



Technical Details

Industrial Cameras: GigE Camera Start Up



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Prerequisites

1

- Computer with GigE (1000 MBit/s) networking card
- Power supply via power over Ethernet (PoE) switch, PoE injector or 12V power supply from TIS
- The PoE switch and PoE injector must comply with IEEE 802.3af standards A and B [1000 (1 Gigabit) DC & Bi-Data (mode A and B)] and provide a voltage of 37-57VDC.
- As an alternative to power over Ethernet, a power supply from The Imaging Source can be used.
- Cat 6 network cable up to 100m length.



Connecting

2

If the camera is operated via an external 12V power supply, the camera can be connected directly to the computer's network card or switch.
If the camera is operated via PoE, the camera is connected to the PoE device which is then connected to the computer or a switch.
The camera is properly connected and supplied with power when the LED on the camera's network connector remains green and the yellow LED blinks.



3

The camera software can be downloaded from our website <https://www.theimagingsource.com/>. Drivers and programs are available in the "Support" menu under "Software for Windows."

IC Capture and IC Measure are useful for becoming acquainted with the camera.

If the camera is operated with IC Capture, IC Measure, IC Imaging Control or other DirectShow-compatible software, the The Imaging Source GigE driver "Device Driver for Gige Cameras" must be downloaded and installed. The GigE driver installs the "GigECam IP Config" program. It lists all cameras in the network and is used for configuring the cameras and for firmware updates.

The "GigECam IP Config" program is called up in the Windows Notification Area (Figure 1 below):

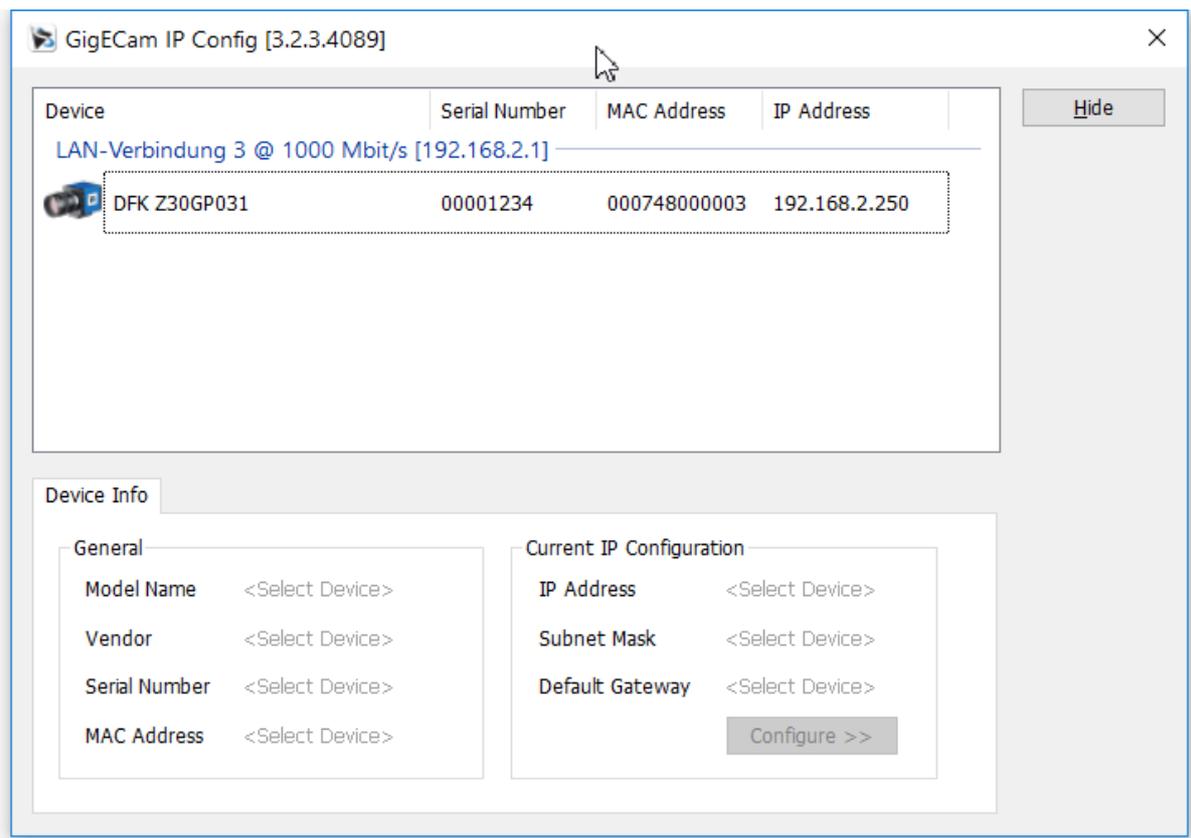


Figure 1: Windows Notification Area

Alternatively, the program can also be found in Windows 10 in the Start menu under "The Imaging Source Europe GmbH."



Assuming correct camera configuration, IC Capture and IC Measure will display it in the camera selection dialog (Figure 2).

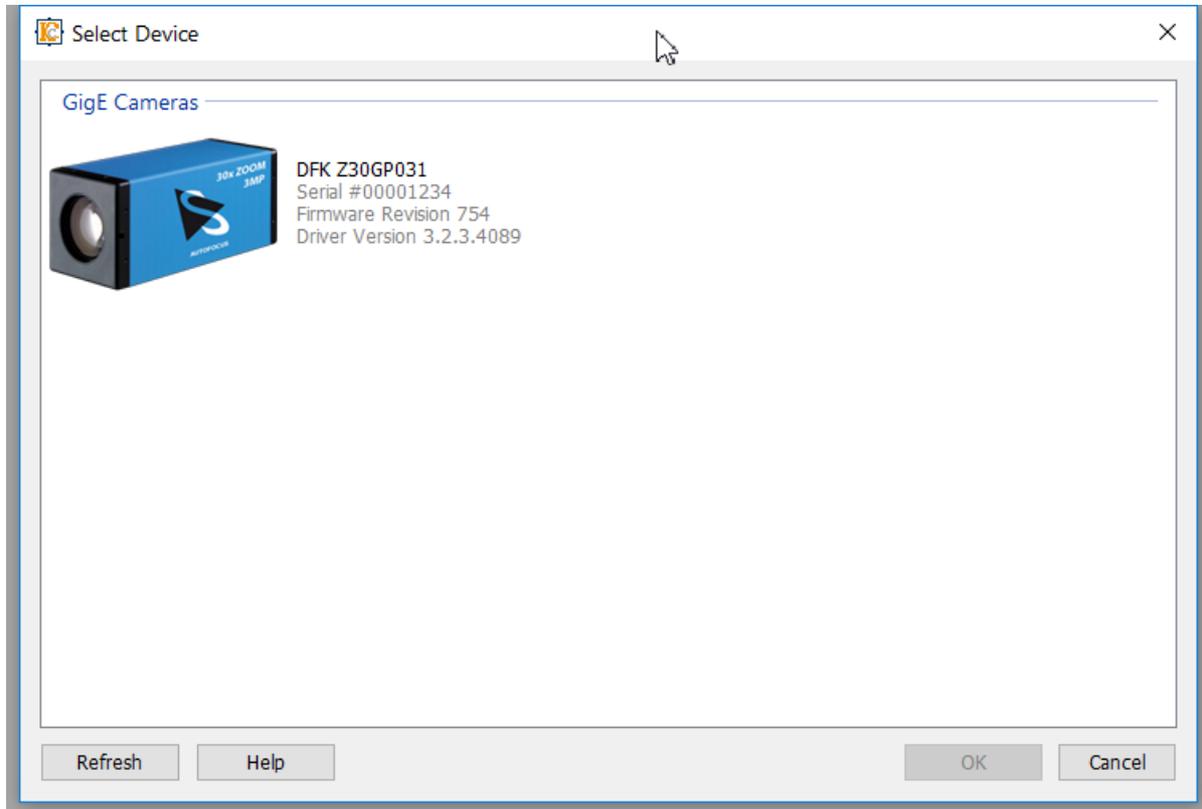


Figure 2: Camera Selection Dialogue

When using GigE-Vision compatible software such as MVTec HALCON, National Instruments LabVIEW with IMAQ, it is not necessary to install software from The Imaging Source. For the configuration of IP addresses and firmware updates, however, our GigE driver and the "GigECam IP Config" program is required.



The GigE-Vision protocol offers three options for setting camera IP addresses:

1. The camera has a defined IP address, subnet mask and gateway.*
2. Configuration via a DHCP server*
At startup, the camera searches for a DHCP server that manages the IP addresses on the local network. If a server is found, the camera uses the assigned IP address.
3. Link-local address
The camera automatically selects a randomly selected address from the address range 169.254.0.0/16.

*(1) and (2) are optional: upon delivery (1) is deactivated and (2) activated.

The three configuration methods are tried one after the other until a valid IP configuration is found.



4.1 Examples

1. Defined IP configuration

This configuration is recommended when using cameras with multiple network cards.

Network adapter 1:

IP address 192.168.1.1 subnet mask 255.255.255.0

camera 1 to adapter 1:

IP address 192.168.1.2 subnet mask 255.255.255.0

camera 2 to adapter 1:

IP address 192.168.1.3 subnet mask 255.255.255.0

Network adapter 2:

IP address 192.168.2.1 subnet mask 255.255.255.0

camera 1 to adapter 2:

IP address 192.168.2.2 subnet mask 255.255.255.0

Network adapter 3:

IP address 192.168.3.1 subnet mask 255.255.255.0

camera 1 to adapter 3:

IP address 192.168.3.2 subnet mask 255.255.255.0

2. Configuration with DHCP-Server:

Network adapter:

IP address 192.168.0.a subnet mask 255.255.255.0

Camera:

IP address 192.168.0.b subnet mask 255.255.255.0

3. Link-local address

This is the simplest configuration when using a single network card exclusively for the cameras.

Important: Only one network card may be operated with link-local configuration.

Network adapter:

IP address 169.254.a.b subnet mask 255.255.0.0

camera:

IP address 169.254.c.d subnet mask 255.255.0.0



IP Configuration

4.2 Configuring IP Addresses: Windows

In the "GigEcam IP Config" program, click on the camera to be configured (Figure 3).

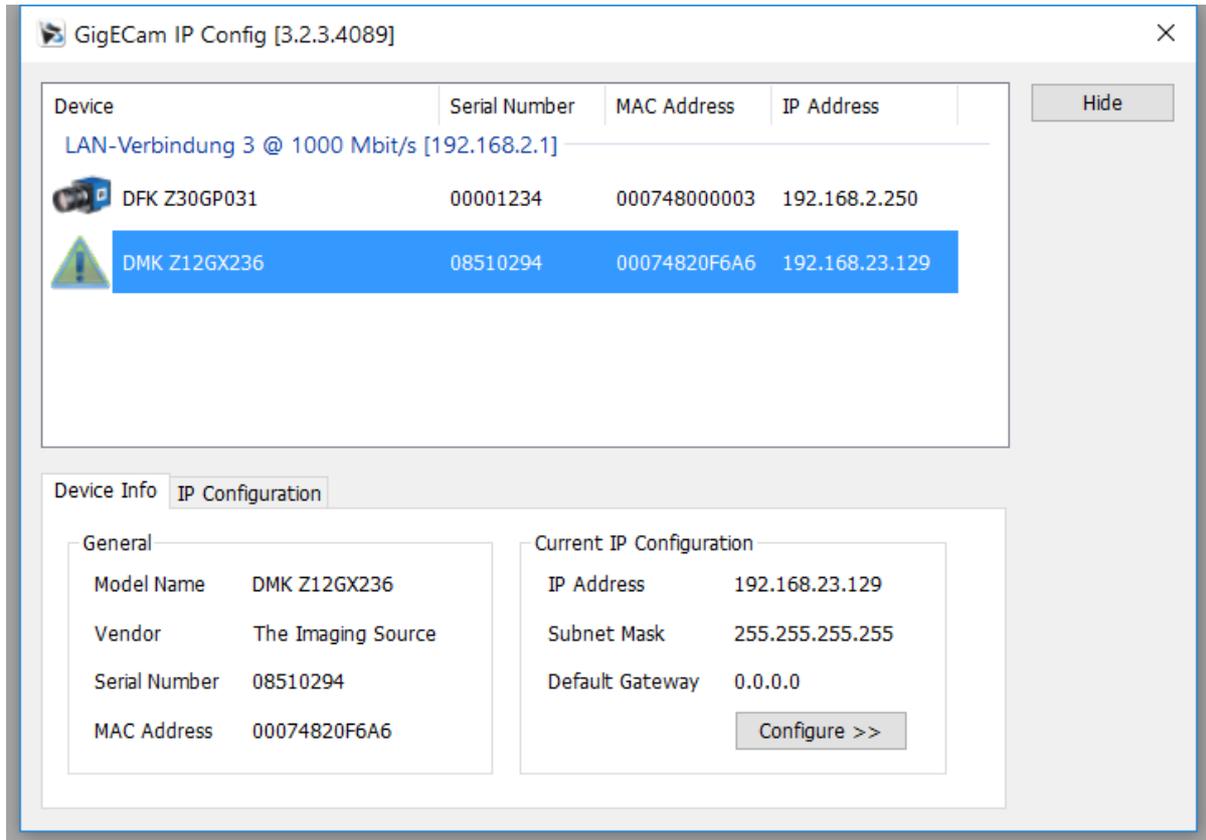


Figure 3: "GigEcam IP Config" dialog box

If the camera has an unsuitable IP address, this is indicated by a warning signal (Figure 4).



IP Configuration

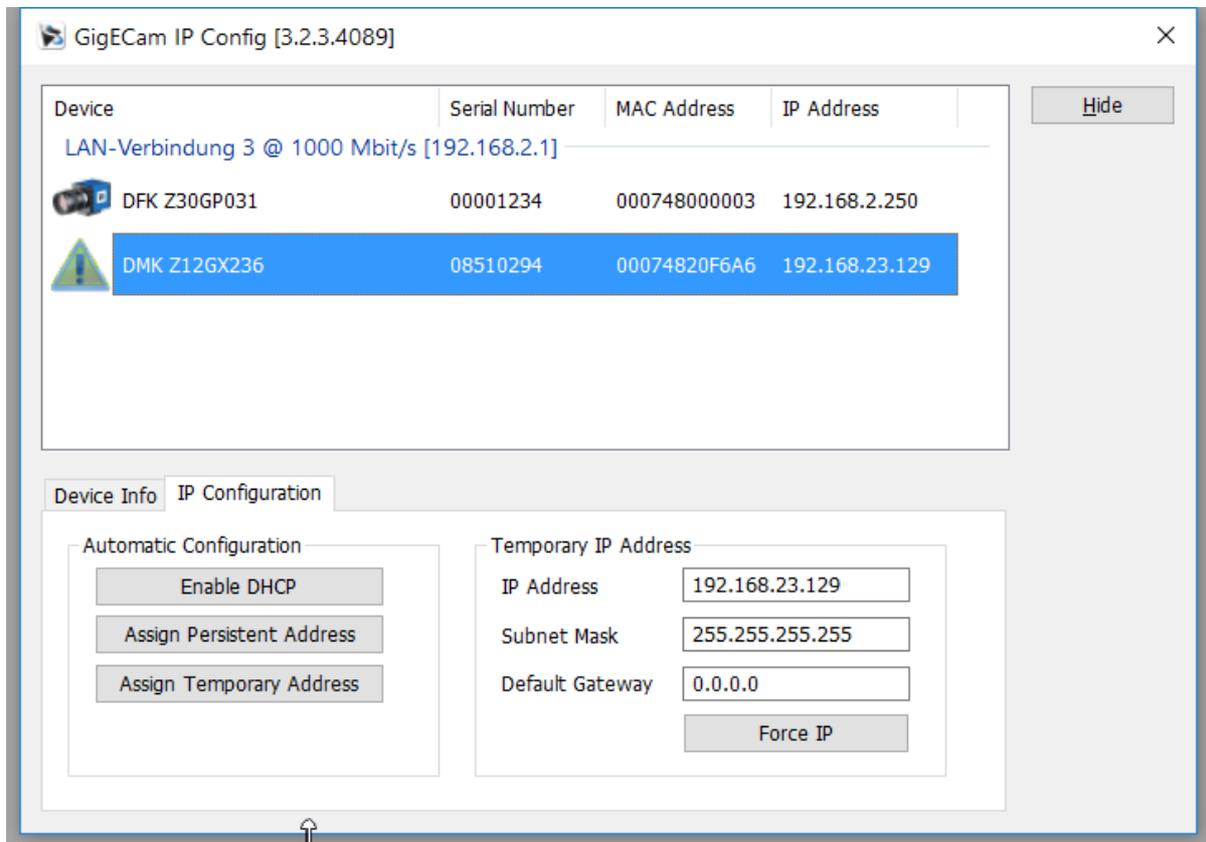


Figure 4: "GigEcam IP Config" warning message

After selecting the camera, click on the "IP Configuration" tab at the bottom of the screen.

Buttons:

- **Enable DHCP**
The camera is set to DHCP and requests a new IP address from an available DHCP server. If there is no DHCP server on the network, the camera autoconfigures a link local IP address.
- **Assign Persistent Address**
The camera is given a valid IP address not currently assigned in the network. This address is permanently stored in the camera and is used even after restarting the camera.
- **Assigning a Temporary Address**
The camera is given a valid IP address not currently assigned in the network. This address is deleted after restarting the camera.



IP Configuration

- Force IP
The IP address, subnet mask and default gateway entered in the input fields are temporarily written to the camera; they are valid until the next camera restart.



4.3 Configuring IP Addresses: Linux

The Linux software for our cameras is based on the Gnome Aravis library and Gstreamer. The current sources can be downloaded from <https://github.com/TheImagingSource/tiscamera>. Please read "Readme" which explains in detail how to compile the sources and install the binaries.

The included tool "tcam-gigetool" shows the connected cameras:

```
$ tcam-gigetool list
```

```
----- Interface: enp2s0 [192.168.0.153] -----
```

Model Name	Serial Number	User Defined Name	Current IP
GigECam	4031A002	12x Zoom Color	192.168.0.195
DFK 33GX174e	42619961		192.168.0.197

```
----- Interface: enp7s1 [192.168.2.4] -----
```

Model Name	Serial Number	User Defined Name	Current IP
DFK Z30GP031	00001234		192.168.2.250

This tool can be used to set the IP addresses of the cameras.

If a camera is in an unsuitable network and is not listed, the rpfilter must be turned off:

```
sudo sysctl -w net.ipv4.conf.enp2s0.rpfilters=0
sudo sysctl -w net.ipv4.conf.enp7s1.rpfilters=0
```



Jumbo Frames

5

In order to enhance performance of network adapters, we recommend the activation of jumbo frames. Doing so increases the size of the network packets used for data transmission. Fewer packets are then transmitted, resulting in a lower computational load on the receiving computer.

5.1 Windows

The network card is displayed in the Windows Device Manager (Figure 5).



Jumbo Frames

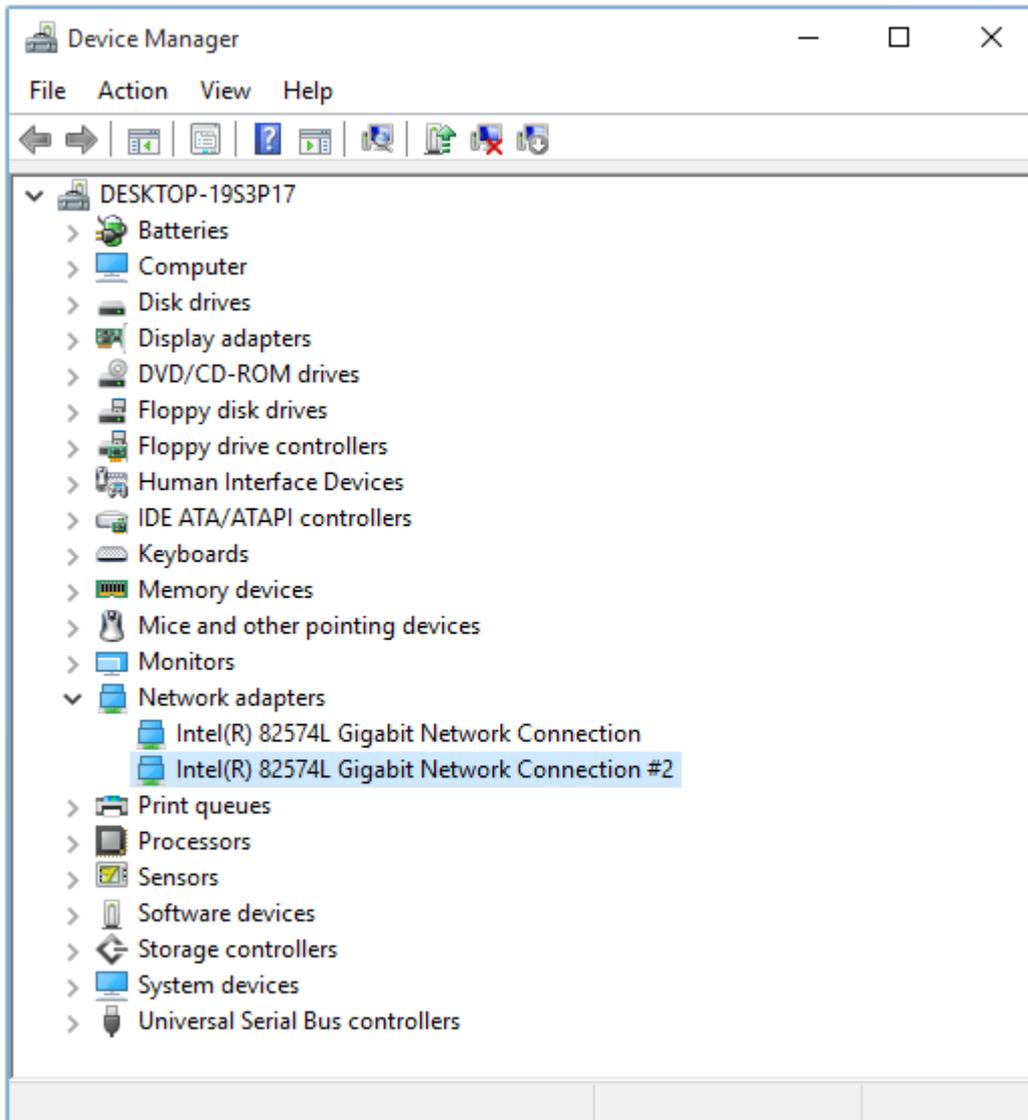


Figure 5: Network card displayed in Windows Device Manager.

Right clicking on the network card displays a context menu - click on "Properties." In the properties dialog, look for "Jumbo Frames." Most of the time, you will find "Jumbo Frames" under "Advanced" (Figure 6):



Jumbo Frames

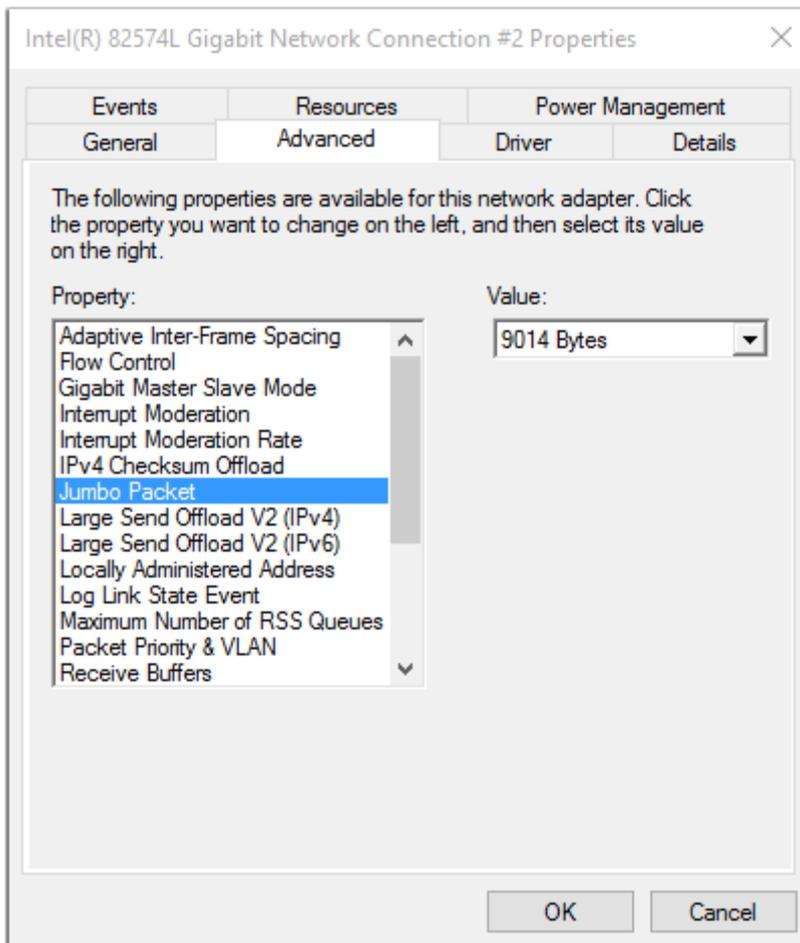


Figure 6: Properties dialog box displaying “advanced” settings.

The display depends on the network card driver: 9014 bytes is sufficient. Smaller package sizes can also be used. Click "OK" to activate jumbo frames.



Jumbo Frames

5.2 Linux

For Linux, it is also recommended to activate jumbo frames on the network card. To do this, determine the network controller to which the camera is connected. In the example above, cameras are connected to "enp2s0" and "enp7s1."

Jumbo frames are set in Linux with the program "ip" and the "mtu" parameter.

```
ip link set enp2s0 mtu 9000  
ip link set enp7s1 mtu 9000
```

This is, however, only a temporary solution. With the next system startup, the default size returns again. This can be permanently configured in the file `/etc/network/interfaces`; in Ubuntu this can be done via the network settings in the GUI.



6

If the camera is not recognized, does not deliver images or has another problem, please check the following:

6.1 Status LEDs do not indicate operation readiness

Verify camera power and connection: If all LEDs on the camera are off then the camera has no power. Please use an external power supply or PoE.

Green LED is off and the yellow LED flashes. If the camera is connected to a 10 Mbit or 100 Mbit network, it will cease to function. Please make sure that all devices between the camera and the PC, as well as the PC network card support GigE (1000mBit/s) speed.

The camera is displayed in the GigECamera Config tool, but not in other programs such as IC Capture or IC Measure. If you click on the camera in the GigECamera IP Config program, a warning symbol appears in front of the camera. This happens when there is an IP address conflict.

If the camera has an invalid IP address, in most cases it can still be found by the tools. In the first step, you assign a temporary IP address to the camera to reboot it. Afterwards, the camera can be configured to DHCP or a new valid IP can be assigned.

6.2 Camera not displayed in IP Config tool

If the camera is not displayed in the system but appears to be configured correctly:

Please turn off all firewalls and check if the camera appears.

If a "Security Software" is installed, deactivate it. Some of these programs block the camera.

6.3 Camera does not return images after opening

If several cameras are connected to a network controller, the frame rate must be reduced.



If several cameras are connected to a managed switch, please activate FlowControl and switch off power-saving devices as necessary.

CPU loads above 85% can prevent image delivery. Please check which device is creating the problem and reduce the CPU load.

"Security software" which scans all network packets can dramatically reduce performance causing all camera images to be discarded because delivery takes too long.

Kaspersky Endpoint Security 10 blocks access to live video. In order for IC Capture or any other program to be able to view the live video, it must have the rights to do so in the Endpoint Security 10 settings.

6.4 Camera cannot be configured using the IP Config tool (address conflict)

Two devices in the network have the same IP address. In this case, no operating system can decide which device to exchange data with.

It is worse if a switch and a camera have the same IP address.

There are two options for this case:

1. If possible, remove the device whose IP address is not to be changed from the network and then assign a valid IP address to the other camera as described above. The first device can then be reconnected.
2. If it is not possible to remove the devices from the network, e. g. during remote access, the camera can be assigned an address using the MAC address.

6.4.1 Windows

Open a command line (cmd). With

```
cd "\\Program Files (x86)\The Imaging Source Europe GmbH\GigECam Driver and Tools\ipconfig_api"
```

bzw. auf Windows 32 Bit

```
cd "\\Program Files\The Imaging Source Europe GmbH\GigECam Driver and Tools\ipconfig_api"
```

change to the program folder of the GigE IP Config Tools. It is not case sensitive. With the command:



```
ipconfig_cmd rescue mac=xx:xx:xx:xx:xx:xx ip=x.x.x.x subnet=y.y.y.y  
gateway=z.z.z.z static=on
```

Can a new fixed IP address be written to the camera.

Example:

The GigE IP Camera Config program shows "000748009968" as MAC address and the new IP address should be "192.168.1.15". The command line then looks like this:

```
ipconfig_cmd rescue mac=00:07:48:00:99:68 ip=192.168.1.15  
gateway=192.168.1.1 static=on
```

6.4.2 Linux

In Linux there is a similar program to Windows. Example:

```
tcam-gigetool rescue --ip 192.168.2.129 --netmask 255.255.255.0 --gateway  
0.0.0.0 20714291
```

Here you can also enter a serial number instead of the MAC address, since the serial number is used to infer the MAC address from the serial number.

6.5 Camera disappears after a short time

For example, the camera can be selected in IC Capture and disappears as soon as an attempt is made to start the live video. This is also an indicator for a 10/100 mBit/s network.

6.6 Image is not sharp

6.6.1 C/CS-mount lens

This happens when a C-mount lens is used, but the 5mm ring and protective cap are removed from the camera. The unscrewed protective cap must be separated from the 5mm intermediate ring. The ring is then screwed between camera and lens.

If a CS-mount lens is used, the ring is still on the camera and must be unscrewed.



6.6.2 M12 mini lens

The mini lenses are focused by the screw-in depth into the lens holder. They are only screwed in until a sharp image is created. For cameras with focus mechanism, the focus value in IC Capture should be set to 500 and then the lens screwed in until the image is reasonably sharp. The autofocus algorithm will then continue focusing.

The mini lens can be attached to its thread with a little Teflon tape in the focus mechanism.