

*Technical Manual*

***Creating Media for the  
Motorola V3xx***

Version 01.00



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# Overview

Welcome to the *Creating Media for the Motorola V3xx* guide. This guide contains all the information you need to get started developing pictures, animation, and sounds for the Motorola V3xx.

The Motorola V3xx Media Guide covers the following areas:

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

This document assumes you are familiar with creating different media using the appropriate tools. This guide does not cover the tools required to create media, rather, it concentrates on the features and technical abilities of the handset when working with media.

Motorola recommends that if you are not the sole author or creator of the graphics, video, or sound, you obtain sufficient license rights, including the rights under all patents, trademarks, trade names, copyrights, and other third party proprietary rights.

## Glossary

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Table 1 shows common terms used in this guide:

| Term       | Definition   |
|------------|--|
| AMR        | Adaptive Multi Rate  |
| GIF        | Graphics Interchange Format  |
| MIDI       | Musical Instrument Digital Interface                                       |
| MIDI Patch | One of the channels in a MIDI device, defined by the general MIDI standard |
| MPEG       | Moving Pictures Experts Group  |
| Pixel      | One picture element on the display   |
| QCIF       | Quarter Common Intermediate Format   |
| WAP        | Wireless Application Protocol  |

| Term | Definition      |
|------|-----------------|
| WBMP | Wireless Bitmap |

**Table 1 Glossary**

## References

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Table 2 shows references providing information related to developing media for the Motorola V3xx:

| Organization                   | URL   |
|--------------------------------|---|
| 3GPP                           | <a href="http://www.3gpp.org">http://www.3gpp.org</a>                             |
| MIDI Manufacturers Association | <a href="http://www.midi.org">http://www.midi.org</a>                             |
| Motorola Developer Program     | <a href="http://developer.motorola.com">http://developer.motorola.com</a>         |
| Moving Pictures Experts Group  | <a href="http://www.chiariglione.org/mpeg/">http://www.chiariglione.org/mpeg/</a> |
| WAP Forum                      | <a href="http://www.wapforum.org">http://www.wapforum.org</a>                     |
| World Wide Web Consortium      | <a href="http://www.w3.org">http://www.w3.org</a>                                 |
| Open Mobile Alliance           | <a href="http://www.openmobilealliance.org">http://www.openmobilealliance.org</a> |

**Table 2 References**

## Revision History

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| Version | Date<br>(DD-MMM-YYYY) | Reason                        |
|---------|-----------------------|-------------------------------|
| 00.01   | 15-SEP-2006           | Initial draft.                |
| 00.02   | 19-OCT-2006           | Updates after Motorola review |
| 01.00   | 18-DEC-2006           | Document release.             |

**Table 3 Revision History**

# Display

This chapter describes the display characteristics for the Motorola V3xx.

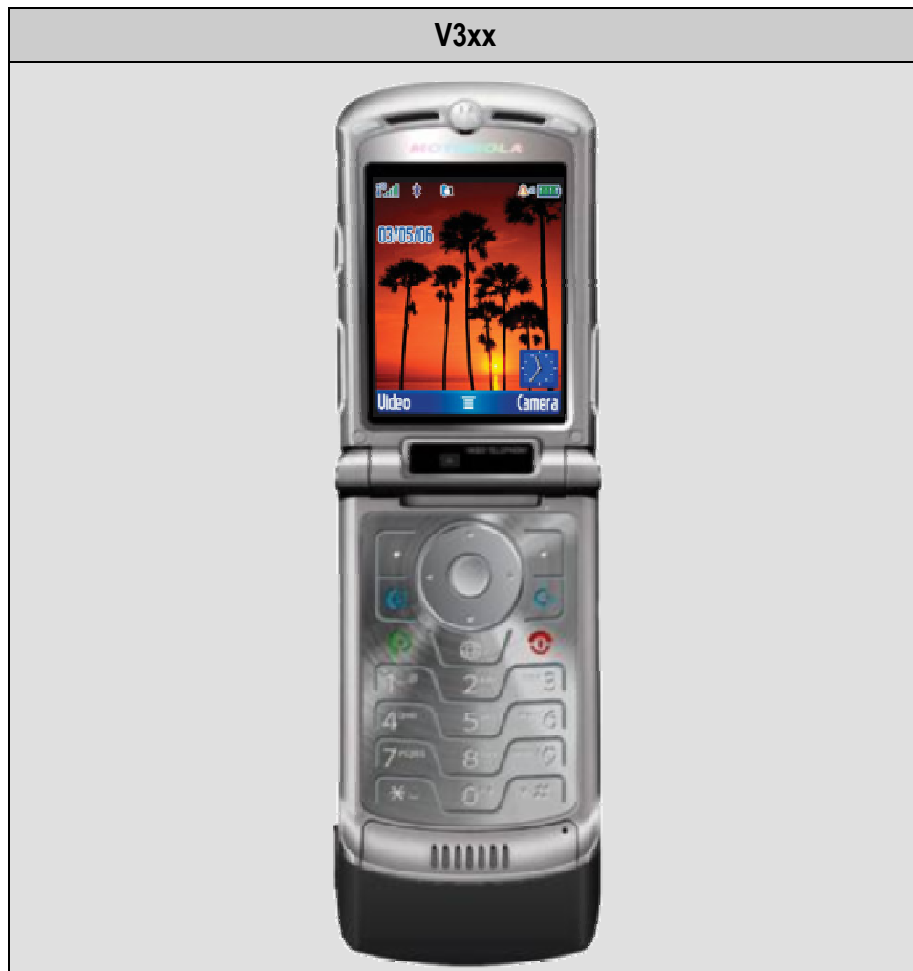


Figure 1 Display characteristics for the Motorola V3xx

# Display Info

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The physical internal display characteristics of the Motorola V3xx are the following:

| Item              | Description                                   |
|-------------------|---|
| Screen resolution | Internal: 240x320<br>External: 96x80          |
| Screen dimensions | 2.0 Inches                                    |
| Color depth       | 16 Bits                                       |
| Maximum colors    | Internal: Up to 262 K<br>External: Up to 65 K |
| Text area         | Numeric                                       |

**Table 4 Display Info**



**Figure 2 The Motorola V3xx display**

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**Note:** Screen shot may not reflect actual display size.

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# Graphics & Video

This chapter describes the graphic environment available in the Motorola V3xx. It includes information on picture and animation formats, size restrictions, pre-defined media, and more. Use this chapter as a reference when creating pictures or animations that support your products.

In general, file size is limited by available memory. All media (wallpaper, screensavers, ring tones, and themes), whether pre-loaded on the device or downloaded by the user, share the same storage area. The available memory for downloaded files will vary based on the media pre-loaded into the device. This pre-loaded media will vary from region to region and from carrier to carrier. Motorola recommends keeping all media files as small as possible to ensure the consumer has the ability to download and use a variety of files to enhance the user experience.

## Supported Picture Formats

---

The Motorola V3xx supports the following graphic and animation formats:

| Type    | Description  |
|---------|--|
| GIF 87a | Graphics Interchange Format, a standard file format for lossless compression of still images. It is used to display static images and 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.                           |
| BMP     | File writing format, where the information is recorded using "bitmap".   |
| EMS BMP | Enhanced Messaging Service bitmap  |
| 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. |
| JPEG    | Joint Photography Expert Group standard. JPEG is designed for compressing either full-color or gray-scale images of natural, real-world scenes, not line art or lettering.               |

| Type | Description   |
|------|---|
| PNG  | Portable Network Graphics (PNG) format is intended to provide a portable, legally unencumbered, well-compressed, well-specified standard for lossless bit mapped image files. |

**Table 5 Graphic and animation formats**

Table 6 shows the maximum decode size and resolution for supported picture formats:

| Format       | Maximum Decode Size                         | Resolution |
|--------------|---|------------|
| JPEG         | Up to UXGA 1200x1600 pixels (2.0 MegaPixel) | QVGA       |
| PNG          | Up to VGA (640 x 480 pixels)                |            |
| BMP          |   |            |
| GIF 87a, 89a |   |            |
| WBMP         | (255 x 255 pixels)                          |            |
| EMS BMP      |   |            |

**Table 6 Maximum decode size and resolution**

## Video Playback

The Motorola handset supports the video formats described in Table 7:

| Type                     | Description   |
|--------------------------|---|
| MPEG-4                   | <p>The MPEG-4 format provides standardized technological elements that enable interactive multimedia (video/audio), interactive graphics, and digital television.</p> <p>Codec support includes:</p> <ul style="list-style-type: none"> <li>• MPEG</li> <li>• H.263 Baseline</li> </ul> <p>A maximum of 15 fps for video playback and 15 fps for video capture is available at a bit rate of up to 64 kbps when maximum size is QCIF.</p> |
| H.263                    | An International Telecommunication Union (ITU) standard for video compression.  |
| WMV v9 (also WMV v7, v8) | WMV - Windows Media Video is a generic name for the set of streaming video technologies developed. This format also supports WMV version 7 and 8.   |



|                    |                |           |        |          |      |  |
|--------------------|----------------|-----------|--------|----------|------|--|
| WMV + WMA          | Up to 128 Kbps | Up to 108 | 15 fps | Up to 96 | 44.1 |  |
| Real Audio + Video |                | Up to 96  |        | Up to 96 | 44.1 |  |

**Table 9 Graphic and animation formats**

Table 10 shows the bit rate, frame size, frame rate, and extension for supported video streaming formats:

| Format                           | Bit Rate (kbps) | Frame Size | Frame Rate (fps) | Extension    |
|----------------------------------|-----------------|------------|------------------|--------------|
| MPEG4                            | Up to 128       | QCIF       | 15               | .mp4         |
| H.263                            |                 |            |                  | .3gp         |
| WMV v9 (also WMV v7, v8)         | Up to 128       |            | 15               | .asf<br>.wmv |
| Real Video 9 (also Real Video 8) |                 |            |                  | .rv          |

**Table 10 Bit rate, frame size and frame rate streaming supported**

Table 11 shows the specifications for video + audio streaming:

| Format                           | Total<br>Bit Rate<br>(kbps) | Video |                    |               | Audio              |                        |             |
|----------------------------------|-----------------------------|-------|--------------------|---------------|--------------------|------------------------|-------------|
|                                  |                             | Size  | Bit rate<br>(kbps) | Frame<br>Rate | Bit Rate<br>(kbps) | Sampling Rate<br>(kHz) | Stereo/Mono |
| MPEG4/H.263 +<br>AMR-NB          | 128                         | QCIF  | Up to 115          | 15 fps        | Up to 12.2         | 8                      | Mono        |
| MPEG4/H.263 +<br>AMR-WB          |                             |       | Up to 104          |               | Up to 23.85        | 16                     |             |
| MPEG4/H.263 +<br>AAC             |                             |       | Up to 96           |               | Up to 32           | 44.1                   | Stereo/Mono |
| MPEG4 / H.263 +<br>AAC+          |                             |       |                    |               |                    |                        |             |
| MPEG4 / H.263 +<br>Enhanced AAC+ |                             |       |                    |               |                    |                        |             |
| WMV + WMA                        |                             |       |                    |               |                    |                        |             |
| Real Audio + Video<br>8/9        |                             |       | Up to 96           |               | Up to 32           |                        |             |

**Table 11 Video + Audio streaming**

Table 12 shows the total bit rate, size and frame rate or video share:

| Format  | Total<br>Bit Rate | Video |          |            |
|---|-------------------|-------|----------|------------|
|   |                   | Size  | Bit Rate | Frame Rate |
| MPEG4 Simple Visual Profile Level 0 (packet switched video) | 64 kbps           | QCIF  | 59 kbps  | 15 fps     |
| H.263 Baseline Profile 0 Level 10 (packet switched video)   |                   |       |          |            |

Table 12 video share

## Graphics and Video Capture

Table 13 shows the video quality, bit rates, frame size, frame rate, and maximum durations for video capture:

| Format         | Video Quality | Bit Rate (kbps) | Frame Size | Frame Rate | Maximum Capture Duration |
|----------------|---------------|-----------------|------------|------------|--------------------------|
| MPEG4 or H.263 | Low           | Up to 64        | QCIF       | 15         | 1 hour                   |
|                | Medium        | Up to 96        |            |            |                          |
|                | High          | Up to 128       |            |            |                          |

Table 13 Maximum durations for video capture

Table 14 shows the video quality, bit rates, frame size, frame rate, and maximum durations for video + audio capture:

| Format                  | Total<br>Bit Rate<br>(kbps) | Video |                 |            | Audio           |               |             | Maximum<br>Capture<br>Duration |
|-------------------------|-----------------------------|-------|-----------------|------------|-----------------|---------------|-------------|--------------------------------|
|                         |                             | Size  | Bit rate (kbps) | Frame Rate | Bit Rate (kbps) | Sampling Rate | Stereo/Mono |                                |
| MPEG4 or H.263 + AMR-NB | Up to 128                   | QCIF  | Up to 115       | 15 fps     | 12.2            | 8 kHz         | Mono        | 1 hour                         |
| MPEG4 or H.263 + AMR-WB |                             |       | Up to 104       |            | 23.85           | 16 kHz        |             |                                |

Table 14 Maximum durations for video + audio capture

Table 15 shows the still image capture resolution and size of the supported formats:

| Format | Camera                | Resolution                 | Size (pixels)    |
|--------|-----------------------|----------------------------|------------------|
| JPEG   | Internal              | Large (VGA)                | 640x480 pixels   |
|        |                       | Medium (QVGA)              | 320x240 pixels   |
|        |                       | Small (QQVGA)              | 160x120 pixels   |
|        | External <sup>1</sup> | X-Large (SXGA, 1.3 MPixel) | 1280x1024 pixels |
|        |                       | Large (VGA)                | 640x480 pixels   |
|        |                       | Medium (QVGA)              | 320x240 pixels   |
|        |                       | Small (QQVGA)              | 160x120 pixels   |

Table 15 Still image capture

## Video Telephony

Table 16 shows the specifications for supported circuit-switched video telephony formats:

| Format         | Total Bit Rate (kbps) <sup>2</sup> | Video |                 |            | Audio           |               |             |
|----------------|------------------------------------|-------|-----------------|------------|-----------------|---------------|-------------|
|                |                                    | Size  | Bit rate (kbps) | Frame Rate | Bit Rate (kbps) | Sampling Rate | Stereo/Mono |
| MPEG4+AMR-NB   | 64                                 | QCIF  | 38 to 42        | 15 fps     | Up to 12.2      | 8 kHz         | Mono        |
| MPEG4+ G.723.1 |                                    |       |                 |            |                 |               |             |
| H.263+AMR-NB   |                                    |       |                 |            |                 |               |             |
| H.263+ G.723.1 |                                    |       |                 |            |                 |               |             |

Table 16 Supported circuit-switched video telephony formats

**Note:** Total Bit Rate indicates the maximum possible data rate used on the circuit-switched radio access bearer, taking into account the overhead needed by the video telephony protocols. A total bit rate of 64 kbps allocates 42 kbps to video , 12 kbps to audio, and 10kbps to protocol overhead.

<sup>1</sup> The RAZR V3xx External Camera is mounted portrait.

# MMS/SMS Support

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The Motorola V3xx MMS/SMS applications support use of the following image formats/sizes:

- JPEG
- GIF
- BMP
- PNG
- EMS BMP

The Motorola V3xx supports use of the following audio formats:

- MP3
- MIDI
- AMR-NB, AMR-WB
- AAC
- AAC+
- Enhanced AAC+
- WMA
- XMF
- Real Audio 9,8
- iMelody

# 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 following image formats are supported for wallpaper:

## **Technical Specifications for Wallpapers:**

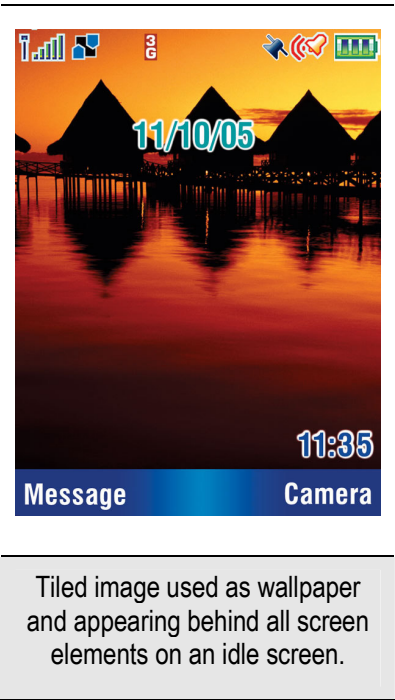
- Dimensions: Internal: 240 x 320, External: 96 x 80
- Colors: Internal: Up to 262k, External: Up to 65K
- Recommended File Size: Internal: Up to 50 K

Wallpaper images are displayed on screen as shown in Figure 3.

|   |  |
|---|--|
|  |  |
| Wallpaper images appear behind all screen elements on the idle screen.            | Wallpaper images appear behind all screen elements on the menu screen.             |

**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 4.



**Figure 4** 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.
- **Fit-to-screen** – the image is resized to fill the screen while keeping the original aspect ratio (refer to Figure 3).
- **Tile** – if the image is too large, it is resized to fit the display and tiled, if the image is too small, it is tiled 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.

# Sound

This chapter describes the sound environment available in the Motorola V3xx. It includes information on sound formats and more. Use this chapter as a reference when creating sounds for your products.

In general, file size is limited by available memory. The available memory for downloaded files will vary based on the media that is pre-loaded into the device. This pre-loaded media will vary from region to region and from carrier to carrier. We recommend keeping all media files as small as possible to ensure the consumer has the ability to download and use a variety of files to enhance the user experience.

## Alert Tone Support

---

Downloaded audio files can be applied to a number of alert tones on the device including Ring tones for incoming calls, Text Message, and Date Book Alarms.

## Ring Tones

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

## Supported Sound Formats

---

The Motorola V3xx supports the following sound formats:

| Type | Description   |
|------|---|
| MIDI | The Motorola V3xx are MIDI 1.0 compliant (.mid, .midi, .mmf, .smf), and supports any data format described in <i>The Complete MIDI 1.0 Detailed Specification</i> , including: <ul style="list-style-type: none"><li>– MIDI, Type 0</li><li>– MIDI, Type 1</li><li>– Scalable Polyphonic MIDI (SP-MIDI)</li></ul> |
| AAC  | Short for Advanced Audio Encoding (.aac, .adcs, .adif), one of the audio compression formats defined in the MPEG-2 standard. AAC  |

| Type           | Description   |
|----------------|---|
|                | boosts higher quality audio reproduction than MP3 and requires 30% less data to do so.  |
| AMR-NB, AMR-WB | Adaptive Multi Rate offers a wide range of data rates. The philosophy behind AMR is to lower the data rate as the interference increases to enable better error correction.   |
| GSM FULL RATE  | Format for speech coding used in most GSM networks. The GSM full rate requires one full rate traffic channel to carry its data. The compression involves mapping input blocks of 160 speech samples to encoded blocks of 260 bits.  |
| MP3            | The MP3 format (.mp3) provides the coding of audio for digital storage.   |
| Real Audio     | Real Audio (.ra, .rm) is a compressed format suitable for streaming over the internet.  |
| WAV            | Format for storing files (.wav). Linear pcm 8-bit and 16-bit, CCITT A-law and U-law.  |
| WMA            | Windows Media Audio (.wma), referring to components of the more general Windows Media Format proprietary standard.  |
| XMF            | Mobile XMF-MIDI: XMF (eXtensible Music Format) is an open standard file format for gathering together into a single file all media assets (and/or links to external media assets) required to render a MIDI note-based piece (or suite of related pieces) in a computer-based player (or possibly an instrument) with consistent audio playback across all players and platforms, and suited for interactivity, content protection, meta-data, and the Internet – and keep it simple. |
| 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.   |

**Table 17 Supported audio formats**

Table 18 shows the bit rate, sampling rate, and stereo/mono capabilities for each supported format:

| Format                | Bit Rate (kbps)   | Sampling Rate (kHz)                               | Stereo/Mono   |
|-----------------------|---|---|---------------|
| AMR-NB                | 4.75 kbps – 12.20 kbps<br>(supports all 3GPP specified rates) | 8 kHz   | Mono          |
| AMR – WB              | 6.6 – 23.85 (suports all 3GPP specified rates)                | 16  |               |
| AAC<br>(MPEG4 AAC-LC) | Up to 256 kbps  | 48 kHz  | Stereo / Mono |
| AAC+                  | Up to 128 kbps<br>(16 to 128 kbps)                            | Up to 48 kHz<br>(16, 22.05, 24, 32, 44.1, 48 kHz) | Stereo / Mono |
| Enhanced AAC+         |   |   | Stereo        |

|   |   |          |               |
|---|---|----------|---------------|
| MP3 <sup>2</sup>                                | Up to 256 kbps                                    | 48 kHz   | Stereo / Mono |
| 8-bit Linear PCM                                | 64 kbps   | 8 kHz    | Mono          |
| 16-bit Linear PCM                               | 128 kbps  |          |               |
| 8-bit A-law PCM                                 | 64 kbps   |          |               |
| 8-bit mu-law PCM                                |   |          |               |
| GSM Full Rate                                   | 12.20 Kbps  |          |               |
| WMA v9 L2<br>(also WMA v3, v7, v8)              | Up to 160 Kbps                                    | 48 kHz   | Stereo/Mono   |
| Real Audio 8<br>Supports LBR (Cook)<br>formats. | Up to 96 Kbps                                     | 44.1 kHz |               |
| Real Audio Sipro<br>(ACELP®.net)                | 5.0 Kbps (fixed rate)<br>8.5/6.5 Kbps (dual rate) | 8 kHz    | Mono          |
|   | 16 Kbps (wide-band)                               | 16 kHz   |               |

**Table 18 Audio bit rate, sampling rate and stereo/mono capabilities**

**Note:** Real Audio 8 supports the Flavor index of 17-26, inclusive. Flavor indexes less than 17(G2) or greater than 26 (surround) are not supported.

Table 19 shows the bit rate, sampling rate, stereo/mono, and extension for supported streaming audio formats:

| Format  | Bit Rate (kbps) <sup>3</sup>                                  | Sampling Rate kHz                                    | Stereo/Mono   | Extension    |
|---|---|--|---------------|--------------|
| AMR-NB  | 4.75 kbps – 12.20 kbps<br>(supports all 3GPP specified rates) | 8 kHz  | Mono          | .sdp<br>.rts |
| AMR-WB  | 6.6 kbps - 23.85 Kbps<br>(supports all 3GPP specified rates)  | 16 kHz   |               |              |
| AAC   | Up to 128 kbps  | 48 kHz   | Stereo / Mono |              |
| AAC+  | Up to 128 kbps<br>(16 to 128 kbps)                            | Up to 48 kHz<br>(16, 22.05, 24,<br>32, 44.1, 48 kHz) |               |              |
| AAC+ Enhanced                                   |   |  |               |              |
| WMA v9<br>(also WMA v3, v7, v8)                 | Up to 128 kbps  | 48 kHz   |               |              |
| Real Audio 8<br>Supports LBR<br>(Cook) formats. | Up to 96 kbps   | 44.1 kHz   |               |              |
| Real Audio Sipro<br>(ACELP®.net)                | 5.0 Kbps (fixed rate)<br>8.5/6.5 Kbps (dual rate)             | 8 kHz  | Mono          |              |
|   | 16 Kbps (wide-band)   | 16 kHz   |               |              |

**Table 19 Bit rate, sampling rate, stereo/mono streaming**

<sup>2</sup> Supports the MP3 coding scheme for the compression of audio signals, as defined in the MPEG-1 and MPEG-2, Part 3 (audio), Layer 3 standard.

---

**Note:** Real Audio 8 supports the Flavor index of 17-26, inclusive. Flavor indexes less than 17(G2) or greater than 26 (surround) are not supported.

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## MIDI Support

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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: 15KB
- MIDI Instruments: 128 Melodic, 47 Percussion
- Maximum Polyphony: 64 voices
- Minimum Duration per note: 20ms
- Maximum Duration (NW dependent): 16-30 secs

| Format          | File Type           | Polyphony Channels | Instruments (Gen. MIDI Level 1) |
|-----------------|---------------------|--------------------|---------------------------------|
| Standard MIDI   | Type 0              | 64                 | 128 Melodic, 47 Percussion      |
|                 | Type 1              |                    |                                 |
|                 | SP                  |                    |                                 |
| Mobile XMF MIDI | Type 0              |                    |                                 |
|                 | Type 1              |                    |                                 |
|                 | Type 2 (mobile DLS) |                    |                                 |

**Table 20 MIDI Format Specification**

## MIDI Key Mapping

---

The Motorola V3xx 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                  |

| Patch Number | Patch Names             | Valid MIDI Note Numbers |
|--------------|-------------------------|-------------------------|
| 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                  |
| 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                   |

| Patch Number | Patch Names            | Valid MIDI Note Numbers |
|--------------|------------------------|-------------------------|
| 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                   |
| 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                   |

| Patch Number | Patch Names       | Valid MIDI Note Numbers |
|--------------|-------------------|-------------------------|
| 65           | Alto Sax          | 48-84                   |
| 66           | Tenor Sax         | 36-84                   |
| 67           | Baritone Sax      | 24-84                   |
| 68           | Oboe              | 48-96                   |
| 69           | English Horn      | 48-96                   |
| 70           | Bassoon           | 24-84                   |
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| 73           | Flute             | 48-96                   |
| 74           | Recorder          | 60-96                   |
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| 76           | Blown Bottle      | 48-96                   |
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| 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                   |



| Patch Number | Patch Names       | Valid MIDI Note Numbers |
|--------------|-------------------|-------------------------|
| 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                   |
| 102          | FX 7 (echoes)     | 36-96                   |
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| 104          | Sitar             | 48-77                   |
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| 108          | Kalimba           | 48-96                   |
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| 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                   |

Table 21 MIDI Key Mapping

## 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 V3xx.

### 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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## MP3 Audio Guidelines

---

MP3 (MPEG Audio Layer 3) is an audio compression technology that is part of the MPEG-1 and MPEG-2 specifications. Developed in Germany in 1991 by the Fraunhofer Institute, MP3 uses perceptual audio coding to compress CD-quality sound by a factor of 12, while providing almost the same fidelity. Because MP3 audio is digitized, not synthesized, reproduction (disregarding speaker quality) is identical on all devices. Therefore MP3 ring tones provide a near-CD quality audio experience for listeners as opposed to their MIDI counterparts which differ greatly from device to device.

The following recommendations should be used when designing MP3 audio clips for use in the phone:

**Technical Specifications for MP3:**

- Sample Rates: 48 kHz
- Bit Rate: Up to 256 kbps
- No file size and duration restrictions

## Available Sound Properties

---

Follow technical specifications outlined above.

## Design Guidelines

---

Since ring tones need to be at a consistent audible level, compressing the original content to reduce the peak-to-average ratio is necessary. After the audio is compressed it is advisable to re-normalize the audio to 0db before saving the compressed MP3 file.

---

**Note:** Ring tones are generally between 15-20 seconds in length. Based on the recommended bit rates that would yield a file size between 75-150K per tone. It is advisable to keep file size beneath 100K to allow the end-user to download multiple tones, but there is no file size limit except for total free memory available on the device.

---

# Appendix A: DRM

## Digital Rights Management

---

Digital Rights Management (DRM) is a method of protecting content from illegal distribution by embedding the content into an encrypted package along with rules dictating its use. Using a set of keys and a license for the specific file, a DRM application is required to decrypt the content for playback. The DRM application will be transparent to the user except for the cases where the user acquires a file without a proper license. Applications that will interact with DRM encoded files include the following:

- Media Center
- MMS
- Browser
- Email
- KJava
- Address Book
- Drawing Pad
- Camera
- Recorder
- File Manager
- Phone (calling)
- Power Up/Down Animation
- Wallpaper

For more information, refer to the following references found at <http://www.openmobilealliance.org> :

- OMA-Download-DRM-v1\_0-20020905-C
- OMA-Download-DRMREL-v1\_0-20030801-C
- OMA-Download-DRMCF-v1\_0-20030801-C

# Supported DRM Solutions

---

Two DRM solutions are supported by Motorola handsets. The solutions are the following:

- Forward Locking – Forward locking construct defined by the OMA DRM specification. Similar to NDIS implementation in MMS/EMS.
- Combined Delivery – The OMA Combined Delivery mechanism is an extension of OMA forward locking. The Combined Delivery mechanism differs by including a rights object within the DRM message which governs the consumption of the content included along with the rights object. A handset that supports Combined Delivery will support OMA forward locking.
- Separate Delivery – The OMA Separate Delivery mechanism is an extension of OMA Forward locking. The Separate Delivery mechanism differs by delivering the content and the rights object separately. The Motorola V3xx supports retrieving rights via WAP Push and via HTTP response.

## Download

---

Forward Lock files will be downloaded within a DRM message. The download manager will recognize the DRM message of MIME type 'application/vnd.oma.drm.message' as a valid file type.

The download manager will discard any DRM message that contains more than one media object within the DRM message.

OMA Combined Delivery will be downloaded within a DRM message and will consist of a media object and a rights object. The download manager will recognize the DRM message MIME type and the MIME type 'application/vnd.oma.drm.rights+xml' as a valid file type. A single media object in the body of the DRM message, that is encoded in the following identity transfer encoding '7bit', '8 bit', and 'binary,' will be accepted by the download manager.

## Installation

---

### **Forward Lock**

After the download of a DRM message has been completed, the download manager will strip out the media object that is encapsulated within the DRM message prior to dispatching the object for preview. The MIME type associated with the encapsulated media object will be used to verify that the OMA download descriptor 'type' meta data field matches the MIME type of the media object within the DRM message.

Once the media object has been extracted from the DRM message, the original DRM message can be discarded. Along with passing the media object to the content dispatcher for preview, the download manager shall indicate to the content dispatcher that the media object is 'forward locked'.

The mechanism for indicating a 'forward locked' status is to set the NDIS bit for the file within the file system.

### **Combined Delivery**

After the download of a DRM message has been completed, the handset will strip out the media object and the rights object that are encapsulated within the DRM message prior to dispatching the object for preview. If the DRM message is received without a descriptor file, the MIME type associated with the encapsulated media object should be used to verify that the OMA download descriptor 'type' meta data field matches the MIME type of the media object within the DRM message.

Once the media object has been extracted from the DRM message, the original DRM message can be discarded. Along with passing the media object to the content dispatcher for preview, the handset shall indicate to the content dispatcher that the media object is 'forward locked'.

- If the user selects to store the content from the preview: The media shall be stored in the appropriate file directory and shall be marked as 'forward-locked' using the NDIS bit. The rights object shall be stored in a protected portion of the file system. Rights objects are NEVER to be forwarded. Association between the rights object and the media MUST be maintained while stored in the file system.

### **Separate Delivery**

In V3xx implementation, for Forward Lock and Combined Delivery content, the Media objects will be encrypted (AES128) and packaged according to the same mechanism as Separate delivery, the encryption key is generated randomly and unique to each content on a phone. Thus the encrypted content can be stored anywhere in the phone or TransFlash card. A right object will also be created to save the right constraints and encryption key. The right object is stored in a hidden directory in phone flash memory which can not be accessed by end user. Thus the mechanism for indicating a 'forward locked' status is to set a special field in right object.

## **Right Object**

---

Forward Lock files do not have Right Objects associated with the content. The user has unlimited usage. The handset will mark the file as "do not forward" and the user will be able to consume the content as a normal file. The only limitation is the handset will not allow the user to send the file via any transfer method.

In the case of Combined Delivery there is a Right Object associated with the content. The Right Object will be stored in a secure area and the user will not have access to it. The handset will not allow the user to send it via any delivery method. The Right Object will define the constraints for content usage. This Right Object can have count, time, date, or interval constraints. The application will check the Right Object before consuming the content.

Content downloaded using the OMA Separate Delivery format has been converted from plaintext format into DRM content format (DCF). This conversion includes symmetric encryption of the content making the DRM protected content object useless to parties not having access to the Content Encryption Key (CEK). The CEK is contained within a rights object which is delivered independently of the DCF(containing the media). The DCF file can be distributed as much as desired, yet it will remain protected as the rights object shall be forward-locked. This is the basis for the superdistribution model. Typically, the DCF object is downloaded using the browser, after which the rights object is separately delivered to the device using WAP push. Handsets that support Separate Delivery **MUST** support OMA combined delivery as well as OMA forward locking.

## File Types

---

DRM solutions apply to all file formats. The OMA DRM solution is content agnostic and can be used for any type of content that the handset supports. Individual files are handled in the same manner as a DRM file would be handled. Files downloaded using OMA Combined Delivery will be downloaded within a DRM message and will consist of a media object and a rights object. The download manager will recognize the DRM message MIME type and the MIME type 'application/vnd.oma.drm.rights+xml' as a valid file type. A single media object in the body of the DRM message that is encoded in the following identity transfer encoding '7bit', '8 bit', and 'binary' will be accepted by the download manager.

RFC 2045 [RFC2045] defines the Content-Transfer-Encoding, which specifies how a specific body part is encoded for transfer by some transfer protocol. Content-Transfer-Encoding **MUST** only be used with body parts of DRM message, not with the whole body of the DRM message. The device **MUST** support the identity transfer encoding "binary". Other nonidentity Content-Transfer-Encodings like "base64" **MAY** also be supported

A Content-Transfer-Encoding header, as defined in RFC 2045 [RFC2045], **MUST** be present in the body part of the DRM message.



# Appendix B: MIME Types

This appendix provides a list of common MIME types used on various Motorola handsets. The list is sorted by category and provides file type descriptions, as well as the MIME types used to download different media files.

**NOTE:** The file and MIME types shown below are not supported by all Motorola handsets. Please refer to the handset's media guide to determine what file types a particular handset supports.

| Application | File type                                      | Suffix               | Permission    | Mimetype   |
|-------------|--|----------------------|---------------|--|
| Drawingpad  | Gif  | .gif                 | Display,Print | image/gif  |
|             | Jpeg   | .jpg, .jpeg          | Display,Print | image/jpeg   |
|             | bmp  | .bmp                 | Display,Print | image/bmp  |
|             | ems bmp  | .ems                 | Display,Print | Image/ems.userdefined.picture<br>Image/ems.userdefined.animation<br>Image/ems.predefined.animation |
|             | wbmp   | .wbmp                | Display,Print | image/vnd.wap.wbmp   |
|             | Png  | .png                 | Display,Print | image/png  |
| Realplayer  | aac  | .mp4                 | Play          | audio/mp4  |
|             |  | .3ga                 | Play          | audio/3gpp   |
|             | aac (mpeg4<br>aac-lc) aac+<br>Enhanced<br>aac+ | .mp4<br>.3ga<br>.m4a | Play          | audio/mp4<br>audio/3gpp<br>audio/m4a   |
|             |  |                      | Play          | audio/x-midi   |
|             | Mp3  | .mp3                 | Play          | audio/mp3  |
|             |  |                      | Play          | audio/x-mp3  |
|             |  |                      | Play          | audio/mpeg3  |
|             |  |                      | Play          | audio/x-mpeg3  |
|             | wav  | .wav                 | Play          | audio/wav  |
|             |  |                      | Play          | audio/x-wav  |
|             | amr,   | amr                  | Play          | audio/amr  |
|             | amr-nb, amr-<br>wb                             | .mpg4, .3ga          | Play          | audio/mp4, audio/3gpp  |
|             | wma  | .wma<br>.asf         | Play          | audio/x-ms-wma<br>audio/asf  |
|             |  |                      | Play          | audio/x-ms-wma   |
|             | xfm, midi                                      | .xfm, .midi,<br>.mid | Play          | audio/midi, audio/mid, audio/x-mid,<br>audio/x-midi, audio/mobile-xfm                              |
|             | 3gp  | .3gp                 | Play          | video/3gp  |
|             |  |                      | Play          | video/3gpp   |
|             |  | .3ga                 | Play          | audio/3gpp   |
|             | mp4  | .mp4                 | Play          | video/mp4  |

|  |                                |            |      |                               |
|--|--------------------------------|------------|------|-------------------------------|
|  |                                |            | Play | audio/mp4                     |
|  |                                |            | Play | video/mp4v-es                 |
|  | mpeg4                          | .mp4, .3gp | Play | video/mp4, video/3gpp         |
|  |                                |            | Play | video/mpeg4                   |
|  |                                |            | Play | video/mp4v-es                 |
|  | rm                             | .rm, .ram, | Play | video/vnd.rn-realvideo        |
|  |                                |            | Play | audio/x-pn-realaudio          |
|  |                                |            | Play | application/vnd.rn-realmeida. |
|  | h.263                          | .mp4, .3gp | Play | video/mp4, video/3gpp         |
|  | mpeg4 + amr-nb, mpeg4 + amr-wb | .mp4, .3gp | Play | video/mp4, video/3gpp         |
|  | mpeg4 + aac                    | .mp4, .3gp | Play | video/mp4, video/3gpp         |
|  | h.263 + amr-nb, h.263 + amr-wb | .mp4, .3gp | Play | video/mp4, video/3gpp         |
|  | h.263 + aac                    | .mp4, .3gp | Play | video/mp4, video/3gpp         |

**Table 22 MIME Types**

---

**Note:** Tone Sequence as defined in JSR-135 is equal to the following: audio/x-tone-seq  
Different strings in the same group are synonyms and are equally applicable for the corresponding media type.

---

Please note the following when mapping MIME types to a server:

- A MIME type can be mapped to zero or more file extensions
- Extension mapping is case insensitive

For information on configuring servers to deploy programs or files over-the-air, or to determine which MIME types are supported by a particular handset, download the *Basic Over-the-Air Server Configuration* whitepaper from the MOTODEV website (<http://developer.motorola.com>).

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