



GEL IMAGE FILE FORMAT

Molecular Dynamics GEL Image File Format

Revision 2



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INTRODUCTION:

Molecular Dynamics GEL image format is an extension to the industry-standard TIFF file format. The format is described in the TIFF Specification for greyscale images commonly referred to as TiffG. To obtain a copy of the specification, you can download it from the Adobe FTP site at:

<ftp://ftp.adobe.com/pub/adobe/DeveloperSupport/TechNotes/PDFfiles/TIFF6.pdf>

STANDARD TIFF FIELDS:

The following are the important TIFF fields that must be present in the image file:

TIFF FIELD (* = Required)	DESCRIPTION	VALID VALUES
Name: NewSubfileType Tag: 254 Type: LONG N: 1	The kind of data contained in this subfile. Used to specify reduced resolution images that are stored in the same file.	0
Name: ImageWidth Tag: 256 Type: SHORT N: 1	The number of columns in the image, i.e., the number of pixels along a scanline.	Varies with scan area.
Name: ImageLength Tag: 257 Type: SHORT N: 1	The number of rows in the image (also known as scanlines)	Varies with scan area.
Name: BitsPerSample Tag: 258 Type: SHORT N: 1	The number of bits for each sample. Since we are using greyscale images, the bits per sample = bits per pixel.	8 or 16 depending on scan mode.
Name: Compression Tag: 259 Type: SHORT N: 1	Compression scheme used in this image. We do not compress the data.	1 = No Compression
Name: PhotoInterpretation Tag: 262 Type: SHORT N: 1	The color space of the image data, i.e., what data value is interpreted as white and what is interpreted as black.	0 = White is Zero. 0 is imaged as white max value is imaged as black.
Name: DocumentName Tag: 269 Type: ASCII N: n	The name of the image file.	No default.
Name: Make Tag: 271 Type: ASCII N: n	The name of the scanner manufacturer.	No default.
Name: Model Tag: 272 Type: ASCII N: n	The model name of the scanner that generated the image.	No default.
Name: StripOffsets Tag: 273 Type: LONG N: 1	For each strip, the byte offset to the beginning of the strip. Since the image is stored as one strip, this field is the offset to the start of the image data	Varies depending on image.



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Name: SamplesPerPixel Tag: 277 Type: SHORT N: 1	The number of components per pixel. For greyscale images this value is 1.	1
Name: RowsPerStrip Tag: 278 Type: LONG N: 1	The number of rows of image data in each strip of image.	Since the image is stored as one strip, this field is equal to the ImageLength.
Name: StripByteCounts Tag: 279 Type: LONG N: 1	The number of bytes of data in each strip of image.	Since image is stored as one strip, this field is equal to ImageWidth * ImageLength * BitsPerSample * SamplesPerPixel / 8.
Name: MinSampleValue Tag: 280 Type: SHORT N: 1	The minimum component value used in the file.	Varies depending on instrument. In most cases = 0
Name: MaxSampleValue Tag: 281 Type: SHORT N: 1	The maximum component value used in this file.	Varies depending on instrument.
Name: XResolution Tag: 282 Type: RATIONAL N: 1	The number of pixels per ResolutionUnit in the ImageWidth.	Varies depending on scanner resolution setting.
Name: YResolution Tag: 283 Type: RATIONAL N: 1	The number of pixels per ResolutionUnit in the ImageLength.	Varies depending on scanner resolution setting.
Name: XPosition Tag: 286 Type: RATIONAL N: 1	X offset of the image with respect to the left of the scan area.	Optional field. No default.
Name: YPosition Tag: 287 Type: RATIONAL N: 1	Y offset of the image with respect to the top of the scan area.	Optional field. No default.
Name: ResolutionUnit Tag: 296 Type: SHORT N: 1	Unit of the Xresolution and Yresolution fields.	3 = centimeter 2 = inch 1 = No absolute unit.
Name: Software Tag: 305 Type: ASCII N: n	Name and version of the software used to scan this image.	No default.
Name: DateTime Tag: 306 Type: ASCII N: n	The date and time the image was scanned. Use a 24-hour clock to represent the time.	Current date and time. Valid format: YYYY:MM:DD hh:mm:ss
Name: Artist Tag: 315 Type: ASCII N: n	The name of the person that generated this image.	No default.



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PRIVATE TIFF FIELDS:

Molecular Dynamics has applied through Aldus Corp. (now owned by Adobe Inc.) to reserve ten private TIFF fields to further describe the image files. The format and values for the private fields is shown in the table below. These fields follow the standard fields TIFF fields in the header.

The Molecular Dynamics private fields are:

TIFF FIELD (* = Required)	DESCRIPTION	VALID VALUES
Name: MD_FILETAG* Tag: 33445 Type: LONG N: 1	Specifies the pixel data format encoding.	2 = Square Root Data Format 128 = Linear Data Format Default = 128
Name: MD_SCALEPIXEL* Tag: 33446 Type: RATIONAL N: 1	Specifies a scale factor for each pixel to scale the data before presenting it to the user.	Varies with instrument. Default = 1 / 1
Name: MD_COLORTABLE* Tag: 33447 Type: SHORT N: n	Used to specify the conversion range for 16-bit images to 8-bit images. Since the display is only 8-bit, the data must be converted before before display. 8-bit value = (16-bit value - low range) * 255 / (high range - low range)	VAL[0] = lowest possible VAL[1] = low range VAL[n-2] = high range VAL[n-1] = highest possible For n > 4, the intermediate values are ignored.
Name: MD_LABNAME Tag: 33448 Type: ASCII N: n	Name of the lab that scanned this file.	No default for this field.
Name: MD_SAMPLEINFO Tag: 33449 Type: ASCII N: n	Information about the sample as entered by the person that scanned the file.	No default for this field.
Name: MD_PREPDATE Tag: 33450 Type: ASCII N: n	Date the sample was prepared. Format is YY/MM/DD	No default for this field.
Name: MD_PREPTIME Tag: 33451 Type: ASCII N: n	Time the sample was prepared. Format is HH:MM using the 24-hour clock.	No default for this field.
Name: MD_FILEUNITS Tag: 33452 Type: ASCII N: n	Units for data in this file.	"O.D." for Densitometer "Counts" for PhosphorImager "RFU" for FluorImager No default for this field.



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Transformation of Square-Root Encoded Data to Linear Data

To transform pixel values from the PhosphorImager or FluorImager data files to linear values, you apply the following algorithm:

- Read the pixel value from the file
- Multiply the pixel value by itself to square the data. This value is guaranteed to fit in a signed-long integer (32-bit quantity).
- Multiply the squared pixel value by the Scale factor and assign it to a variable of type **double**

Example:

Pixel_Value = 342

Long_Pixel_Value = Pixel_Value * Pixel_Value = 116964

Double_Pixel_Value = (Long_Pixel_Value * Scale.numerator) / Scale.denominator
= (116964 * 1) / 21025 = 5.563