




Creating Media for the Motorola T720 Handset

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Note

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Contact Information

Motorola, Inc.
PCS Sector
600 N. U.S. Highway 45
Libertyville, IL 60048

Additional information can be obtained at:

<http://www.motorola.com/developers>

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Overview

The Motorola T720 series handset has unique capabilities that allow it to offer the ultimate in personalization.

Several of the T720's features are:

- A color LCD screen that displays 4096 colors, so that it displays graphics in rich detail.
- A polyphonic speaker that provides a superior sound quality for the user's incoming calls. Its tone generation hardware is MIDI 1.0 compliant and can thus generate a wide variety of customized ring tones.

Terminology

CSTN (a.k.a. Passive Matrix Display)

Color super twisted nematics

EMS

Enhanced Messaging Service.

GIF 87a

Graphics Interchange Format, a standard file format for lossless compression of still images. It is used to display static images.

GIF 89a

The GIF 89a standard is a superset of the GIF 87a specification. It allows a sequence of GIF images to be displayed in succession that generates an animation.

iMelody

ERTA standard for the textual representation of a ring tone.

MIDI

Musical Instrument Digital Interface

Pixel

One picture element on the display consisting of red, blue and green sub-pixels.

WAP

Wireless Application Protocol

WBMP

Wireless Bitmap format specified in the WAP specifications. It is an optimized bitmap format intended for use in portable devices with smaller screens and limited display capabilities.

Layout

Screen size: 120 by 160 pixels
Screen dimensions (color): 29 mm by 38 mm

Figure 1 shows the arrangement of the T720's display.



Figure 1: Layout of the T720's screen.

The screen can display up to nine lines of text, plus one line of status icons.

Media

Graphic formats supported

- GIF 87a
- GIF 89a
- WBMP
- EMS 5.0 Bitmaps

The maximum image size allowed is 160 by 160 pixels. Images large than this size generate a damaged image notification on the handset's screen.

Color Values

The screen supports a 12-bit pixel size, which allows 4,096 colors to be displayed.

The 12-bit colors are created from 24-bit color values by truncating the least significant bits for the color's R, G and B components. For example, A color of `rgb(254, 227, 206)` is drawn as `rgb(240, 224, 192)`. You can simulate the color shift in some programs by converting colors to a 12-bit pixel size.

To convert the color value `0xFEE3CE` which is (red: `0xFE`, blue: `0xE3`, green: `0xCE`) zero out the second value in each color. The color now becomes `0xF0E0C0` (red: `0xF0`, blue:`0xE0`, green:`0xC0`).

The color shift from 24 bit to 12 bit values is most apparent in smooth gradients, where color banding can occur. Table 1 illustrates of how the color conversion effects various color mages.

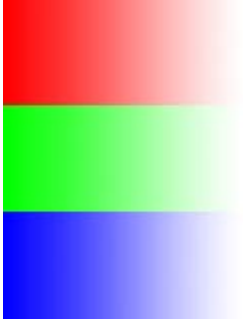
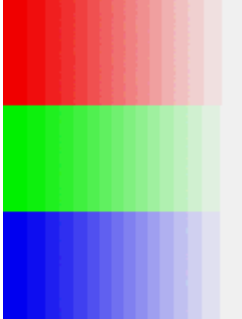




| 24 bit color | 12 bit color |
|--|---|
|  |  |
|  <p data-bbox="277 814 756 842"><code>rgb(254, 227, 206), or 0xFEE3CE</code></p> |  <p data-bbox="899 814 1378 842"><code>rgb(240, 224, 192), or 0xF0E0C0</code></p> |
|  |  |

Table 1: The effect of reducing color values from 24 bits to 12 bits.

Screen Saver

Screen savers are animated or static images that are shown full screen when the phone has been inactive for a period of time.

The recommended format for a screen saver is animated GIF (GIF 89a). Other file types that can be used for screen savers are static GIF (GIF 87a), WBMP, and EMS 5.0 bitmaps.

Screen savers are displayed on the entire screen. If the screen saver image does not fill the entire screen, then it is centered horizontally and vertically. If the screen saver image is larger than the display in either the x or y axis, then it is resized to fit the display in both axes while maintaining the original aspect ratio.

It is strongly recommended that screen savers be the same dimensions as the screen.

Animated screen savers execute for one minute and then halt on the first frame of the animation. The first frame of the animation is the frame that will be on the screen when the animation stops, so you must ensure that it is a key frame.

Wallpaper

Wallpaper images are static images that are shown on both the idle screen and the main menu screen. Wallpaper images can be tiled or centered as selected by the user; centered is the default setting.

The recommended format for a wallpaper graphic is a static GIF (GIF87a) file. Other file types that can be used as wallpaper image are WBMP and EMS 5.0 bitmaps.

Wallpaper images are displayed on screen as shown in Table 2.




| | | |
|--|--|--|
|  |  |  |
| <p>Wallpaper image.</p> | <p>Wallpaper images appear behind all screen elements on the idle screen.</p> | <p>Wallpaper images appear behind all screen elements on the menu screen.</p> |

Table 2: How a wallpaper is displayed on the idle screen and main menu screen.

If the user has selected to tile the wallpaper, the image is tiled starting from the upper left hand corner of the working area. The image is tiled horizontally and vertically equal to the display size, as shown in Figure 2.

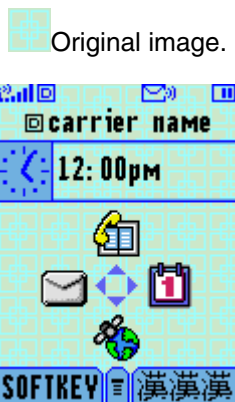


Figure 2: A GIF Image as tiled wallpaper.

The user can set any item in the picture viewer to be the wallpaper image. If the user selects an animated GIF image, the first frame of the animated GIF becomes as the wallpaper image. It's important that the colors of the wallpaper image allow the text displayed on the screen to remain legible.

If the wallpaper image is larger than the display in either the x or y axis then it is resized to fit the display in both axes while maintaining the original aspect ratio.

Ring Tone

The T720 product is fully MIDI 1.0 compliant, and therefore the device supports any data format described in *The Complete MIDI 1.0 Detailed Specification*.

Audio Formats

The T720 handset supports the following audio formats:

Scalable Polyphony MIDI (SP-MIDI) 1.0
iMelody

MIDI is the preferred audio format for ring tones.

Audio Guidelines

The following are suggested guidelines to maximize sound quality while reducing the overall file size of a MIDI Ring Tone file for use with the T720 handset.

Tip 1: Use MIDI's running status feature

In the MIDI standard, a key-on or a key-off event will use at most three bytes each. However, when several key events occur on the same MIDI-channel, the running status feature can be used. In principle, running status means that the first byte of, say, a key-on event is omitted. In addition, the key-on event having a velocity of zero is equivalent to the key-off event. Thus, combining running status with key-on events that have zero velocity reduces the number of bytes needed to encode all key events.

EXAMPLE:

Without using the running status, features, the sequence

91 2E 23 8E, 91 2B 50 8E, 81 2E 64 00, 81 2B 64 00

represents "Key 2E ON" Velocity 23 MIDI Ch 1", "Key 2B ON Velocity 50 MIDI Ch 1", "Key 2E OFF Velocity 64 MIDI Ch 1", "Key 2B OFF Velocity 64 MIDI Ch 1". Using the running status feature reduces the sequence to:

91 2E 23 8E, 2B 50 8E, 2E 00 00, 2B 00 00,

That is, the command byte is omitted and velocity zero is used for key off.

Tip 2: Use Standard MIDI File (SMF) type 1

The MIDI content can be stored in a Standard MIDI File (SMF) of type 0 or type 1. In a type 0 SMF, the file format uses one header chunk with one track chunk. In a type 1 SMF, the format uses one header chunk with several track chunks. SMF type 2 should not be used.

In general, it is more efficient to store the MIDI data as a type 1 file. The increased efficiency is achieved because each track contains only one MIDI channel and one instrument (This is often the case). The running status feature can be applied on each individual track, thereby reducing the track size. To further reduce the size of the file, use one track per used MIDI channel. That is, if a tempo/conductor track exists, merge it with the first instrument track. Remove all unnecessary meta events such as the “track name” and “lyric” meta events.

To summarize, the following measures can be taken in order to reduce the SMF:

1. Use SMF type 1 (Or verify that a type 1 file is smaller than a type 0 file and use the smallest file).
2. Use running status.
3. One and only one instrument per track. Try not to change channels.
4. Do not change tempo in the middle of the music. That is, set the tempo once.
5. Use beat, instead of SMPTE, to set the tempo.
6. Do not use Copyright Text Fields.
7. Limit the use of continuous controller information such as pitch-bend and volume.
8. Turn off the options below:
 - Sequence Number - MIDI sequence ids
 - Text - embedded text for any optional fields
 - Sequence / Track Name
 - Instrument Name
 - Lyric
 - Marker - for synchronization purposes
 - Cue Point
 - Midi Channel Prefix - associate channels with all events following
 - Sequencer-Specific settings

Items one through three above optimize the encoding of the notes, while items four to eight optimize the overall melody. The above measures provide an SMF file that is ready-made for compression. However, prior to compression, the composer/content author can add a few values for key velocity, thereby increasing the redundancy of the file.

Tip 3: Consider the Frequency Response

While the handset’s Wavetable Synthesizer is capable of producing all notes called out by the MIDI Specification, the polyphonic speaker limits its frequency response. The speaker cannot produce sounds above 4 kHz (approximately MIDI note C9) and rolls off quickly below 800Hz (approximately MIDI Note G6). Therefore, the recommended note range for a ring tone is between G6 and C9, , assuming that the lowest MIDI note is C0. Notes beneath G6 can still be produced at a lower amplitude level, however.