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GenICam ICD FLIR AX5 Camera - PC

Contents

1 Connectivity Overview

1.1 Physical interfaces

The FLIR IR camera, when used for GenICam data transfer, can be used in two ways.

- Dedicated Gigabit Ethernet
- Shared Ethernet

A Dedicated Gigabit Ethernet is recommended for high speed applications and when image streaming would disturb other equipment on a Shared Ethernet.

1.2 Low level protocols

On the mentioned physical interface, it is possible to run different low level protocols.

1.2.1 Ethernet

The IP GigEVision streaming protocol is used for image transfer and the GigEVision control protocol is used for camera control.

Some other IP protocols are supported for network management functions. They should work seamlessly on any LAN, provided that a proper IP adress, netmask and possibly gateway is set in the camera.

1.3 Functionality

The ethernet communication functionality is provided by an iPORT IP Engine inside the camera. You can use it to manage image streaming and control the camera through the GenICam command control interface.

1.3.1 GenICam

To be able to acquire images and control the camera, you have to have a software environment that meets the specifications of the machine vision standards GigE Vision and GenICam. For more information about this, see http://www.genicam.org/.

Such environments are, for example,

- "Measurement and Automation Explorer (MAX)" from National Instruments.
- "EBus SDK" from Pleora Technologies.
- "Common Vision Blox" from Stemmer Imaging.
- "Cognex Vision Pro" from Cognex

The camera supports the GenICam standard command set, and some FLIR specific commands.

The GenICam Standard Features Naming Convention (available at http://www.genicam.org/) is used.

1.3.2   IP services

It is also possible to access the system using tcp/ip with the exposed services described here.

1.3.2.1   DHCP

The camera supports the client part of the Dynamic Host Configuration Protocol (DHCP).

1.3.2.2   Remote detection

1.3.2.2.1   GigEVision Control Protocol (GVCP)

GigEVision camera queries return the model name and MAC address of the cameras found.

For more information, see http://www.machinevisiononline.org

2   GeniCam Commands

2.1   Introduction

The goal of GenICam is to provide a generic programming interface for all kinds of cameras.

The GenICam standard consists of multiple modules according to the main tasks to be solved:

- GenApi : GenICam application programming interface (API) for camera configuration and control

- GenTL : GenICam transport layer (TL) for grabbing images

The GenApi module deals with the problem of how to configure and control a camera. The key idea is to make camera manufacturers provide machine readable versions of the manuals for their cameras. These camera description files contain all of the required information to automatically map a camera's features to named *registers*.

The GenTL module is still under construction. Until it is finished, image transfers are made through software environment specific interfaces.

This section defines the GenICam registers of the GigEVision compatible camera.

Inside the FLIR AX5 camera, there is an iPORT IP Engine. It has a number of status registers and registers that control the way in which it acquires images from the camera.

From the iPORT IP Engine point of view, the FLIR AX5 camera is regarded as a GigE Vision device with some special FLIR Camera features.

To be able to use these registers to acquire images and control the camera, you have to establish a connection to it through a software environment that meets the specifications of the machine vision standards GigE Vision and GenICam, such as the eBus SDK from Pleora Technologies.

2.2   GenICam registers

Depending on the camera model, all registers may not be available or functional on a particular camera.

2.2.1   Register types

The registers have one of the following types:

Integer	An integer value, between -2 147 483 648 and 2 147 483 647.
String (max length including null)	An ASCII string, for example "ThermaCAM". The string must be terminated with a Null (binary 0) character
Bool	The integer value 1 for true, or the integer value 0 for false.
Float	An IEEE 754 -1985 encoded floating point value, between ±3.4028235×10^38 .
Enum	An integer value with a specific encoding.
Cmd	An integer value with a specific encoding used as a command.

They can be accessed in one of these three ways:

RO	Read only
RW	Read write
WO	Write only

2.2.2   IP Engine status and control

To establish a connection through the Pleora eBUS SDK, you have to connect using the IP address of the camera and retrieve a handle to the map of register nodes. Information about them will automatically be downloaded from the camera.

2.2.2.1   Device Information registers

Registers associated with device information

Name	Type	Access	Comment
DeviceVendorName	String (32)	RO	Provides the name of the manufacturer of the device.
DeviceModelName	String (32)	RO	Provides the model of the device.
DeviceVersion	String (32)	RO	Provides the version of the device.
DeviceManufacturerInfo	String (48)	RO	Provides extended manufacturer information about the device. *)
DeviceID	String (16)	RO	This register holds a camera identifier.
DeviceUserID	String (16)	RW	This register holds a user-programmable identifier.
DeviceReset	Cmd	WO	Resets the Camera Head and the IP Engine.
CameraSN	Integer	RO	Camera module serial number.
SensorSN	Integer	RO	Sensor serial number.
CameraFirmwareVersion	Integer	RO	Camera module software version. One version component per byte, major version in MSB. For example, 0x0F000293 translates to version 15.0.2.147
SensorFirmwareVersion	Integer	RO	Sensor firmware version. One version component per byte, major version in MSB. For example, 0xF020C05 translates to version 15.2.12.5

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Name	Type	Access	Comment
SensorResolution	Enum	RO	Sensor resolution and effective pixel pitch 0=Tau640 640x512, 17u 1=Tau336 336x256, 17u 2=Tau324 320x256, 25u 3=Tau160 160x128, 50u 4=Tau80 80x64, 50u
SensorFocalLength	Enum	RO	Sensor focal length in millimeters 0=7.5 mm 1=9 mm 2=13 mm 3=19 mm 4=25 mm 5=35 mm (Fits onto the WFOV flange) 6=35 mm 7=50 mm 8=60 mm 9=100 mm 10=5 mm
SensorFrameRate	Enum	RO	Sensor frame rate 0=Slow (effective frame rate <= 9 Hz) 1=Fast (60 Hz)
SensorTemperature	Float	RO	FPA temperature in degrees Celsius
HousingTemperature	Float	RO	Sensor module housing temperature in degrees Celsius. (Added in XML interface ver 1.1.8)
CameraHeadReset	Cmd	WO	Resets only the Camera Head. (Added in XML interface ver 1.1.7)

*) The DeviceManufacturerInfo register contains six entries separated by commas (Camera ID, Generic ID, Streaming interface, Streaming interface version, Command interface, Command (or XML) interface version), for example: "ATAU, Gen_A/G, GEV, 1.0.0,GEV,1.1.6".

2.2.2.2   IP Engine status registers

Registers associated with the IP Engine status

Name	Type	Access	Comment
IPEngineFirmwareVersionMajor	Integer	RO	This register represents the major version of the iPORT IP Engine firmware.
IPEngineFirmwareVersionMinor	Integer	RO	This register represents the minor version of the iPORT IP Engine firmware.
IPEngineInitSequenceStatus	Integer	RO	This register reports the status of the initialization sequence. A null value indicates that the initialization sequence ran successfully. Otherwise, it returns the index of the register write that failed in the sequence.

2.2.3 GigE Vision (GEV) standard interface

2.2.3.1 GigE Vision Image size control registers

Registers associated with the image size.

Name	Type	Access	Comment
Width	Integer	RW	This register represents the current image width from the camera (in pixels). Mandatory GEV feature.
Height	Integer	RW	This register represents the current image height from the camera (in pixels). Mandatory GEV feature.
OffsetX	Integer	RW	This register represents the horizontal distance (in pixels) from the center of the detector to the center of the image. This offset plus the current image width cannot exceed the detector width.
OffsetY	Integer	RW	This register represents the vertical distance (in pixels) from the center of the detector to the center of the image. This offset plus the current image width cannot exceed the detector height.
PixelFormat	Enum	RW	This register indicates the format of the pixel to use during the acquisition. Pixel format as defined in GVSP (the GigEVision Streaming Protocol). Mandatory GEV feature. The difference between Mono14 and Mono16 is the MSB bits (bit14 and bit15). In Mono14, these bits are masked off and are always 0. In Mono16, these bits are always 1. The recommendation is to NOT use Mono16 unless you have to. When switching between **Mono8** and **Mono14**/**Mono16** you also need to set the register CMOSBitDepth (This is no longer necessary starting from XML interface ver 1.5.5). Available enumeration names are **Mono8**, **Mono14** and **Mono16**.
PayloadSize	Integer	RO	Number of bytes transferred for each image on the stream channel. Mandatory GEV feature.

Name	Type	Access	Comment
TestImageSelector	Enum	RW	This feature selects the type of test image that is created by the GEV interface board. 0=Off 1= TestPattern

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2.2.3.2 GigE Vision Acquisition control registers

Registers associated with the IP Engine acquisition of images from the camera and their transmission on the ethernet.

Name	Type	Access	Comment
AcquisitionFrameCount	Integer	RW	This register provides the number of frames to be acquired in MultiFrame Acquisition mode.
AcquisitionMode	Enum	RW	This register controls the acquisition mode of the device. Mandatory GEV feature. 0=Continuous 1=SingleFrame 2=MultiFrame
AcquisitionStart	Cmd	WO	This register starts the Acquisition of the device. Mandatory GEV feature.
AcquisitionStop	Cmd	WO	This register stops the Acquisition of the device at the end of the current Frame. Mandatory GEV feature.

2.2.3.3 GigE Vision Network Configuration registers

Registers associated with the GEV transport protocol.

Name	Type	Access	Comment
GevVersionMajor	Integer	RO	This register represents the major version of the GEV specification
GevVersionMinor	Integer	RO	This register represents the minor version of the specification.
GevDeviceModeIsBigEndian	Bool	RO	Endianness might be used to interpret multi-byte data for READMEM and WRITEMEM commands.
GevDeviceModeCharacterSet	Enum	RO	This register represents the character set used by all the strings of the bootstrap registers.
GevMACAddressHigh	Integer	RO	This register stores the upper two bytes of the MAC address of the given network interface.
GevMACAddressLow	Integer	RO	This register stores the lower four bytes of the MAC address of the given network interface.
GevSupportedIPConfigurationLLA	Bool	RO	This register indicates if Link Local Address IP configuration scheme is supported by the given network interface.
GevSupportedIPConfigurationDHCP	Bool	RO	This register indicates if DHCP IP configuration scheme is supported by the given network interface
GevSupportedIPConfigurationPersistentIP	Bool	RO	This register indicates if Persistent IP configuration scheme is supported by the given network interface.
GevCurrentIPConfigurationLLA	Bool	RW	This register indicates if Link Local Address IP configuration scheme is activated on the given network interface.
GevCurrentIPConfigurationDHCP	Bool	RW	This register indicates if DHCP IP configuration scheme is activated on the given network interface.
GevCurrentIPConfigurationPersistentIP	Bool	RW	This register indicates if PersistentIP configuration scheme is activated on the given network interface
GevCurrentIPAddress	Integer	RO	This register reports the IP address for the given network interface once it has been configured.

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Name	Type	Access	Comment
GevCurrentSubnetMask	Integer	RO	This register provides the subnet mask of the given interface.
GevCurrentDefaultGateway	Integer	RO	This register indicates the default gateway IP address to be used on the given network interface.
GevFirstURL	String (512)	RO	This register holds the first URL to the XML device description file.
GevSecondURL	String (512)	RO	This register holds the second URL to the XML device description file.
GevNumberOfInterfaces	Integer	RO	This register indicates the number of physical network interfaces supported by this device
GevPersistentIPAddress	Integer	RW	This register indicates the Persistent IP address for this network interface.
GevPersistentSubnetMask	Integer	RW	This register indicates the Persistent subnet mask associated with the Persistent IP address on this network interface.
GevPersistentDefaultGateway	Integer	RW	This register indicates the persistent default gateway for this network interface.
GevHeartbeatTimeout	Integer	RW	This register indicates the current heartbeat timeout in milliseconds.
GevCCP	Enum	RW	This register is used to grant privilege to an application. 0=Open access 1=Exclusive access 2=Control access
GevSCPInterfaceIndex	Integer	RW	Index of network interface to use (from 0 to 3).

To make the iPort announce network configuration changes on the ethernet, you have to reset the iPort using the DeviceReset command register.

2.2.3.4 User Set Control registers

Contains the features related to the User Set Control to save and load the user device settings.

Name	Type	Access	Comment
UserSetSelector	Selector	RW	Selects the feature User Set to load, save or configure.
UserSetLoad[UserSetSelector]	Cmd	WO	Loads the User Set specified by UserSetSelector to the device and makes it active.
UserSetSave[UserSetSelector]	Cmd	WO	Save the User Set specified by UserSetSelector to the non-volatile memory of the device.
UserSetDefaultSelector	Enum	RW	Selects the feature User Set to load and make active when the device is reset.

2.2.4 FLIR AX5 Camera interface

2.2.4.1 Feature registers

Registers associated with camera features

Name	Type	Access	Comment
CameraCapabilities	Integer	RO	Camera capabilities. Bit mask. 0=Focus, auto focus single shot 1=Focus, motor 2=Digital I/O capable 3=IRWindowing
SensorSetDefaults	Cmd	WO	Sets all current settings as power on defaults
SensorSetToFactoryDefaults	Cmd	WO	Reset camera with factory header values.
SyncMode	Enum	RW	External sync feature.The camera provides the ability to either accept or output a frame synchronization signal. 0=**Disabled** (default). The camera will turn off frame synchronization. 1=**SelfSyncMaster**. The camera will output a frame synchronization signal on the Sync output pin of the GPIO connector. 2=**SelfSyncSlave**. The camera will accept a frame synchronization signal on the Sync input signal on the GPIO connector. The camera output will be frozen if the camera is in slave mode and no external synchronization signal is received. 3=**ExtSyncMaster**. The camera will accept a frame synchronization signal on the Sync input signal on the GPIO connector. The camera output will be frozen if the camera is in slave mode and no external synchronization signal is received. The camera will output a frame synchronization signal on the Sync output pin of the GPIO connector when configured as a Sync master.
SensorExternalSync	Enum	RO	Camera head external sync mode. Possible values are **Disabled** (0), **Slave** (1) or **Master** (2).

Name	Type	Access	Comment
BaudRate	Enum	RW	Gets or sets the baud rate of the serial communication channel. Default is Auto detected (**baudAuto**).
CameraOptions	Integer	RO	Gets the options vector, a set of flags indicating installed options. (Added in XML ver 1.5.0) Camera options status flags (0 = disabled, 1 = enabled): 0x0001 = Reserved 0x0002 = Auto Gain (if not set it means that camera only has one measurement range) 0x0004 = Digital Output 0x0008 = Spot Meter 0x0010 = Isotherm 0x0020 = Torsion Shutter 0x0040 = Heater Control (not used) 0x0080 = Hide Logo 0x0100 = Reserved 0x0200 = Lock AGC 0x0400 = Limit AGC 0x0800 = Enable Snapshot 0x1000 = Lock Splash Screen 1 0x2000 = Unified Offset 0x8000 = Advanced Radiometry

2.2.4.2 Measurement registers

The camera has a list of measurement ranges (called gain modes) which you can inspect through these registers. You can also make the camera switch to one of them using the SensorGainMode register.

Temperature (in Kelvin) = B / log(R / (S - O) + F), where S is the 14-bit digital signal value. log(x) is the base-e logarithm of the x parameter.

Name	Type	Access	Comment
SensorGainMode	Enum	RW	Dynamic range control mode. 1=**LowGainMode**. Mode for higher temperatures (lower sensitivity). 2=**HighGainMode**. Mode for lower temperatures (< 100 deg Celsius)
R	Integer	RW	Gets and sets the Planck R constant. This value is used when converting from signal value to temperature.
B	Float	RW	Gets or sets Planck B constant. This value is used when converting from signal value to temperature. Value range 1300 - 1600.
F	Float	RW	Gets or sets Planck F constant. This value is used when converting from signal value to temperature. Value range 0.5 - 2.
O	Float	RO	Gets the Planck O (offset) constant. This value is used when converting from signal value to temperature.
LensNumber	Enum	RW	Gets or sets the active lens (which affects which correction terms are applied) 0=**Lens0**. Lens type 0 (default) 1=**Lens1**. Lens type 1
LensSelector	Enum	RW	Selected lens (0 - 1) 0=**Lens0**. Lens type 0 (default) 1=**Lens1**. Lens type 1
FNumber	Float	RW	Selected lens F number (focal ratio), 0.5 - 8.0
Transmission	Float	RW	Selected lens transmission factor, 0.5 - 1.0
OInt	Integer	RW	Gets and sets Planck O (offset) constant. This value is used when converting from signal value to temperature. (Added in XML ver 1.5.0) This register also accepts negative values.

Name	Type	Access	Comment
RThg	Integer	RW	Gets and sets Thermography R constant. This value is used when converting from signal value to temperature. (Added in XML ver 1.5.0)
J1	Float	RW	Gets and sets Thermography J1 (or gain). This value is used when converting from signal value to temperature. Value range 0 - 200. (Added in XML ver 1.5.0)
TemperatureLinearMode	Enum	RW	Select signal or temperature linear mode. (Added in XML ver 1.5.0). This register is locked during acquisition. 0=**Off** (normal signal mode) 1=**On** (temperature linear mode)
TemperatureLinearResolution	Enum	RW	Select temperature linear resolution. (Added in XML ver 1.5.0). This register is locked during acquisition. 0=**Low** resolution, 0.4K/count 14-bit 1=**High** resolution, 0.04K/count 14-bit

2.2.4.3   Object Parameter registers

Registers associated with infrared measurement conditions. These registers affects the temperature linear output.

Name	Type	Access	Comment
ReflectedTemperature	Float	RW	Target object reflected temperature in Kelvin. Value range 223.15 - 600.0 K
ObjectEmissivity	Float	RW	Target object emissivity. Value range 0.5 - 1.0. Default 1.0.
WindowTransmission	Float	RW	Protective window transmission factor. Value range 0.5 - 1.0. Default 1.0. (Added in XML ver 1.5.0)
WindowTemperature	Float	RW	Protective window temperature in Kelvin. Value range 223.15 - 600.0 K. Default 295.15 K. (Added in XML ver 1.5.0)
AtmosphericTransmission	Float	RW	Estimated atmospheric transmission factor. 0.5 - 1.0 (default 1.0). (Added in XML ver 1.5.0)

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Name	Type	Access	Comment
AtmosphericTemperature	Float	RW	Estimated atmospheric temperature between camera and target object. Value range 223.15 - 600.0 Kelvin. (Added in XML ver 1.5.0)

2.2.4.4 Monochrome 8-bit video registers

Registers associated with the 8-bit monochrome video format. Manipulating these registers will only have effect if the CMOSBitDepth register is 8-bit and the PixelFormat is Mono8.

Name	Type	Access	Comment
Contrast	Integer	RW	Image contrast. Available when ImageAdjustMethod is **Manual**, **OnceBright** or **AutoBright**.
Brightness	Integer	RW	Image brightness. Available when ImageAdjustMethod is **Manual**.
ImageAdjustMethod	Enum	RW	0=**PlateauHistogram**. Colorize using histogram. 1=**OnceBright** 2=**AutoBright** 3=**Manual** 4=**Linear**
VideoOrientation	Enum	RW	Digital 8-bit video orientation mode 0=**Normal** 1=**Invert** (flip image vertically) 2=**Revert** (flip image horizontally) 3=**InvertRevert** (flip image vertically and horizontally)
PlateauLevel	Integer	RW	Plateau level when ImageAdjustMethod is **PlateauHistogram**. Range 0-1000.
ITTMidpoint	Integer	RW	Gets and sets the ITT midpoint offset. The ITT Midpoint can be used to shift the 8-bit histogram darker or brighter. The nominal value is 128. A lower value causes a darker image.
BrightnessBias	Integer	RW	Gets and sets the brightness bias value in auto bright mode. Range -2048 - 2048. Only available when ImageAdjustMethod equals Autobright.
MaxAGCGain	Integer	RW	Gets and sets the max value of video gain. Range 0-255.

Name	Type	Access	Comment
ITTFilter	Integer	RW	Gets and sets the IIR filter value. Range 0-255. The IIR filter is used to adjust how quickly the AGC algorithm reacts to a change in scene or parameter value. If the IIR filter value is set to a low value, then if a hot object enters the field of view, the AGC will adjust more slowly to the hot object, resulting in a more gradual transition. In some applications, this can be more pleasing than a sudden change to background brightness. Default value is 64.
SensorVideoStandard	Enum	RW	Analogue video mode. Affects frame rate on digital interface. 0=**NTSC30HZ** Video mode NTSC, 30 Hz 1=**PAL25HZ** Video mode PAL, 25 Hz 4=**NTSC60HZ** Video mode NTSC, 60 Hz (default) 5=**PAL50HZ** Video mode PAL, 50 Hz
AGCROI	Enum	RW	Region of interest for AGC (Automatic Gain Correction). In some situations, it is desirable to have the AGC algorithm ignore a portion of the scene when collecting the histogram. 0=**Default** (Full frame) 1=**ROI_40p** 40% of frame width and 40% of frame height from frame center 2=**ROI_30p** 30% of frame width and 30% of frame height from frame center 3=**ROI_20p** 20% of frame width and 20% of frame height from frame center 4=**ROI_10p** 10% of frame width and 10% of frame height from frame center 5=**ROI_Top40** Full frame width. 80% of top part. 6=**ROI_Top30** Full frame width. 60% of top part. 7=**ROI_Top20** Full frame width. 40% of top part. 8=**ROI_Top10** Full frame width. 20% of top part. 9=**ROI_Top00** Full frame width. 0% of top part. 10=**ROI_TopN10** Full frame width. -20% of top part.

		11=**ROI_W40_Top40** 80% frame width. 80% of top part.
		12=**ROI_W40_Top30** 80% frame width. 60% of top part.
		13=**ROI_W40_Top20** 80% frame width. 40% of top part.
		14=**ROI_W40_Top10** 80% frame width. 20% of top part.
		15=**ROI_W40_Top00** 80% frame width. 0% of top part.
		16=**ROI_W40_TopN10** 80% frame width. -20% of top part.
		17=**ROI_B40_Top40** Full frame width. 80% of bottom part and 80% of top part.
		18=**ROI_B40_Top30** Full frame width. 80% of bottom part and 60% of top part.
		19=**ROI_B40_Top20** Full frame width. 80% of bottom part and 40% of top part.
		20=**ROI_B40_Top10** Full frame width. 80% of bottom part and 20% of top part.
		21=**ROI_B40_Top00** Full frame width. 80% of bottom part and 0% of top part.
		22=**ROI_B40_TopN10** Full frame width. 80% of bottom part and -20% of top part.

2.2.4.5 Image quality registers

Registers associated with the image quality

Name	Type	Access	Comment
NUCMode	Enum	RW	Non-Uniform Correction (NUC) mode 0=**Manual** (no automatic NUC) 1=**Automatic** by camera (default) 2=**External** (no shutter is used)
NUCAction	Cmd	WO	Do image correction (NUC) operation.
NUCActionLong	Cmd	WO	Do long image correction (NUC) operation. NOTE: When operating in manual NUCMode, gain state switching (changing SensorGainMode) is suspended until a long NUCAction is commanded. Added in XML ver 1.5.0.

Name	Type	Access	Comment
NUCTempDelta	Float	RO	Temperature difference in Celsius used to trigger automatic NUC.
NUCTempDeltaW	Integer	WO	Sets the temperature difference used to trigger automatic non-uniform corrections. Each increment represents 0.1 C.
NUCIntervalFrames	Integer	RO	The interval (in frames) between automatic NUC corrections.
NUCIntervalFramesW	Integer	WO	The interval (in frames) between automatic NUC corrections.
SensorDDEMode	Enum	RW	Dynamic Digital Detail Enhancement mode 0=**Manual** 1=**Automatic**
SensorDDEIndex	Integer	RW	Dynamic Digital Detail Enhancement index. Range 0-63. Default is 17 which means no enhancement. This register is only available when the DDE mode is Automatic. Values less than 17 soften the image and filter fixed pattern noise. Values greater than 17 sharpen the detail in the image. Added in XML ver 1.5.0.
SensorDDEGain	Integer	RW	Gain of the DDE filter. Range 0-255. Available only when SensorDDEMode is Manual. Gain value of 0 means that DDE is off. For gain > 0, details are enhanced by gain/16. A value of 64 means 4X enhancement of details.
SensorDDEThrs	Integer	RW	Threshold of the DDE filter. Range 0-255. Available only when SensorDDEMode is Manual. The threshold value represents the maximum detail magnitude that is boosted. Details with magnitude exceeding the threshold are not enhanced.
SensorDDESpatial	Integer	RW	DDE Spatial Threshold. Range 0-15. Available only when SensorDDEMode is Manual. This value represents the threshold of the pre-filter (smoothing filter) applied to the signal prior to high-frequency boost. The pre-filter prevents low-magnitude fixed-pattern noise from being amplified.

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Name	Type	Access	Comment
ShutterPosition	Enum	RW	Gets or sets the shutter position 0=**Open** 1=**Close**
CorrectionMask	Integer	RW	Correction mask: bit 0 - 2: reserved bit 3 = Bad pixel replacement bit 4 = temporal filter bit 5 - 15 = reserved Default is 0x3F (all corrections enabled). 0x2F (to disable temporal filter). 0x37 (to disable bad pixel replacement).

2.2.4.6   Image stream registers

Registers associated with the image format or with the image stream..

Name	Type	Access	Comment
IRTestPattern	Enum	RW	This register selects the type of test image that is created by the IR camera. 0=**Off** 1= **Ascending_Ramp**. Ascending ramp pattern
DigitalOutput	Enum	RW	Gets and sets the digital output channel mode. 2=**bit8Bit** (deprecated, XP/CMOS enabled) 3=**bit14bit** (deprecated, XP/CMOS enabled) 5=**Disabled** (XP and LVDS channels disabled) 6=**Enabled** (XP and LVDS channels enabled, default)
XPMode	Enum	RW	Gets and set the XP channel mode 0=**Disabled** 1=**BT656** 2=**CMOS** (default)
LVDSMode	Enum	RW	Gets and sets the LVDS mode 0=**Disabled** (default) 1=**Enabled**
CMOSBitDepth	Enum	RW	Gets and sets the CMOS mode bit depth 0=**bit14bit**. Bit depth 14 bit 1=**bit8bit**. Bit depth 8 bit (default)
LVDSBitDepth	Enum	RW	Gets and sets the LVDS mode bit depth 0=**bit14bit**. Bit depth 14 bit (default) 1=**bit8bit**. Bit depth 8 bit

The image pixels are transferred left to right, row by row, from top to bottom. The byte order is in accordance with the GevDeviceModeIsBigEndian register.

2.2.4.7 External I/O registers

Registers associated with configuring camera external I/O ports.

Name	Type	Access	Comment
LineSelector	Enum	RW	Current selected Input port. **Line0** represents GPI (General Purpose Input).
LineMode	Enum	RO	Type of I/O port 0=**Input** 1=**Output**
LineStatus	Boolean	RO	Returns the current status of the selected input line
LineDebounceFactor	Integer	RW	Controls the width of the window during which spurious transitions from input lines are filtered out (in increments of ~480 ns). Value range is 0 to 65535.
UserOutputSelector	Enum	RW	Current selected Output port. **UserOutput0** represents GPO (General Purpose Output).
UserOutputValue	Boolean	RW	Sets the current status of the selected output line.