画像仕様書

IMAGE FORMAT DESCRIPTION
BAS2500 system

FUJI PHOTO FILM Co. LTD.
SCIENCE SYSTEMS

2003 April Ver 1.0

BAS2500 Image data format description

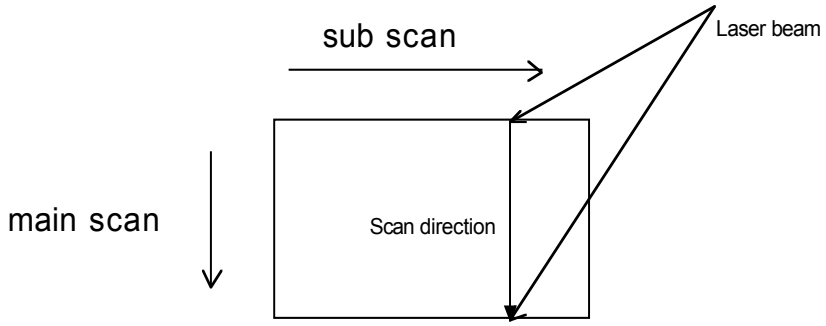
This document describes the image format of FUJI BAS2500.

1. Word definition

<main scan and sub scan>

These two words are used on BAS system.

The “main scan” is a direction of scanning beam. The “sub scan” is a direction of IP.



The beam is scanned from front side to back side if you stand up in front of BAS2500 scanner.

And the IP moves from right side to left side.

Therefore the origin (0,0) is the front-left corner, if you will place the IP reading area is up in BAS2500.

<QL value>

The QL(Quantum Level) data is a pixel data stored after scanning. The image data value stored on PC harddisk is this QL value. It is a logarithmic data generated on BAS2500 system. Therefore it needs linear transformation to make a quantitation from these QL value.

<PSL value>

The PSL(Photo Stimulated Luminescence) value is a log to linear converted data from QL value. This value shows radiation dose stored on IP, and this value is independent from changing “sensitivity” or “latitude” parameters. The PSL value is always the same changing “sensitivity” or “latitude” if the radiation dose to IP is the same.

2. Image data specification

BAS Image Spec.

	Max data size (MB)	Resolution (μm)	Bit depth (bit)	Sensitivity	Latitude	IP size (cm)	Max pixels
BAS2500	62.8	50, 100, 200	8,16	1000,4000, 10000,30000	4,5	20x40	4096x8040 2048x4020 1024x2010

The image size is variable. The size is fixed at IP reading time using Fuji IP reader software.

3. Type of image format

Fuji has two types of image format for Windows, MacOS, and Solaris. These are generated by Fuji reader software named “Image Reader” for MacOS and Windows, and BAStation for Solaris. Our image consists from a binary image data, and an ASCII text of image information. The FujiC format is only used on MacOS including raw image and information in a single file. The other is img/inf format. The img file is the raw data of image named like ～.img, and with no file headers. The inf file is the information part of image data. This img/inf format can use on these three platforms.

	img/inf format	FujiC format
Windows OS	yes	no
MacOS	yes	yes
Solaris	yes	no

3.1 img / inf format

The ～.img is a binary data that stores image in MOTOROLA format. The two bytes image data like “00FFH” is stored in “00H” and “FFH” order. So please be attention the byte order is different on INTEL based PC. You may need to swap the byte order to read the image density. The ～.inf is a text file that stores image information. The delimiter is user choice or depends on OS. It will have “CR” for MacOS, “LF” for Solaris, or “CR+LF” for DOS the end of each lines. The inf file format meaning is the same as FujiC fff1 format.

The first 15 lines of inf file is the same on any scanners and any reader softwares. The rest of lines used for own purpose only.

This is a typical example of BAS2500 inf file.

LineNo	item	data example	contents
1	Header	BAS_IMAGE_FILE ¶	fixed label
2	Original Name	testread ¶	file name using at first save time
3	IP Type	20*40 ¶	shows IP size
4	Resolution 1	50 ¶	(50),(100),or (200) shows pixel size of the main scan direction in μm
5	Resolution 2	50 ¶	(50),(100),or (200) shows pixel size of the sub scan direction in μm
6	Gradation	16 ¶	(16) or (8) bit depth at one pixel
7	Pixel Number	4096 ¶	pixel number along the main scan direction. depends on selected area size. maximum number is 4096.
8	Raster Number	8040 ¶	pixel number along the sub scan direction. depends on selected area size. maximum number is 8040.
9	Sensitivity	30000 ¶	(30000),(10000),(4000),or (1000) the large value will be more sensitive.
10	Latitude	5 ¶	(5),(4) dynamic range of “above number” power of 10.
11	Date and Time 1	Fri Jan 19 16:45:15 1996 ¶	scan date and time ctime(3) format of UNIX function
12	Date and Time 2	822037515 ¶	passing time in second from 1970.1.1 AM9:00:00 UNIX time function value
13	Over Flow pixels	13 ¶	saturated pixel number(s) saturated pixel shows wrong quantitative calculation
14	Reserved	¶	
15	Comment	this is sample ¶	user comment (up to 255 byte)
16～	extended		used for information area for the reader software

The ¶ mark shows a delimiter.

The following is img file dump

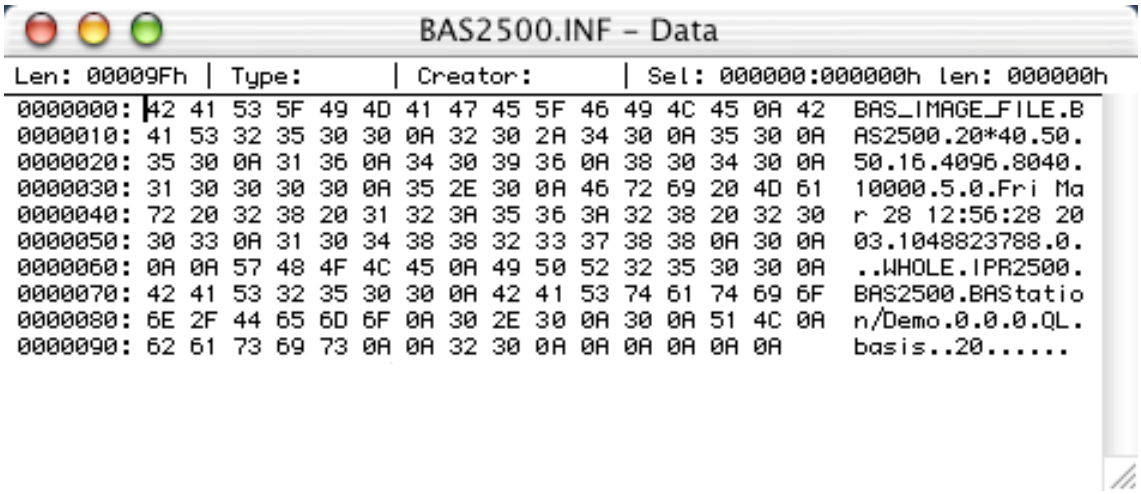
BAS2500.IMG – Data

Len: 3ED0000h | Type: BetA | Creator: Bas1 | Sel: 000000:000000h len: 000000h

```
0000000: 00 00 00 00 03 10 00 00 10 BB 00 00 00 00 00 00  ................
0000010: 0D 70 00 00 00 00 27 63 00 00 00 00 00 00 00 00  .p....'c........
0000020: 00 00 00 00 00 00 3B 82 00 00 00 00 00 00 00 00  ......;.........
0000030: 00 00 00 00 00 00 22 91 00 00 00 00 00 00 00 00  ......".........
0000040: 00 00 1A 5E 00 00 1F 46 00 00 20 DA 00 00 00 00  ...^...F.. .....
0000050: 00 00 00 00 00 00 00 00 00 00 0A 22 0F 60 00 00  ...........".`..
0000060: 00 00 00 00 37 3D 00 00 00 00 3A 77 00 00 00 00  ....7=....:w....
0000070: 2B 19 00 00 00 00 00 00 00 00 00 00 00 00 00 00  +...............
0000080: 06 CC 00 00 00 00 3B 19 1F A2 00 00 00 00 00 00  ......;.........
0000090: 00 00 00 00 00 00 00 00 3A 22 2A 90 00 00 00 00  ........:"*.....
00000A0: 00 00 02 AD 00 00 20 96 00 00 00 00 00 00 00 00  ...... .........
00000B0: 00 00 00 00 00 00 00 00 00 00 17 86 00 00 00 00  ................
00000C0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 29 E8  ..............).
00000D0: 02 60 00 00 00 00 00 00 00 00 00 26 21 00 00 00  .`.........&!....
00000E0: 11 5D 00 00 00 00 00 00 00 00 00 00 15 14 00 00  .]..............
00000F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
0000100: 00 00 00 00 00 00 00 00 0A 09 00 00 00 00 00 00  ................
0000110: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 21 AD  ..............!.
0000120: 00 00 00 00 00 00 00 00 00 00 0D 5E 00 00 00 00  ...........^....
0000130: 00 00 00 00 28 9C 00 00 00 00 00 00 00 00 24 0B  ....(.........$.
0000140: 25 FE 00 00 00 00 14 F3 00 00 00 00 00 00 00 00  %...............
0000150: 00 00 00 00 00 00 00 00 00 00 00 00 33 37 00 00  ............37..
0000160: 3D 8B 00 00 00 00 00 00 00 00 2E 44 00 00 32 43  =..........D..2C
0000170: 1D 69 00 00 00 00 00 00 09 00 00 00 00 00 00 00  .i..............
0000180: 00 00 2E 21 00 00 00 00 00 00 00 00 00 00 3C 7A  ...!..........<z
0000190: 12 F9 00 00 00 00 00 00 19 EB 00 00 00 00 00 00  ................
00001A0: 00 00 00 00 27 97 1C 99 00 00 29 0F 1B 9E 00 00  ....'.....).....
00001B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00001C0: 00 00 00 00 3A C6 1B 4B 00 00 00 00 00 00 00 00  ....:..K........
00001D0: 00 00 00 00 00 00 00 00 37 6A 00 00 00 00 00 00  ........7j......
00001E0: 00 00 00 00 00 00 00 0D 36 32 A9 00 00 00 00 00  ........62......
00001F0: 38 E4 33 67 00 00 00 00 00 00 21 A0 00 00 00 00  8.3g......!.....
0000200: 00 00 00 00 00 00 00 ED 00 00 2F EA 00 00 00 00  ........../.....
0000210: 00 00 2A 5A 00 00 00 00 00 00 00 00 23 3D 00 00  ..*Z........#=..
0000220: 00 00 00 00 00 00 00 00 00 00 00 00 13 58 00 00  .............X..
0000230: 00 00 11 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
0000240: 16 B7 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
0000250: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
0000260: 00 00 00 00 00 00 00 00 00 00 00 12 66 0E 04 00  ............f...
0000270: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
0000280: 08 DF 00 00 00 00 1F 0B 00 00 15 D1 00 00 00 00  ................
0000290: 00 00 00 00 01 2D 00 00 00 00 00 00 00 00 00 00  .....-..........
```

The following is inf file dump

the delimiter is used LF(0A) for this sample. This is Solaris inf file.



3.2 FujiC format

The FujiC format is used only on Macintosh. It contains resolution, gradation, sensitivity, and other data in fff1 resource and version information of a file in vers resource. These two resources are stored in the resource fork. The image pixel data is stored in a data fork.

The FujiC format has Bas1 creator and FujC File Type in recent version of ImageReader software. We have used “BasP” creator or “Fuji”, “Fuj1”, “Fuj3” creator in older version.

<fff1 resource>

The fff1 resource (ID=128) has

256 bytes for one information x 50 items

in a binary format. In other words to say, it has 50 sets of Str255 type data of Toolbox data type.

<vers resource>

The vers resource (ID=1) format is a vers resource controlled by Macintosh Resource Manager. The format is as follows ;

items	contents
Version number	2.0.0
Release	Final
Non-release	0
Country code	14-Japan
Short version string	2.0.0
Long version string	2.0.0

'fff1' resource format (ID=128)

IP image

No	item	data example	contents
1	Header	BAS_IMAGE_FILE	fixed label
2	Original Name	testread	file name using at first save time
3	IP Type	20*40	shows IP size
4	Resolution 1	50	(50),(100),or (200) shows pixel size of the main scan direction in μm
5	Resolution 2	50	(50),(100),or (200) shows pixel size of the sub scan direction in μm
6	Gradation	16	(16) or (8) bit depth at one pixel
7	Pixel Number	4096	pixel number along the main scan direction. depends on selected area size. maximum number is 4096.
8	Raster Number	8040	pixel number along the sub scan direction. depends on selected area size. maximum number is 8040.
9	Sensitivity	30000	(30000),(10000),(4000),or (1000) the large value will be more sensitive.
10	Latitude	5	(5),(4) dynamic range of “above number” power of 10.
11	Date and Time 1	Fri Jan 19 16:45:15 1996	scan date and time ctime(3) format of UNIX function
12	Date and Time 2	822037515	passing time in second from 1970.1.1 AM9:00:00 UNIX time function value
13	Over Flow pixels	13	saturated pixel number(s) saturated pixel shows wrong quantitative calculation
14	Reserved		
15	Comment	this is sample	user comment
.....	Reserved		
50	Reserved	inf	(inf) extension name of information file

3.3 Quantitative Calculation

The quantitative calculation is made from summation of ～.img file pixels. The "～.img" file is a sequential data of pixel stream. It is necessary to make a log to linear conversion on the BAS systems. Because the BAS system generates an image data as a logarithmic compression. The ROI quantitative calculation should be done, the log to linear conversion on each pixels in the ROI first, then make summation of each converted pixel value. We are using the "PSL" as IP quantified value unit name.

ROI	Region Of Interest
PSL:	Photo Stimulated luminescence
AU:	Arbitrary Unit

Conversion formula

$$PSL = \left(\frac{Res}{100}\right)^2 \times \frac{4000}{S} \times 10^{L\left(\frac{QL}{G}-\frac{1}{2}\right)}$$

note: EXCEPTION if QL=0 then PSL defines as PSL=0.

PSL: quantified value in linear scale

Res : Resolution in μm

S: Sensitivity

L: Latitude

G: Gradation

8bit G=255

16bit G=65535

QL: a pixel value in ～.img file

range of QL is from 0 to 255 (for 8bit), 65535 (for 16bit)

Changing History

Ver	Date	Contents
1.0	April 18 2003	*first edition, based on BAS/FLA/LAS image format V2.0(1999) inf file line #13,#14 has been changed (Takahisa Yamane)

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