

Technical Manual

***Creating Media for the
Motorola A835 Handset***

Version 1.0



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Overview

Welcome to the *Creating Media for the Motorola A835 Handset* guide. This guide contains all the information you need to get started developing pictures, animation, and sounds for the Motorola A835 handset.

The Motorola A835 handset guide covers these areas:

- Display information like size, color depth, and more
- Graphic support information
- Sound support information

This document assumes you familiar with creating different media using the appropriate tools. This guide does not cover the tools required to create pictures, animations, sounds, or messages. Instead, it concentrates on the features and limitations of the device when working with media.

Document History

Version	Date	Author	Comments
Final (0.1)	31 Mar 2003	MW MDP	First draft
Revision	19 Nov 2003	Motorola	Revision of previous MW work.

Glossary

Here are definitions of common terms used in this manual:

Term	Definition
AMR	Adaptive Multi Rate
EMS	Enhanced Messaging Service
GIF	Graphics Interchange Format
iMelody	Infrared Data Association (IrDA) standard for the textual representation of a ring tone.
MIDI	Musical Instrument Digital Interface
MIDI Patch	One of the channels in a MIDI device, defined by the general MIDI standard
Pixel	One picture element on the display
WAP	Wireless Application Protocol
WBMP	Wireless Bitmap

References

The following references provide information related to developing media for this device:

Organization	URL
3GPP	www.3gpp.org
Infrared Data Association	www.irda.org
MIDI Manufacturers Association	www.midi.org
Motorola Developer Program	www.motocoder.com
WAP Forum	www.wapforum.org
World Wide Web Consortium	www.w3.org

Display

This chapter describes the display characteristics for the Motorola A835 handset.

Display Info

The physical internal display characteristics of the Motorola A835 handset are the following:

Item	Description
Screen resolution	176 x 220
Screen dimensions	29 mm x 39 mm viewing area
Pixel pitch	0.198
Color depth	16-bit
Maximum Colors	Capable of supporting up to 64K colors



Figure 1. The Motorola A835 display.

Graphics

This chapter describes the graphic environment available in the Motorola A835 handsets. It includes information on picture and animation formats, size restrictions, pre-defined media, and more. Use it as a reference when creating pictures or animations that support your products.

Supported Picture Formats

The Motorola A835 handsets support these graphic formats:

Type	Description
EMS 5.0 Bitmaps	Enhanced Messaging Service bitmap
GIF 87a	Graphics Interchange Format, a standard file format for lossless compression of still images. It is used to display static images. This is the preferred format for pictures.
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.
WBMP	Wireless Bitmap format described in the WAP specifications. It is an optimized bitmap format intended for use in portable devices with smaller screens and limited display capabilities.
BMP	Bitmap: A graphics format that specifies images using a rectangular pattern of pixels.
PNG	Portable Network Graphics: the PNG format is intended to provide a portable, legally encumbered, well-compressed, well-specified standard for lossless bit mapped image files.
JPEG	Short for Joint Photographic Experts Group. JPEG is a lossy compression technique for color images.

Picture Support

The Motorola A835 handset supports the following picture resolution:

Type	Description
Low	80 x 60
MMS	160 x 120
Medium	320 x 240
High	640 x 480
Fit-to-screen	176 x 144

Animation Support

The Motorola A835 handset supports use of these animation settings:

Type	Description
Small	Color, 8 x 8 pixels
Large	Color, 16 x 16 pixels
Frames	4 frames maximum (EMS animations only)
Rate	500 ms
Loop	Continuous

Screensaver Support

The Motorola A835 supports screensavers. **Screensavers** are animated or static images selected by the user 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 also supported are the following: static GIF (GIF 87a), WBMP, and EMS 5.0 bitmaps.

Technical Specifications for Screen Savers:

- Dimensions: 176 x 220
- Recommended Number of Frames: 8
- Colors: 64K

- Recommended File Size: 30K

Screen savers are displayed using the entire screen. In the event an image is larger or smaller than the display, the following rules apply:

- **Image too small** – image is shown at actual size and centered on display.
- **Image too large** – image is resized to fill the display while keeping the original aspect ratio.




		
<p>Image scaled to fit on the display while maintaining the original aspect ratio.</p>	<p>Original Image</p>	<p>Image scaled to fill the display while maintaining the original aspect ratio.</p>



Figure 2. How large screensaver images are displayed on the screen


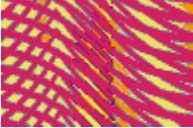
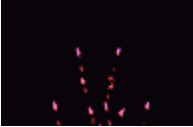





Note: By default, bars may appear on the left/right or top/bottom of the image to fill the display

If the screensaver is an animation, it plays for one minute and then halts at the first animation frame. This first frame, or key frame, then remains on the screen. Please note when creating the animation, the first frame must be a key frame.

Pre-Loaded Screensavers

The Motorola A835 handset can include these pre-loaded screensavers images.

Name	Screensaver	Size (Pixels)
Alien		176 x 220
Bounce		176 x 220

Name	Screensaver	Size (Pixels)
Boxing		176 x 220
Cosmic		176 x 220
Fireworks		176 x 220
Frog		176 x 220
Jazzy		176 x 220
Party		176 x 220
Spaceship		176 x 220
Warped		176 x 220

Note: Image displayed does not reflect actual display size.

Wallpaper Support

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

Technical Specifications for Wallpapers:

- Dimensions: 176 x 220
- Colors: 64 K
- Recommended File Size: up to 15kb

Wallpaper images are displayed on screen as shown below.



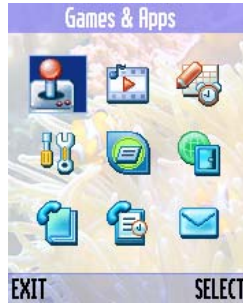
		
<p>Wallpaper image. (example only)</p>	<p>Wallpaper images appear behind all screen elements on the idle screen.</p>	<p>Wallpaper images appear behind all screen elements on the menu screen.</p>

Figure 3. How 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 3.


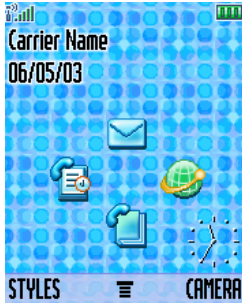
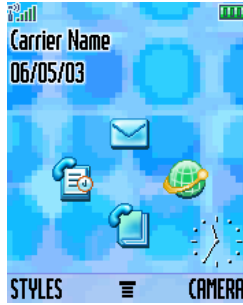
		
<p>Original image</p>	<p>Tiled image used as wallpaper and appearing behind all screen elements on an idle screen.</p>	<p>Image set to fill screen.</p>

Figure 4. A GIF Image as tiled wallpaper.

The user has the following options for wallpaper:

- **Center** – the image is resized to fit on the screen while keeping the aspect ratio.

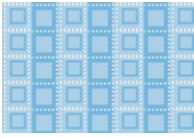





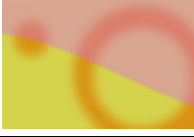

Graphics



- **Fit-to-screen** – the image is resized to fill the screen while keeping the original aspect ratio (refer to Figure 2).
- **Tile** – if the image is too large, it is resized to fit the display and tiled, if the image is too small, it tiles as displayed.

If the user selects an animated GIF image, the first frame of the animated GIF becomes the wallpaper image. It's important that the colors of the wallpaper image allow the text displayed on the screen to remain legible.

Pre-Loaded Wallpaper

The Motorola A835 handset can include these pre-defined wallpaper images.

Name	Wallpaper	Size (Pixels)
Grid		176 x 220
Dots		176 x 220
Flowers		176 x 220
Fragment		176 x 220
Landscape		176 x 220
Lines		176 x 220
Organic		176 x 220
Rays		176 x 220

Name	Wallpaper	Size (Pixels)
Streaks		176 x 220
Waves		176 x 220

Note: Image displayed does not reflect actual display size.

Sound

This chapter describes the sound environment available in the Motorola A835 handset. It includes information on sound formats, pre-defined melodies and ring tones, and more. Use it as a reference when creating sounds for your products.

Supported Sound Formats

The Motorola A835 handsets support these sound formats:

Type	Description
MIDI	The Motorola A835 product is fully MIDI 1.0 compliant, and supports any data format described in <i>The Complete MIDI 1.0 Detailed Specification</i> , including: <ul style="list-style-type: none"> – MIDI, Type 0 – MIDI, Type 1 – Scalable Polyphonic MIDI (SP-MIDI)
iMelody	iMelody is the Infrared Data Association (IrDA) standard for the textual representation of a ring tone that can be used to transfer melodies between devices. For more information, follow the link below: http://www.irda.org/standards/pubs/iMelody.pdf

Sound Support

The Motorola A835 handsets support use of these sound settings:

Type	Description
Recommended Size	9Kb
Duration	20 ms (minimum duration for a single note)

Ring Tone Support

Ring tones should not exceed 30 seconds because most voice mail systems pick up after four rings (16-25 seconds depending on the system).

Due to this length suggestion and the fact that Motorola A835's synthesizer has a maximum polyphony of 16 notes, ring tone length should never exceed 9Kb.

MIDI Support

The Musical Instrument Digital Interface (MIDI) enables consumers to use multimedia computers and electronic musical instruments to create, enjoy and learn about music.

The MIDI protocol is a music description language in which every word describes an action of musical performance. Each action is stored as a binary word and when combined, store as MIDI files. These files can then be replayed by any electronic device that can read the MIDI file and recreate the performance using its available sound system.

Technical Specifications for MIDI:

- Recommended File Size: up to 15k
- MIDI Instruments: 128
- Maximum Polyphony: 24 voices
- Minimum Duration per note: 20ms
- Maximum Duration (NW dependent): 16-30 secs

MIDI Key Mapping

The Motorola A835 supports all 128 general MIDI instruments and the standard drum kit, but due to frequency limitations, not all MIDI notes are supported for all patches.

Patch Number	Patch Names	Valid MIDI Note Numbers
0	Acoustic Grand Piano	21-108
1	Bright Acoustic Piano	21-108
2	Electric Grand Piano	22-108
3	Honky-tonk Piano	21-108
4	Electric Piano 1	21-108
5	Electric Piano 2	24-103

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Patch Number	Patch Names	Valid MIDI Note Numbers
6	Harpsichord	24-89
7	Clavinet	24-96
8	Celesta	48-108
9	Glockenspiel	65-108
10	Music Box	48-84
11	Vibraphone	48-96
12	Marimba	48-97
13	Xylophone	48-108
14	Tubular Bells	48-96
15	Dulcimer	48-96
16	Drawbar Organ	24-96
17	Percussive Organ	24-96
18	Rock Organ	24-96
19	Church Organ	21-96
20	Reed Organ	24-96
21	Accordion	48-89
22	Harmonica	48-84
23	Tango Accordion	48-89
24	Acoustic Guitar (nylon)	36-84
25	Acoustic Guitar (steel)	36-84
26	Electric Guitar (jazz)	36-86
27	Electric Guitar (clean)	36-86
28	Electric Guitar (muted)	36-86
29	Overdriven Guitar	36-96
30	Distortion Guitar	36-96
31	Guitar Harmonics	36-96
32	Acoustic Bass	24-72
33	Electric Bass (finger)	24-72
34	Electric Bass (pick)	24-72
35	Fretless Bass	24-72
36	Slap Bass 1	24-72
37	Slap Bass 2	24-72

Patch Number	Patch Names	Valid MIDI Note Numbers
38	Synth Bass 1	24-96
39	Synth Bass 2	24-96
40	Violin	48-96
41	Viola	48-96
42	Cello	36-96
43	Contrabass	24-96
44	Tremolo Strings	24-96
45	Pizzicato Strings	24-96
46	Orchestral Harp	21-103
47	Timpani	36-84
48	String Ensemble 1	24-96
49	String Ensemble 2	24-96
50	Synth Strings 1	24-96
51	Synth Strings 2	24-96
52	Choir Aahs	36-96
53	Voice Oohs	36-96
54	Synth Voice	36-96
55	Orchestra Hit	36-72
56	Trumpet	36-96
57	Trombone	36-96
58	Tuba	24-72
59	Muted Trumpet	48-84
60	French Horn	36-96
61	Brass Section	24-96
62	Synth Brass 1	24-96
63	Synth Brass 2	24-96
64	Soprano Sax	48-89
65	Alto Sax	48-84
66	Tenor Sax	36-84
67	Baritone Sax	24-84
68	Oboe	48-96
69	English Horn	48-96

Sound

Patch Number	Patch Names	Valid MIDI Note Numbers
70	Bassoon	24-84
71	Clarinet	48-96
72	Piccolo	60-108
73	Flute	48-96
74	Recorder	60-96
75	Pan Flute	48-96
76	Blown Bottle	48-96
77	Shakuhachi	48-96
78	Whistle	48-91
79	Ocarina	60-96
80	Lead 1 (square)	24-96
81	Lead 2 (sawtooth)	24-96
82	Lead 3 (calliope)	36-96
83	Lead 4 (chiff)	36-96
84	Lead 5 (charang)	36-96
85	Lead 6 (voice)	36-96
86	Lead 7 (fifths)	36-96
87	Lead 8 (bass+lead)	24-96
88	Pad 1 (new age)	36-96
89	Pad 2 (warm)	36-96
90	Pad 3 (polysynth)	36-96
91	Pad 4 (choir)	36-96
92	Pad 5 (bowed)	36-96
93	Pad 6 (metallic)	36-96
94	Pad 7 (halo)	36-96
95	Pad 8 (sweep)	36-96
96	FX 1 (rain)	36-96
97	FX 2 (soundtrack)	36-96
98	FX 3 (crystal)	36-108
99	FX 4 (atmosphere)	36-96
100	FX 5 (brightness)	36-96
101	FX 6 (goblins)	36-96

Patch Number	Patch Names	Valid MIDI Note Numbers
102	FX 7 (echoes)	36-96
103	FX 8 (sci-fi)	36-96
104	Sitar	48-77
105	Banjo	48-84
106	Shamisen	48-79
107	Koto	48-96
108	Kalimba	48-96
109	Bagpipe	36-77
110	Fiddle	48-96
111	Shanai	48-96
112	Tinkle Bell	60-96
113	Agogo	48-72
114	Steel Drums	48-88
115	Woodblock	48-72
116	Tailo Drum	48-72
117	Melodic Drum	36-84
118	Synth Drum	36-84
119	Reverse Cymbal	48-72
120	Guitar Fret Noise	48-72
121	Breath Noise	48-72
122	Seashore	48-72
123	Bird Tweet	48-72
124	Telephone Ring	48-72
125	Helicopter	48-72
126	Applause	48-72
127	Gunshot	48-72
none	Drums	35-81

MIDI 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 Motorola A835.

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 the first byte of 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 (often the case). The running status feature can be applied on each individual track, thereby reducing the track size. To reduce the size of the file even further, use one track per used MIDI channel. That is, if a temple/conductor track exists, merge it with the first instrument track and 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 Presix - 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

Even though the MIDI synthesizer is sampled at 22 KHz, the polyphonic speaker's frequency response is not as wide. Try to keep the majority of melodic information below 6000 Hz.

NOTE: The use of MIDI notes below 800 Hz may cause a decrease in volume when playing the note. Always test your audio on an actual device to ensure the accuracy of the sound you want to produce.

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