIDEO CHANNEL ZONE DEF command

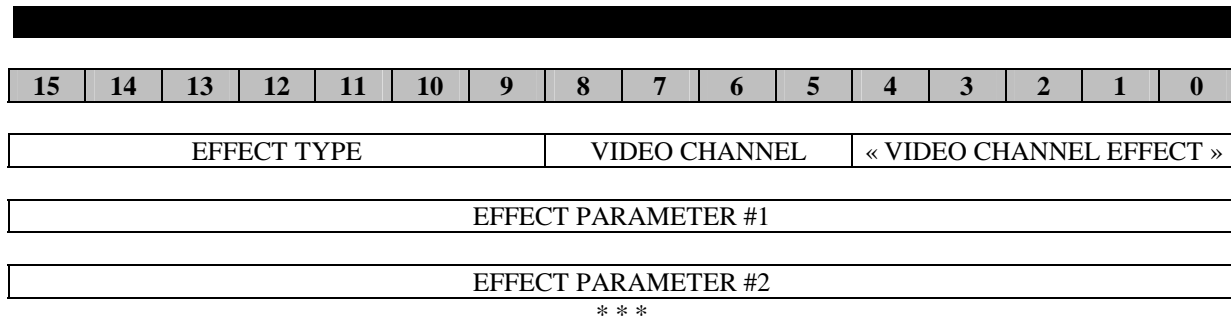
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3.5.4 VIDEO CHANNEL EFFECT (effect #3) command

This command is used to apply a particular effect on a video zone, eg. within a slideshow or animation. This effect is applied to text or picture (text or pictures transitions, ...), depending on track type.

Note 1 : For very light implementations, ignore this command.

Note 2 : The EFFECT_TYPE defines the number of parameter that follows (see Figure 35).



- « PICTURE EFFECT » PICTURE EFFECT command
- EFFECT TYPE type of effect applied (see Figure 35)
- EFFECT PARAMETER #1 first effect parameter (see Figure 35)
- EFFECT PARAMETER #2 second effect parameter (see Figure 35)
- * * *
- EFFECT PARAMETER #N effect parameter N (see Figure 35)

Figure 34 : VIDEO ZONE EFFECT command

EFFECT TYPE	EFFECT NAME	DESCRIPTION	PARAMETERS
0	Clear video channel	video channel background must be applied to all video channel zone	None
1	Active pixels shading	active pixels colors must shade to ending color	#1 : running time (*) #2 : ending color (*)
2	Background pixels shading	background pixels (eg. inactive) colors must shade to ending color	#1 : running time (*) #2 : ending color (*)
others	To be defined		

(*) description in next version of this document.

Figure 35 : effects on video zone

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4 TRACKS CODING

4.1 MIDI and MISC Tracks

4.1.1 Midi coding in MSEQ format

There are two types of MIDI Track :

- original MIDI file (the data are contained in bulks)
- compressed MSEQ MIDI file (compression ratio = 1:2 to 1:3). This format is called MISC (Midi Sequentially Compressed)

The MISC format in MSEQ is defined as follows. It is generated by the MSEQ builder software, using a MIDI original format. Like in MIDI, there are 16 MIDI-channels, delta-time similar commands, note-on command, effects commands...

The conversion MIDI to MSEQ is nearly non-destructive.

Are only affected :

- velocity (range 0-127) is reduced to range 0-63
- number of instruments in General MIDI (range 0-127) is reduced to range 0-15, but 7 sounds banks are available for each of them. It is then possible to keep the GM compatibility.

The .KAR or .ST3 MIDI files (or .MID including karaoke text or other text information) can also be converted in MSEQ. Then, all MIDI music tracks are merged in a single MISC track, and the MIDI text track is converted in a single MSEQ text track. The two are then synchronized using MSEQ synchronisation commands (every time a Carriage Return occurs).

4.1.2 Why using MSEQ compressed MIDI format

- because the length of MSEQ file will be at least divided by 2, for the same sound quality.
- because the MSEQ commands are totally predictive : NOTE commands specifies the running time of a note. So, for example, MIDI Sequencer doesn't have to wait for the MIDI NOTE-OFF command.
- It can be easily synchronized not only with karaoke text, but also other types of text and pictures and animated pictures.

Thus, this format is particularly adapted to little platforms, like Mobile phones or PDA, and to multi-processors platforms (each track can be played by a different processor).

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4.1.3 MISC format

The MSEQ compressed MIDI format uses MSEQ Sequential commands.

4.1.3.1 Relative Time Base (RTB)

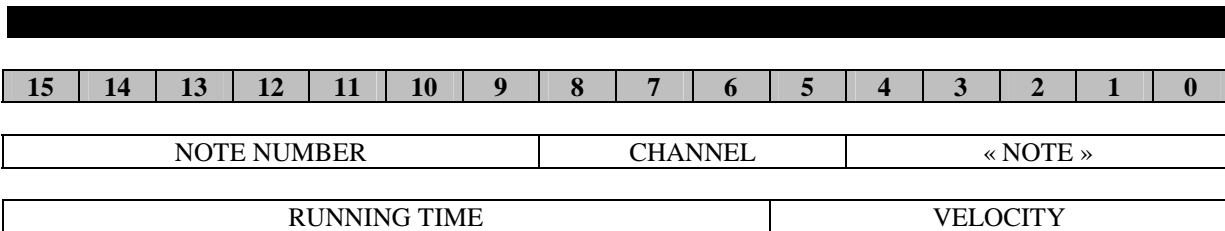
The RTB defines, for each track, the time base for playing notes. At least one RTB must be defined at the track beginning.

DELAY commands use the ATB time base.

NOTE commands use the (RTB x ATB) time base. This time base is in fact the biggest divider of all NOTE lengths.

Other commands are executed immediately.

4.1.3.2 NOTE command



« NOTE » NOTE command

CHANNEL sound channel, from 0 to 15. Most of the time, a single instrument is associated with a channel number. The definition is the same than in MIDI format.

NOTE NUMBER this is the note to be played. Definition is the same than in MIDI format (Middle C of an 88 note piano-style keyboard has a reference value of 60).

VELOCITY this is the volume of the note to be played. Definition is the same than in MIDI format, excepted that the range is reduced to 0-63.

RUNNING TIME defines the length of time the note has to be played. The note will sound during RUNNING_TIME x RTB x ATB (in μS).

Figure 36 : NOTE command

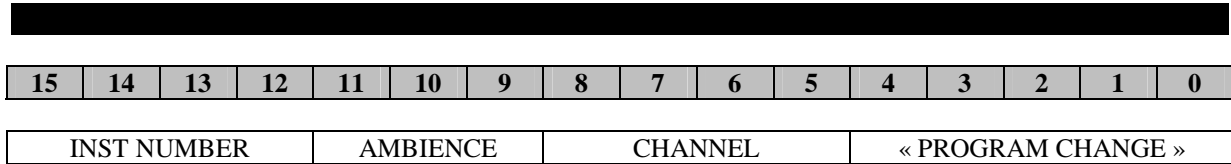
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4.1.3.3 PROGRAM CHANGE command

As in MIDI, this command is used to set a particular instrument on a specific MIDI channel. So it specifies which instrument will be played on this channel (using NOTE command). At least one PROGRAM_CHANGE command per channel should be used at the beginning of the Compressed MIDI track.

Note : this command must be immediately executed. It has no running time. The INST_NUMBER and AMBIENCE are set to this channel up to an other PROGRAM_CHANGE definition on this channel.

Usually, the init value for each channel is « Classic Piano » (variation = 0, inst_number = 0).



« PROGRAM CHANGE » PROGRAM CHANGE command

CHANNEL sound channel, from 0 to 15. Most of the time, a single instrument is associated with a channel number. The definition is the same than in MIDI format.

AMBIENCE sound variation, from 0 to 7 (see Figure 39). VARIATION=7 sets a proprietary kind of sound. So if requested, it could result in an strange variation on other platforms.

INST NUMBER instrument number to be associated to this channel. values 0 to 15 are possible and must respect the Figure 38 definitions (to be GM compatible).

Figure 37 : PROGRAM CHANGE command

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In MSEQ format, the number of instruments is reduced to 16 (128 in General MIDI), but in respect of GM sound requirements. In fact, in GM, there are 16 instruments families. the MSEQ format proposes 1 sound for each family. But this sound can be played in 8 ambiances (rock, pop, classic, ...).

General MIDI instrument number	SEQ instrument number	INSTRUMENT
1 - 8	0	Piano
9 - 16	1	Chromatic percussion
17 - 24	2	Orguan
25 - 32	3	Guitar
33 - 40	4	Bass
41 - 48	5	Strings (violin, harp...)
49 - 56	6	Ensemble (orchestral, chorus)
57 - 64	7	Brass
65 - 72	8	Reed (Saxophone, clarinet...)
73 - 80	9	Pipe (flute, ...)
81 - 88	10	Lead Synthesiser (solo type)
89 - 96	11	Synthesiser pad (orchestral)
97 - 104	12	Synthesiser effect (special effects)
105 - 112	13	Ethnic (sitar, banjo...)
113 - 120	14	Percussive
121 - 128	15	Sounds effects (telephone !, explosion...)

Figure 38 : General MIDI to MSEQ instrument conversion

SOUND AMBIENCE (BANK NUMBER)	SOUND TYPE
0	Classic (default)
1	Rock
2	Pop
3	Techno
4	Disco
5	Jazz
6	Folk
7	Proprietary

Figure 39 : sound variations (sound banks)

Important note : In fact, MSEQ format can be totally compatible with GM : then ignore the variation number, and encode the INST_NUMBER in 7 bits (like in GM). This will be compatible with GM AND MSEQ (even if some instrument numbers in GM will result in strange ambiances in MSEQ, the sound family will be respected).

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4.1.3.4 VOLUME command

Like the MIDI Volume Control-Change, this command is used to set a volume on a specific channel. Only 64 values are possible (127 in MIDI).

The init value for playing MIDI is 32. Then this value is changed with the VOLUME command.

Thus, the volume of any note played on this channel will be :

$$Total\ volume\ (range\ 0 - 64) = \frac{NOTE\ velocity \times channel\ VOLUME}{64}$$

Note : this command must be immediately executed. It has no running time. The VOL_VALUE is applied to this channel up to an other VOLUME definition on this channel.

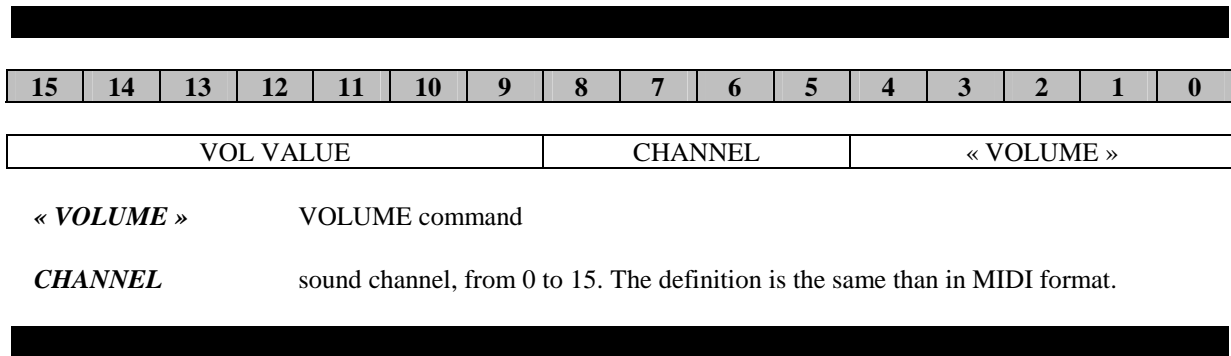


Figure 40 : VOLUME command

Important note : use of this command for other tracks is not defined in this document, but is reserved. For example, in future MSEQ format upgrade, this command could be implemented to set the display brightness in any “displaying” track.

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4.1.3.5 SOUND EFFECT (effect #2) command

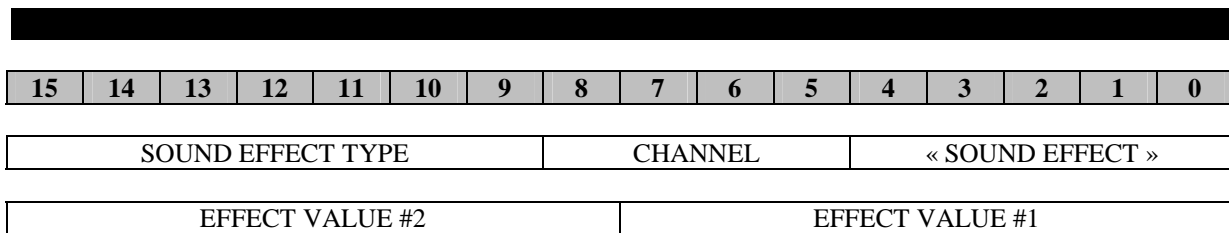
As in MIDI, this command is used to apply a particular effect on a specific channel. This effect is applied to any note that is still playing or that will be played on this channel (using NOTE command).

Note 1 : this command must be immediately executed. It has no running time.

Note 2 : For light implementations, use the effect only on the notes that will be played (not on the notes that are still running). For specific effects like Sostenuato, see Figure 42.

For very light implementations, ignore this command.

Note 3 : some effects do not require EFFECT_VALUE_#2. Then fill these bits with 0.



« SOUND EFFECT » SOUND EFFECT command

CHANNEL sound channel, from 0 to 15. The definition is the same than in MIDI format.

EFFECT TYPE type of effect applied. Includes most of the MIDI CONTROL_CHANGE (with no change in the controller number). See Figure 42

EFFECT VALUE #1 first effect parameter (see Figure 42)

EFFECT VALUE #2 depending on effects, a second effect parameter can be necessary to define the applied effect (see Figure 42)

Figure 41 : SOUND EFFECT command

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SOUND EFFECT TYPE	DESCRIPTION	EFFECT VALUE #1	EFFECT VALUE #2	COMMENTS
1	Modulation	Modulation (0-127)	0	
5	Portamento time	Portamento time (0-127)	0	sets the portamento time value
7	Volume	Volume (0-127)	0	similar to VOLUME command Prefer VOLUME command
10	Pan	Pan (0-127)	0	Left / Right Pan
64	Substain	(*)	0	
65	Portamento ON/OFF	OFF (0-63) ON (64-127)	0	applies the portamento effect
66	Sostenuto	OFF (0-63) ON (64-127)	0	Sostenuto ON : all notes that are running are kept active until Sostenuto OFF occurs.
67	Soft pedal	(*)	0	
68	Legato	(*)	0	
69	Hold 2	(*)	0	
other values	NOT DEFINED			

(*) fill with : value (0-127) or : OFF (0-63) / ON (64-127)

This table is to be completed on next version of this document

Figure 42 : SOUND EFFECT types table (MIDI compatible)

4.1.4 Sequencing example

To be Completed.

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4.2 Text Track

4.2.1 SHORT TEXT command

This command is particularly used for displaying little amount of text. For example, Karaoké using word-by-word or syllable-by-syllable displaying.

If text length to be displayed is more than 16 characters (or 18 characters including CR and LF), then the LONG TEXT command should be better used.



15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

RSV	CR	SP	TEXT LENGTH	VIDEO CHANNEL	« SHORT TEXT »
-----	----	----	-------------	---------------	----------------

16-bits coding :

CAR #1

CAR #2

* * *

8-bits coding :

CAR #2	CAR #1
--------	--------

CAR #4	CAR #3
--------	--------

* * *

« *SHORT TEXT* » SHORT TEXT command

VIDEO CHANNEL video channel, from 0 to 15. Defines on which video channel (where) the text must be displayed.

SP a space character must be added after all characters display.

CR if set to 1, go to the next line beginning before displaying first character.

RSV *set to 0.*

TEXT LENGTH number of characters (1-16) following in that command. Value 0 means one character, value 15 is for 16 characters.

CAR #n characters. Characters could be coded in USC2 (16 bits) or ASCII (8 bits). The « TEXT EFFECT » command sets the coding type. CTRL characters can be used (CR, LF, PAGE UP, etc...). If coding is in 8 bits and number of characters is odd, the last character **must be 0xFF** (and be ignored by player).

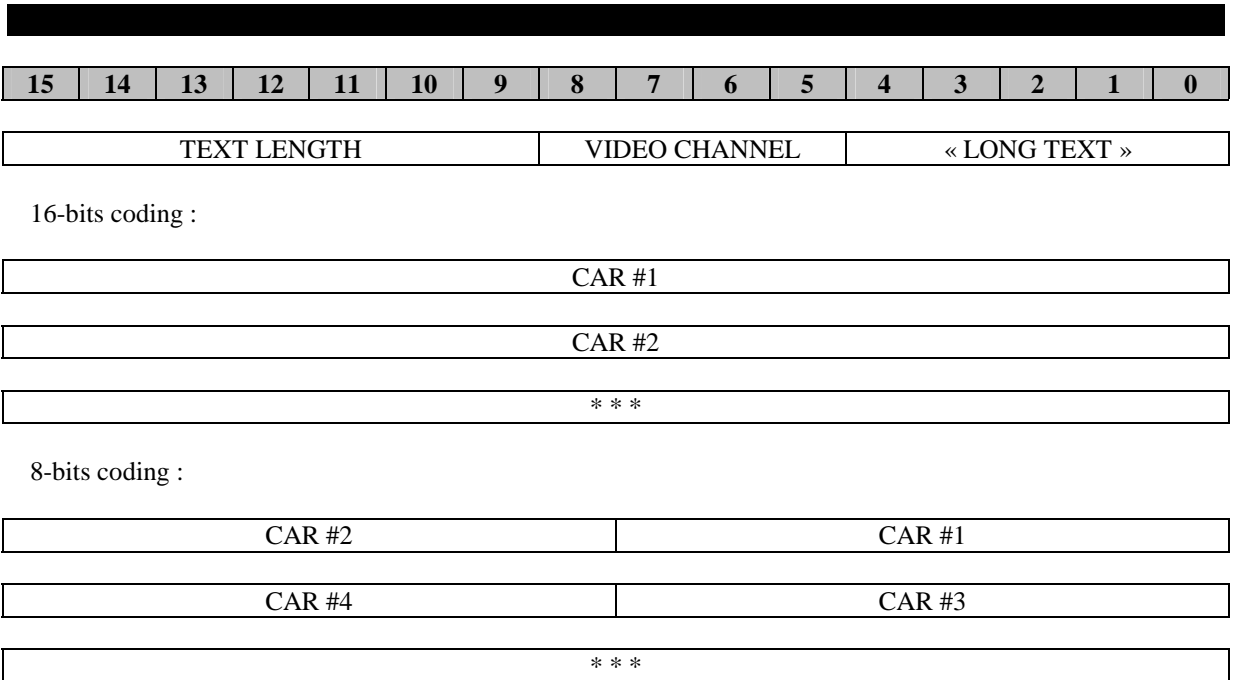


Figure 43 : SHORT TEXT command

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4.2.2 LONG TEXT command

This command is used for displaying long parts of text. Then, only one LONG TEXT command can display up to 128 characters.



« *LONG TEXT* »

LONG TEXT command

VIDEO CHANNEL video channel, from 0 to 15. Defines on which video channel (where) the text must be displayed.

TEXT LENGTH number of characters following in that command.

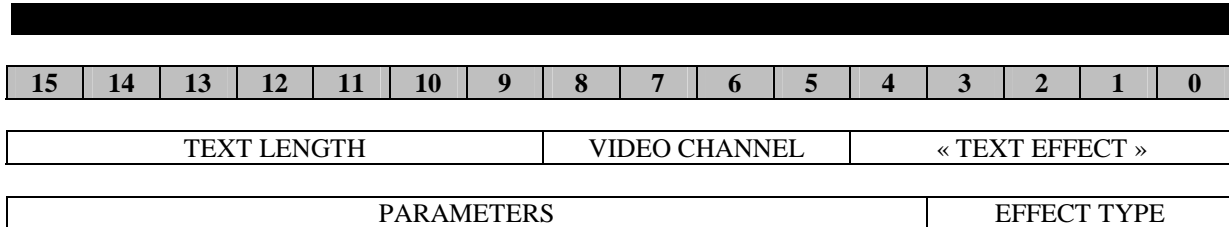
CAR #n characters. Characters could be coded in USC2 (16 bits) or ASCII (8 bits). The « TEXT EFFECT » command sets the coding type. CTRL characters can be used (CR, LF, PAGE UP, etc...).

Figure 44 : LONG TEXT command

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4.2.3 TEXT EFFECT (effect #6) command

As in EMS standard, this command is used to specify how the following text will be formatted. This effect is applied to TEXT LENGTH characters following this command on the concerned channel.



« **TEXT EFFECT** » Text formatting command

VIDEO CHANNEL video channel, from 0 to 15. Defines on which video channel (where) the text must be displayed.

TEXT LENGTH this command will be applied to TEXT LENGTH characters following that command on the concerned video channel. The following characters should be coded either using SHORT TEXT or LONG TEXT commands. After TEXT LENGTH characters, the style applied is *default*.

If TEXT LENGTH=0, this command will be applied to any characters following that command, up to an other similar (eg. same EFFECT TYPE) TEXT EFFECT command.

« **EFFECT TYPE** » Formatting type. Specifies the type of PARAMETERS.

EFFECT TYPE	DEFINITION
0	Text coding
1	Text style & alignment (EMS compatible)
2	Text font
3	Text color
4 .. 0xF	Reserved

Figure 45 : TEXT EFFECT types

4.2.3.1 EFFECT TYPE = 0 (TEXT CODING)



TEXT CODING type of character set used.

TEXT CODING	CHARACTER SET	In SHORT / LONG TEXT commands	
		number of bits per character	number of characters per 16-bits word
0	(reserved)	(reserved)	(reserved)
1	ASCII (default)	8	2
2	USC2	16	1
3..15	(reserved)	(reserved)	(reserved)

Figure 46 : character sets

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4.2.3.2 EFFECT TYPE = 1 (TEXT STYLE & ALIGN, EMS compatible)

BR	INV	BL	RSV	S	U	I	B	FONT	ALIGN	EFFECT TYPE = 1
----	-----	----	-----	---	---	---	---	------	-------	-----------------

ALIGN sets the text alignment

ALIGN	TEXT ALIGNMENT
0	Left
1	Center
2	Right
3	Language dependant (default)

Figure 47 : text alignment

FONT sets the text font. The Normal, Large and Small fonts are platform-dependent.

FONT	TEXT FONT SIZE
0	Normal (default)
1	Large
2	Small
3	EMS reserved

Figure 48 : EMS font definition

- B** sets **Bold** style (1=ON, 0=OFF)
- I** sets *Italic* style (1=ON, 0=OFF)
- U** sets Underlined style (1=ON, 0=OFF)
- S** sets ~~Striked~~ style (1=ON, 0=OFF)

- RSV** EMS reserved

- BL** sets Blink mode (1=ON, 0=OFF)
- INV** sets **Inversed** style (1=ON, 0=OFF)
- BR** sets **Bright** style (1=ON, 0=OFF)

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4.2.3.3 EFFECT TYPE = 2 (TEXT FONT)

RSV	FONT DEF	FONT SIZE	EFFECT TYPE = 2
-----	----------	-----------	-----------------

FONT DEF type of font used.

note : If that kind of font is not implemented in your platform, then the closer font should be applied

FONT	FONT TYPE
0	System (default)
1	Proportionnal
2	Pica
3	Condensed
4	Elite
5	Arial
6	Roman
7 ... 31	Reserved

Figure 49 : font definition

FONT SIZE size of used font. If no font is defined then default font is « system ». This command replaces EMS font size definition. **Value 0 is prohibited.**

4.2.3.4 EFFECT TYPE = 3 (TEXT COLOR)

RED COLOR	GREEN COLOR	BLUE COLOR	EFFECT TYPE = 3
-----------	-------------	------------	-----------------

RED / GREEN / BLUE COLOR color used for the text. It is not indexed, but directly defined (16 levels per color, so 4096 can be used). So color 0x000 is black, and color 0xFFFF is white.

For HTML pages translating (256 levels per color), ignore the 4 LSB bits (color #0F1C23 is 0x012 in MSEQ format).



Figure 50 : TEXT EFFECT command

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4.3 Image Track

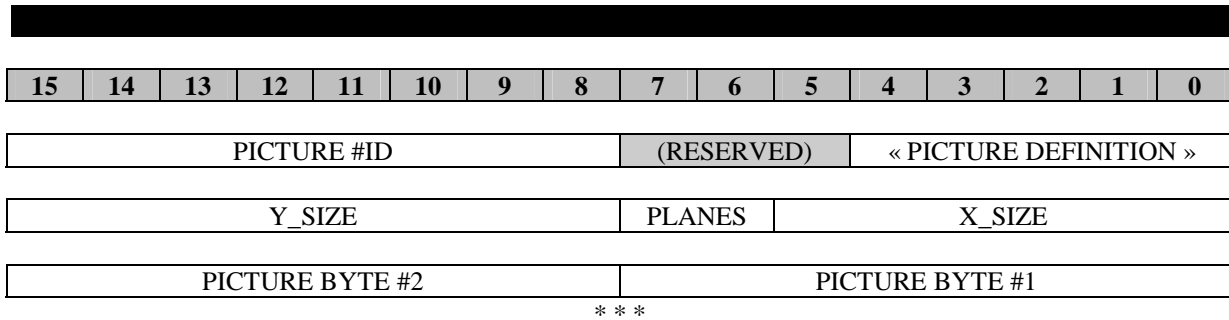
4.3.1 PICTURE DEFINITION command

This command is used to define a black & white or greyscale picture of X * Y pixels. Then this picture can be later displayed with « **USE OBJECT** » command. **The type of this object is 0x20.**

X_SIZE is modulo 8 pixels, then this command is EMS compatible with Large, small and variable size pictures; in MSEQ format, you need to first define, then display the picture.

If an already-defined ID number is used, then the old picture definition is erased and replaced with the new one. So the MSEQ generator tool must cleverly attribute ID numbers, according to picture occurrences.

As the picture is only defined once, this feature improves the data bandwidth and speeds up the picture display.



« **PICTURE DEFINITION** » Picture definition command

PICTURE #ID picture number (ID for image identification). **Value 0 is reserved.**
So, 255 pictures can be defined at the same time.

X_SIZE width in number of pixels, modulo 8. So, if X_SIZE=3, the defined picture is 24 pixels wide.

PLANES specifies the number of bits used to define a single pixel in the following bitmap definition. E.g. the number of greyscale colours.

Y_SIZE height in number of pixels. If Y_SIZE=5, then the picture is 5 pixels high.

PICTURE BYTES bytes used to define picture, arranged as mentioned in Figure 53. If number of PICTURE BYTES is odd, then last PICTURE BYTE is 0xFF.

Figure 51 : PICTURE DEFINITION command

ED	1	APPROVED FOR EXTERNAL (LIMITED DIFFUSION)		It. 2
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PLANES	COLOURS CODING
0	reserved
1	<ul style="list-style-type: none"> • 0 = White (no pixel) • 1 = Black (pixel)
2	4 greyscale levels <ul style="list-style-type: none"> • 0 = White (no pixel) • 1 = Clear grey • 2 = Dark grey • 3 = Black
3	8 greyscale levels <ul style="list-style-type: none"> • 0 = White (no pixel) • 1..6 = greyscale colours • 7 = Black
4	16 greyscale levels <ul style="list-style-type: none"> • 0 = White (no pixel) • 1..14 = greyscale colours • 15 = Black

Figure 52 : picture colours vs PLANES

8 pixels definition per byte

ANIMATION BYTE #1								ANIMATION BYTE #2				ANIMATION BYTE #3			
7	6	5	4	3	2	1	0								
ANIMATION BYTE #4								ANIMATION BYTE #5				ANIMATION BYTE #6			

Example 1 : X_SIZE=3 by Y_SIZE=2 picture, PLANES=1 (24 x 2 pixels x 1 colour)

4 pixels definition per byte

ANIMATION BYTE #1				ANIMATION BYTE #2			
3	2	1	0				
ANIMATION BYTE #3				ANIMATION BYTE #4			
ANIMATION BYTE #5				ANIMATION BYTE #6			
ANIMATION BYTE #7				ANIMATION BYTE #8			

Example 2 : X_SIZE=1 by Y_SIZE=4 picture, PLANES=2 (8 x 4 pixels x 4 colours)

Figure 53 : pixels arrangement in a picture definition (examples)

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4.4 Animation Track

4.4.1 ANIMATION DEFINITION command

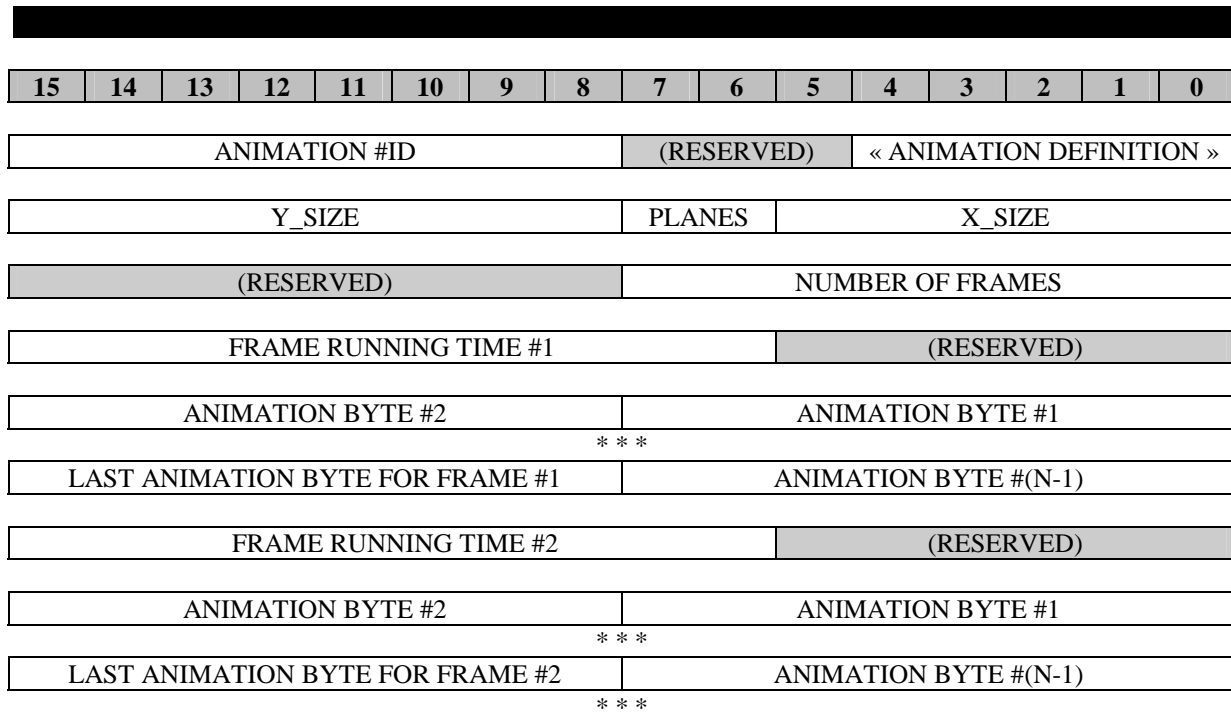
This command is used to define an animation of X * Y pixels * P pictures. Then this animation can be later displayed with « **USE OBJECT** » command. **The type of this object is 0x30.**

X_SIZE is modulo 8 pixels, then this command is EMS compatible with Large and small animations ; in MSEQ format, you need to first define, then display the animation.

If an already-defined ID number is used, then the old animation definition is erased and replaced with the new one. So the MSEQ generator tool must cleverly attribute ID numbers, according to animation occurrences.

As the animation is only defined once, this features improves the data bandwidth and speeds up the animation display.

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« ANIMATION DEFINITION » animation definition command

ANIMATION #ID animation number (ID for image identification). **Value 0 is reserved.** So, 255 animations can be defined at the same time.

X_SIZE width in number of pixels, modulo 8. So, if X_SIZE=3, the defined animation is 24 pixels wide.

PLANES specifies the number of bits used to define a single pixel in the following bitmap definition. E.g. the number of greyscale colors. See “4.3.1. PICTURE DEFINITION command” for more information.

Y_SIZE height in number of pixels. If Y_SIZE=5, then the animation is 5 pixels high.

NUMBER OF FRAMES number of pictures inserted in animation

ANIMATION BYTES pixels in animation, arranged as mentioned in Figure 55. If number of ANIMATION BYTES is odd, then last ANIMATION BYTE is 0xFF.

FRAME RUNNING TIME length of time the picture #n must be displayed (before displaying next frame). The picture will be displayed during RUNNING_TIME x RTB x ATB (in μS). **Value 0 is prohibited.**

Figure 54 : ANIMATION DEFINITION command

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ANIMATION BYTE #1	ANIMATION BYTE #2	ANIMATION BYTE #3
7 6 5 4 3 2 1 0		
ANIMATION BYTE #4	ANIMATION BYTE #5	ANIMATION BYTE #6

Frame #1

ANIMATION BYTE #7	ANIMATION BYTE #8	ANIMATION BYTE #9
7 6 5 4 3 2 1 0		
ANIMATION BYTE #10	ANIMATION BYTE #11	ANIMATION BYTE #12

Frame #2

example of a X_SIZE=3 by Y_SIZE=2 animation, PLANES=1 (24 x 2 pixels x 1 colour), based on 2 frames

Figure 55 : pixels and frames arrangement in an animation definition

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4.5 System track

A special Track, the “System” track, contains some events that must be generated on the target platform.

4.5.1 SPECIAL EFFECT command (effect #1)

This command is used to initiate a specific event on the target platform. This command is based on Imelody format coding.

Note 1 : If the target system does not integrate that type of effect, ignore this command.

Note 2 : The EFFECT_TYPE defines the number of parameter that follows (see Figure 57).

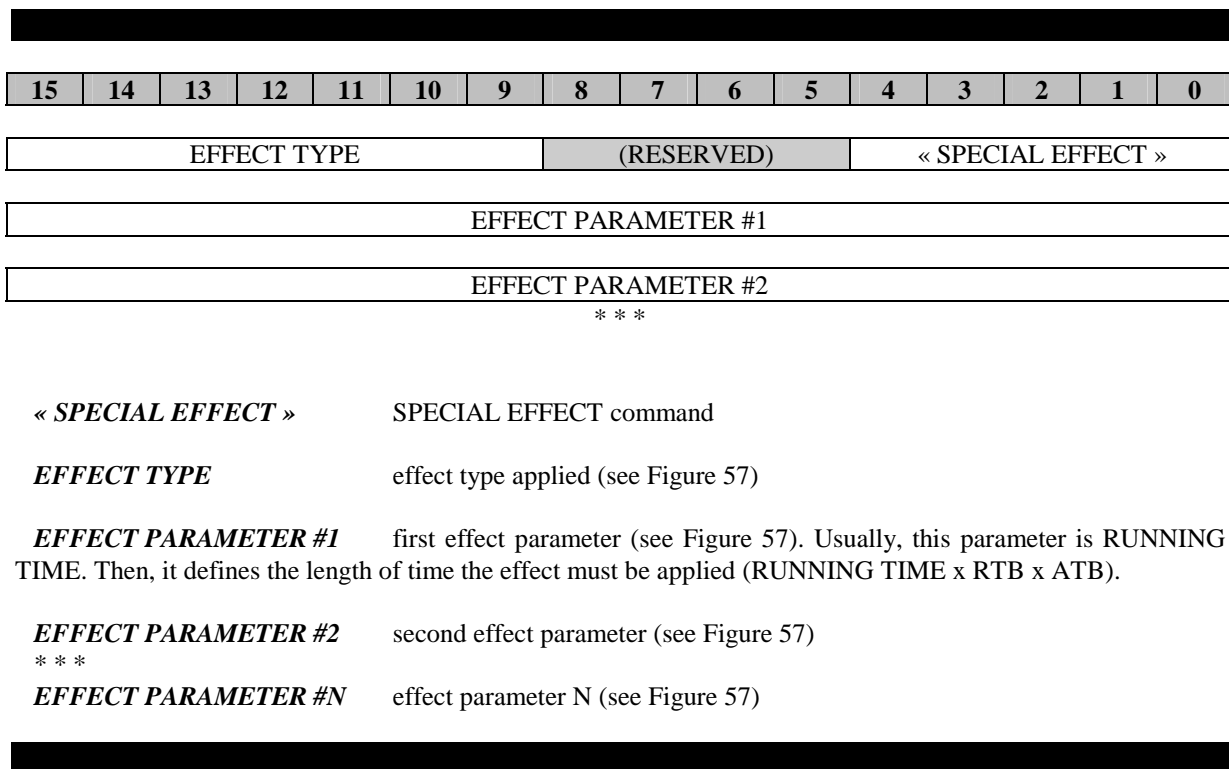


Figure 56 : SPECIAL EFFECT command

EFFECT TYPE	EFFECT NAME	DESCRIPTION	PARAMETERS
0	led	switches on a visible LED	#1 : running time
1	vibe	activates a vibrator	#1 : running time
2	backlight	activates the display backlight	#1 : running time
3	buzzer	a buzzer sound is played	#1 : running time
others	To be defined		

Figure 57 : target effects

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5 SUMMARY - TABLES
5.1 SEQ functional-command set (summary)

Command (hex)	SEQ functional-Command description	Type of Track	Time Base applied	EMS compatible
00	Short Text	All TEXT tracks	***	similar
01	Long Text	All TEXT tracks	***	similar
02	Note	Compressed MIDI tracks only	Absolute TB x Relative TB	***
03	Program Change	Compressed MIDI tracks only (MIDI based, extensions to other tracks to be defined)	***	***
04	Volume	Compressed MIDI tracks MIDI tracks (between bulks) or any « Sampled sounds family » tracks	***	***
05	Special effect (effect #1)	System (Imelody « Special effect command » based)	Absolute TB x Relative TB	based on Imelody
06	Sound effect (effect #2)	Compressed MIDI tracks only (MIDI based)	***	***
07	Video channel effect (effect #3)	***	Absolute TB x Relative TB	***
08	reserved (picture effect)			***
09	reserved (anim. effect)			***
0A	Text effect (effect #6)	Text (EMS « Text formatting » based)	***	yes (+ extensions)
0B	reserved			***
0C	reserved			***
0D	reserved			***
0E	Animation Definition	Animated pictures (EMS based « Small and Large animation »)	***	yes (+ running time), combined with Use Object command
0F	reserved			***
10	reserved			***
11	Picture Definition	Static pictures (EMS based « Variable picture »)	***	yes (+ running time), combined with Use Object command
12	reserved			***

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5.2 SEQ basic-command set (summary)

Command (hex)	SEQ basic-Command description	Type of Track	Time Base applied	EMS compatible
13	Video Zone	text, static and animated pictures	***	***
14	Video Properties	text, static and animated pictures	***	***
15	reserved	***	***	***
16	Delay (Delta Time)	Any	Absolute TB	***
17	Extended Delay	Any	Absolute TB	***
18	R-Delay	Any	Absolute TB x Relative TB	***
19	Synchronisation	Any	***	***
1A	reserved	***	***	***
1B	Relative Time Base definition	Any (this RTB change should be applied anywhere in any track)	(defines an ATB sub-multiple)	***
1C	Bulk definition	bulk definitions start & end commands (for any type of bulk)	***	***
1D	Use object	Play any already-defined or predefined objects command (for any type of bulk)	Absolute TB x Relative TB	EMS predefined objects (sounds & animations)
1E	Track definition	start & end of track definitions (for any track)	start/end of Time bases for each track	***
1F	System command	***	***	***

Figure 58 : MSEQ commands table

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5.3 Track and Bulk types (summary)

TRACK TYPE	DESCRIPTION
0x00	Multi-purpose Track* (track definition)
0x01 to 0x0F	synthetic sounds
0x01	Compressed MIDI
0x02	Original MIDI
0x03 to 0x07	(reserved)
0x08 to 0x0F	sampled sounds
0x08	EMS-style & native-MSEQ predefined sounds
0x09	WAV
0x0A	AU
0x0B	MP3
0x0C	(reserved)
0x0D	AMR
0x0E to 0x0F	(reserved)
0x10 to 0x1F	text
0x10	simple text
0x11	(reserved)
0x12	advertisement text
0x13	(reserved)
0x14	information text
0x15	priority information text
0x16 to 0x1F	(reserved)
0x20 to 0x2F	static pictures
0x20	EMS-style & native-MSEQ variable size pictures
0x21	(reserved)
0x22	GIF (up to 256 colors)
0x23	(reserved)
0x24	JPEG
0x25	(reserved)
0x26	PNG
0x27 to 0x2F	(reserved)
0x30 to 0x3E	animated pictures
0x30	EMS-style & native-MSEQ animated pictures
0x31	(reserved)
0x32	AVI
0x33	Animated GIF
0x34	(reserved)
0x35	MPEG 2
0x36	MPEG 4
0x37	(reserved)
0x38	Real Media
0x39 to 0x3D	(reserved)
0x3E	System (Special effects)
0x3F	proprietary**

Figure 59 : Track and Bulk types, object types

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** In a multi-purpose Track, any data and bulk types can be included. This type of Track is easy to make, **and is specially design for streaming data flow (T-MODE=1)**. But this format is more difficult to decode, especially in multi-processors platforms. Try to avoid that type when building MSEQ files.*

*** proprietary type means that all data bulks inside that track are proprietary type. A Proprietary bulk includes only proprietary data, its format is defined in the data itself.*

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6 IMPLEMENTATION STEPS

We recommend the following steps of implementation. These steps should be discussed with all MSEQ major actors. The table shown here is just a proposal (default).

	MIDI		Sampled sounds				Text		Static pictures				Animated pictures					W	ST
	Original MIDI	MISC	WAV	AU	mp3	AMR	Formatted text	Colour text	EMS pictures	GIF (static only)	JPG	PNG	EMS animated	AVI	GIF	MPEG2	MPEG4	Windowing	Streaming
STEP 1 : cards / light advertising		✓					✓		✓				✓						
STEP 2 : full colour & sounds advertisement		✓					✓	✓	✓			✓	✓						✓
STEP 3a : full multimedia (HTML-like)		✓					✓	✓	✓		✓	✓		✓				✓	✓
STEP 3b : advanced features		✓			✓		✓	✓	✓		✓	✓		✓				✓	✓
STEP 3c /4 : MSEQ played inside HTML		✓					✓	✓			✓			✓				✓	✓

- ✓ : new feature to be implemented
- ✓ : feature driver already in mobile phone, only the MSEQ player interface have to be developed.

Figure 60 : MSEQ features implementation steps proposal

END OF DOCUMENT

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