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7000/8000 dual/multiple stream series video/audio stream user data format

Version 1.0s

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Revision History

version	Issue date	author	comment
1.0a	2007/04/12	Evan	Modify from 7000 series format
1.0b	2007/04/25	Evan	1. Add 7000 series and 2000 series JPEG format 2. Add Field mode identification
1.0c	2007/11/2	Evan	Add PIR and white-light LED explanation
1.0d	2007/11/2	Evan	User Data of video stream extend method
1.0e	2008/02/21	Evan	Modify User Data of video stream extend method (TLV format)
1.0f	2008/2/29	Evan	Remove F2F identification on video application data
1.0g	2008/5/20	Evan	Add new Motion Detection Window information on User Data.
1.0h	2008/5/21	Joe	Change motion detection tag value and some fields name
1.0i	2008/5/26	Evan	1. Rename data packet to application data 2. Change user data of video stream Move video on text part from “application data” to “Header extension

			content”. 3. New add appendix part to explain new motion detection information 4. Refine TLV data format.
1.0j	2008/5/27	Evan	1. Re-define Tag value and reserve 0 ~ 15 for short content info use.. 2. Add new Tampering detect, PIR in the application data
1.0k	2008/8/07	Evan	1. Add Parser Type field.
1.0l	2008/10/9	Evan	1. Modify and re-draw the layout of header extension content. 2. Modify keyword of F2F identification
1.0m	2008/10/15	WeiCheng	1. Extend TLV tag to 0xFFFFFFFF
1.0n	2008/10/24	WeiCheng	1. Add Padding in user data to make user data four bytes alignment
1.0o	2008/12/15	Evan	1. Appendix part : Modify Tag index number and re-define tag value. 2. Change user data of video stream of application data from hex to dec (0x16 ➔ 16, 0x17 ➔ 17).
1.0p	2009/01/14	WeiCheng	1. Add “Valid DST and TZV” field.
1.0q	2009/07/17	WeiCheng	1. Add temperature alarm
1.0r	2009/09/04	Baboo	1. Add stream type “h264”
1.0s	2009/09/10	WeiCheng	1. Modify the wording 2. Modify for VIVOTEK CIS

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Overview

VIVOTEK embedded some useful information in the video stream so that the developer can use them for advanced features in their software. The information includes digital input states, digital output states, motion detection, etc. This document describes the media data format used in 7000 dual-stream series and 7000/8000 multiple-stream series products.

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RTP header

Real-time Transport Protocol header (RFC 1889) is used to carry media data for vivotek 7000/8000 series product. The first twelve octets are present in every RTP packet. The RTP header has following format.

Version	Padding	Extension	CSRC count	Marker bit	Payload type	Sequence number	Timestamp
2 bits	1 bit	1 bit	4 bits	1 bit	7 bits	16 bits	32 bits
←---RTP header size ----------							

SSRC	CSRC
32 bits	0-15 items, 32 bits each
--→	

- Field descriptions:

Version	2 bits	Version of RTP
Padding	1 bit	If the padding bit is set, the packet contains one or more additional padding octets at the end which are not part of the payload. The last octet of the padding contains a count of how many padding octets should be ignored.
Extension	1 bit	If the extension bit is set, the fixed header is followed by exactly one header extension, with a format defined below
CSRC count	4 bits	The CSRC count contains the number of CSRC identifiers that follow the fixed header.
Marker	1 bit	For video stream, if marker bit is set, that means this packet is the last packet of one video frame
Payload type	7 bits	profile number of media codec
Sequence number	16 bits	The sequence number increments by one for each RTP data packet sent, and may be used by the receiver to detect packet loss and to restore packet sequence
Timestamp	32 bits	The timestamp reflects the sampling instant of the first octet in the RTP data packet. If an audio application reads blocks covering 160 sampling periods from the input device, the timestamp would be increased by 160 for each such block
SSRC	32 bits	The SSRC field identifies the synchronization source. This identifier is chosen randomly
CSRC	0 to 15 items, 32	The CSRC list identifies the contributing sources for the payload

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	bits each	contained in this packet. The number of identifiers is given by the CC field. CSRC identifiers are inserted by mixers, using the SSRC identifiers of contributing sources

RTP header extension

Profile number for vivotek extension	length
←----------------------16 bits---------------→	←----------------------16 bits---------------→
Header extension content(32 bits)	
Header extension content(32bits)	
……	

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If the extension bit in the RTP header is set, a variable-length header extension is appended to the RTP header, following the CSRC list if present. The header extension contains a 16-bit length field that counts the number of 32-bit words in the extension, excluding the four-octet extension header (therefore zero is a valid length). Only a single extension may be appended to the RTP data header.

For video bit stream, extension profile number is 0x5282
For audio bit stream, extension profile number is 0x5532

JPEG header

JPEG (SOI)	JPEG Extension	JPEG Extension Length	Header extension content
2 bytes	2 bytes	2 bytes	(JPEG Extension Length * bytes)
0xFFD8	0xFFE2	variable	variable
JPEG image			

- Field descriptions:

JPEG SOI	2 bytes	0xFFD8, Start Of Image
JPEG extension	2 bytes	0xFFE2, Application-specific markers
JPEG extension length	2 bytes	Variable
Header extension content	JPEG extension length * bytes	VIVOTEK's proprietary information

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Header extension content

The total amount of header extension content needs to be 32 bits aligned. All VIVOTEK's proprietary information is stored in header extension content. Zero padding is used in front of them in order to be 32 bits aligned. Skipping all the zero byte from the beginning of header extension content will reach the meaningful VIVOTEK's proprietary information

The layout of header extension content:

(1) MPEG4 Type:

Pending	Extension content
00 ...	VIVOTEK's proprietary information

VIVOTEK's proprietary information :

Extension Type	Length tag	Extension Length	Extension Content
8 bits	1 bit	7 bits ~ 128 bytes	(Extension Length * bytes)
0x02	0	variable	Video_Text

Extension Type	Length tag	Extension Length	Extension Content
8 bits	1 bit	7 bits ~ 128 bytes	(Extension Length * bytes)
0x01	0	variable	Application data content

(2) JPEG Type:

F2F identification
10 bytes
FM_IL/ FM_PG Mode

Extension Type	Length tag	Extension Length	Extension Content
8 bits	1 bit	7 bits ~ 128 bytes	(Extension Length * bytes)
0x02	0	variable	Video_Text

Extension Type	Length tag	Extension Length	Extension Content
8 bits	1 bit	7 bits ~ 128 bytes	(Extension Length * bytes)
0x01	0	variable	Application data content

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- Field descriptions:

F2F identification	10 bytes	**(JPEG only)** Field to frame identification. If Frame Interleave mode, mark "**FM_IL Mode**" If Frame packet mode, mark "**FM_PG Mode**"
Extension Type	8 bits	Currently there are 2 extension type 0x01 means **Application data** extension type 0x02 means **(Text on Video)Location** extension type
Length tag	1 bit	0 means following 7 bits is the length of **content** 1 means following 7 bits is the length of **information length**
Extension length	7 bits ~ 128 bytes	If length tag is 0,read the value of 7 bits as extension length If length tag is 1, read the value of 7 bits as length of extension length (for example: 0x02 bytes). Then read the value of following 2 byte as extension lengths
Extension Content	information length bytes	Information corresponding to extension type 0x01: application data extension (see details below) 0x02: (Text on VIdeo)Location information (ASCII string) 0x03: Reserved for Intelligent video information (IVA).

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Application Data

- **Video application data**

The application data of video is from the “packet size” field to the “user data” field.

To achieve 32-bits alignment, the size of user data must be multiple of 32-bits. The unit of “user data length” is 32-bits. Pad zero bits to achieve 32-bits alignment.

(1) MPEG-4 format:

For MPEG-4, one application data contains one frame. Each frame contains the data as followings.

The layout of application data:

Application Data Size	Stream type (FourCC)	Frame type	DI alert flag	Reserved	DO flag	Time modified flag
32 bits	32 bits	4 bits	4 bits	8 bits	2 bits	1 bit
	←--- Application data size ----------					

Audio DI flag	Do flag (2)	DI (2) flag	DI alert flag (2)	Timezone flag	Daylight saving flag	Timezone	Parser Type	Valid DST and TZV	Reserved
1 bit	2 bits	1 bit	4 bits	1 bit	1 bit	7 bits	1 bit	1 bit	2 bits
--									

Second	Millisecond	User data length	User data	Bitstream
32 bits	16 bits	8 bits	User data length *4 bytes	Packet size – 16 – User data length*4 bytes
---→				

(2) JPEG format:

For JPEG, the extra data is included in the application header for every image. Each image contains the data as followings.

The layout of application data:

Reserved	Stream type (FourCC)	Frame type	DI alert flag	Reserved	DO flag	Time modified flag
32 bits	32 bits	4 bits	4 bits	8 bits	2 bits	1 bit

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Audio DI flag	Do flag (2)	DI (2) flag	DI alert flag (2)	Timezone flag	Daylight saving flag	Timezone
1 bit	2 bits	1 bit	4 bits	1 bit	1 bit	7 bits

Parser Type	Valid DST and TZV	Reserved	Second	Millisecond	User data length	User data
1 bit	1 bit	2 bits	32 bits	16 bits	8 bits	UserDataLength *4 bytes

- Field descriptions:

Reserved	32 bits	This field is reserved and should be set to 0
Stream type	32 bits	The unique ID for the codec type (FourCC) Currently support stream types are listed below: 1. "mp4v" => MPEG4 simple profile video 2. "h264" => H.264 video 3. "jpeg" => Motion JPEG 4. "h263" => H.263 or MPEG4-SHM video 5. "aac " => MPEG4 AAC audio 6. "GAMR" => GAMR audio 7. "7221" => G.7221 audio 8. "729A" => G.729A audio
Frame type	4 bits	Indicate the type of frame, intra, prediction or bi-direction prediction. For audio stream, the field is always zero. 0x0: Intra frame, (for MPEG-4, it means intra frame with VO header) 0x1: Prediction frame (P) 0x2: Bi-direction prediction frame (B)
DI alert flag	4 bits	Each bit is used to indicate the DI alert triggered by user defined (H/L). It will add the flexibility except the three alert windows to motion detection with extra devices. It supports four digital input sources in the present. The LSB indicates the first digital input source. If support PIR function, Bit 2 indicates PIR device status. For example: Bit 1 (LSB) : 1st DI Bit 2: 2nd DI or PIR Bit 3: 3rd DI Bit 4 (MSB) : 4th DI
Reserved	8 bits	This field is reserved and should be set to 0.

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DO flag	2 bits	Each bit is to indicate the digital output status. The LSB indicates the first digital output. (DO1 DO0) If support White-light LED function, Bit 2 (DO1) indicates LED device status.
Time modified flag	1 bit	If the time is modified according to timezone, its value is 1. Otherwise, its value is 0. This bit is always 1 in 4000/5000/6000/7000 series. The “Second” field below represents the relative to 0h local time on 1 January 1970.
Audio DI flag	1 bit	Audio packets take the DI alert information. This bit is always 1 in 4000/5000/6000/7000/8000 series.
DO flag (2)	2 bits	Each bit is to indicate the digital output status. The LSB indicates the third digital output. (DO3 DO2)
DI (2) flag	1 bit	Indicate the validness of following 4 bits DI. If it is zero, the following 4 bits are always zero.
DI alert flag (2)	4 bits	Each bit is used to indicate the DI alert triggered by user defined. The LSB indicates the fifth digital input.
Timezone flag	1 bit	The flag to indicate the presentation of timezone. If it is 1, the following 8 bits are daylight + timezone. If it is 0, the following 8 bits should be set to 0.
Daylight saving	1 bit	If it is 1, the daylight saving time is applied. If it is 0, the daylight saving time is not applied or this time zone does not have any daylight savings time rules.
Timezone	7 bits	It starts from zero, GMT-12:00. The unit is 15 minutes. For example, its value is 34 for GMT-3:30 Newfoundland.
Parser Type	1 bit	If it is 0, not support parse new add user data information. If it is 1, support parse new add user data information, such as, Capture window info, Cropping width/Height, Motion window info, Tampering detect info and PIR info field. (support new datapacketdef.h for fields pbyExtendedBuffer and dwExtendedBufferLength)
Valid DST and TZV	1 bit	Because the Daylight saving and the Timezone fields were implemented inappropriately, this field is added to correct the mistake. If it is 1, the Daylight saving field and the Timezone field are valid. If it is 0, the Daylight saving field and the Timezone field are invalid.
Reserved	2 bits	This field is reserved and should be set to 0.

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Second	32 bits	The second that the first frame in the Data Packet belongs to. It is relative to 0h UTC on 1 January 1970.
Millisecond	16 bits	The millisecond that the first frame in the Data Packet belongs to. The range is (0, 999).
User data length	8 bits	The number of 4-bytes in the "User data" field
User data	Varies	The content of user data is stream-dependent. The detail description is in the next section.
Bitstream	varies	The media bitstream. The size of bitstream can calculate from the packet size and header size.

- User Data of video stream

Motion detect w0	Alert flag	Percent	Axis	Motion detect w1	Motion detect w2	Alert flag	Percent	Axis	No signal
1 bit	1 bit	7 bits	4*10 bits	1 bit	1 bit	1 bit	7 bits	4*10 bits	1 bit
1	0	20	(1,1,10,10)	0	1	1	50	(50,50,60,55)	1

(The above fields are left for compatibility and is obsolete if the following fields exists)

Reserved	Padding	Capture window info tag	Capture window info length	Capture width	Capture height	X-axis offset	Y-axis offset	Cropping width	Cropping height
4 bits	0~24 bits	8 bits	8 bits	16 bits	16 bits	16 bits	16 bits	16 bits	16 bits
0	0	**16 (0x10)**	12	0~65535	0~65535	0~65535	0~65535	0~65535	0~65535

Motion window info tag	Motion window info length	Motion window number	Motion detect #1	Alert flag #1	Percent #1	Axis #1	Motion detect #2	Alert flag #2
8 bits	8 bits	8 bits	8 bits	1 bit	7 bits	4*16 bits	8 bits	1 bit
17 (0x11)	1 + Motion window number * 10	0~12	1	0	20	(1,1,10,10)	2	0

Percent #2	Axis #2	Tampering detect info tag	Tampering detect info length	Tampering alert	Tampering Reserved	PIR info tag	PIR value
7 bits	4*16 bits	8 bits	8 bits	1 bit	7 bits	7 bits	1 bit
20	(1,1,10,10)	**24 (0x18)**	NA	NA	NA	**0xE0 (Tag:0)**	0/1

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Temperature alarm tag	Temperature alarm value						
7 bits	1 bit						
0xE2 (Tag:1)	0/1						

- Field descriptions

Motion detect w#	1 bit	Indicate the on/off of motion detection. 0: disable motion detection 1: enable motion detection If the motion detection was enabled, alert flag, percent and axis fields follows. If the motion detection was disabled, there are no these three fields.
Alert flag	1 bit	Indicates whether the movement is over the threshold the user defined.
Percent	7 bits	The percent of motion detection. It ranges from 0 to 100.
Axis	4*10 bits	The rectangle of window for motion detection. Each element is encoded in 10 bits. ✧ 1st element (the top-left x-axis): the real x1-axis plus one (+1). The range is (1, 1023) ✧ 2nd element (the top-left y-axis): the real y1-axis plus one (+1). The range is (1, 1023) ✧ 3rd element: the width of rectangle ✧ 4th element: the height of rectangle
No signal	1 bit	Indicates the loss of video signal
Reserved (1)	4 bits	This field is reserved for original user date byte alignment and should be set to 0.
Reserved (2)	0~24 bits	This field is reserved for total user date four bytes alignment and should be set to 0.
Capture window info tag	8 bits	**16 (0x10), Capture window info tag**
Capture window info length	8 bits	12, indicates the length of capture window info in byte.
Capture width	16 bits	Indicates the width of current capture size. (Appendix 1)
Capture height	16 bits	Indicates the height of current capture size. (Appendix 1)
X-axis offset	16 bits	Indicates the X-axis offset value of cropping window. (Appendix 1)
Y-axis offset	16 bits	Indicates the Y-axis offset value of cropping window. (Appendix 1)
Cropping width	16 bits	Indicates the width of current cropping size. (Appendix 1)
Cropping height	16 bits	Indicates the height of current cropping size. (Appendix 1)

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Motion window info tag	8 bits	**17 (0x11), Motion window information tag**
Motion window info length	8 bits	1 + Motion window number * 10 (<= 127)
Motion window number	8 bits	0 ~ 12, indicate the number of motion window
Motion detect #number	8 bits	0 ~ 12, Indicate the number of motion detection.
Alert flag #	1 bit	Indicates whether the movement is over the threshold the user defined.
Percent #	7 bits	The percent of motion detection. It ranges from 0 to 100.
Axis	4*16 bits	The rectangle of window for motion detection. Each element is encoded in 16 bits. ✧ 1st element (the top-left x-axis): the real x1-axis plus one (+1). The range is (1, 65535) ✧ 2nd element (the top-left y-axis): the real y1-axis plus one (+1). The range is (1, 65535) ✧ 3rd element: the width of rectangle ✧ 4th element: the height of rectangle
Tampering detect info tag	8 bits	**24 (0x18), Tampering detect info tag**
Tampering detect info length	8 bits	(>= 1), Tampering detect info length
Tampering detect alert	1 bit	Indicates the alert flag of tampering detect.
Tampering Reserved	(length*8) – 1 bits	Tampering Reserved
PIR info tag	7 bits	**0xE0 (Tag: 0) // Use short content** **(0) indicates PIR info tag**
PIR value	1 bit	PIR value
Temperature alarm tag	7 bits	**0xE2 (Tag: 1) // Use short content** **(1) indicates temperature alarm info tag**
Temperature alarm value	1 bit	Temperature alarm value

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◆ User Data of video stream extend method (TLV format)

1. Usage instruction

※ Case 1 (Tag: 0x00 ~ 0xBF)

Tag format (1)

Tag
8 bits 0x00~0x7F

Tag format (2)

Tag length						Tag value
Bit1	Bit2	Bit3	Bit 4	Bit 5	Length of tag (Bit 6 ~ Bit 8)	Tag (Length of tag * bytes)
1	0	x	x	x	0 ~ 4	128 ~ 4294967295

(1) In Length part : The 1st bit is 0

Tag	Length		Value
	Bit1	Length of content (Bit 2 ~ Bit 8)	Content info (Length of content * bytes)
	0	1~127	Main content

(2) In Length part : The 1st bit is 1 , 2nd bit is 0

Tag	Length				Value
	Bit1	Bit2	The length of content length (6 bits)	Length of content	Content info (Length of content * bytes)
	1	0	1 ~ 63	(The length of content length * bytes)	Main content

(3) In Length part : The 1st bit is 1 , 2nd bit is 1, 3rd bit is 0

Tag	Length					Value
	Bit1	Bit2	Bit 3	Unused bit (3 bits)	Length of content (2 bits)	Content info (Length of content * bytes)
	1	1	0	0~7	(1~3)	Main content

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(4) In Length part : The 1st bit is 1 , 2nd bit is 1, 3rd bit is 1

Tag	Length						Value
	Bit 1	Bit 2	Bit 3	Unused bit (3 bits)	The length of content length (2 bits)	Length of content	Content info (Length of content * bytes)
	1	1	1	0~7	(1~3)	(The length of content length * bytes)	Main content

※ **Case 2 (Tag: 0xC0 ~ 0xDF)**

(1) In Tag part: The 4th bit is 0

Tag					Value	
Bit1	Bit2	Bit3	Bit 4	Tag value (Bit 5 ~ Bit 8)	Unused bit (3 bits)	Content info (5 bits)
1	1	0	0	0 ~ 15	0~5	0~31

(2) In Tag part: The 4th bit is 1

Tag					Value
Bit1	Bit2	Bit3	Bit 4	Tag value (Bit 5 ~ Bit 8)	Content info (1 byte)
1	1	0	1	0 ~ 15	0 ~ 255

※ **Case 3 (Tag: 0xE0 ~ 0xFF), The 1st bit is 1 , 2nd bit is 1, 3rd bit is 1**

Tag				Value
Bit1	Bit2	Bit3	Tag value (Bit 4 ~ Bit 7)	Content info (Bit 8)
1	1	1	0 ~ 15	0~1

※ **[Unused bit] :** indicates the number of unused bit in the content info.

- **For example:** if unused bit is 0x03, we will not read 3 bits data from low bit of content info.

Unused bit (3 bits)	Content info (8 bits)			
0x03	**(8~4 bit)**	X	X	X

Unused bit (3 bits)	Content info (16 bits)			
0x03	**(16~4 bit)**	X	X	X

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- **Audio application data**

The only difference between audio and video application data is user data section.

In the present, there is no security information for audio stream. If the size of bitstream is fixed (mostly for speech), store the total number of access unit and the fixed size of access unit. If the size of bitstream is variable, store the total number of access unit and the size of each access unit in this Data Packet. Make the size of user data is the multiple of 32-bits for alignment. System needs to control the times of calling audio decoder. Calculate the time difference from sampling frequency. If there are multiple selections of sampling frequency and channel number in an audio stream type, the user data contains the sampling frequency and channel number.

Fixed unit size flag	Sampling freq & channel number field flag	Reserved	Access unit number (n)	Access unit size (1)	…	Access unit size (n)	Sampling frequency	Channel number
1 bit	1 bit	6 bits	8 bits	16 bits		16 bits	24 bits	8 bits

- Field descriptions

Fixed unit size flag	1 bit	Indicating the size of access unit is fixed or not
Sampling freq & channel number field flag	1 bit	Indicating the existence of sampling frequency and channel number fields
Reserved	6 bits	This field is reserved and should be set to 0.
Access unit number	8 bits	The number of access units in this Data Packet
Access unit size	16 bits	The size in bytes of access units
Sampling Frequency	24 bits	The audio sampling frequency
Channel number	8 bits	The audio output channel configuration

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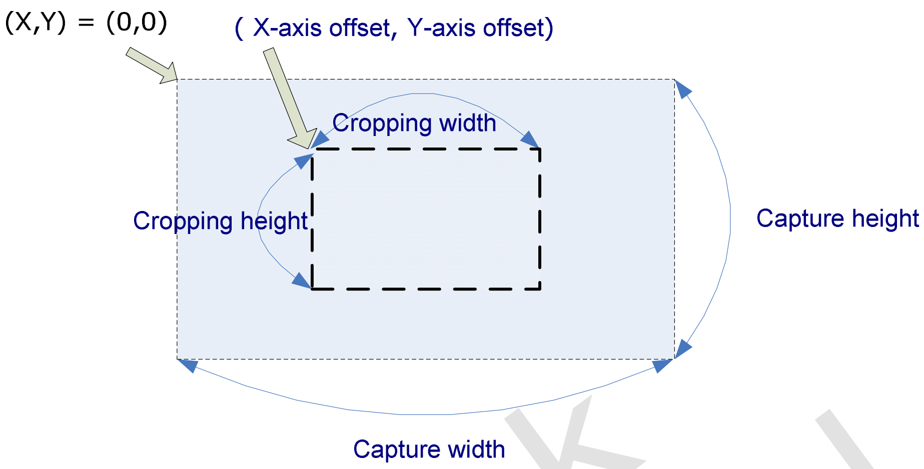
Appendix

1. The relationship of offset, capture window, cropping window, and axis:



2. The current tag table:

Tag index (Decimal)	Description
0	PIR info tag
1	Temperature alarm tag
2 ~ 15	Reserve for short content info use
16	Capture window info tag
17	Motion window info tag
18 ~ 23	N/A
24	Tampering detect info tag

※ **P.S.** 0 ~ 15: reserve for short content info use.

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