Basler ace, aviator, and beat

REGISTER STRUCTURE AND ACCESS METHODS FOR CAMERA LINK CAMERAS

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1 Applicability

This document applies to Basler ace, Basler aviator, and Basler beat Camera Link cameras that are used with the Basler pylon software.

You should be aware that **not every register and not every setting within each register is available on all cameras. Also, the kind of access can vary between camera series and the indicated access may not apply for your camera model.** For example, the sensor bit depth register has read write (RW) access for ace cameras but read only (RO) access for Basler beat cameras.

For a particular camera model, only a specific subset of registers and certain settings with those registers are available on the camera model. This document describes the registers and the register values that are implemented for each camera feature. You should, however, also consult the camera user's manual. The user's manual describes which registers are implemented for each specific feature and how each feature operates.

As you will see in the next chapter, each register includes an entry that will let you check to see if the register is implemented on the camera you are working with. Each register also includes entries that will let you check to see which values within the register are implemented on your camera.

2 Introduction

Each camera has blocks of mapped memory space known as registers. By reading values from the registers, you can determine basic information about the camera and information about the camera's current settings. By writing values to the registers, you can control how the camera's features will operate.

2.1 Register Structure and Register Use Basics

The following register types are available in the camera: boolean, fixed point, scalar, info, string, enumeration, bitfield, array, and command. As detailed in Chapter 3 on page 4, the layout of each type of register is strictly defined. So if you know the base address and type of a register, you can use the layout information for that type of register to interpret the meaning of the fields within the register.

In Chapter 4 on page 15, you will find a description of all available registers. Each register description will indicate the base address and the type of register. The description will also indicate which feature is controlled by the register. In many cases, several different registers are used to control a feature, so the register description will indicate what aspect of the feature is controlled by the register.

For example, assume that you wanted to adjust the camera's gamma feature. Two of the registers associated with the gamma feature are: the Gamma Enable register and the Gamma register. As shown on page 30, the Gamma Enable register has a base address of 0x00020500, it is of the boolean type, and the register is used to enable the gamma feature. And as shown on page 31, the Gamma register has a base address of 0x00020520, it is of the fixed point type, and it is used to set the gamma value (when the gamma type is set to "user"). With this information, you can locate the enable field within the Gamma Enable register and use it to enable the gamma feature. You can then locate the value field within the Gamma register and use it to set the gamma.

Each register includes an "implemented", an "available", and a "locked" field. Before writing a value to a register, you should check these fields to make sure that the register is implemented on the camera you are working with, that it is available, and that it is unlocked for writing. With some registers, the availability depends on the way that related registers are set. So it is possible for a register to be implemented, but not available.

For the enumeration type of register, there are also fields that indicate which enumeration values are implemented and which are available. You should check to determine if a particular enumeration value is implemented and is available before you attempt to write it to an enumeration register.

For register types that have a minimum, a maximum, and an increment field available, you should check these fields before you write value to the register.

Each register has a field that indicates the validity of the value currently in the register. You should always check a register’s validity field after you write a value to the register.

3 Register Layouts by Type

3.1 Boolean Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Reserved																															enable

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Enable	0 = disabled, 1 = enabled	Yes

3.2 Fixed Point Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Value																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x08	Min																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0C	Max																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x10	Increment																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x14	Fixed Point Position																															

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Value	The register's value.	Yes
Min	The minimum allowed register value.	No
Max	The maximum allowed register value.	No
Increment	The allowed increment for the register value.	No
Fixed Point Position	The position of the fixed point within the register value.	No

3.3 Scalar Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Value																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x08	Min																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0C	Max																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x10	Increment																															

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Value	The register's value.	Yes
Min	The minimum allowed register value.	No
Max	The maximum allowed register value.	No
Increment	The allowed increment for the register value.	No

3.4 Info Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Size																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x08	Value																															

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Size	The size of the register's value field in bytes.	No
Value	The register's value.	No

The size of an info register is arbitrary.

3.5 String Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Size																															

Offset	n	n-1	...	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x08	Value																															

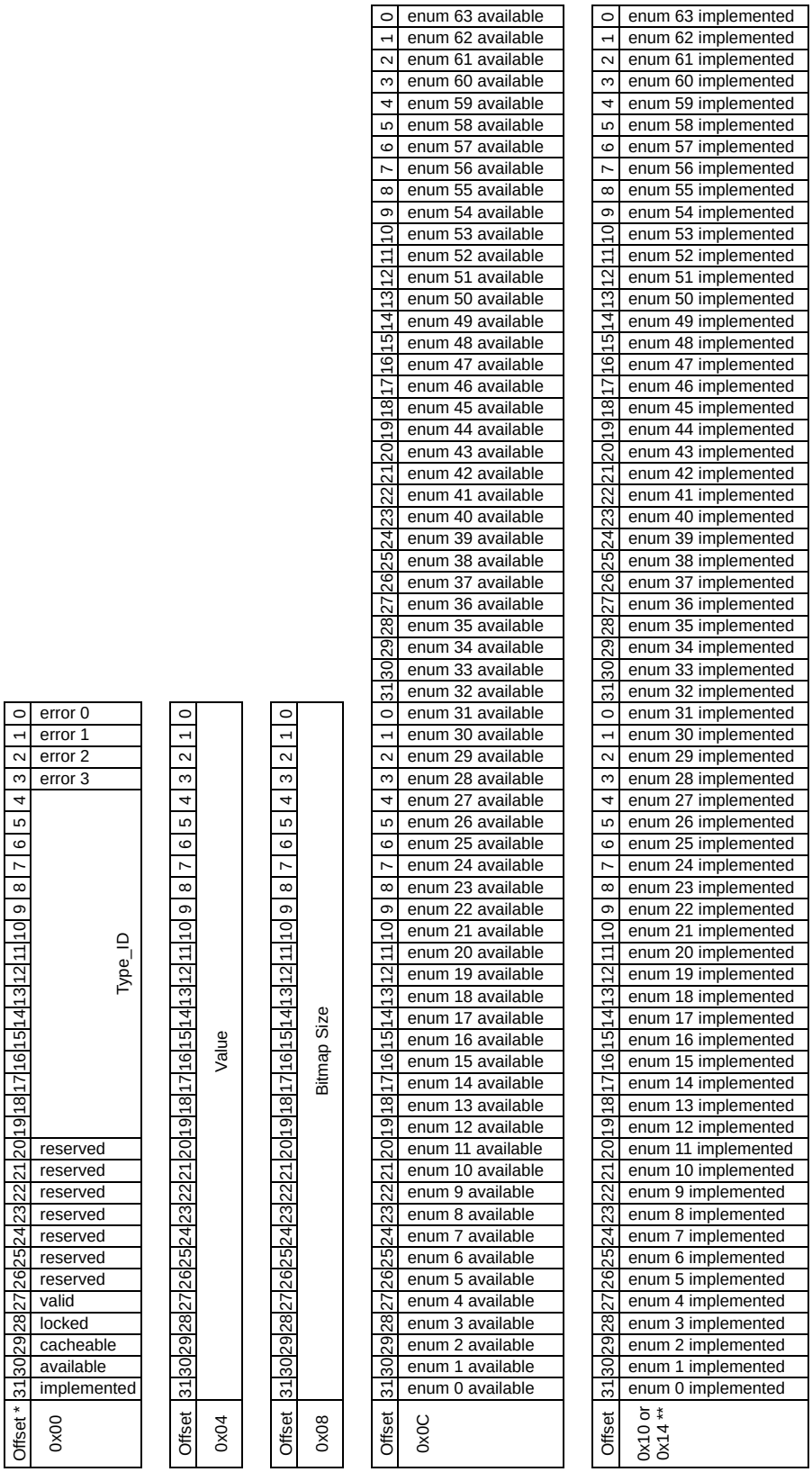
* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Size	The size of the register's value field in bytes.	No
Value	The register's value.	Yes for String type registers. No for StringRO type registers.

The size of a string register is arbitrary.

Some string registers are read/write and some are read only. The "Access" property in each register description indicates whether the register is RW or RO.

3.6 Enumeration Type Registers



* Indicates the offset from the register's base address.

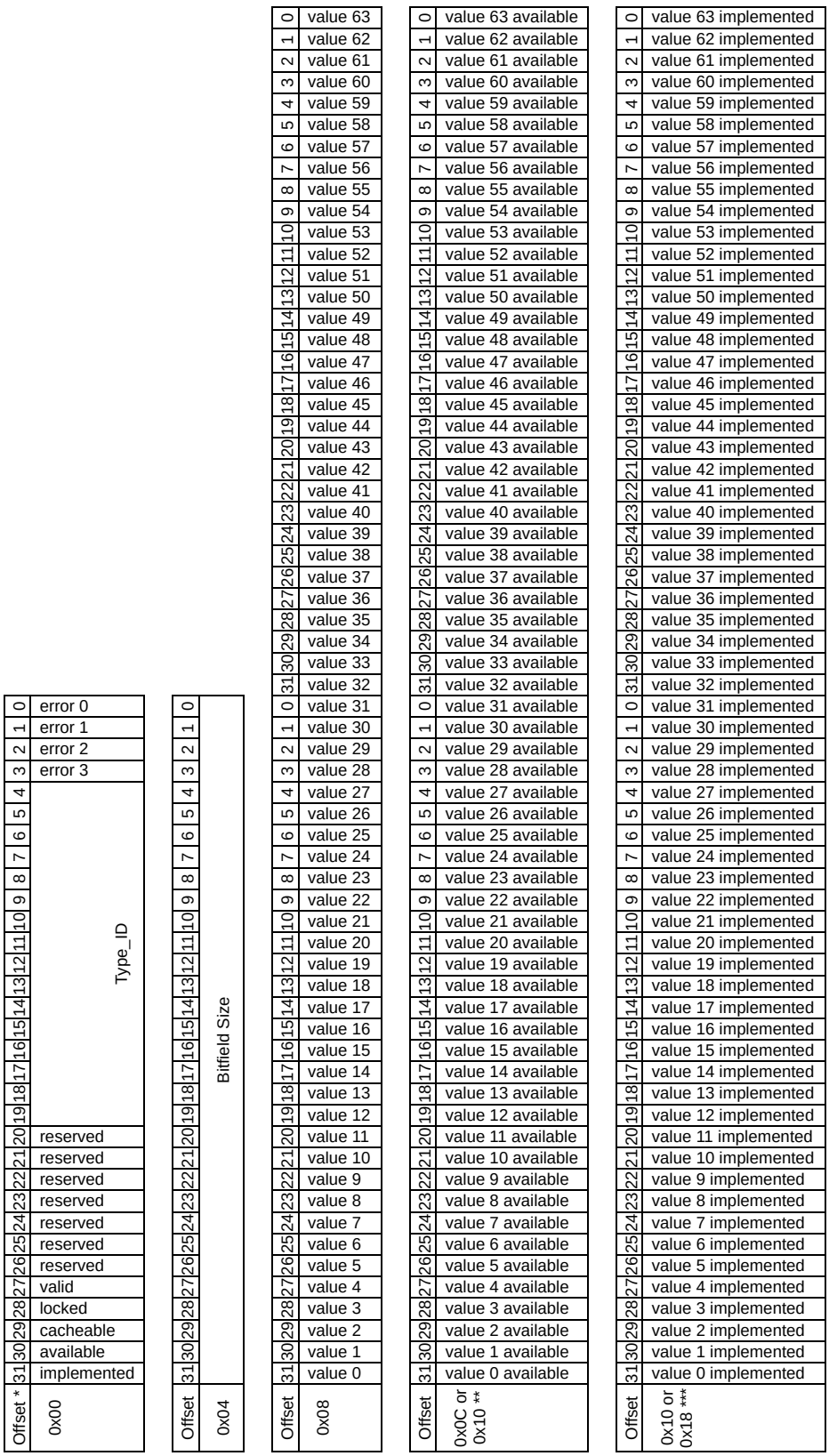
** The offset will be 0x10 if the bitmap size is 4 bytes or 0x14 if the bitmap size is 8 bytes.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Value	The register's value.	Yes for Enumeration type registers. No for EnumerationRO type registers.
Bitmap Size	States the size (in bytes) of the bitmap that indicates the availability of enumeration values. The bitmap size also applies to the bitmap that indicates whether the enumeration values are implemented.	No
Enum 0 Available, Enum 1 Available, etc.	Indicates whether an enumeration value of 0 is available, Indicates whether an enumeration value of 1 is available, etc.	No
Enum 0 Implemented, Enum 1 Implemented, etc.	Indicates whether an enumeration value of 0 is implemented, Indicates whether an enumeration value of 1 is implemented, etc.	No

The size of an enumeration register is arbitrary. (In the illustration on the previous page, the size of the bitmap indicating availability and the size of the bitmap indicating implementation are 64 bits to illustrate endianness.)

Some enumeration registers are read/write and some are read only. The "Access" property in each register description indicates whether the register is RW or RO.

3.7 Bitfield Type Registers



* Indicates the offset from the register's base address.

** The offset will be 0x0C if the bitmap size is 4 bytes or 0x10 if the bitmap size is 8 bytes.

** The offset will be 0x10 if the bitmap size is 4 bytes or 0x18 if the bitmap size is 8 bytes.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type_ID for this kind of register.	No
Error 3	Indicates if error 3 is present.	No
Error 2	Indicates if error 2 is present.	No
Error 1	Indicates if error 1 is present.	No
Error 0	Indicates if error 0 is present.	No
Bitfield Size	States the size (in bytes) of the bitfield. The bitfield size also applies to the field that indicates whether the bit values are implemented and the field that indicates whether the bit values are available.	No
Value 0, Value 1, etc.	Holds the value for bit 0 of the bitfield, holds the value for bit 1 of the bitfield, etc.	Yes
Enum 0 Available, Enum 1 Available, etc.	Indicates whether value 0 in the bitfield is available, indicates whether value 1 in the bitfield is available, etc.	No
Enum 0 Implemented, Enum 1 Implemented, etc.	Indicates whether value 0 in the bitfiled is implemented, indicates whether value 1 in the bitfield is implemented, etc.	No

The size of a bitfield register is arbitrary. (In the illustration on the previous page, the size of the bitfield, the size of the field indicating availability, and the size of the field indicating implementation are 64 bits to illustrate endianness.)

Some enumeration registers are read/write and some are read only. The "Access" property in each register description indicates whether the register is RW or RO.

3.8 Array Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Item Size																															

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x08	Item Number																															

Offset	n	n-1	...	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0C	Values																															

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Item Size	The per item size in bytes.	No
Item Number	The number of items in the array.	No
Values	The array values.	Yes

The size of an info register is arbitrary.

3.9 Command Type Registers

Offset *	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00	implemented	available	cacheable	locked	valid	reserved	reserved	reserved	reserved	reserved	reserved	reserved	Type_ID																error 3	error 2	error 1	error 0

Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x04	Reserved																															execute

* Indicates the offset from the register's base address.

Designation	Meaning	Writeable
Implemented	Indicates whether the register is implemented.	No
Available	Indicates the register's availability.	No
Cacheable	Indicates whether the register is cacheable by GenIcam.	No
Locked	Indicates whether the register is currently locked for writing.	No
Valid	Indicates whether the value represented by the register is valid.	No
Reserved	These bits are reserved.	No
Type_ID	Specifies a type ID for this kind of register.	No
Error 3	Indicates whether error 3 is present.	No
Error 2	Indicates whether error 2 is present.	No
Error 1	Indicates whether error 1 is present.	No
Error 0	Indicates whether error 0 is present.	No
Execute	1 = execute the command (resets to 0 when execution is complete).	Yes

4 Register Descriptions

4.1 Device Information Registers

Device Vendor Name

The Device Vendor Name value indicates the manufacturer of the device.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0100
Access:	RO
Size (Bytes):	32

Device Model Name

The Device Model Name value indicates the model name of the device.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0200
Access:	RO
Size (Bytes):	32

Device Firmware Version

The Device Firmware Version value indicates the version of the device’s firmware.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0300
Access:	RO
Size (Bytes):	236

Device Version

The Device Version value indicates an identifier for the version of the device. This value is typically the material number of the device.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0400
Access:	RO
Size (Bytes):	32

Device ID

The Device ID value indicates an identifier for the device. This value is typically the serial number of the device.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0500
Access:	RO
Size (Bytes):	32

Device Manufacturer Info

The Device Manufacturer Info value indicates extended information about the device.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x0580
Access:	RO
Size (Bytes):	32

Device User ID

The Device User ID value is used to store a user programmable identifier.

Register type:	String (see page 8 for the layout of a string type register)
Base address:	0x00012000 (**Note:** The base address was formerly 0x00000600. The register at this former location will be retained for backward compatibility.)
Access:	RW
Size (Bytes):	32

Device Temperature Sensor Board

The Device Temperature Sensor Board value indicates the current temperature of the temperature sensor on the camera's imaging sensor board in degrees C.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011000 (**Note:** The base address was formerly 0x00008000. The register at this former location will be retained for backward compatibility.)
Access:	RO
Size (Bytes):	4

Device Temperature Core Board

The Device Temperature Core Board value indicates the current temperature of the temperature sensor on the camera's core board in degrees C.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011020
Access:	RO
Size (Bytes):	4

Device Temperature Frame Grabber Board

The Device Temperature Frame Grabber Board value indicates the current temperature of the temperature sensor on the camera's frame grabber board in degrees C.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011040
Access:	RO
Size (Bytes):	4

Device Temperature Case

The Device Temperature Case value indicates the current temperature in degrees C of the temperature sensor on the camera's housing.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011060
Access:	RO
Size (Bytes):	4

Over Temperature

The Over Temperature value indicates whether an over temperature condition has been detected for the camera.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011100 (**Note:** The base address was formerly 0x00008200. The register at this former location will be retained for backward compatibility. The register was formerly named the Over Temperature Sensor Board register).
Access:	RO
Size (Bytes):	4

Critical Temperature

The Critical Temperature value indicates whether a critical temperature condition has been detected for the camera. When a critical temperature condition is detected, the camera will be below but close to an over temperature condition.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00011200
Access:	RO
Size (Bytes):	4

Sensor Width

The Sensor Width value indicates the effective width of the camera's imaging sensor in pixels.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x10000
Access:	RO
Size (Bytes):	4

Sensor Height

The Sensor Height value indicates the effective height of the camera's imaging sensor in pixels.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00010020
Access:	RO
Size (Bytes):	4

Device Scan Type

The Device Scan Type value indicates the scan type of the camera's imaging sensor.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00010040	
Access:	RO	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Areascan	The imaging sensor is an area scan sensor.	0
Linescan	The imaging sensor is a line scan sensor.	1

Device Registers Valid

The Device Registers Valid value indicates whether the current register set is valid and consistent.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00010060
Access:	RO
Size (Bytes):	4

Last User Error

The Last User Error value indicates the last user-induced error that was detected by the camera.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00013000	
Access:	RO	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoError	No error has been detected.	0
Overtrigger	The camera was over triggered.	1
Userset	An error occurred while loading a user set.	2
InvalidParameter	At least one parameter was not valid.	3

Clear Last User Error

Setting the Clear Last User Error value to 1 erases the last stored value in the Last User Error register.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00013020

4.2 Transport Layer Registers

CL Serial Port Baud Rate

The CL Serial Port Baud Rate value sets the baud rate for the serial port that is built into the Camera Link interface.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x0700	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Baud9600	The rate is 9600 baud.	15
Baud19200	The rate is 19200 baud.	17
Baud38400	The rate is 38400 baud.	18
Baud57600	The rate is 57600 baud.	19
Baud115200	The rate is 115200 baud.	20
Baud230400	The rate is 230400 baud.	21
Baud460800	The rate is 460800 baud.	22
Baud921600	The rate is 921600 baud.	23

When changing the serial port baud rate, use the following procedure:

1. Issue the write command with the new setting.
2. Wait one second.
3. Change the setting on the serial port of the PC that the camera is using.
4. Resume communication.

The RS-644 serial port on some Camera Link frame grabbers will only support a baud rate of 9600. If you are using a Camera Link frame grabber, check the documentation for the frame grabber before attempting to change the baud rate.

If you change the baud rate, the camera will return to the 9600 baud setting when it is reset or powered off and back on.

CL Tap Geometry

The CL Tap Geometry value sets the tap geometry that will be used when image data is read out of the camera's image buffer and transmitted via the Camera Link interface.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x0720	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
CLGeometry1X_1Y	The tap geometry is 1X-1Y.	0
CLGeometry1X2_1Y	The tap geometry is 1X2-1Y.	1
CLGeometry1X_2YE	The tap geometry is 1X-2YE.	6
CLGeometry1X3_1Y	The tap geometry is 1X3-1Y.	7
CLGeometry1X4_1Y	The tap geometry is 1X4-1Y.	9
CLGeometry1X6_1Y	The tap geometry is 1X6-1Y.	11
CLGeometry1X8_1Y	The tap geometry is 1X8-1Y.	12
CLGeometry1X10_1Y	The tap geometry is 1X10-1Y.	14

CL Pixel Clock

The CL Pixel Clock value sets the pixel clock speed that will be used by the Camera Link interface.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x0740	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
CLClock20	The pixel clock speed is 20 MHz.	1
CLClock32_5	The pixel clock speed is 32.5 MHz.	4
CLClock40	The pixel clock speed is 40 MHz.	6
CLClock48	The pixel clock speed is 48 MHz.	10
CLClock65	The pixel clock speed is 65 MHz.	16
CLClock82	The pixel clock speed is 82 MHz.	23
CLClock82_5	The pixel clock speed is 82.5 MHz.	24
CLClock84	The pixel clock speed is 84 MHz.	27

CL Interline Delay

The CL Interline Delay value sets a delay (in µs) between the end of transmission of one line in an image and the start of transmission of the next line.

Register type:	Scalar (see page 6 for the layout of an enumeration type register)
Base address:	0x0760
Access:	RW
Signed:	False

CL Configuration

Indicates the Camera Link configuration that the camera will use given its current tap geometry setting.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x0780	
Access:	RO	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
CLConfigurationBase	The camera will use the base Camera Link configuration.	1
CLConfigurationMedium	The camera will use the medium Camera Link configuration.	2
CLConfigurationFull	The camera will use the full Camera Link configuration.	3
CLConfigurationDual Base	The camera will use the dual base Camera Link configuration.	4
CLConfigurationDeca	The camera will use the deca Camera Link configuration.	5

4.3 Analog Control Registers

Gain All

The Gain All value sets a base amount of gain that will be applied to each tap of the camera's imaging sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020020
Access:	RW
Signed:	False

Gain Tap 1

The Gain Tap 1 value sets an amount of gain that will be applied to tap 1 of the camera's imaging sensor. The amount of gain specified by the Gain Tap 1 value will be an addition to the base gain set by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020040
Access:	RW
Signed:	False

Gain Tap 2

The Gain Tap 2 value sets an amount of gain that will be applied to tap 2 of the camera's imaging sensor. The amount of gain specified by the Gain Tap 2 value will be an addition to the gain specified by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020060
Access:	RW
Signed:	False

Gain Tap 3

The Gain Tap 3 value sets an amount of gain that will be applied to tap 3 of the camera's imaging sensor. The amount of gain specified by the Gain Tap 3 value will be an addition to the gain specified by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020080
Access:	RW
Signed:	False

Gain Tap 4

The Gain Tap 4 value sets an amount of gain that will be applied to tap 4 of the camera's imaging sensor. The amount of gain specified by the Gain Tap 4 value will be an addition to the gain set by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000200A0
Access:	RW
Signed:	False

Gain Tap Red

The Gain Tap Red value sets an amount of gain that will be applied to red pixels of the camera's imaging sensor. The amount of gain specified by the Gain Tap Red value will be an addition to the gain set by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020140
Access:	RW
Signed:	False

Gain Tap Green

The Gain Tap Green value sets an amount of gain that will be applied to green pixels of the camera's imaging sensor. The amount of gain specified by the Gain Tap Green value will be an addition to the gain set by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020160
Access:	RW
Signed:	False

Gain Tap Blue

The Gain Tap Blue value sets an amount of gain that will be applied to blue pixels of the camera's imaging sensor. The amount of gain specified by the Gain Tap Blue value will be an addition to the gain set by the Gain All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020180
Access:	RW
Signed:	False

Black Level All

The Black Level All value sets the base black level that will be applied to each tap of the camera's imaging sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020200
Access:	RW
Signed:	False

Black Level Tap1

The Black Level Tap 1 value sets a black level that will be applied to tap 1 of the camera's imaging sensor. The black level specified by the Black Level Tap 1 value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020220
Access:	RW
Signed:	False

Black Level Tap 2

The Black Level Tap 2 value sets a black level that will be applied to tap 2 of the camera's imaging sensor. The black level specified by the Black Level Tap 2 value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020240
Access:	RW
Signed:	False

Black Level Tap 3

The Black Level Tap 3 value sets a black level that will be applied to tap 3 of the camera's imaging sensor. The black level specified by the Black Level Tap 3 value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020260
Access:	RW
Signed:	False

Black Level Tap 4

The Black Level Tap 4 value sets a black level that will be applied to tap 4 of the camera's imaging sensor. The black level specified by the Black Level Tap 4 value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020280
Access:	RW
Signed:	False

Black Level Red

The Black Level Red value sets a black level that will be applied to red pixels of the camera's imaging sensor. The black level specified by the Black Level Red value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020340
Access:	RW
Signed:	False

Black Level Green

The Black Level Green value sets a black level that will be applied to green pixels of the camera's imaging sensor. The black level specified by the Black Level Green value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020360
Access:	RW
Signed:	False

Black Level Blue

The Black Level Blue value sets a black level that will be applied to blue pixels of the camera's imaging sensor. The black level specified by the Black Level Blue value will be an addition to the black level set by the Black Level All value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020380
Access:	RW
Signed:	False

Balance White Red

The Balance White Red value adjusts the intensity of the red in the acquired images. The white balancing feature is used to adjust the color balance of the acquired images.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x00020420
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 64

Balance White Green

The Balance White Green value adjusts the intensity of the green in the acquired images. The white balancing feature is used to adjust the color balance of the acquired images.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x00020440
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 64

Balance White Blue

The Balance White Blue value adjusts the intensity of the blue in the acquired images. The white balancing feature is used to adjust the color balance of the acquired images.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x00020460
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 64

Balance White Reset

Allows to return to the balance white settings that existed before the recent balance white adjustments. The fall back settings are the ones that were used during the latest camera startup.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00020480

Gamma Enable

The Gamma Enable value is used to enable the camera's gamma feature. Typically, gamma correction compensates for nonlinearity in the display system (such as a monitor).

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00020500
Access:	RW

Gamma Selector

The Gamma Selector value is used to select the type of gamma correction that the camera will use.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00020540	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The gamma value is set by the user via the Gamma register.	1
sRGB	The gamma is set to a fixed sRGB curve (suitable for use with most sRGB monitors).	2

Gamma

When the Gamma Selector register is set to "user", the Gamma value is used to set the level of gamma correction that will be performed on acquired images.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x00020520
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 65536

Digital Shift

The Digital Shift feature is used to change which bit in each of the camera's ADCs will be used as the most significant bit (MSB).

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020600
Access:	RW
Signed:	False

Substrate Voltage

The Substrate Voltage value sets the substrate voltage for the camera’s imaging sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00020800
Access:	RW
Signed:	False

4.4 Image Format Registers

Sensor Digitization Taps

The Sensor Digitization Taps value sets the number of taps on the camera's imaging sensor that will be used to read pixel values out of the sensor.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030000	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
One	One tap is used to read pixel data out of the imaging sensor.	0
Four	Four taps are used to read pixel data out of the imaging sensor.	3

Sensor Bit Depth

The Sensor Bit Depth value sets the bit depth of the pixel data produced by the camera’s imaging sensor.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030500	
Access:	RW,	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
BitDepth8	The sensor will produce pixel data at 8 bit depth per pixel.	8
BitDepth10	The sensor will produce pixel data at 10 bit depth per pixel.	10
BitDepth12	The sensor will produce pixel data at 12 bit depth per pixel.	12
BitDepth14	The sensor will produce pixel data at 14 bit depth per pixel.	14
BitDepth16	The sensor will produce pixel data at 16 bit depth per pixel.	16

Pixel Format

The Pixel Format value sets the pixel format to use during image acquisition. The Pixel Format value combines all of the information provided by the Pixel Coding, Pixel Size, Pixel Color Filter values into one single value.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030020	
Access:	RW	
Size (Bytes):	8	
Enumeration values:		
Name	**Description**	**Value**
Mono8	The pixel format is Mono 8.	1
Mono10	The pixel format is Mono 10.	3
Mono12	The pixel format is Mono 12.	5
BayerGR8	The pixel format is Bayer GR 8.	10
BayerRG8	The pixel format is Bayer RG 8.	11
BayerGB8	The pixel format is Bayer GB 8.	12
BayerBG8	The pixel format is Bayer BG 8.	13
BayerGR10	The pixel format is Bayer GR 10.	14
BayerRG10	The pixel format is Bayer RG 10.	15
BayerGB10	The pixel format is Bayer GB 10.	16
BayerBG10	The pixel format is Bayer BG 10.	17
BayerGR12	The pixel format is Bayer GR 12.	18
BayerRG12	The pixel format is Bayer RG 12.	20
BayerGB12	The pixel format is Bayer GB 12.	22
BayerBG12	The pixel format is Bayer BG 12.	24

Pixel Size

The Pixel Size value indicates the total size in bits of a pixel in the image. This value must always be in agreement with the Pixel Format value.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000300A0	
Access:	RO	
Size (Bytes):	8	
Enumeration values:		
Name	**Description**	**Value**
Bpp1	The pixel size is 1 bit per pixel.	1
Bpp2	The pixel size is 2 bits per pixel.	2
Bpp4	The pixel size is 4 bits per pixel.	4
Bpp8	The pixel size is 8 bits per pixel.	8
Bpp10	The pixel size is 10 bits per pixel.	10
Bpp12	The pixel size is 12 bits per pixel.	12
Bpp16	The pixel size is 16 bits per pixel.	16
Bpp24	The pixel size is 24 bits per pixel.	24
Bpp36	The pixel size is 36 bits per pixel.	36
Bpp48	The pixel size is 48 bits per pixel.	48

Pixel Color Filter

The Pixel Color Filter value indicates the type of color filter that is applied to the image. This value must always be in agreement with the Pixel Format value.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030100	
Access:	RO	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
None	There is no color filter.	0
BayerRG	The color filter is Bayer RG.	1
BayerGB	The color filter is Bayer GB.	2
BayerGR	The color filter is Bayer GR.	3
BayerBG	The color filter is Bayer BG.	4
BayerCYGM	The color filter is Bayer CYGM.	5
BayerGMCY	The color filter is Bayer GMCY.	6
BayerCYMG	The color filter is Bayer CYMG.	7
BayerMGCY	The color filter is Bayer MGCY.	8
BayerYCMG	The color filter is Bayer YCMG.	9
BayerMGYC	The color filter is Bayer MGYC.	10
BayerYCGM	The color filter is Bayer YCGM.	11
BayerGMYC	The color filter is Bayer GMYC.	12

Pixel Dynamic Range Min

The Pixel Dynamic Range Min value indicates the smallest value that can be returned during the pixel digitization process. This corresponds to the darkest value that the camera can produce. For color cameras, the value indicates the smallest value that each color component can take.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00030120
Access:	RO
Size (Bytes):	4

Pixel Dynamic Range Max

The Pixel Dynamic Range Max value indicates the largest value that can be returned during the pixel digitization process. This corresponds to the brightest value that the camera can produce. For color cameras, this value indicates the largest value that each color component can take.

Register type:	Info (see page 6 for the layout of an info type register)
Base address:	0x00030140
Access:	RO
Size (Bytes):	4

Test Image Selector

The Test Image Selector value is used to enable the camera's test image feature and to select which test image will be generated and transmitted by the camera.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030160	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	The test image function is off and the camera will operate normally.	0
Testimage1	The camera will generate and output test image 1.	1
Testimage2	The camera will generate and output test image 2.	2
Testimage3	The camera will generate and output test image 3.	3
Testimage4	The camera will generate and output test image 4.	4
Testimage5	The camera will generate and output test image 5.	5
Testimage6	The camera will generate and output test image 6.	6

Width

The Width value sets the width in pixels of the camera's image area of interest (AOI).
If binning horizontal is enabled, the value is read only and indicates the width of the image that will be transmitted from the camera.
If stacked zone imaging is enabled, the value sets the width for all zones.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030200
Access:	RW
Signed:	False

Width Max

The Width Max value indicates the maximum allowed width of the image in pixels taking into account any function that may limit the allowed width.

Register type:	Info (see page 7 for the layout of a info type register)
Base address:	0x00030360
Access:	RO
Size (bytes):	4

Height

The Height value sets the height in pixels of the camera's image area of interest (AOI).
If stacked zone imaging or binning vertical are enabled, the value is read only and indicates the total height of the images that will be transmitted from the camera.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030220
Access:	RW
Signed:	False

Height Max

The Height Max value indicates the maximum allowed height of the image in pixels taking into account any function that may limit the allowed height.

Register type:	Info (see page 7 for the layout of a info type register)
Base address:	0x00030380
Access:	RO
Size (bytes):	4

Offset X

The Offset X value sets the horizontal offset in pixels for the camera's image area of interest (AOI), i.e., the value sets the distance between the left side of the imaging sensor and the left side of the AOI.

If stacked zone imaging is enabled, the value sets the distance between the left side of the sensor and the left side of all zones.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030240
Access:	RW
Signed:	False

Offset Y

The Offset Y value sets the vertical offset in pixels for the camera's image area of interest (AOI), i.e., the value sets the distance between the top of the imaging sensor and the top of the AOI.

If stacked zone imaging is enabled, the value is read only and indicates the Y offset for the zone nearest to the top of the sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030260
Access:	RW
Signed:	False

Center X

The Center X value is used to enable automatic horizontal centering of the camera's image area of interest (AOI).

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00030280
Access:	RW

Center Y

The Center Y value is used to enable automatic vertical centering of the camera's image area of interest (AOI).

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000302A0
Access:	RW

Prelines

The Prelines value sets the level for the prelines feature.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00080060
Access:	RW
Signed:	False

Stacked Zone Imaging Enable

The Stacked Zone Imaging Enable value is used to enable the camera's stacked zone imaging feature.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E000
Access:	RW

Stacked Zone Imaging Number Zones

The Stacked Zone Imaging Number Zones value indicates the maximum number of zones supported by the camera's stacked zone imaging feature.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x0003E020
Access:	RO
Size (bytes):	4

Stacked Zone Imaging Zone 1 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 1 Enable value is used to enable the use of stacked zone 1.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E040
Access:	RW

Stacked Zone Imaging Zone 1 Offset Y

The Stacked Zone Imaging Zone 1 Offset Y value sets the vertical offset in pixels for zone 1, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 1.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E060
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 1 Height

The Stacked Zone Imaging Zone 1 Height value sets the height in pixels for zone 1.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E080
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 2 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 2 Enable value is used to enable the use of stacked zone 2.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E0A0
Access:	RW

Stacked Zone Imaging Zone 2 Offset Y

The Stacked Zone Imaging Zone 2 Offset Y value sets the vertical offset in pixels for zone 2, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 2.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E0C0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 2 Height

The Stacked Zone Imaging Zone 2 Height value sets the height in pixels for zone 2.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E0E0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 3 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 3 Enable value is used to enable the use of stacked zone 3.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E100
Access:	RW

Stacked Zone Imaging Zone 3 Offset Y

The Stacked Zone Imaging Zone 3 Offset Y value sets the vertical offset in pixels for zone 3, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 3.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E120
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 3 Height

The Stacked Zone Imaging Zone 3 Height value sets the height in pixels for zone 3.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E140
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 4 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 4 Enable value is used to enable the use of stacked zone 4.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E160
Access:	RW

Stacked Zone Imaging Zone 4 Offset Y

The Stacked Zone Imaging Zone 4 Offset Y value sets the vertical offset in pixels for zone 4, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 4.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E180
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 4 Height

The Stacked Zone Imaging Zone 4 Height value sets the height in pixels for zone 4.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E1A0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 5 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 5 Enable value is used to enable the use of stacked zone 5.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E1C0
Access:	RW

Stacked Zone Imaging Zone 5 Offset Y

The Stacked Zone Imaging Zone 5 Offset Y value sets the vertical offset in pixels for zone 5, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 5.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E1E0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 5 Height

The Stacked Zone Imaging Zone 5 Height value sets the height in pixels for zone 5.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E200
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 6 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 6 Enable value is used to enable the use of stacked zone 6.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E220
Access:	RW

Stacked Zone Imaging Zone 6 Offset Y

The Stacked Zone Imaging Zone 6 Offset Y value sets the vertical offset in pixels for zone 6, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 6.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E240
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 6 Height

The Stacked Zone Imaging Zone 6 Height value sets the height in pixels for zone 6.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E260
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 7 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 7 Enable value is used to enable the use of stacked zone 7.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E280
Access:	RW

Stacked Zone Imaging Zone 7 Offset Y

The Stacked Zone Imaging Zone 7 Offset Y value sets the vertical offset in pixels for zone 7, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 7.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E2A0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 7 Height

The Stacked Zone Imaging Zone 7 Height value sets the height in pixels for zone 7.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E2C0
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 8 Enable

Assuming that the stacked zone imaging feature has been enabled, the Stacked Zone Imaging Zone 8 Enable value is used to enable the use of stacked zone 8.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x0003E2E0
Access:	RW

Stacked Zone Imaging Zone 8 Offset Y

The Stacked Zone Imaging Zone 8 Offset Y value sets the vertical offset in pixels for zone 8, i.e., the value sets the distance between the top of the imaging sensor and the top of zone 8.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E300
Access:	RW
Signed:	False

Stacked Zone Imaging Zone 8 Height

The Stacked Zone Imaging Zone 8 Height value sets the height in pixels for zone 8.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0003E320
Access:	RW
Signed:	False

Reverse X

The Reverse X value is used to enable horizontal mirroring of the acquired images, i.e., the images are flipped about their vertical axis before they are transmitted from the camera. Note that the image AOI settings are applied after the image is flipped.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000302C0
Access:	RW

Reverse Y

The Reverse Y value is used to enable vertical mirroring of the acquired images, i.e., the images are flipped about their horizontal axis before they are transmitted from the camera. Note that the image AOI settings are applied after the image is flipped.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00030300
Access:	RW

Binning Horizontal

The horizontal binning feature allows to horizontally combine pixel values from adjacent columns into one pixel. The Binning Horizontal value determines the number of pixels that will be combined horizontally. A value of 1 means that no horizontal binning will be performed. A value of 2 means that the pixels in each 2 adjacent columns will be combined. A value of 3 means that the pixels in each 3 adjacent columns will be combined. Etc. Note that using horizontal binning reduces the horizontal resolution of the sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030320
Access:	RW
Signed:	False

Binning Vertical

The vertical binning feature allows to vertically combine pixel values from adjacent lines into one pixel. The Binning Vertical value determines the number of pixels that will be combined vertically. A value of 1 means that no vertical binning will be performed. A value of 2 means that the pixels in each 2 adjacent lines will be combined. A value of 3 means that the pixels in each 3 adjacent lines will be combined. Etc. Note that using vertical binning reduces the vertical resolution of the sensor.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030340
Access:	RW
Signed:	False

Decimation Horizontal

The Decimation Horizontal value specifies the extent of horizontal subsampling of the acquired frame. If the value is set to one the complete frame will be transmitted out of the camera (no subsampling). If, for example, the value is set to two for a mono camera only every other column of the acquired frame will be transmitted out of the camera. If the value is set to two for a color camera only every other pair of columns of the acquired frame will be transmitted out of the camera.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000303A0
Access:	RW
Signed:	False

Decimation Vertical

The Decimation Vertical value specifies the extent of vertical subsampling of the acquired frame. If the value is set to one the complete frame will be transmitted out of the camera (no subsampling). If, for example, the value is set to two for a mono camera only every other line of the acquired frame will be transmitted out of the camera. If the value is set to two for a color camera only every other pair of lines of the acquired frame will be transmitted out of the camera.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000303C0
Access:	RW
Signed:	False

Spatial Correction

The Spatial Correction value specifies the direction in which the imaged object passes a color line scan camera and it specifies the spatial correction delay to ensure that matching line acquisitions are combined for full color information.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00030400
Access:	RW
Signed:	True

Interlaced Output Selector

The Interlaced Output Selector value sets the field output mode for a camera with interlaced sensor readout.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030420	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Field0Only	The camera will use the Field 0 Only output mode.	0
Field1Only	The camera will use the Field 1 Only output mode.	1
Field0First	The camera will use the Field 0 First output mode.	2
ConcatenatedNewFields	The camera will use the Concatenated New Fields output mode.	3
DeinterlacedNewFields	The camera will use the Deinterlaced New Fields.output mode.	4
ConcatenatedReuseField	The camera will use the Concatenated Reuse Field output mode.	5
DeinterlacedReuseField	The camera will use the Deinterlaced Reuse Field output mode.	6

Deinterlacer Selector

The Deinterlacer Selector value selects the deinterlacer for a camera with interlaced sensor readout.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00030440	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Weave	Deinterlacing by weaving fields 0 and 1.	0

4.5 Acquisition Control Registers

Trigger Mode Acquisition Start

The Trigger Mode Acquisition Start value sets the mode for the acquisition start trigger.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040100	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
OFF	The trigger mode is set to off.	0
ON	The trigger mode is set to on.	1

Acquisition Frame Count

If the Acquisition Start Trigger Mode value has been set to On, the camera's acquisition state will become valid when the camera receives an acquisition start trigger signal. The acquisition state will remain valid until the camera acquires the number of frames specified by the Acquisition Frame Count value.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000400A0
Access:	RW
Signed:	False

Trigger Source Acquisition Start

If the Trigger Source Acquisition Start value is set to On, the Trigger Source Acquisition Start value sets the source signal that will be used for the acquisition start trigger.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040140	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Software	An internally generated software signal will be used as the trigger signal.	0
Line1	A signal input into input line 1 will be used as the trigger signal.	1
Line2	A signal input into input line 2 will be used as the trigger signal.	2
Line3	A signal input into input line 3 will be used as the trigger signal.	3
Line4	A signal input into input line 4 will be used as the trigger signal.	4
Line5	A signal input into input line 5 will be used as the trigger signal.	5
Line6	A signal input into input line 6 will be used as the trigger signal.	6
Line7	A signal input into input line 7 will be used as the trigger signal.	7
Line8	A signal input into input line 8 will be used as the trigger signal.	8
CC1	A signal input into CC 1 in the Camera Link interface will be used as the trigger signal.	9
CC2	A signal input into CC 2 in the Camera Link interface will be used as the trigger signal.	10
CC3	A signal input into CC 3 in the Camera Link interface will be used as the trigger signal.	11
CC4	A signal input into CC 4 in the Camera Link interface will be used as the trigger signal.	12
ShaftEncoder	A signal output from the shaft encoder module will be used as the trigger signal.	13
FrequencyConverter	A signal output from the frequency converter module will be used as the trigger signal.	14

Trigger Software Acquisition Start

If the Trigger Mode Acquisition Start value has been set to On and the Trigger Source Acquisition Start value has been set to Software, setting the Trigger Software Acquisition Start value to 1 initiates an internal (software based) acquisition start trigger signal in the camera.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00040120

Trigger Activation Acquisition Start

The Trigger Activation Acquisition Start value determines when the acquisition start trigger signal will be considered as valid.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040160	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
RisingEdge	The trigger signal is considered valid on the rising edge of the signal.	0
FallingEdge	The trigger signal is considered valid on the falling edge of the signal.	1
AnyEdge	The trigger signal is considered valid both on the rising edge and on the falling edge of the signal.	2
LevelHigh	The trigger signal is considered valid as long as it is high.	3
LevelLow	The trigger signal is considered valid as long as it is low.	4

Trigger Delay Raw Acquisition Start

The Trigger Delay Raw Acquisition Start value sets a delay in the units specified by the camera's Time Base register (see page 61). The delay will be applied to each hardware acquisition start trigger received. The camera will not respond to a trigger until the delay has expired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00040180
Access:	RW
Signed:	False

Status Acquisition Trigger Wait

The Status Acquisition Trigger Wait value indicates whether the camera is ready to receive a new acquisition start trigger signal. A value of 0 indicates that the camera is not ready. A value of 1 indicates that the camera is ready.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00040600
Access:	RO
Size (Bytes):	4

Trigger Mode Frame Start

The Trigger Mode Frame Start value sets the mode for the frame start trigger.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040200	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
OFF	The trigger mode is set to off.	0
ON	The trigger mode is set to on.	1

Trigger Source Frame Start

If the Trigger Source Frame Start value is set to On, the Trigger Source Frame Start value sets the source signal that will be used for the frame start trigger.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040240	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Software	An internally generated software signal will be used as the trigger signal.	0
Line1	A signal input into input line 1 will be used as the trigger signal.	1
Line2	A signal input into input line 2 will be used as the trigger signal.	2
Line3	A signal input into input line 3 will be used as the trigger signal.	3
Line4	A signal input into input line 4 will be used as the trigger signal.	4
Line5	A signal input into input line 5 will be used as the trigger signal.	5
Line6	A signal input into input line 6 will be used as the trigger signal.	6
Line7	A signal input into input line 7 will be used as the trigger signal.	7
Line8	A signal input into input line 8 will be used as the trigger signal.	8
CC1	A signal input into CC 1 in the Camera Link interface will be used as the trigger signal.	9
CC2	A signal input into CC 2 in the Camera Link interface will be used as the trigger signal.	10
CC3	A signal input into CC 3 in the Camera Link interface will be used as the trigger signal.	11
CC4	A signal input into CC 4 in the Camera Link interface will be used as the trigger signal.	12
ShaftEncoder	A signal output from the shaft encoder module will be used as the trigger signal.	13
FrequencyConverter	A signal output from the frequency converter module will be used as the trigger signal.	14

Trigger Software Frame Start

If the Trigger Mode Frame Start value has been set to On and the Trigger Source Frame Start value has been set to Software, setting the Trigger Software Frame Start value to 1 initiates an internal (software based) frame start trigger signal in the camera.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00040220

Trigger Activation Frame Start

The Trigger Activation Frame Start value determines when the frame start trigger signal will be considered as valid.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040260	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
RisingEdge	The trigger signal is considered valid on the rising edge of the signal.	0
FallingEdge	The trigger signal is considered valid on the falling edge of the signal.	1
AnyEdge	The trigger signal is considered valid both on the rising edge and on the falling edge of the signal.	2
LevelHigh	The trigger signal is considered valid as long as it is high.	3
LevelLow	The trigger signal is considered valid as long as it is low.	4

Trigger Delay Raw Frame Start

The Trigger Delay Raw Frame Start value sets a delay in the units specified by the camera's Time Base register (see page 61). The delay will be applied to each frame start trigger received. The camera will not respond to a trigger until the delay has expired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00040280
Access:	RW
Signed:	False

Status Frame Trigger Wait

The Status Frame Trigger Wait value indicates whether the camera is ready to receive a new frame start trigger signal. A value of 0 indicates that the camera is not ready. A value of 1 indicates that the camera is ready.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00040660
Access:	RO
Size (Bytes):	4

Trigger Source Line Start

If the Trigger Source Line Start value is set to On, the Trigger Source Line Start value sets the source signal that will be used for the line start trigger.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040340	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Software	An internally generated software signal will be used as the trigger signal.	0
Line1	A signal input into input line 1 will be used as the trigger signal.	1
Line2	A signal input into input line 2 will be used as the trigger signal.	2
Line3	A signal input into input line 3 will be used as the trigger signal.	3
Line4	A signal input into input line 4 will be used as the trigger signal.	4
Line5	A signal input into input line 5 will be used as the trigger signal.	5
Line6	A signal input into input line 6 will be used as the trigger signal.	6
Line7	A signal input into input line 7 will be used as the trigger signal.	7
Line8	A signal input into input line 8 will be used as the trigger signal.	8
CC1	A signal input into CC 1 in the Camera Link interface will be used as the trigger signal.	9
CC2	A signal input into CC 2 in the Camera Link interface will be used as the trigger signal.	10
CC3	A signal input into CC 3 in the Camera Link interface will be used as the trigger signal.	11
CC4	A signal input into CC 4 in the Camera Link interface will be used as the trigger signal.	12

ShaftEncoder	A signal output from the shaft encoder module will be used as the trigger signal.	13
FrequencyConverter	A signal output from the frequency converter module will be used as the trigger signal.	14

Trigger Activation Line Start

The Trigger Activation Line Start value determines when the line start trigger signal will be considered as valid.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040360	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
RisingEdge	The trigger signal is considered valid on the rising edge of the signal.	0
FallingEdge	The trigger signal is considered valid on the falling edge of the signal.	1
AnyEdge	The trigger signal is considered valid both on the rising edge and on the falling edge of the signal.	2
LevelHigh	The trigger signal is considered valid as long as it is high.	3
LevelLow	The trigger signal is considered valid as long as it is low.	4

Exposure Overlap Time Max Raw

The Exposure Overlap Time Max Raw value is used to time the rise of the frame trigger wait signal when the camera is operating in the trigger width exposure mode.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x0004E000
Access:	RW
Signed:	False

Readout Time Raw

The Readout Time Raw value indicates the amount of time that it takes to read an acquired image out of the imaging sensor in the units specified by the camera's Time Base register (see page 61). This value takes into account all of the camera settings that can impact the sensor readout time.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x0004E020
Access:	RO
Size (Bytes):	4

4.6 Exposure Control Registers

Exposure Mode

The Exposure mode parameter sets the camera's exposure mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040400	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	The exposure is disabled.	0
Timed	The exposure mode is timed.	1
TriggerWidth	The exposure mode is trigger width.	2

Exposure Time Raw

If the Exposure Mode value has been set to timed, the Exposure Time Raw value sets the camera's exposure time in the units specified by the camera's Time Base register (see page 61). The Exposure Time Raw value controls how long the pixels in the sensor will be exposed to light during each frame or line acquisition.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00040460
Access:	RW
Signed:	False

Status Exposure Active

The Status Exposure Active value indicates whether exposure is taking place. A value of 0 indicates that exposure is not taking place. A value of 1 indicates that exposure is taking place.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000406C0
Access:	RO
Size (Bytes):	4

4.7 Time Base Register

Time Base

The Time Base value represents the camera's internal time base in nanoseconds. For example, if the value of this register is 1000, then the time base for the camera is one microsecond.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00040440
Access:	RO
Size (Bytes):	4

4.8 Frame Period Registers

Acquisition Frame Period Enable

The Acquisition Frame Period Enable value enables setting the camera's acquisition frame period to a specified value.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00040480
Access:	RW

Acquisition Frame Period Raw

The Acquisition Frame Period Raw value sets the acquisition frame period in the units specified by the camera's Time Base register (see page 61).

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000404A0
Access:	RW
Signed:	False

Resulting Frame Period Raw

The Resulting Frame Period Raw value indicates the minimum allowed acquisition frame period in the units specified by the camera's Time Base register (see page 61). The indicated value takes into account all of the current camera settings that can affect the minimum allowed acquisition frame period.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00040500
Access:	RO
Size (Bytes):	4

Acquisition Line Period Raw

The Acquisition Line Period Raw value sets the acquisition line period in the units specified by the camera's Time Base register (see page 61).

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00040520
Access:	RW
Signed:	False

4.9 Sequencer Control Registers

Sequence Enable

The Sequence Enable value is used to enable the sequencer feature and existing sequence sets for image acquisition. The sequencer feature must be disabled when configuring sequence sets and before issuing a sequence set load command.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00130000
Access:	RW

Sequence Async Restart

Setting the Sequence Async Restart value to 1 restarts the sequence of sequence sets for image acquisition. The sequence set with lowest index number will be used first. The restart is asynchronous to the frame start trigger.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00130220

Sequence Async Advance

Setting the Sequence Async Advance value to 1 advances from the current sequence set to the one with the next higher sequence set index number. The advance is asynchronous to the frame trigger. Only available in Controlled sequence advance mode.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00130240

Sequence Current Set

The Sequence Current Set value indicates the sequence set index number of the current set. The current set sets the current parameter values of the sequence parameters in the active set.

Register type:	Info (see page 6 for the layout of an info type register)
Base address:	0x00130260
Access:	RO
Size (Bytes):	4

Sequence Set Load

Setting the Sequence Set Load value to 1 copies the parameter values from a sequence set into the camera's active set. Previous parameter values in the active set will be overwritten. The parameter values will come from the sequence set that is currently selected in the Sequence Set Index register.

The sequencer feature must be disabled before issuing the sequence set load command.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00130020

Sequence Set Store

Setting the Sequence Set Store value to 1 copies the camera's current parameter values from the active set into the sequence set designated by the current setting of the Sequence Set Index register. Previous parameter values in the designated sequence set will be overwritten.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00130040

Sequence Set Total Number

The Sequence Set Total Number value specifies the total number of different sequence sets that will be included within a sequence set cycle (Auto and Controlled advance modes) or will "in principle" be available (Free Selection advance mode). The maximum number is 64.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00130060
Access:	RW
Signed:	False

Sequence Set Index

Each sequence set is identified by the Sequence Set Index number, starting from zero. The sequence set index number is involved when e.g. a sequence set is selected.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00130080
Access:	RW
Signed:	False

Sequence Set Executions

The Sequence Set Executions value specifies how many times a sequence set is consecutively used. Only available in Auto sequence advance mode.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x001300A0
Access:	RW
Signed:	False

Sequence Advance Mode

The Sequence Advance Mode value sets the scheme for advancing from one sequence set to the next.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130200	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
AutoSequenceAdvance	Automatic advance as external triggers are received. Advance according to increasing sequence set index numbers and related register settings.	0
ControlledSequenceAdvance	Sequence set advance controlled by a source that can be selected.	1
FreeSelectionSequenceAdvance	Sequence set advance by selecting sequence sets at will. The selection is controlled by the sates of the input line(s).	2

Sequence Restart Control Source

The Sequence Restart Control Source value sets the source for synchronous restart of a sequence set cycle. Only available in Auto and Controlled sequence advance modes.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130400	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled. With this setting, sequence restart is only possible by software commands.	0
AlwaysActive	With this setting, sequence control is always active.	1
Line1	A signal input into input line 1 will be used as the trigger signal.	2
Line2	A signal input into input line 2 will be used as the trigger signal.	3
Line3	A signal input into input line 3 will be used as the trigger signal.	4
Line4	A signal input into input line 4 will be used as the trigger signal.	5
Line5	A signal input into input line 5 will be used as the trigger signal.	6
Line6	A signal input into input line 6 will be used as the trigger signal.	7
Line7	A signal input into input line 7 will be used as the trigger signal.	8
Line8	A signal input into input line 8 will be used as the trigger signal.	9
CC1	A signal input into CC 1 in the Camera Link interface will be used as the trigger signal.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used as the trigger signal.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used as the trigger signal.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used as the trigger signal.	13

Sequence Advance Control Source

The Sequence Advance Control Source value sets the source for synchronous advance from one sequence set to the next. Only available in Controlled sequence advance mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130420	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled. With this setting, advance is only possible by software commands.	0
AlwaysActive	With this setting, sequence control is always active.	1
Line1	A signal input into input line 1 will be used as the trigger signal.	2
Line2	A signal input into input line 2 will be used as the trigger signal.	3
Line3	A signal input into input line 3 will be used as the trigger signal.	4
Line4	A signal input into input line 4 will be used as the trigger signal.	5
Line5	A signal input into input line 5 will be used as the trigger signal.	6
Line6	A signal input into input line 6 will be used as the trigger signal.	7
Line7	A signal input into input line 7 will be used as the trigger signal.	8
Line8	A signal input into input line 8 will be used as the trigger signal.	9
CC1	A signal input into CC 1 in the Camera Link interface will be used as the trigger signal.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used as the trigger signal.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used as the trigger signal.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used as the trigger signal.	13

Sequence Address Bit 0 Source

The Sequence Address Bit 0 Source value sets the source for bit 0 of the sequence set index number. Only available in Free Selection sequence advance mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130500	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled.	0
AlwaysActive	Bit 0 of the sequence set index number will be set to 1.	1
Line1	A signal input into input line 1 will be used for setting bit 0.	2
Line2	A signal input into input line 2 will be used for setting bit 0.	3
Line3	A signal input into input line 3 will be used for setting bit 0.	4
Line4	A signal input into input line 4 will be used for setting bit 0.	5
Line5	A signal input into input line 5 will be used for setting bit 0.	6
Line6	A signal input into input line 6 will be used for setting bit 0.	7
Line7	A signal input into input line 7 will be used for setting bit 0.	8
Line8	A signal input into input line 8 will be used for setting bit 0.	9
CC1	A signal input into CC 1 in the Camera Link interface will be used for setting bit 0.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used for setting bit 0.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used for setting bit 0.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used for setting bit 0.	13

Sequence Address Bit 1 Source

The Sequence Address Bit 1 Source value sets the source for bit 1 of the sequence set index number. Only available in Free Selection sequence advance mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130520	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled.	0
AlwaysActive	Bit 1 of the sequence set index number will be set to 1.	1
Line1	A signal input into input line 1 will be used for setting bit 1.	2
Line2	A signal input into input line 2 will be used for setting bit 1.	3
Line3	A signal input into input line 3 will be used for setting bit 1.	4
Line4	A signal input into input line 4 will be used for setting bit 1.	5
Line5	A signal input into input line 5 will be used for setting bit 1.	6
Line6	A signal input into input line 6 will be used for setting bit 1.	7
Line7	A signal input into input line 7 will be used for setting bit 1.	8
Line8	A signal input into input line 8 will be used for setting bit 1.	9
CC1	A signal input into CC 1 in the Camera Link interface will be used for setting bit 1.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used for setting bit 1.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used for setting bit 1.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used for setting bit 1.	13

Sequence Address Bit 2 Source

The Sequence Address Bit 2 Source value sets the source for bit 2 of the sequence set index number. Only available in Free Selection sequence advance mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130540	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled.	0
AlwaysActive	Bit 2 of the sequence set index number will be set to 1.	1
Line1	A signal input into input line 1 will be used for setting bit 2.	2
Line2	A signal input into input line 2 will be used for setting bit 2.	3
Line3	A signal input into input line 3 will be used for setting bit 2.	4
Line4	A signal input into input line 4 will be used for setting bit 2.	5
Line5	A signal input into input line 5 will be used for setting bit 2	6
Line6	A signal input into input line 6 will be used for setting bit 2	7
Line7	A signal input into input line 7 will be used for setting bit 2	8
Line8	A signal input into input line 8 will be used for setting bit 2	9
CC1	A signal input into CC 1 in the Camera Link interface will be used for setting bit 2.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used for setting bit 2.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used for setting bit 2.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used for setting bit 2.	13

Sequence Address Bit 3 Source

The Sequence Address Bit 3 Source value sets the source for bit 3 of the sequence set index number. Only available in Free Selection sequence advance mode.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00130560	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Disabled	Disabled.	0
AlwaysActive	Bit 3 of the sequence set index number will be set to 1.	1
Line1	A signal input into input line 1 will be used for setting bit 3.	2
Line2	A signal input into input line 2 will be used for setting bit 3.	3
Line3	A signal input into input line 3 will be used for setting bit 3.	4
Line4	A signal input into input line 4 will be used for setting bit 3.	5
Line5	A signal input into input line 5 will be used for setting bit 3.	6
Line6	A signal input into input line 6 will be used for setting bit 3.	7
Line7	A signal input into input line 7 will be used for setting bit 3.	8
Line8	A signal input into input line 8 will be used for setting bit 3.	9
CC1	A signal input into CC 1 in the Camera Link interface will be used for setting bit 3.	10
CC2	A signal input into CC 2 in the Camera Link interface will be used for setting bit 3.	11
CC3	A signal input into CC 3 in the Camera Link interface will be used for setting bit 3.	12
CC4	A signal input into CC 4 in the Camera Link interface will be used for setting bit 3.	13

4.10 Timer Control Registers

Timer Time Base Delay

The Timer Time Base Delay value sets the time base for each timer delay in the units specified by the camera's Time Base register (see page 61).

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00053F00
Access:	RW
Signed:	False

Timer Time Base Duration

The Timer Time Base Duration value sets the time base for each timer duration in the units specified by the camera's Time Base register (see page 61).

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00053F20
Access:	RW
Signed:	False

Timer Delay Raw Timer 1

The product of the Timer Delay Raw Timer 1 value and the Timer Time Base Delay value (see above) determines the timer 1 delay. In other words:

Timer 1 Delay = Timer Delay Raw Timer 1 x Timer Time Base Delay

The timer 1 delay specifies how much time will elapse between the point where timer 1 is triggered and the point where the timer 1 signal goes high.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00054000
Access:	RW
Signed:	False

Timer Duration Raw Timer 1

The product of the Timer Duration Raw Timer 1 value and the Timer Time Base Duration value (see page 73) determines the timer 1 duration. In other words:

Timer 1 Duration = Timer Duration Raw Timer 1 x Timer Time Base Duration

The timer 1 duration specifies how long the timer 1 signal will remain high before it goes low again.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00054020
Access:	RW
Signed:	False

Timer Delay Raw Timer 2

The product of the Timer Delay Raw Timer 2 value and the Timer Time Base Delay value (see page 73) determines the timer 2 delay. In other words:

Timer 2 Delay = Timer Delay Raw Timer 2 x Timer Time Base Delay

The timer 2 delay specifies how much time will elapse between the point where timer 2 is triggered and the point where the timer 2 signal goes high.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00054040
Access:	RW
Signed:	False

Timer Duration Raw Timer 2

The product of the Timer Duration Raw Timer 2 value and the Timer Time Base Duration value (see page 73) determines the timer 2 duration. In other words:

Timer 2 Duration = Timer Duration Raw Timer 2 x Timer Time Base Duration

The timer 2 duration specifies how long the timer 2 signal will remain high before it goes low again.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00054060
Access:	RW
Signed:	False

Timer Delay Raw Timer 3

The product of the Timer Delay Raw Timer 3 value and the Timer Time Base Delay value (see page 73) determines the timer 3 delay. In other words:

Timer 3 Delay = Timer Delay Raw Timer 3 x Timer Time Base Delay

The timer 3 delay specifies how much time will elapse between the point where timer 3 is triggered and the point where the timer 3 signal goes high.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00054080
Access:	RW
Signed:	False

Timer Duration Raw Timer 3

The product of the Timer Duration Raw Timer 3 value and the Timer Time Base Duration value (see page 73) determines the timer 3 duration. In other words:

Timer 3 Duration = Timer Duration Raw Timer 3 x Timer Time Base Duration

The timer 3 duration specifies how long the timer 3 signal will remain high before it goes low again.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000540A0
Access:	RW
Signed:	False

Timer Delay Raw Timer 4

The product of the Timer Delay Raw Timer 4 value and the Timer Time Base Delay value (see page 73) determines the timer 4 delay. In other words:

Timer 4 Delay = Timer Delay Raw Timer 4 x Timer Time Base Delay

The timer 4 delay specifies how much time will elapse between the point where timer 4 is triggered and the point where the timer 4 signal goes high.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000540C0
Access:	RW
Signed:	False

Timer Duration Raw Timer 4

The product of the Timer Duration Raw Timer 4 value and the Timer Time Base Duration value (see page 73) determines the timer 4 duration. In other words:

Timer 4 Duration = Timer Duration Raw Timer 4 x Timer Time Base Duration

The timer 4 duration specifies how long the timer 4 signal will remain high before it goes low again.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000540E0
Access:	RW
Signed:	False

4.11 User Set Control Registers

User Set Load

Setting the User Set Load value to 1 loads the selected user set or the default set into the camera's active set. Use the User Set Selector register to select a user set or the default set.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00060000

User Set Save

Setting the User Set Save value to 1 saves the camera's current settings into the selected user configuration set. Use the User Set Selector register to select a user set.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x00060020

User Set Selector

The User Set Selector value is used to select a user set or the default set.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00060040	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Default	Selects the Default Set.	0
UserSet1	Selects User Set 1.	1
UserSet2	Selects User Set 2.	2
UserSet3	Selects User Set 3.	3

Default Set Selector

The Default Set Selector value is used to select which factory setup will be the default set.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00060080	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Standard	Selects the standard factory setup.	0
HighGain	Selects the high gain factory setup.	1
Auto	Selects the auto functions factory setup.	2
Color	Selects the color correction factory setup.	3

User Set Default Selector

The User Set Default Selector value is used to select the default set or a user set as the "startup" set. The startup set will be loaded into the active set when the camera boots up.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00060060	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Default	Selects the Default Set.	0
UserSet1	Selects User Set 1.	1
UserSet2	Selects User Set 2.	2
UserSet3	Selects User Set 3.	3

4.12 Shading Correction Registers

Gain Shading Enable

The Gain Shading Enable value is used to enable and disable gain shading correction (also known as PRNU shading correction).

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000D0000
Access:	RW

Gain Shading Startup Set

The Gain Shading Startup Set value is used to select a gain shading set to operate at startup.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000D0020	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
DefaultShadingSet	Selects the Default Shading Set for startup.	0
UserShadingSet1	Selects the User Shading Set 1 for startup.	1
UserShadingSet2	Selects the User Shading Set 2 for startup.	2

Gain Shading Set Selector

The Gain Shading Set Selector value is used to select a gain shading set for copying into the volatile memory (via the Gain Shading Activate register) or for configuring (via the Gain Shading Create register).

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000D0040	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
DefaultShadingSet	Selects the Default Shading Set.	0
UserShadingSet1	Selects the User Shading Set 1.	1
UserShadingSet2	Selects the User Shading Set 2.	2

Gain Shading Activate

The Gain Shading Activate value causes the gain shading set selected via the Gain Shading Set Selector register to be copied into the camera's volatile memory. When the gain shading correction feature is enabled, the gain shading set in the volatile memory will be used.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x000D0060

Gain Shading Create

The Gain Shading Create value allows to create and configure a user gain shading set, as selected via the Gain Shading Set Selector.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x000D0080

Gain Shading Status

The Gain Shading Status value allows to determine an error status related to gain shading correction. The following error statuses can be indicated: No error, Startup Set error, Activate error, Create error.

Register type:	Info (see page 7 for the layout of a info type register)
Base address:	0x000D00A0
Access:	RO
Size (bytes):	4

4.13 User Defined Value Registers

User Defined Value 1

The User Defined Value 1 can be set to an arbitrary value and used as desired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000600A0
Access:	RW
Signed:	True

User Defined Value 2

The User Defined Value 2 can be set to an arbitrary value and used as desired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000600C0
Access:	RW
Signed:	True

User Defined Value 3

The User Defined Value 3 can be set to an arbitrary value and used as desired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00060100
Access:	RW
Signed:	True

User Defined Value 4

The User Defined Value 4 can be set to an arbitrary value and used as desired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00060140
Access:	RW
Signed:	True

User Defined Value 5

The User Defined Value 5 can be set to an arbitrary value and used as desired.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00060180
Access:	RW
Signed:	True

4.14 Auto Function Control Registers

Gain Auto

The Gain Auto value is used to enable the camera's auto gain function and to select the mode of operation for the function.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00020000	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	Automatic operation is disabled. Gain must be adjusted manually.	0
Once	The camera will perform one automatic gain adjustment routine. When the routine is finished, automatic adjustment will stop. The final settings made by the routine will then remain in place.	1
Continuous	The camera will continuously perform automatic gain adjustments.	2

Exposure Auto

The Exposure Auto value is used to enable the camera's auto exposure function and to select the mode of operation for the function.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00040420	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	Automatic operation is disabled. Exposure time must be adjusted manually.	0
Once	The camera will perform one automatic exposure time adjustment routine. When the routine is finished, automatic adjustment will stop. The final settings made by the routine will then remain in place.	1
Continuous	The camera will continuously perform automatic exposure time adjustments.	2

Balance White Auto

The Balance White Auto value is used to enable the camera's auto white balance function and to select the mode of operation for the function.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x00020400	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	Automatic operation is disabled. White balance must be adjusted manually.	0
Once	The camera will perform one automatic white balance adjustment routine. When the routine is finished, automatic adjustment will stop. The final settings made by the routine will then remain in place.	1
Continuous	The camera will continuously perform automatic white balance adjustments.	2

Auto Target Value

The Auto Target Value sets the target gray value that will be used for the camera's auto functions.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070000
Access:	RW
Signed:	False

Auto Gain Lower Limit

The Auto Gain Lower Limit value sets the lower limit for the camera's gain auto function. This value represents the lowest gain that the gain auto function will be allowed to use.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070020
Access:	RW
Signed:	False

Auto Gain Upper Limit

The Auto Gain Upper Limit value sets the upper limit for the camera's gain auto function. This value represents the highest gain that the gain auto function will be allowed to use.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070040
Access:	RW
Signed:	False

Auto Exposure Lower Limit

The Auto Exposure Lower Limit value sets the lower limit for the camera's exposure auto function. This value determines the lowest exposure time that the exposure auto function will be allowed to use.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070060
Access:	RW
Signed:	False

Auto Exposure Upper Limit

The Auto Exposure Upper Limit value sets the upper limit for the camera's exposure auto function. This value determines the highest exposure time that the exposure auto function will be allowed to use.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070080
Access:	RW
Signed:	False

Auto Function Profile

When the gain auto and the exposure auto functions are both enabled, the Auto Function Profile value determines whether the gain or the exposure time will be kept as low as possible when the camera is making automatic adjustments to achieve the target average gray value.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000700A0	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
MinGain	Keep gain as low as possible.	0
MinShutter	Keep exposure time as low as possible.	1

Gray Value Adjustment Damping

The Gray Value Adjustment Damping sets the damping factor for gray value adjustment. Gray Value adjustment damping is used together with the camera’s auto functions.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000700C0
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 1024

Auto AOI 1 Left

The Auto AOI 1 Left value sets the horizontal offset in pixels for Auto AOI 1, i.e., the value sets the distance between the left side of the imaging sensor and the left side of Auto AOI 1. Auto AOI 1 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070100
Access:	RW
Signed:	False

Auto AOI 2 Left

The Auto AOI 2 Left value sets the horizontal offset in pixels for Auto AOI 2, i.e., the value sets the distance between the left side of the imaging sensor and the left side of Auto AOI 2. Auto AOI 2 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070120
Access:	RW
Signed:	False

Auto AOI 1 Top

The Auto AOI 1 Top value sets the vertical offset in pixels for Auto AOI 1, i.e., the value sets the distance between the top of the imaging sensor and the top of Auto AOI 1. Auto AOI 1 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070200
Access:	RW
Signed:	False

Auto AOI 2 Top

The Auto AOI 2 Top value sets the vertical offset in pixels for Auto AOI 2, i.e., the value sets the distance between the top of the imaging sensor and the top of Auto AOI 2. Auto AOI 2 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070220
Access:	RW
Signed:	False

Auto AOI 1 Width

The Auto AOI 1 Width value sets the width in pixels of Auto AOI 1. Auto AOI 1 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070300
Access:	RW
Signed:	False

Auto AOI 2 Width

The Auto AOI 2 Width value sets the width in pixels of Auto AOI 2. Auto AOI 2 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070320
Access:	RW
Signed:	False

Auto AOI 1 Height

The Auto AOI 1 Height value sets the height in pixels of Auto AOI 1. Auto AOI 1 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070400
Access:	RW
Signed:	False

Auto AOI 2 Height

The Auto AOI 2 Height value sets the height in pixels of Auto AOI 2. Auto AOI 2 is used by the camera's auto function features.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x00070420
Access:	RW
Signed:	False

Auto AOI 1 Usage

The Auto AOI 1 Usage value determines which auto function(s) will use the pixel values from within AOI 1 to control the operation of the function.

Register type:	Bitfield (see page 11 for the layout of a bitfield type register)
Base address:	0x00070500

Auto AOI 2 Usage

The Auto AOI 2 Usage value determines which auto function(s) will use the pixel values from within AOI 2 to control the operation of the function.

Register type:	Bitfield (see page 11 for the layout of a bitfield type register)
Base address:	0x00070520

4.15 Color Enhancement Registers

Light Source Selector

Selects the type of lighting that will be corrected for when the camera performs matrix color transformation.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000E0000	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Off	No alterations will be made to the pixel values.	0
Custom	The user can set the values in the transformation matrix as desired.	1
Daylight	The transformation matrix will be populated with a set of values appropriate for correcting images captured in daylight lighting with a color temperature around 5000K.	2
Tungsten	The transformation matrix will be populated with a set of values appropriate for correcting images captured in tungsten lighting with a color temperature around 2500K to 3000K.	3
Flash	The transformation matrix will be populated with a set of values appropriate for correcting images captured in flash lighting.	4
Daylight_6500K	Deprecated	5
Daylight6500K	The transformation matrix will be populated with a set of values appropriate for correcting images captured in daylight lighting with a color temperature around 6500K.	6
LightSource0	The user can set the values in the transformation matrix as desired.	16
LightSource1	The user can set the values in the transformation matrix as desired.	17

Processed Raw Enable

The Processed Raw Enable feature is only available for cameras using an RGB color filter. The Processed Raw Enable value is used to enable the processed raw enable feature. When enabled, the feature transforms the pixel data to raw data after color enhancement was performed. Accordingly, the processed raw enable feature must always be enabled when color enhancement is combined with pixel data output in one of the raw formats. We recommend to always enable the processed raw enable feature when color enhancement is used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000E2000
Access:	RW

Color Matrix Factor

Determines how strong an effect the matrix correction function will have on the colors output by the camera. If the value is set to 65536 the matrix correction function will have full effect. A lower setting means that matrix correction will have less of an effect.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0400
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 65536

Color Matrix RGB2RGB 00

Row 0, column 0 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0020
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 01

Row 0, column 1 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0040
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 02

Row 0, column 2 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0060
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 10

Row 1, column 0 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0080
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 11

Row 1, column 1 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E00A0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 12

Row 1, column 2 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E00C0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 20

Row 2, column 0 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E00E0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 21

Row 2, column 1 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0100
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix RGB2RGB 22

Row 2, column 2 matrix value for RGB to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0120
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Matrix YUV2RGB 00

Row 0, column 0 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0200
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 01

Row 0, column 1 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0220
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 02

Row 0, column 2 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0240
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 10

Row 1, column 0 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0260
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 11

Row 1, column 1 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0280
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 12

Row 1, column 2 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E02A0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 20

Row 2, column 0 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E02C0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 21

Row 2, column 1 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E02E0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Matrix YUV2RGB 22

Row 2, column 2 matrix value for YUV to RGB matrix transformation.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E0300
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 64

Color Adjustment Enable

The Color Adjustment Enable value is used to enable the camera's color adjustment feature. The feature allows to adjust saturation and hue for selected colors.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000E1000
Access:	RW

Color Adjustment Reset

Setting the Color Adjustment Reset value to 1 returns the current settings of the color adjustment feature to the settings that are associated with the currently set value of the Light Source Selector register. If the currently set value is "Off" the settings of the color adjustment feature will be set to neutral values.

Register type:	Command (see page 14 for the layout of a command type register)
Base address:	0x000E1020

Color Adjustment Saturation Red

The Color Adjustment Saturation Red value sets the saturation of red for those colors in the image where red predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1040
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Red

The Color Adjustment Hue Red value sets the hue of red for those colors in the image where red predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1060
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Adjustment Saturation Yellow

The Color Adjustment Saturation Yellow value sets the saturation of yellow for those colors in the image where yellow predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1080
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Yellow

The Color Adjustment Hue Yellow value sets the hue of yellow for those colors in the image where yellow predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E10A0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Adjustment Saturation Green

The Color Adjustment Saturation Green value sets the saturation of green for those colors in the image where green predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E10C0
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Green

The Color Adjustment Hue Green value sets the hue of green for those colors in the image where green predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E10E0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Adjustment Saturation Cyan

The Color Adjustment Saturation Cyan value sets the saturation of cyan for those colors in the image where cyan predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1100
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Cyan

The Color Adjustment Hue Cyan value sets the hue of cyan for those colors in the image where cyan predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1120
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Adjustment Saturation Blue

The Color Adjustment Saturation Blue value sets the saturation of blue for those colors in the image where blue predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1140
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Blue

The Color Adjustment Hue Blue value sets the hue of blue for those colors in the image where blue predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1160
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

Color Adjustment Saturation Magenta

The Color Adjustment Saturation Magenta value sets the saturation of magenta for those colors in the image where magenta predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E1180
Access:	RW
Signed:	False
Conversion:	Abs = Raw / 128

Color Adjustment Hue Magenta

The Color Adjustment Hue Magenta value sets the hue of magenta for those colors in the image where magenta predominates.

Register type:	Fixed Point (see page 5 for the layout of a fixed point type register)
Base address:	0x000E11C0
Access:	RW
Signed:	True
Conversion:	Abs = Raw / 32

4.16 Remove Parameter Limits Registers

Remove Param Limits Gain

The Remove Param Limits Gain value is used to disable the normal limits on the gain range. The allowed range of values for gain is normally limited. The limited range is designed to ensure optimum camera performance. Disabling the normal limits typically extends the range to the limits dictated by the physical restrictions of the camera's electronic devices.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00080000
Access:	RW

Remove Param Limits Black Level

The Remove Param Limits Black Level value is used to disable the normal limits on the black level range. The allowed range of values for black level is normally limited. The limited range is designed to ensure optimum camera performance. Disabling the normal limits typically extends the range to the limits dictated by the physical restrictions of the camera's electronic devices.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00080020
Access:	RW

Remove Param Limits Exposure Time

The Remove Param Limits Exposure Time value is used to disable the normal limits on the exposure time range. The allowed range of values for the Exposure Time Raw register is normally limited. The limited range is designed to ensure optimum camera performance. Disabling the normal limits typically extends the range to limits dictated by the physical restrictions of the camera's electronic devices.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00080040
Access:	RW

Remove Param Limits Frame Rate

The Remove Param Limits Frame Rate value is used to disable the limit on the maximum frame rate range. The allowed range of values for frame rate is normally limited. The limited range is designed to ensure optimum camera performance. Disabling the normal limits typically extends the range to limits dictated by the physical restrictions of the camera's electronic devices.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00080080
Access:	RW

Remove Param Limits Auto Target Value

The Remove Param Limits Auto Target Value value is used to disable the normal limits on the target gray value range. The allowed range of values for the auto target value is normally limited. The limited range is designed to ensure optimum camera performance. Disabling the normal limits typically extends the range to the limits dictated by the physical restrictions of the camera's electronic devices.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000800A0
Access:	RW

4.17 LUT Control Registers

LUT In Depth

The LUT In Depth value indicates the bit depth of the pixel values entered as input values in the lookup table.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00090000
Access:	RO
Size (Bytes):	4

LUT Out Depth

The LUT Out Depth value indicates the bit depth of the pixel values entered as output values in the lookup table.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00090020
Access:	RO
Size (Bytes):	4

LUT Interpolation Step

The LUT Interpolation Step value indicates the number of steps needed to move from one effective value in the lookup table to the next effective value in the lookup table.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x00090040
Access:	RO
Size (Bytes):	4

LUT Enable

The LUT Enable value is used to enable the lookup table feature.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x00090060
Access:	RW

LUT

An array containing the values to use for the lookup table feature.

Register type:	Array (see page 13 for the layout of an array type register)
Base address:	0x00090100
Access:	RW

4.18 Digital I/O Controls

Line Mode Line 1

If line 1 is GPIO, the Line Mode Line 1 value determines whether line 1 will operate as an input or as an output.

If the line 1 functionality is fixed as an input or fixed as an output, the Line Mode Line 1 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0000	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 1

The Line Inverter Line 1 value is used to enable the invert function on line 1.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0020
Access:	RW

Line Status Line 1

The Line Status Line 1 value indicates the current state of line 1.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0040
Access:	RO
Size (Bytes):	4

Line Source Line 1

If line 1 is an output, the Line Source Line 1 value sets the source signal for the line.

If line 1 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0060	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 1 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 1

If the electrical format for line 1 is settable, the Line Format Line 1 value sets the electrical format for line 1.

If the electrical format for line 1 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0080	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 1

If line 1 is an input, the Input Debouncer Time Line 1 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 1 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C00A0
Access:	RW
Signed:	False

Termination Enable Line 1

The Termination Enable Line 1 value is used to enable the termination resistor on input line 1. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C00C0
Access:	RW

User Output Line 1

If line 1 is an output and the Line Source Line 1 value is set to "User", the User Output Line 1 value sets the state of line 1.

If line 1 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C00E0
Access:	RW

Min Out Pulse Width Line 1

If line 1 is an output, the Min Out Pulse Width Line 1 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 1 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0100
Access:	RW
Signed:	False

Line Logic Line 1

The Line Logic Line 1 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0120
Access:	RO
Size (bytes):	4

Sync User Output Line 1

If line 1 is an output and the Line Source Line 1 value is set to "Sync User Output", the Sync User Output Line 1 value sets the state of line 1 for the related sequence set.

If line 1 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0140
Access:	RW

Line Mode Line 2

If line 2 is GPIO, the Line Mode Line 2 value determines whether line 2 will operate as an input or as an output.

If the line 2 functionality is fixed as an input or fixed as an output, the Line Mode Line 2 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0200	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 2

The Line Inverter Line 2 value enables the invert function on line 2.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0220
Access:	RW

Line Status Line 2

The Line Status Line 2 value indicates the current state of line 2.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0240
Access:	RO
Size (Bytes):	4

Line Source Line 2

If line 2 is an output, the Line Source Line 2 value sets the source signal for the line.

If line 2 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0260	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 2 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 2

If the electrical format for line 2 is settable, the Line Format Line 2 value sets the electrical format for line 2.

If the electrical format for line 2 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0280	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 2

If line 2 is an input, the Input Debouncer Time Line 2 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 2 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C02A0
Access:	RW
Signed:	False

Termination Enable Line 2

The Termination Enable Line 2 value is used to enable the termination resistor on input line 2. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C02C0
Access:	RW

User Output Line 2

If line 2 is an output and the Line Source Line 2 value is set to "User", the User Output Line 2 register sets the state of line 2.

If line 2 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C02E0
Access:	RW

Min Out Pulse Width Line 2

If line 2 is an output, the Min Out Pulse Width Line 2 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 2 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0300
Access:	RW
Signed:	False

Line Logic Line 2

The Line Logic Line 2 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0320
Access:	RO
Size (bytes):	4

Sync User Output Line 2

If line 2 is an output and the Line Source Line 2 value is set to "Sync User Output", the Sync User Output Line 2 value sets the state of line 2 for the related sequence set.

If line 2 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0340
Access:	RW

Line Mode Line 3

If line 3 is GPIO, the Line Mode Line 3 value determines whether line 3 will operate as an input or as an output.

If the line 3 functionality is fixed as an input or fixed as an output, the Line Mode Line 3 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0400	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 3

The Line Inverter Line 3 value enables the invert function on line 3.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0420
Access:	RW

Line Status Line 3

The Line Status Line 3 value indicates the current state of line 3.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0440
Access:	RO
Size (Bytes):	4

Line Source Line 3

If line 3 is an output, the Line Source Line 3 value sets the source signal for the line.

If line 3 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0460	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 3 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 3

If the electrical format for line 3 is settable, the Line Format Line 3 value sets the electrical format for line 3.

If the electrical format for line 3 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0480	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 3

If line 3 is an input, the Input Debouncer Time Line 3 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 3 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C04A0
Access:	RW
Signed:	False

Termination Enable Line 3

The Termination Enable Line 3 value is used to enable the termination resistor on input line 3. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C04C0
Access:	RW

User Output Line 3

If line 3 is an output and the Line Source Line 3 value is set to "User", the User Output Line 3 register sets the state of line 3.

If line 3 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C04E0
Access:	RW

Min Out Pulse Width Line 3

If line 3 is an output, the Min Out Pulse Width Line 3 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 3 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0500
Access:	RW
Signed:	False

Line Logic Line 3

The Line Logic Line 3 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0520
Access:	RO
Size (bytes):	4

Sync User Output Line 3

If line 3 is an output and the Line Source Line 3 value is set to "Sync User Output", the Sync User Output Line 3 value sets the state of line 3 for the related sequence set.

If line 3 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0540
Access:	RW

Line Mode Line 4

If line 4 is GPIO, the Line Mode Line 4 value determines whether line 4 will operate as an input or as an output.

If the line 4 functionality is fixed as an input or fixed as an output, the Line Mode Line 4 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0600	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 4

The Line Inverter Line 4 value enables the invert function on line 4.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0620
Access:	RW

Line Status Line 4

The Line Status Line 4 value indicates the current state of line 4.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0640
Access:	RO
Size (Bytes):	4

Line Source Line 4

If line 4 is an output, the Line Source Line 4 value sets the source signal for the line.

If line 4 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0660	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7

Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 4 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 4

If the electrical format for line 4 is settable, the Line Format Line 4 value sets the electrical format for line 4.

If the electrical format for line 4 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0680	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 4

If line 4 is an input, the Input Debouncer Time Line 4 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 4 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C06A0
Access:	RW
Signed:	False

Termination Enable Line 4

The Termination Enable Line 4 value is used to enable the termination resistor on input line 4. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C06C0
Access:	RW

User Output Line 4

If line 4 is an output and the Line Source Line 4 value is set to "User", the User Output Line 4 register sets the state of line 4.

If line 4 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C06E0
Access:	RW

Min Out Pulse Width Line 4

If line 4 is an output, the Min Out Pulse Width Line 4 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 4 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0700
Access:	RW
Signed:	False

Line Logic Line 4

The Line Logic Line 4 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0720
Access:	RO
Size (bytes):	4

Sync User Output Line 4

If line 4 is an output and the Line Source Line 4 value is set to "Sync User Output", the Sync User Output Line 4 value sets the state of line 4 for the related sequence set.

If line 4 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0740
Access:	RW

Line Mode Line 5

If line 5 is GPIO, the Line Mode Line 5 value determines whether line 5 will operate as an input or as an output.

If the line 5 functionality is fixed as an input or fixed as an output, the Line Mode Line 5 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0800	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 5

The Line Inverter Line 5 value enables the invert function on line 5.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0820
Access:	RW

Line Status Line 5

The Line Status Line 5 value indicates the current state of line 5.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0840
Access:	RO
Size (Bytes):	4

Line Source Line 5

If line 5 is an output, the Line Source Line 5 value sets the source signal for the line.

If line 5 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0860	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 5 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 5

If the electrical format for line 5 is settable, the Line Format Line 5 value sets the electrical format for line 5.

If the electrical format for line 5 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0880	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
Tristate	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 5

If line 5 is an input, the Input Debouncer Time Line 5 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 5 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C08A0
Access:	RW
Signed:	False

Termination Enable Line 5

The Termination Enable Line 5 value is used to enable the termination resistor on input line 5. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C08C0
Access:	RW

User Output Line 5

If line 5 is an output and the Line Source Line 5 value is set to "User", the User Output Line 5 register sets the state of line 5.

If line 5 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C08E0
Access:	RW

Min Out Pulse Width Line 5

If line 5 is an output, the Min Out Pulse Width Line 5 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera’s Time Base register (see page 61).

If line 5 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0900
Access:	RW
Signed:	False

Line Logic Line 5

The Line Logic Line 5 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0920
Access:	RO
Size (bytes):	4

Sync User Output Line 5

If line 5 is an output and the Line Source Line 5 value is set to "Sync User Output", the Sync User Output Line 5 value sets the state of line 5 for the related sequence set.

If line 5 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0940
Access:	RW

Line Mode Line 6

If line 6 is GPIO, the Line Mode Line 6 value determines whether line 6 will operate as an input or as an output.

If the line 6 functionality is fixed as an input or fixed as an output, the Line Mode Line 6 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0A00	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 6

The Line Inverter Line 6 value enables the invert function on line 6.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0A20
Access:	RW

Line Status Line 6

The Line Status Line 6 value indicates the current state of line 6.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0A40
Access:	RO
Size (Bytes):	4

Line Source Line 6

If line 6 is an output, the Line Source Line 6 value sets the source signal for the line.

If line 6 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0A60	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 6 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 6

If the electrical format for line 6 is settable, the Line Format Line 6 value sets the electrical format for line 6.

If the electrical format for line 6 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0A80	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 6

If line 6 is an input, the Input Debouncer Time Line 6 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 6 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0AA0
Access:	RW
Signed:	False

Termination Enable Line 6

The Termination Enable Line 6 value is used to enable the termination resistor on input line 6. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0AC0
Access:	RW

User Output Line 6

If line 6 is an output and the Line Source Line 6 value is set to "User", the User Output Line 6 register sets the state of line 6.

If line 6 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0AE0
Access:	RW

Min Out Pulse Width Line 6

If line 6 is an output, the Min Out Pulse Width Line 6 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 6 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0B00
Access:	RW
Signed:	False

Line Logic Line 6

The Line Logic Line 6 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0B20
Access:	RO
Size (bytes):	4

Sync User Output Line 6

If line 6 is an output and the Line Source Line 6 value is set to "Sync User Output", the Sync User Output Line 6 value sets the state of line 6 for the related sequence set.

If line 6 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0B40
Access:	RW

Line Mode Line 7

If line 7 is GPIO, the Line Mode Line 7 value determines whether line 7 will operate as an input or as an output.

If the line 7 functionality is fixed as an input or fixed as an output, the Line Mode Line 7 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0C00	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 7

The Line Inverter Line 7 value enables the invert function on line 7.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0C20
Access:	RW

Line Status Line 7

The Line Status Line 7 value indicates the current state of line 7.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0C40
Access:	RO
Size (Bytes):	4

Line Source Line 7

If line 7 is an output, the Line Source Line 7 value sets the source signal for the line.

If line 7 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0C60	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 7 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 7

If the electrical format for line 7 is settable, the Line Format Line 7 value sets the electrical format for line 7.

If the electrical format for line 7 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0C80	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 7

If line 7 is an input, the Input Debouncer Time Line 7 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 7 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0CA0
Access:	RW
Signed:	False

Termination Enable Line 7

The Termination Enable Line 7 value is used to enable the termination resistor on input line 7. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0CC0
Access:	RW

User Output Line 7

If line 7 is an output and the Line Source Line 7 value is set to "User", the User Output Line 7 register sets the state of line 7.

If line 7 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0CE0
Access:	RW

Min Out Pulse Width Line 7

If line 7 is an output, the Min Out Pulse Width Line 7 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera’s Time Base register (see page 61).

If line 7 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0D00
Access:	RW
Signed:	False

Line Logic Line 7

The Line Logic Line 7 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0D20
Access:	RO
Size (bytes):	4

Sync User Output Line 7

If line 7 is an output and the Line Source Line 7 value is set to "Sync User Output", the Sync User Output Line 7 value sets the state of line 7 for the related sequence set.

If line 7 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0D40
Access:	RW

Line Mode Line 8

If line 8 is GPIO, the Line Mode Line 8 value determines whether line 8 will operate as an input or as an output.

If the line 8 functionality is fixed as an input or fixed as an output, the Line Mode Line 8 value is read only and will indicate whether the line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0E00	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter Line 8

The Line Inverter Line 8 value enables the invert function on line 8.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0E20
Access:	RW

Line Status Line 8

The Line Status Line 8 value indicates the current state of line 8.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0E40
Access:	RO
Size (Bytes):	4

Line Source Line 8

If line 8 is an output, the Line Source Line 8 value sets the source signal for the line.

If line 8 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0E60	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 8 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format Line 8

If the electrical format for line 8 is settable, the Line Format Line 8 value sets the electrical format for line 8.

If the electrical format for line 8 is fixed, the register will be read only and will indicate the electrical format for the line.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C0E80	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time Line 8

If line 8 is an input, the Input Debouncer Time Line 8 value sets the debouncer time for the line in units specified by the camera's Time Base register (see page 61).

If line 8 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0EA0
Access:	RW
Signed:	False

Termination Enable Line 8

The Termination Enable Line 8 value is used to enable the termination resistor on input line 8. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0EC0
Access:	RW

User Output Line 8

If line 8 is an output and the Line Source Line 8 value is set to "User", the User Output Line 8 register sets the state of line 8.

If line 8 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0EE0
Access:	RW

Min Out Pulse Width Line 8

If line 8 is an output, the Min Out Pulse Width Line 8 value sets the minimum pulse width for the output signal assigned to the line in units specified by the camera's Time Base register (see page 61).

If line 8 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C0F00
Access:	RW
Signed:	False

Line Logic Line 8

The Line Logic Line 8 value indicates the logic type for the line.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C0F20
Access:	RO
Size (bytes):	4

Sync User Output Line 8

If line 8 is an output and the Line Source Line 8 value is set to "Sync User Output", the Sync User Output Line 8 value sets the state of line 8 for the related sequence set.

If line 8 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C0F40
Access:	RW

Line Mode CC1

If CC1 is GPIO, the Line Mode CC1 value determines whether CC1 will operate as an input or as an output.

If the CC1 functionality is fixed as an input or fixed as an output, the Line Mode CC1 value is read only and will indicate whether CC1 is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1000	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter CC1

The Line Inverter CC1 value enables the invert function on CC1.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1020
Access:	RW

Line Status CC1

The Line Status CC1 value indicates the current state of CC1.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1040
Access:	RO
Size (Bytes):	4

Line Source CC1

If CC1 is an output, the Line Source CC1 value sets the source signal for CC1.

If CC1 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1060	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 1 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format CC1

If the electrical format for CC1 is settable, the Line Format CC1 value sets the electrical format for CC1.

If the electrical format for CC1 is fixed, the register will be read only and will indicate the electrical format for CC1.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1080	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time CC1

If CC1 is an input, the Input Debouncer Time CC1 value sets the debouncer time for CC1 in units specified by the camera's Time Base register (see page 61).

If CC1 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C10A0
Access:	RW
Signed:	False

Termination Enable CC1

The Termination Enable CC1 value is used to enable the termination resistor on input CC1. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C10C0
Access:	RW

User Output CC1

If CC1 is an output and the Line Source CC1 value is set to "User", the User Output CC1 register sets the state of CC1.

If CC1 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C10E0
Access:	RW

Min Out Pulse Width CC1

If CC1 is an output, the Min Out Pulse Width CC1 value sets the minimum pulse width for the output signal assigned to CC1 in units specified by the camera's Time Base register (see page 61).

If CC1 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C1100
Access:	RW
Signed:	False

Line Logic CC1

The Line Logic CC1 value indicates the logic type for CC1.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1120
Access:	RO
Size (bytes):	4

Sync User Output CC1

If CC1 is an output and the Line Source CC1 value is set to "Sync User Output", the Sync User Output CC1 value sets the state of CC1 for the related sequence set.

If line CC1 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1140
Access:	RW

Line Mode CC2

If CC2 is GPIO, the Line Mode CC2 value determines whether CC2 will operate as an input or as an output.

If the CC2 functionality is fixed as an input or fixed as an output, the Line Mode CC2 value is read only and will indicate whether CC2 is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1200	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter CC2

The Line Inverter CC2 value enables the invert function on CC2.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1220
Access:	RW

Line Status CC2

The Line Status CC2 value indicates the current state of CC2.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1240
Access:	RO
Size (Bytes):	4

Line Source CC2

If CC2 is an output, the Line Source CC2 value sets the source signal for CC2.

If CC2 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1260	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait		17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 2 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format CC2

If the electrical format for CC2 is settable, the Line Format CC2 value sets the electrical format for CC2.

If the electrical format for CC2 is fixed, the register will be read only and will indicate the electrical format for CC2.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1280	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time CC2

If CC2 is an input, the Input Debouncer Time CC2 value sets the debouncer time for CC2 in units specified by the camera's Time Base register (see page 61).

If CC2 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C12A0
Access:	RW
Signed:	False

Termination Enable CC2

The Termination Enable CC2 value is used to enable the termination resistor on input CC2. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C12C0
Access:	RW

User Output CC2

If CC2 is an output and the Line Source CC2 value is set to "User", the User Output CC2 register sets the state of CC2.

If CC2 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C12E0
Access:	RW

Min Out Pulse Width CC2

If CC2 is an output, the Min Out Pulse Width CC2 value sets the minimum pulse width for the output signal assigned to CC2 in units specified by the camera's Time Base register (see page 61).

If CC2 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C1300
Access:	RW
Signed:	False

Line Logic CC2

The Line Logic CC2 value indicates the logic type for CC2.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1320
Access:	RO
Size (bytes):	4

Sync User Output CC2

If CC2 is an output and the Line Source CC2 value is set to "Sync User Output", the Sync User Output CC2 value sets the state of CC2 for the related sequence set.

If line CC2 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1340
Access:	RW

Line Mode CC3

If CC3 is GPIO, the Line Mode CC3 value determines whether CC3 will operate as an input or as an output.

If the CC3 functionality is fixed as an input or fixed as an output, the Line Mode CC3 value is read only and will indicate whether CC3 is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1400	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter CC3

The Line Inverter CC3 value enables the invert function on CC3.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1420
Access:	RW

Line Status CC3

The Line Status CC3 value indicates the current state of CC3.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1440
Access:	RO
Size (Bytes):	4

Line Source CC3

If CC3 is an output, the Line Source CC3 value sets the source signal for CC3.

If CC3 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1460	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 3 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format CC3

If the electrical format for CC3 is settable, the Line Format CC3 value sets the electrical format for CC3.

If the electrical format for CC3 is fixed, the register will be read only and will indicate the electrical format for CC3.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1480	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time CC3

If CC3 is an input, the Input Debouncer Time CC3 value sets the debouncer time for CC3 in units specified by the camera's Time Base register (see page 61).

If CC3 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C14A0
Access:	RW
Signed:	False

Termination Enable CC3

The Termination Enable CC3 value is used to enable the termination resistor on input CC3. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C14C0
Access:	RW

User Output CC3

If CC3 is an output and the Line Source CC3 value is set to "User", the User Output CC3 register sets the state of CC3.

If CC3 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C14E0
Access:	RW

Min Out Pulse Width CC3

If CC3 is an output, the Min Out Pulse Width CC3 value sets the minimum pulse width for the output signal assigned to CC3 in units specified by the camera's Time Base register (see page 61).

If CC3 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C1500
Access:	RW
Signed:	False

Line Logic CC3

The Line Logic CC3 value indicates the logic type for CC3.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1520
Access:	RO
Size (bytes):	4

Sync User Output CC3

If CC3 is an output and the Line Source CC3 value is set to "Sync User Output", the Sync User Output CC3 value sets the state of CC3 for the related sequence set.

If line CC3 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1540
Access:	RW

Line Mode CC4

If CC4 is GPIO, the Line Mode CC4 value determines whether CC4 will operate as an input or as an output.

If the CC4 functionality is fixed as an input or fixed as an output, the Line Mode CC4 value is read only and will indicate whether CC4 is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1600	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter CC4

The Line Inverter CC4 value enables the invert function on CC4.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1620
Access:	RW

Line Status CC4

The Line Status CC4 value indicates the current state of CC4.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1640
Access:	RO
Size (Bytes):	4

Line Source CC4

If CC4 is an output, the Line Source CC4 value sets the source signal for CC4.

If CC4 is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1660	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 4 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format CC4

If the electrical format for CC4 is settable, the Line Format CC4 value sets the electrical format for CC4.

If the electrical format for CC4 is fixed, the register will be read only and will indicate the electrical format for CC4.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1680	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time CC4

If CC4 is an input, the Input Debouncer Time CC4 value sets the debouncer time for CC4 in units specified by the camera's Time Base register (see page 61).

If CC4 is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C16A0
Access:	RW
Signed:	False

Termination Enable CC4

The Termination Enable CC4 value is used to enable the termination resistor on input CC4. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C16C0
Access:	RW

User Output CC4

If CC4 is an output and the Line Source CC4 value is set to "User", the User Output CC4 register sets the state of CC4.

If CC4 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C16E0
Access:	RW

Min Out Pulse Width CC4

If CC4 is an output, the Min Out Pulse Width CC4 value sets the minimum pulse width for the output signal assigned to CC4 in units specified by the camera’s Time Base register (see page 61).

If CC4 is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C1700
Access:	RW
Signed:	False

Line Logic CC4

The Line Logic CC4 value indicates the logic type for CC4.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1720
Access:	RO
Size (bytes):	4

Sync User Output CC4

If CC4 is an output and the Line Source CC4 value is set to "Sync User Output", the Sync User Output CC4 value sets the state of CC4 for the related sequence set.

If line CC4 is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1740
Access:	RW

Line Mode CL Spare

If CL Spare is GPIO, the Line Mode CL Spare value determines whether CL Spare will operate as an input or as an output.

If the CL Spare functionality is fixed as an input or fixed as an output, the Line Mode CL Spare value is read only and will indicate whether the CL Spare line is an input or an output.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1800	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
Input	The line will operate as an input	0
Output	The line will operate as an output.	1

Line Inverter CL Spare

The Line Inverter CL Spare value enables the invert function on CL Spare.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1820
Access:	RW

Line Status CL Spare

The Line Status CL Spare value indicates the current state of CL Spare.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1840
Access:	RO
Size (Bytes):	4

Line Source CL Spare

If CL Spare is an output, the Line Source CL Spare value sets the source signal for CL Spare.

If CL Spare is an input, this register setting has no effect.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1860	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
User	The state of the output is set by the user.	0
Frame Trigger Wait (called Trigger Ready on some models)	The source signal for the output is the camera's frame trigger wait (trigger ready) signal.	1
Exposure Active (called Integrate Enabled on some models)	The source signal for the output is the camera's exposure active (integrate enabled) signal.	2
Acquisition Trigger Wait	The source signal for the output is the camera's acquisition trigger wait (trigger ready) signal.	7
Frame Cycle	The source signal for the output is the camera's frame cycle signal.	8
Disable	The output is disabled.	16
Line Trigger Wait	The source signal for the output is the camera's line trigger wait (trigger ready) signal.	17
Timer (also known as Strobe)	The source signal for the output is the camera's timer 4 signal (also known as a strobe signal).	18
Shaft Encoder	The source signal for the output is the output of the shaft encoder module.	19
Frequency Converter	The source signal for the output is the output of the frequency converter module.	20
Flash Window	The source signal for the output is the flash widow signal.	25
Sync User Output	The state of the output is set by the user and is synchronous to sequence set advance.	26

Line Format CL Spare

If the electrical format for CL Spare is settable, the Line Format CL Spare value sets the electrical format for CL Spare.

If the electrical format for CL Spare is fixed, the register will be read only and will indicate the electrical format for CL Spare.

Register type:	Enumeration (see page 9 for the layout of an enumeration type register)	
Base address:	0x000C1880	
Access:	RW	
Size (Bytes):	4	
Enumeration values:		
Name	**Description**	**Value**
NoConnect	The line is not connected.	0
TriState	The line is in tri state mode.	1
TTL	The line will accept TTL level signals.	2
LVDS	The line will accept LVDS level signals.	3
RS422	The line will accept RS-422 level signals.	4
OptoCoupled	The line is opto-coupled.	5

Input Debouncer Time CL Spare

If CL Spare is an input, the Input Debouncer Time CL Spare value sets the debouncer time for CL Spare in units specified by the camera's Time Base register (see page 61).

If CL Spare is an output, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C18A0
Access:	RW
Signed:	False

Termination Enable CL Spare

The Termination Enable CL Spare value is used to enable the termination resistor on input CL Spare. The termination resistor must be used when LVDS level signals are used.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C18C0
Access:	RW

User Output CL Spare

If CL Spare is an output and the Line Source CL Spare value is set to "User", the User Output CL Spare value sets the state of CL Spare.

If CL Spare is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C18E0
Access:	RW

Min Out Pulse Width CL Spare

If CL Spare is an output, the Min Out Pulse Width CL Spare value sets the minimum pulse width for the output signal assigned to CL Spare in units specified by the camera’s Time Base register (see page 61).

If CL Spare is an input, this register has no effect.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C1900
Access:	RW
Signed:	False

Line Logic CL Spare

The Line Logic CL Spare value indicates the logic type for CL Spare.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C1920
Access:	RO
Size (bytes):	4

Sync User Output CL Spare

If CL Spare is an output and the Line Source CL Spare value is set to "Sync User Output", the Sync User Output CL Spare value sets the state of CL Spare for the related sequence set.

If CL Spare is an input, this register has no effect.

Register type:	Boolean (see page 4 for the layout of a boolean type register)
Base address:	0x000C1940
Access:	RW

Line Status All

The Line Status All value indicates the current state of all input and output lines on the camera.

Register type:	Info (see page 7 for the layout of an info type register)
Base address:	0x000C3000
Access:	RO
Size (bytes):	4

User Output Value All

The User Output Value All value sets the value (0 or 1) of all outputs currently configured as user settable.

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C3020
Access:	RW
Signed:	False

Sync User Output Value All

The Sync User Output Value All value sets the value (0 or 1) of all outputs currently configured as "Sync User Output".

Register type:	Scalar (see page 6 for the layout of a scalar type register)
Base address:	0x000C3040
Access:	RW
Signed:	False

5 Register Access Methods

5.1 Introduction

	When the camera is powered on or when a camera reset is performed, your PC may receive random characters on the serial interface. We recommend clearing the serial input buffers in your PC after a camera power on or reset.

The Basler Binary Protocol II

Binary read/write commands are issued to the camera via the RS-644 serial connection in the Camera Link interface between the frame grabber and the camera. A standard application programmer's interface (API) for asynchronous serial reading and writing via the RS-644 port on the frame grabber was defined in the Camera Link standard (version 1.1 or higher, Appendix B, API Functions). All Camera Link compatible frame grabbers provide a software library (.dll file) named clser***.dll where *** is specific to the frame grabber vendor. There are four functions exported by the clser DLL:

- clSerialInit - Initialize the serial communication for a specific board.
- clSerialRead - Read bytes from the camera.
- clSerialWrite - Write bytes to the camera.
- clSerialClose - Close the serial communication.

The Basler Binary Protocol II is a read/write command protocol that was originally developed for use with earlier Basler Camera Link cameras (e.g. the A400k, L400k, L800k, and the sprint). To execute the Binary Protocol II programming commands, you can call up the functions exported by the clser DLL. The advantage of the Basler Binary Protocol I is that you may already be very familiar with using this protocol.

Although the Basler Binary Protocol II can be used to work with the registers of newer Basler Camera Link cameras like the ace, aviator or racer cameras, the protocol can be quite complex to implement. The Basler Binary Protocol Library (BBPL) described in Section 5.2 was developed to simplify register access. We strongly recommend that you use the BBPL for the newer Basler Camera Link cameras.

5.2 The Basler Binary Protocol Library

The Basler Binary Protocol Library (BBPL) is an extension of the clALLSerial/clSerial API defined in Appendix B of the Camera Link Standard. The BBPL adds convenience functions to this API that allow you to more easily read from and write to the registers in Basler Camera Link cameras. In effect, the BBPL uses the Basler Binary Protocol II to access the camera registers, but hides the complexities of the protocol from the user.

Sample Code and Documentation

Sample code and supporting documentation showing how to use the BBPL can be obtained from the Downloads Software section of the Basler website:

www.baslerweb.com

	The BBPL was developed in conjunction with the newer Basler Camera Link cameras like the ace, aviator or racer cameras. When earlier Basler A400k, L400k, L800k, and sprint cameras were introduced, the BBPL did not exist. At that time, users were required to write their own software to implement the Binary Protocol II for accessing the registers in these earlier cameras. If you have already written this type of code, you can use it to access the registers in the newer Basler Camera Link cameras if desired.

Appendix A
Basler Binary Protocol II Details

5.3 Binary Read/Write Command Protocol

With the binary read/write command protocol, data is placed into a “frame” and sent to the camera. When the frame is received, it is checked for validity. If valid, the data is extracted from the frame and the command is executed.

This section describes the layout of a binary command frame. Figure 1 shows a graphical representation of the fields within a basic binary command frame. Figure 2 shows a graphical representation of the fields within a read command and response.

The text following the graphics describes each field of the command frame in detail.

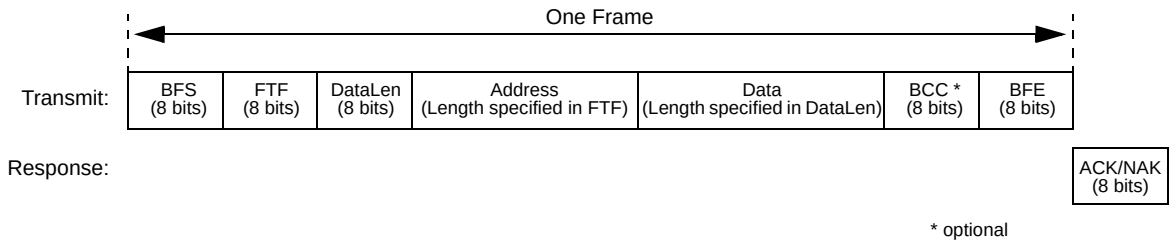


Fig. 1: Representation of a Basic Command Frame and Response

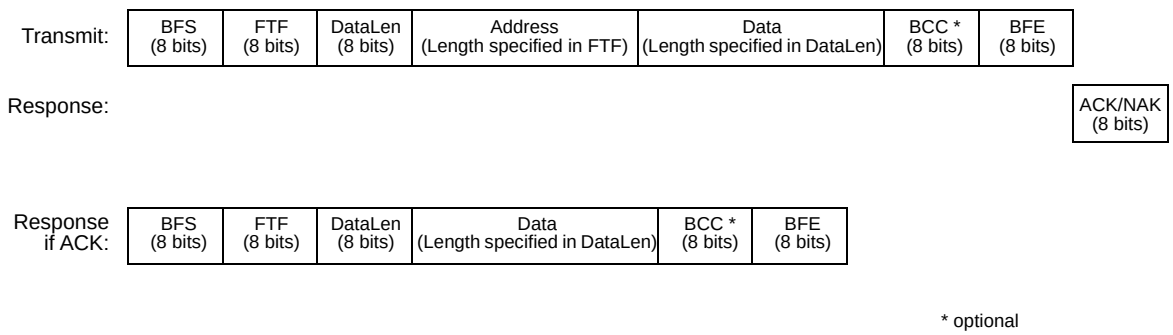


Fig. 2: Representation of the a Read Command Frame and Response

BFS Binary Frame Start field
Identifies the start of a binary frame.
Size = 1 byte
The value of the BFS byte is always 0x01.

FTF Frame Type and Format field
Identifies the frame type and format.
Size = 1 byte
The bits in the FTF field are assigned as follows:

7	6	5	4	3	2	1	0
OpCode					BCC-Code	AddrLen	

The MSB of the FTF field is on the left (highest bit of the OpCode) and the LSB of the field is on the right (lowest bit of the address length).

The value in the OpCode portion of the FTF field defines the function of the binary command, that is, whether it is a read command or a write command. The following OpCodes are available:

OpCode	Function
0b00000	This is a write command used to write a single setting to the camera.
0b00001	This is a read command used to read a single setting from the camera.
0b00010	This is a read response frame without an address field. (The AddrLen bits are "don’t care").

The BCC-Code portion of the FTF field indicates the presence of a Block Check Character (BCC). The use of a BCC is optional.

BCC-Code	Function
0b0	This frame (and also the response frame) contains no BCC field.
0b1	This frame (and also the response frame) contains a BCC field.

The AddrLen portion of the FTF field indicates the size of the register address to which the command is being sent.

AddrLen	Length of the Address Field
0b00	16 bits (= 2 bytes)
0b01	32 bits (= 4 bytes)
0b10	48 bits (= 6 bytes)
0b11	64 bits (= 8 bytes)

Example of an FTF field:

Assume that you are issuing a write command, that you are using a BCC and that the register address you are writing to is a 32 bit address. In this case, the OpCode bits would be 0b00000, the BCC-Code bit would be 0b1 and the AddrLen bits would be 0b01. This would result in a binary value of 0b00000101, which translates to a hex value of 0x05 for the FTF field.

DataLen Data Length field

For read commands, the DataLen field indicates the number of bytes to read from the given register address.

For write commands, the DataLen field indicates the number of bytes contained in the Data field.

Size = 1 byte

Range of possible settings: 0 to 255.

DataLen = 0 will result in an ACK, but no further command will be executed.

Address Address field

For read commands, indicates the register address for the read.

For write commands, indicates the register address for the write.

Size = Number of bytes indicated in the AddrLen portion of the FTF field

Data Data field

For read commands, this field contains no data.

For write commands, this field contains the data to be written to the register.

Size for read commands = 0 bytes.

Size for write commands = the number of bytes indicated in the DataLen field of the frame.

BCC Block Check Character field

The use of a block check character in read/write commands is optional.

If bit 2 of the FTF field is 0, the BCC is not used and the BCC field will contain no data.

If bit 2 of the FTF field is 1, the BCC field will contain the block check character.

Size = 0 bytes if bit 2 of the FTF field is 0
1 byte if bit 2 of the FTF field is 1

The block check character is the exclusive-or sum (XOR sum) of the bytes in the FTF, DataLen, Address, and Data fields (see page 182).

BFE Binary Frame End field
Identifies the end of a binary frame.
Size = 1 byte
The value of the BFE byte is always 0x03.

ACK/NAK Response Positive frame acknowledge/negative frame acknowledge
Size = 1 byte
The value for a positive frame acknowledgement (ACK) is 0x06 and for a negative frame acknowledgement (NAK) is 0x15.

All values are formatted as little endian (Intel format).

5.4 Error Checking and Responses

ACK/NAK

When the camera receives a frame, it checks to see if the order of the bytes in the frame is correct. If the FTF field indicates that the frame includes a BCC, the camera checks to see if the XOR sum of the relevant frame fields matches the block check character. The camera also checks to see if the number of bytes in the data field is equal to the number specified in the DataLen field.

If all checks are correct, an ACK is sent to the host. If any check is incorrect, a NAK is sent.

Byte Timeouts

The camera checks the time between the receipt of each byte in the frame. If the time between any two bytes exceeds 0.5 seconds, the camera enters a “garbage state” and discards any more incoming bytes. The camera remains in this state until it sees a new BFS.

Read Commands

In the normal case, when a read command is sent to the camera, the camera responds with an ACK and a returned frame. The returned frame will contain the data requested.

If the camera receives a read command with an unknown or invalid address in the Address field of the frame, it will respond with an ACK but will send no frame.

If the host sends a read command and gets no ACK/NAK, the host can assume that no camera is present or the camera is in a “garbage state” for some reason.

If the host sends a read command and gets an ACK/NAK but does not receive a frame within 500 ms, the host can assume that there was a problem with the read command.

Write Command

In the normal case, when a write command is sent to the camera the camera responds with an ACK.

If the camera receives a write command with an unknown or invalid address in the Address field of the frame, it will respond with an ACK but will not perform the write.

After a write command has been issued by the host, the host can verify the write by issuing a corresponding read command and checking that the returned data is as expected (unless the address is “write-only”).

	In many registers, only values within a specified range or a specified group of values is valid. If the data in a write command is not within the allowed range or specified group of allowed values, the camera **will not** execute the write command.

5.5 Basic Read/Write Command Explanations

Read Command

This section includes a text description of the hex digits included in a command message used to read the Value field of the Test Image Selector register (see page 37). The intent of this section is to give you a basic understanding of the elements included in a read command. Sample code that illustrates how to send a read command is available from Basler (page 175).

The hex digits included in the read command are:

```
0x01, 0x0D, 0x04, 0x64, 0x01, 0x03, 0x00, 0x6F, 0x03
```

`0x01` is the BFS field.

The value in the BFS field is always 0x01.

`0x0D` is the FTF field.

A hex value of 0x0D in the FTF field converts to a binary value of 0b00001101.

Bits 7 through 3 of the binary value indicate the OpCode. As shown in the OpCode table on page 176, an OpCode value of 0b00001 indicates that this is a read command frame.

Bit 2 indicates the presence or absence of a BCC in the frame. As shown in the OpCode table, when this bit is set to 0b1, it indicates that a BCC is present.

Bits 1 and 0 indicate the AddrLen. As shown in the OpCode table, a value of 0b01 for the AddrLen indicates that the address portion of this frame contains a 32 bit address. (As shown on page 37, the address for the Test Image Selector register is 32 bits.)

`0x04` is the DataLen field.

This field indicates the data size in bytes that will be transferred by using this read command. As shown on page 37, the Test Image Selector register is an enumeration type register. As shown on page 9, the data size for the Value field of an enumeration register is 4 bytes.

(Note that for read commands, the data size specified in the DataLen field represents the number of bytes of data that you expect to see in the response frame. No data bytes are actually included in the read command.)

`0x64, 0x01, 0x03, 0x00` is the Address field (in little endian).

This field indicates the register address from which the data bytes will be read.
As shown on page 37, the base address for the Test Image Selector register is 0x00030160 and the register is of the enumeration type. As shown on page 9, the Value field of an enumeration type register is offset from the base address by 4 bytes. This yields an address for the Value field of 0x00030164.
The little endian values in the address field translate to an address of 0x00030164.

`0x6F` is the BCC field.

See page 182 for instructions on calculating a BCC.

(Note that the use of a BCC is optional. In this example, we assume that a BCC is used.)

`0x03` is the BFE.

The value in the BFE field is always 0x03.

Write Command

This section includes a text description the hex digits included in a command message used to write a value of 0x00000001 to the Value field of the Test Image Selector register (see page 37). The intent of this section is to give you a basic understanding of the elements included in a write command.

The hex digits included in the write command are:

`0x01, 0x05, 0x04, 0x64, 0x01, 0x03, 0x00, 0x01, 0x00, 0x00, 0x00, 0x66, 0x03`

`0x01` is the BFS field.

The value in the BFS field is always 0x01.

`0x05` is the FTF field.

The hex value of 0x05 in the FTF field converts to a binary value of 0b00000101.

Bits 7 through 3 of the binary value indicate the OpCode. As shown in the OpCode table on page 176, an OpCode value of 0b00000 indicates that this is a write command frame.

Bit 2 indicates the presence or absence of a BCC in the frame. As shown in the OpCode table, when this bit is set to 0b1, it indicates that a BCC is present.

Bits 1 and 0 indicate the AddrLen. As shown in the OpCode table, a value of 0b01 for the AddrLen indicates that the address portion of this frame contains a 32 bit address. (All register addresses on this camera are 32 bits.)

`0x04` is the DataLen field.

This field indicates the data size in bytes that will be transferred by using this write command. As shown on page 37, the Test Image Selector register is an enumeration type of register. As shown on page 9, the data size for the Value field of an enumeration register is 4 bytes.

`0x64, 0x01, 0x03, 0x00` is the Address field (in little endian).

This field indicates the register address to which the data bytes will be written.
As shown on page 37, the base address for the Test Image register is 0x00030160 and the register is of the enumeration type. As shown on page 9, the Value field of an enumeration type register is offset from the base address by 4 bytes. This yields an address for the Value field of 0x00030164.
The little endian values in the address field translate to an address of 0x00030164.

`0x01, 0x00, 0x00, 0x00` is the Data field (in little endian).

This field contains the data that must be written to the register. We want to write a value of 0x00000001.

`0x66` is the BCC field.

See Section on page 182 for instructions on calculating a BCC.

(Note that the use of a BCC is optional. In this example, we assume that a BCC is used.)

`0x03` is the BFE field.

The value in the BFE field is always 0x03.

Calculating the Block Check Character

The use of a block check character (BCC) in camera commands is optional (see Section 5.3 on page 175). If you choose to use a BCC, the BCC will be the exclusive-or sum (XOR sum) of the bytes in the FTF field, the DataLen field, the Address field, and the Data field of the command frame. For the write command example shown in page 181, the block check character is 0x66.

Calculating XOR sums is most easily understood when numbers are shown in their binary form, so in the example calculations shown below, the hexadecimal digits in our command have been converted to binary.

To find the XOR sum of two binary numbers, you add the two digits in each column using the following rules:

If both digits are 0, the result is 0.

If both digits are 1, the result is 0.

If one of the digits is a 1 and the other is a 0, the result is 1.

With all of this in mind, here is how the check digit for the write command shown on the previous page would be calculated:

0 0 0 0 0 1 0 1 = the binary representation of 0x05 (FTF)

0 0 0 0 0 1 0 0 = the binary representation of 0x04 (DataLen)

0 0 0 0 0 0 0 1 = XOR sum

0 0 0 0 0 0 0 1 = Previous XOR Sum

0 1 1 0 0 1 0 0 = the binary representation of 0x64 (Address Byte 1)

0 1 1 0 0 1 0 1 = New XOR sum

0 1 1 0 0 1 0 1 = Previous XOR sum

0 0 0 0 0 0 0 1 = the binary representation of 0x01 (Address Byte 2)

0 1 1 0 0 1 0 0 = New XOR sum

0 1 1 0 0 1 0 0 = Previous XOR sum

0 0 0 0 0 0 1 1 = the binary representation of 0x03 (Address Byte 3)

0 1 1 0 0 1 1 1 = New XOR sum

0 1 1 0 0 1 1 1 = Previous XOR sum

0 0 0 0 0 0 0 0 = the binary representation of 0x00 (Address Byte 4)

0 1 1 0 0 1 1 1 = New XOR sum

0 1 1 0 0 1 1 1 = Previous XOR Sum

0 0 0 0 0 0 0 1 = the binary representation of 0x01 (Data Byte 1)

0 1 1 0 0 1 1 0 = New XOR sum

0 1 1 0 0 1 1 0 = Previous XOR Sum

0 0 0 0 0 0 0 0 = the binary representation of 0x00 (Data Byte 2)

0 1 1 0 0 1 1 0 = New XOR sum

0 1 1 0 0 1 1 0 = Previous XOR Sum

0 0 0 0 0 0 0 0 = the binary representation of 0x00 (Data Byte 3)

0 1 1 0 0 1 1 0 = New XOR sum

0 1 1 0 0 1 1 0 = Previous XOR Sum

0 0 0 0 0 0 0 0 = the binary representation of 0x00 (Data Byte 4)

0 1 1 0 0 1 1 0 = Final XOR sum

0 1 1 0 0 1 1 0 = 0x66 = the block check character

Revision History

Doc. ID Number	Date	Changes
AW00099701000	6 Jun 2011	Initial release of this document. Ace related content applies to prototype camera only.
AW00099702000	5 Feb 2014	Updated register descriptions in Section 4.
AW00099703000	17 Apr 2015	Minor modifications throughout the manual. Added information for Basler beat Camera Link cameras throughout the manual.
AW00099704000	20 Nov 2018	Updated register descriptions in Section 4.14.

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