VIDEOLOGY

IMAGING SOLUTIONS INC.
Original Equipment Manufacturer

Application Note
20B45X Series

20B45 series   20B45M series

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For technical assistance with this product, please contact the supplier from whom the product was purchased.

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1. Document History

Revision	Issue Date	Reason	CN#
Rev A	09-19-07	Initial release (Videology Europe rev 2.0 3/1/2011), added Camera Controls (Videology Europe rev 1.0 2/8/2010)	11-0025

2. Description

This is a description to set or change some of the settings inside the camera module.
The settings which can be changed are:

- Mirror, this is a horizontal flip of the image
- Flip, this is a vertical flip of the image
- Auto exposure saturation point
- Shutter speed
- AWB auto and freeze mode
- Enable/disable overlay

3. Setting The Functions

To set these functions and store them in the camera we strongly recommend to use the software tool "**2XB45 camera control**" **SFT-11004**. This is available via Videology website. The advantage is that settings can be stored easier inside the camera when you use this tool, without the risk of damaging the camera.

However in case you need to switch dynamically in your application certain modes, you have to address the camera via I2C.

The communication protocol has a device address, two register addresses and two data bytes.
See figure 1.

Write action

S	Device addrW	A	reg byte 1	A	Reg byte 2	A	Data byte1	A	Data byte2	A	P

Read action

S	Device addrR	A	reg byte 1	A	Reg byte 2	A	Data byte1	A	Data byte2	nA	P

A= acknowledge
nA=Not acknowledge
S= Start condition
P=Stop condition

Figure 1.

Clock speed should not go above **100KHz**!.
The **device address** for writing is 0xBA and for reading is 0xBB.

4. Camera Modes

In the tables below you find per command the required actions to change the camera mode:

Mirror mode:
1. Read register 0x3254 2. Read register 0x301c (mirror status = bit[0] (0=normal, 1=mirror) 3. If mode needs to be changed   a. Set register 0x301c bit[0] accordingly. All other bits should NOT be changed. Set register 0x3254 bit[0]. Incase of mirror b[0]=1, in normal mode b[0]=0. All other bits should NOT be changed.

Flip mode:
1. Read register 0x3254. 2. Read register 0x301c (flip status = bit[1] (0=normal, 1=flip) 3. If mode needs to be changed: a. Set register 0x301c bit[1] accordingly. All other bits should not be changed. Set register 0x3254. In case of flip b[1] = 1, in normal mode b[1] = 0;

Auto exposure saturation point
1. Read register 0xa804 to check if the camera is in AEX mode. Value 0x000f is AEX mode, 0x0000 is manual exposure mode. 2. If mode is not correct load register 0xa804 with 0x000f. 3. Read current saturation point from register 0xa812 Load register 0xa812 with the new saturation level data

Shutter speed
1. Read register 0xa804 to check if the camera is in manual mode. Value 0x000f is AEX mode, 0x0000 is manual exposure mode. 2. If mode is not manual load register 0xa804 with 0x0000. 3. Read current shutter value from register 0x3012. Load register 0x3012 with the new shutter value

Auto white balance mode
1. Read the current white balance mode status from register 0xac04 (if value is 0x00ff than it is Auto white balance mode). If mode is not correct load register 0xac04 with value 0x00ff.

Freeze mode:
To use this mode the camera must be first put in the freeze mode. The camera first needs to run in AWB mode. It will look for the most optimal white balance setting. When this is reached the AWB must be hold, and preferable the R/B gains must be stored and used when the camera is powered up again.
Put the camera in the freeze mode: 1. Make sure camera is in AWB mode by reading register 0xac04. Value 0x00ff means AWB mode. If the camera is not in the correct mode see table Auto White balance Mode. 2. If the AWB reached it's most optimal position stop the AWB function by loading register 0xac04 with value 0x0000. 3. Wait 10 mSec. 4. Read the following registers: 0xac02, 0xac04, 0xac0a, 0xac0c, 0xac0e, 0xac10, 0xac12, 0xac14, 0xac16, 0xac18, 0xac10, 0xac1a, 0xac1c, 0xac1e, 0xac32, 0xac36, 0xac38, 0xac3a, 0xac3c, 0xac3e, 0xac40, 0xac42, 0xac44, 0xac46, 0xac48, 0xac4a, 0xac4c and 0xac4e. wait 5 mS between each read command. These values must be stored so that the can be loaded when the camera is powered up.

Enable or disable overlay

In the camera 4 overlay images can be stored. Depending on the situation overlay's can be enabled or disabled. Note that these overlay images must be loaded by Videology. Please contact us for more information.

Global enabling of the overlay's: The camera can have up to 4 images loaded. By disabling the global overlay functions all active overlays will be stopped in one command.
1. Read current status global overlay by reading register 0x4f02. If the MSbit (b[15] is set the global overlay is active. This does not mean that the overlays are visible. Also the individual overlay must be active to make the visible.
Enable the global overlay by loading register 0x4f02 with value 0x8000, or disable global overlay by loading register 0x4f02 with 0x0000.

Enabling individual overlays:
As mentioned above the camera can be loaded with maximum 4 overlay images. This can all be enabled or disabled individually.
1. Each overlay has its own overlay enable address. Overlay1 = 0x4f08, overlay2 = 0x4f0a, overlay3 = 0x4f0c and overlay4 = 0x4f0e. To read the status per overlay read the corresponding address. The MSbit (b[15]) indicates the status. 1 overlay is enabled, 0 overlay is disabled.
2. Set each overlay as required by setting in each register b[15] to the desired enable or disable mode.
3. The lowest two bits indicates which overlay should be loaded. We advise to use the following values for the lowest two bits per register:
   - in reg 0x4f08→b[1,0] = 00
   - in reg 0x4f0a→b[1,0] = 01
   - in reg 0x4f0c→b[1,0] = 10
in reg 0x4f0e→b[1,0] = 3

If settings need to be stored:
You can use the camera's EEprom to store your settings. Please be careful when you do this. The camera has an 8K EEprom on board, which is 4 pages. The last page is meant to store certain settings. But this page may contain settings already stored from the factory! You should not overwrite the factory settings, since this may influence the start up and final behavior of the camera!

To find out if settings are loaded , read from the EEProm. Settings are stored in groups of 4 bytes (two register address bytes and two data bytes). Keep reading until you find a group of 4 bytes with all 0xff. Here you should start storing your values. **Do not leave unused spaces**!!!
In figure two you find a graphical example:

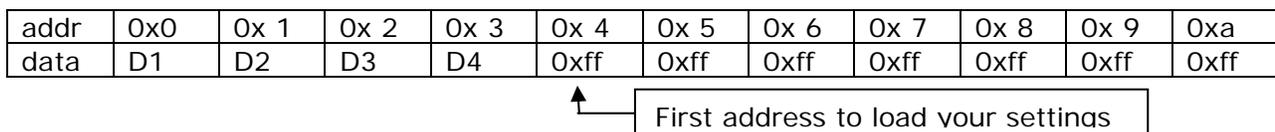| addr	0x0	0x 1	0x 2	0x 3	0x 4	0x 5	0x 6	0x 7	0x 8	0x 9	0xa
data	D1	D2	D3	D4	0xff	0xff	0xff	0xff	0xff	0xff	0xff

First address to load your settings

Figure 2.

Note that you always should store 4 bytes in the following order: Reg Addr MSB, Reg.Addr LSB, Data MSB and Data LSB. So in the case of figure two the MSB of the register address must be stored in register 0x04.

Please be very careful when you store settings. We recommend using Videology's **2XB45 camera control software (SFT-11004)**.

Please note: Videology will not give any warranty in case settings are stored incorrectly, or settings are overwritten!

The Eeprom has a different I2C format. The register addresses and data addresses are only one byte. The device address for the EEProm page 4 is 0xa6 (write) and 0xa7 (read).

5. Camera Control for 20/21B45 camera

Videology's new 20/21B45 camera is equipped with a I^{2}C interface which several functions can be controlled. To set these features you will need to use the software: **SFT-11004**.

5.1. Installation

The software package contains two files: 2xB44Cntrl.exe and inpout32.dll. Not installation required, only make sure that both files are in the same folder before the program is started.

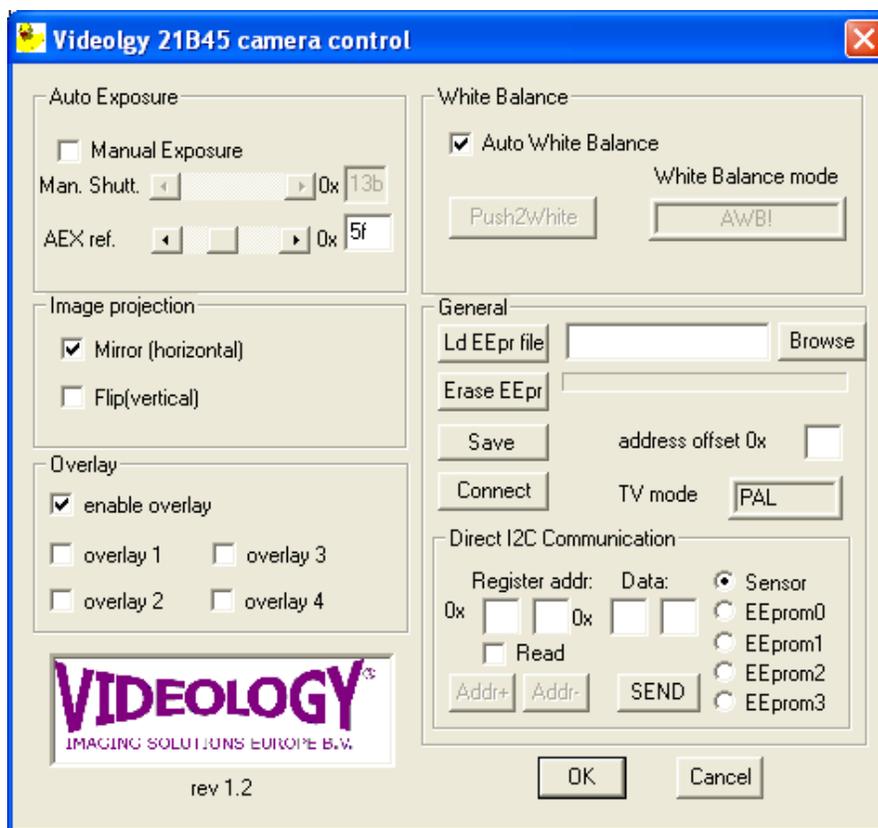### 5.2. Run the Software

Steps for running the software:
1. Connect camera to monitor
2. Connect power (either 3.3 or 5V) to the camera
3. Connect the 25pin cable to the printer port of the computer
4. Connect other end of 25 pin cable to I2C programming board
5. Connect 7 pin connector into the I2C programming board

To start the program click on the icon (shown here below).

2xB445contrl_SFT-11004 - Rev_1_5

After you double clicked the icon the following window will open:

If the software started well and the camera is connected correctly, the window will show the actual settings that are stored in the camera.

5.3. Connect

In case the camera was not connected yet when the software was started, or a communication error occurred you can re-connect to the camera by pushing the connect button.


The tool will load the configuration from the camera and will set the buttons and check boxes accordingly.

5.4. Overlay Functions

The camera can be loaded with maximal 4 different overlay graphics. Please note that they must be loaded inside the camera during the production process. For more details please contact your Videology customer service representative.

To control the overlay graphics you can click one of the check boxes:
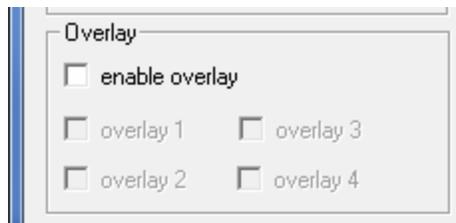
The check box for "enable overlay" is the global enable. If this is unchecked, none of the overlays will be visible. If the global overlay is checked you can select via the other 4 which overlay you want to be visible (if they are loaded).

5.5. Auto Exposure Settings (AEX)

The camera offers two types of exposure: they are auto exposure and manual exposure. The camera will run in Auto exposure mode if the check box "Manual Exposure" is not checked. In this case the user can set the working point of the camera. Either by changing the scroll-bar AEX ref or editing the edit box at the right hand side of the scroll-bar. Nominal value for this setting is 0x48.

In the case manual Exposure is checked, the auto exposure routine is stopped and the camera will stay with the gain at its current position. The rolling shutter exposure time can be controlled with the scroll-bar "Man.Shutt" (Manual shutter). This can also be done with the edit box at the right hand side of the scroll-bar.
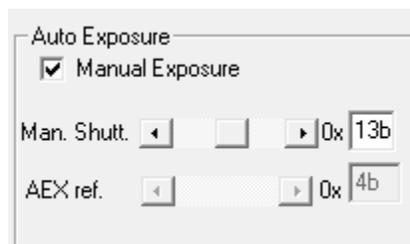
5.6.   Mirror and Flip

To exchange the orientation of the camera in horizontal direction check the "Mirror" check box. For vertical use the "Flip" check box.

Image projection
- ☐ Mirror (horizontal)
- ☐ Flip(vertical)
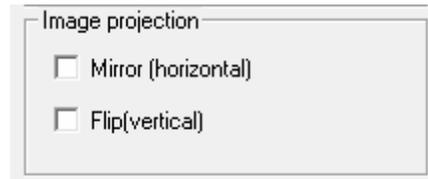
5.7.   White Balance

The default mode for the camera is the auto white balance mode. However, if the camera is always used under one fixed specific type of light you can un-check the (Auto White Balance) box.

In the box for white balance mode you see that this changes from AWB! To Push2White running. This means that the auto mode is still running till you push the "Push2White" button. At that moment the auto mode will stop and the current reached settings will be hold inside the sensor (note they are not stored yet!). The text in the window will change to "P2W = set".

If you are not satisfied with the current settings press the "Push2White" button again, the system will start running again.

White Balance
- ☐ Auto White Balance   Push2White
- White Balance mode   P2W = set
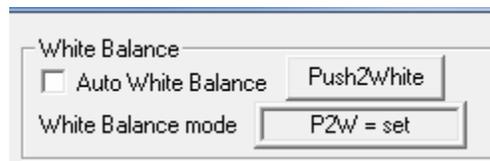
5.8.   General Communication

In this block you can load if required an EEPROM file. Only use a file that you received from Videology. Loading another file can cause that you camera will not work anymore!

The "erase Eepr" button will erase all special settings of the camera. If you do not want to erase all, you can set an offset address.

The TV mode box indicates if your camera is PAL or NTSC.

With the "Save" button you can save all settings you made via this tool (outside the General area!) in the EEPROM of the camera. Please note at the moment you press Save, previous setting will be erased and overwritten.

Via the Direct I2C communication area you can send direct I2C commands to the camera. This tool lets you set registers, read registers and modify the EEPROM. You should only use this part if you are very familiar with the sensor and the camera.

Writing wrong data to the EEPROM can cause the camera not to work anymore! Therefore we strongly recommend not the use this part of the tool.
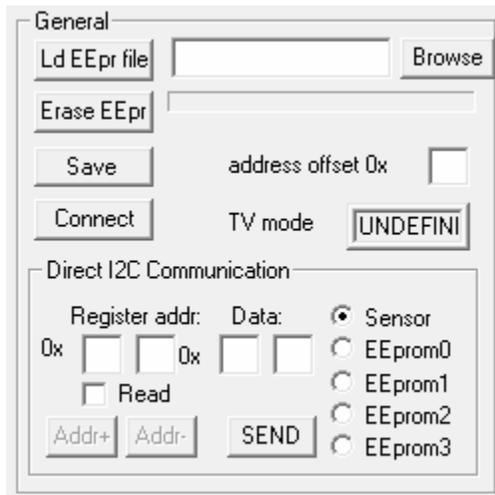
5.9.   I2C Addresses

If you want to develop you own software to control the camera you need to know the following details:

Communication to the sensor: I2C write address = 0xBA, read address = 0xBB.

The register addresses are 16 bits (2 bytes- 2 x 8 bits). Also data is 16 bits.

The EEPROM uses max 8Kbites. These 8K are divided over 4 pages of each 256 bytes.

The register addresses of the eeprom are 8 bites (one byte). This is also the case of for the data. However page write and read can be done on the eeprom.

The addresses are:
        page 0 : write 0xa0 read 0xa1
        page 1 : write 0xa2 read 0xa3
        page 2 : write 0xa4 read 0xa5
        page 3 : write 0xa6 read 0xa7

6. Contact Information

For technical assistance with this product, please contact the supplier from whom the product was purchased.

For OEM inquiries, contact Videology Imaging Solutions:

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