

HiRes V
user manual

january 2009

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Revision 1.0.2 dated 01/30/2009

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INTRODUCTION

The HiRes V CCD camera series is the upgraded model of the former HiRes IV and IV Plus series (HiRes IV also included the former Hurricane specs).

Born to detect extremely faint light emissions, for this series we have appealed to sophisticated sampling and amplification techniques as well as to a 16-bit A/D Converter, to be fully exploited in its dynamics.

All the components are included in the camera head: CCD sensor, Double stage Peltier cooling system, electronics (except for the power supply), allowing you to have a compact system easy to be managed.



The HR V series exists in two version depending on the connection to the PC:

- USB 2.0 connection (standard version)
- our proprietary FDL-PCI Interface card (on request)

The HiRes V CCD camera series is equipped of three integrated peripherals:

- 1) two 32-bit generators able to yield impulses starting from 100 ns with internal time base, or from 20 ns with external time base;
- 2) a 32-bit time delay with a 100 ns step with an internal time base or 20 ns with external time base

allowing you to run an MCP, a LASER or other external devices.

Moreover, it can reach a readout speed up to 1 Mpixel/second.

You can choose between two different cooling systems:

- 1) Double Stage Peltier + air exchanger, performing $\Delta T > 50$ °C below ambient;
- 2) Double Stage Peltier + connection to an external liquid exchanger (not provided by DTA), performing up to $\Delta T = 55$ °C below liquid temperature.

This series displays KODAK and E2V Technologies sensors, either marked by high definition (small pixels: ≤ 16 μm) or high sensitivity (bigger pixels: ≥ 20 μm).

They belong to the front-illuminated kind, with thin indium electrodes able to raise the Quantum Efficiency in the case of shorter wavelengths, or to the back-illuminated type to make the most of the latest CCD technology.

Among the main application fields: Biology, Astronomy, Spectroscopy, RAMAN Spectroscopy, Semiconductor Physics, Plasma Physics and X-Ray Physics.

PERSONAL COMPUTER MINIMUM REQUIREMENTS

- CPU Pentium III 1 GHz .
- 256 Mb of RAM.
- Microsoft Windows 98, ME, 2000, XP or LINUX (we tested the SuSE LINUX 9.0 version)
- PCI bus compliant 2.1.

PERSONAL COMPUTER RECOMMENDED REQUIREMENTS

- CPU Pentium IV 2 GHz or higher.
- 512 Mb RAM.
- Colour monitor 19".

Note:

camera models mounting big dimension sensors (as KAF-16801E/LE with 4096X4096 pixels) require a very good performance computer, with a good BUS-PCI.
Moreover, each of the image acquired has a dimension of 32 Mb, involving a big memory request.

For these reasons, we suggest customers to use a computer having the following specs:

- 1) DUAL CORE of 3GHz
- 2) 1 Gb RAM
- 3) XP Professional Operative System or better.

The combination of the specs suggested above allows customer to reach the higher performances of the CCD camera.

A) CASE WITH USB CONNECTION

A1) SCHEME OF THE INSTALLATION PROCEDURE

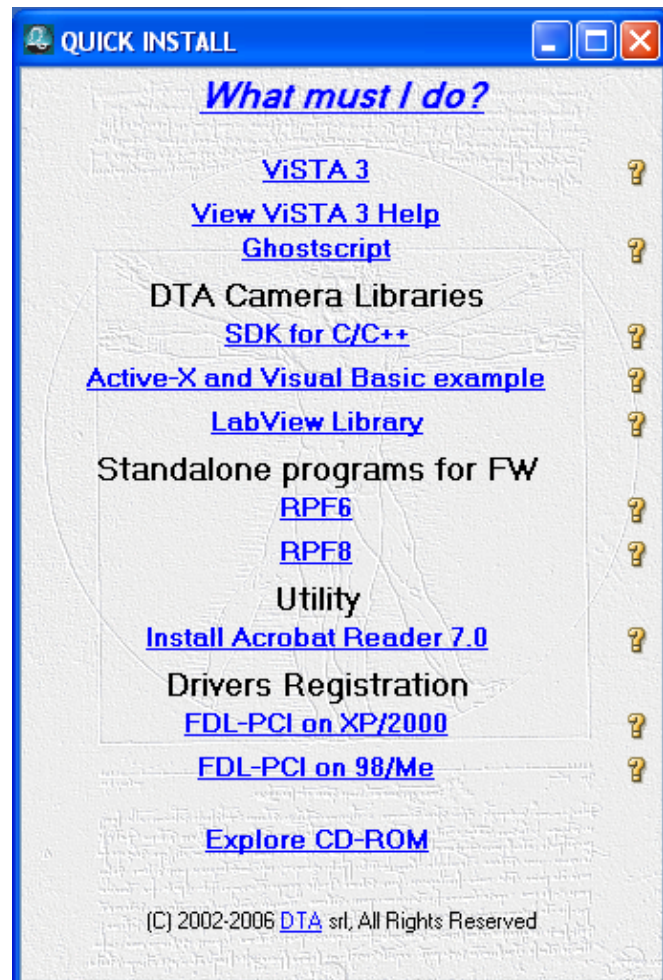
When you use the camera for the first time, you must install the ViSTA software.

Insert the ViSTA 3 CD-ROM, provided with the camera, into the CD-ROM reader, wait a few seconds so as to allow the PC to load the "QUICK INSTALL" menu.

Let click on ViSTA 3 and QUICK INSTALL will start and take you through the process of installing the software.

The default settings will install the full software package and all options.

You may be asked to reboot the PC if certain files in use by Windows needs to be updated.



A2) CONNECTING THE HIRES V

To install your hardware platform on the PC, follow the steps below:

- ⇒ Connect the power supply cable (supplied with a standard length of 2,5 m) to the HiRes V CCD camera.
- ⇒ Turn on the camera and connect the USB cable (supplied with a standard length of 5 m) to the corresponding port of the PC

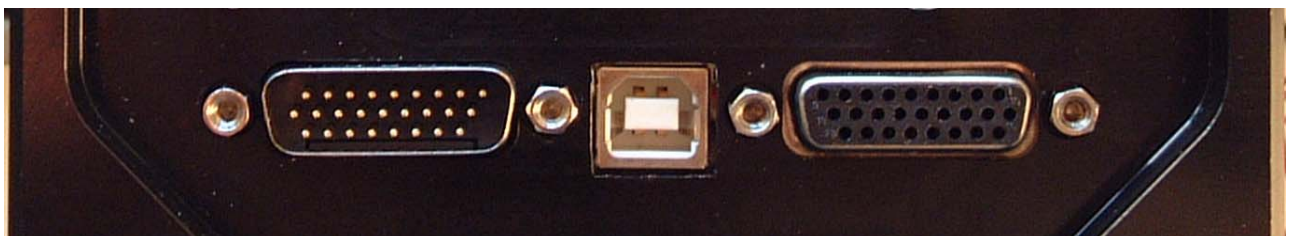
Pay attention:

- 1) The power supply must be connected to an electric system provided of a ground;
- 2) The lateral sides of the camera and of the power supply must be free for the right working of the ventilation system;
- 3) Place the system so that you can easily manage the switch of the power supply, positioned on the front panel.

Now, install the drivers for the USB connection.



Connectors on the right lateral side: on the right, the power supply connector



Connectors on the bottom side: on the middle, the USB connector; on the right, the User Port connector

A3) INSTALLATION OF THE DRIVERS

When you use the camera for the first time, you will be asked to specify where the available drivers are.

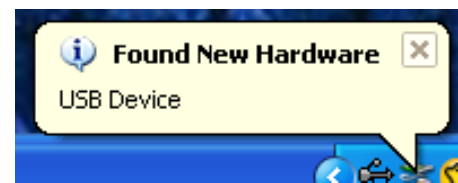
Let's analyse the sequence of operations to be carried out.

It will be shown the example with WINDOWS XP Operating System. The operation are similar for the other Operating Systems.

Follow the steps on the basis of your Operative System.

WINDOWS XP

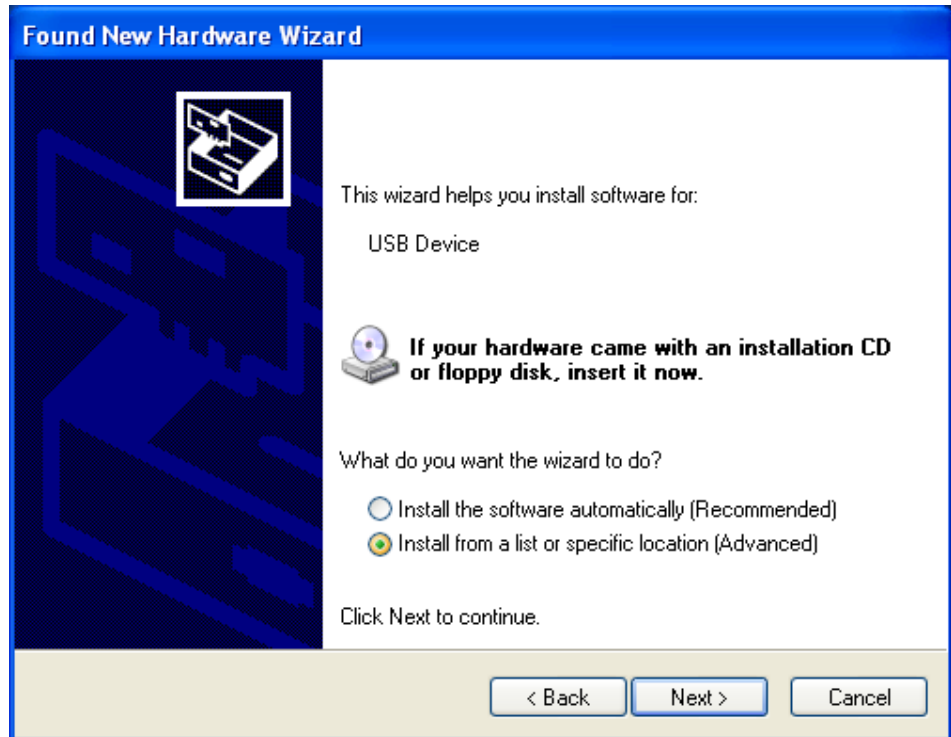
Once you have connected the camera to the PC following the instructions reported on the previous page, a window (like the one shown below) will appear, noticing you a new hardware was found.



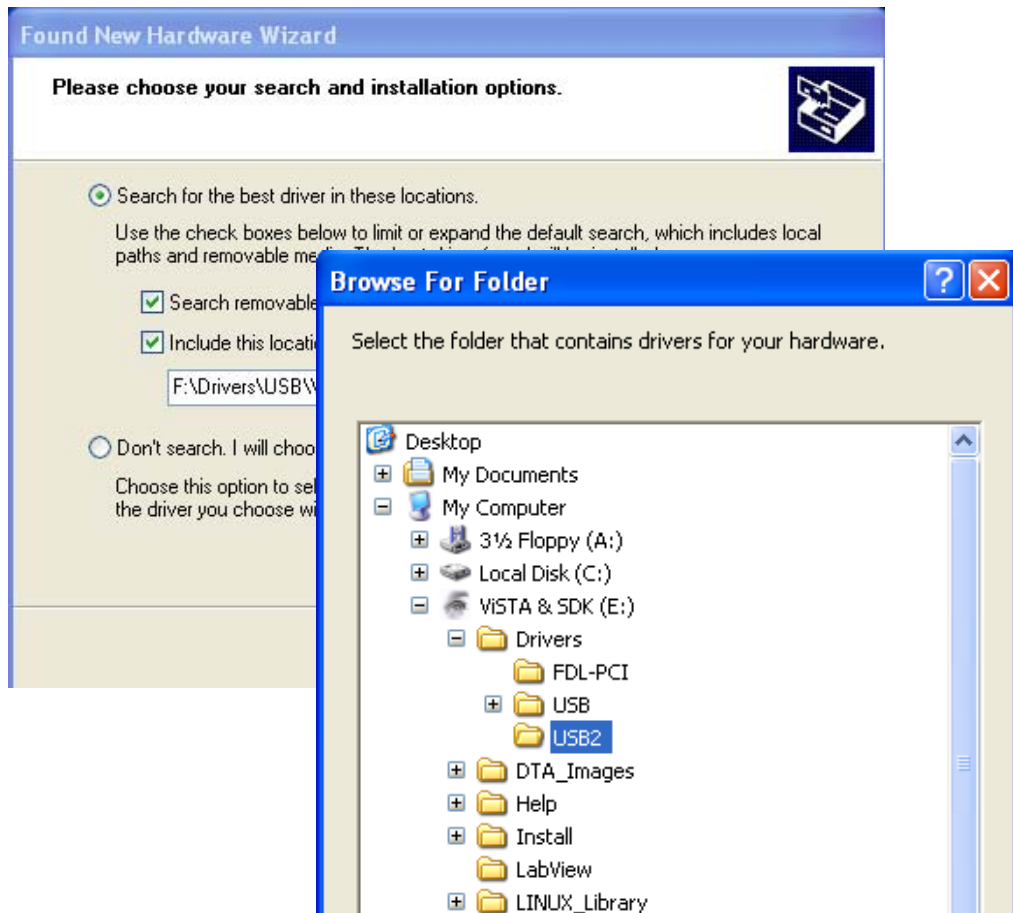
Then, it appears a window like the one shown beside, where you'll be requested to connect for Windows update. Select: "No, not at this time" and click on "Next" to continue the installation.



Select the option "Install from a list or specific location (Advanced)" (recommended choice). Then click on "Next" to continue the installation.



Check the functions selected in the window below (in this case, F:\ indicates the CD-ROM drive) and click on next to continue. Select the folder that contains drivers for USB 2.0 hardware according to your Operative System.

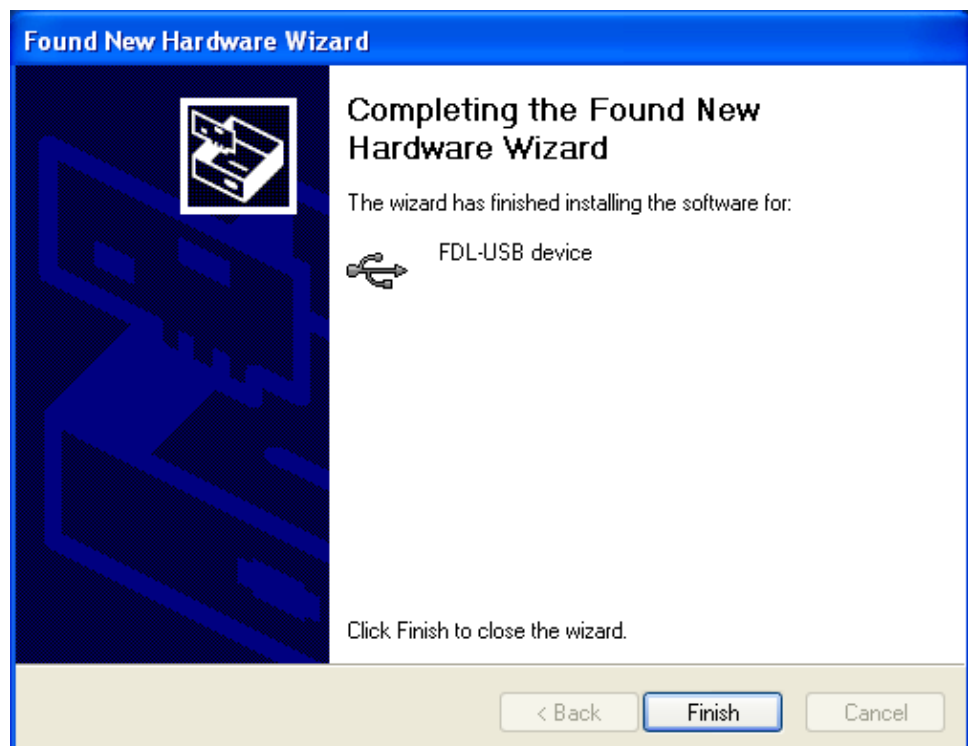


Then, click on OK and wait while the wizard installs the software (just few seconds).

If appears the window beside, click on "Continue Anyway" to go on with the installation process



When the installation has been completed, a window like the one below will appear. Click on finish to close the wizard and restart the PC (recommended choice).

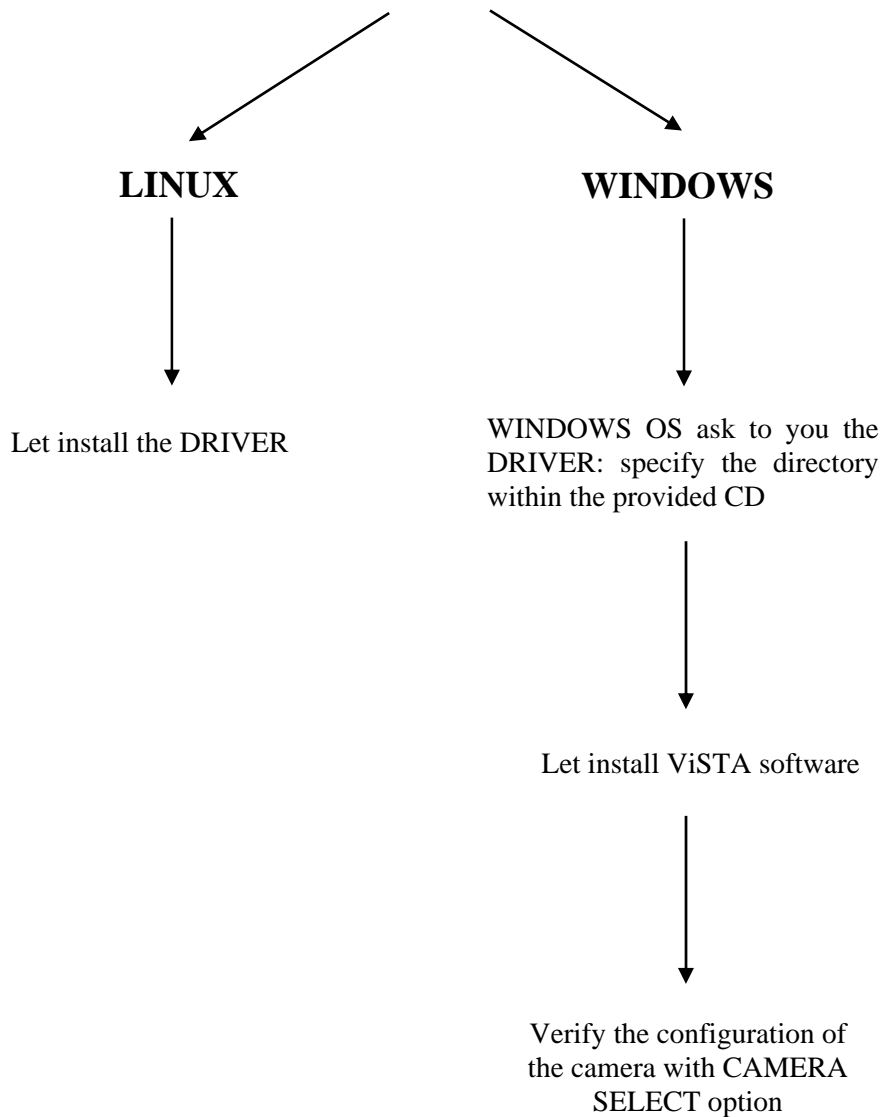


B) CASE WITH FDL-PCI INTERFACE

B1) SCHEME OF THE INSTALLATION PROCEDURE

When you use the camera for the first time, you must install the library and the FDL-PCI interface. For this purpose, please follow the procedure described in the next pages and schematized in the diagram below:

Turn off the PC
Insert the FDL-PCI card interface in the proper slot
Turn on the PC



B2) CONNECTING THE FDL INTERFACE CARD TO THE PC

To install your FDL interface card, do as follow :

⇒ Turn your PC off, including any peripheral.

⇒ Remove the external case of the PC (please see the relevant instructions in the PC Handbook).

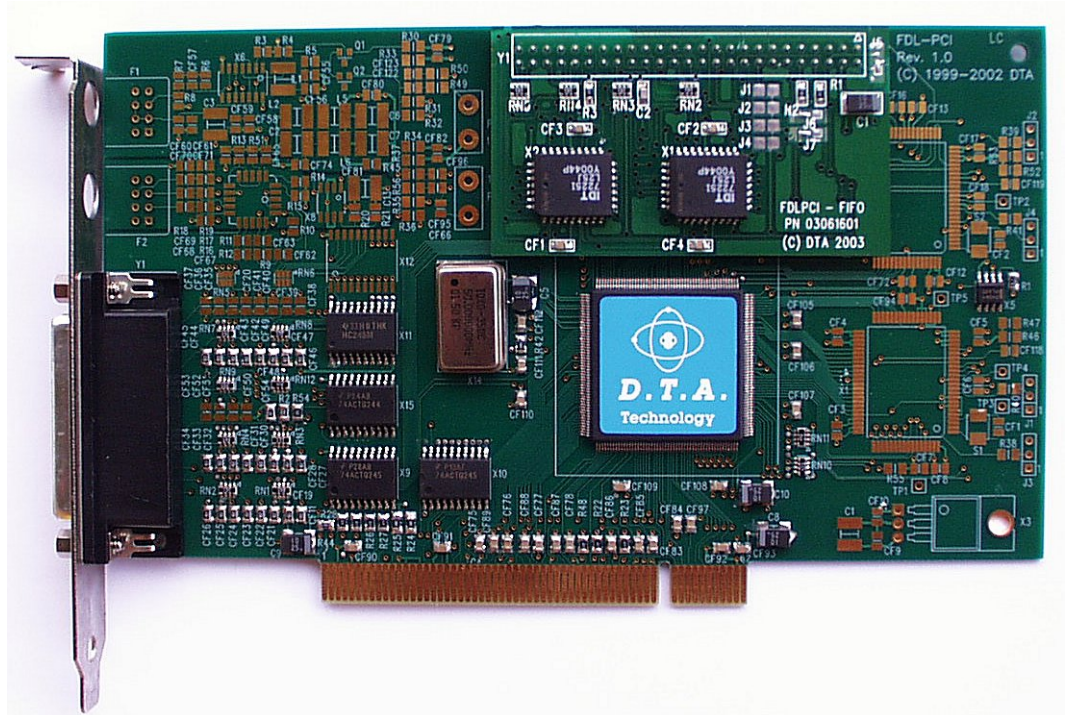
⇒ Choose a free PCI expansion slot. Remove the relevant back cover by means of a screwdriver.

⇒ Insert the camera interface card into the expansion slot. Please make sure that the card is properly and fast inserted. Fix the card by screwing the relevant screw again.

⇒ Reassemble the PC case.

Turn the PC on once again. The interface card installation has been completed.

In case of a fiber optic link connection, a dedicated FDL-PCI is provided with the proper connectors.



B3) LIBRARY & FDL-PCI INSTALLATION

The installation of the library is always linked to the installation of the camera, of course. For this purpose you just need to install the PCI interface as well.

Let's analyse the sequence of operations to be carried out. It will be shown the example with WINDOWS XP Operating System. The operations are similar for the other Operating Systems.

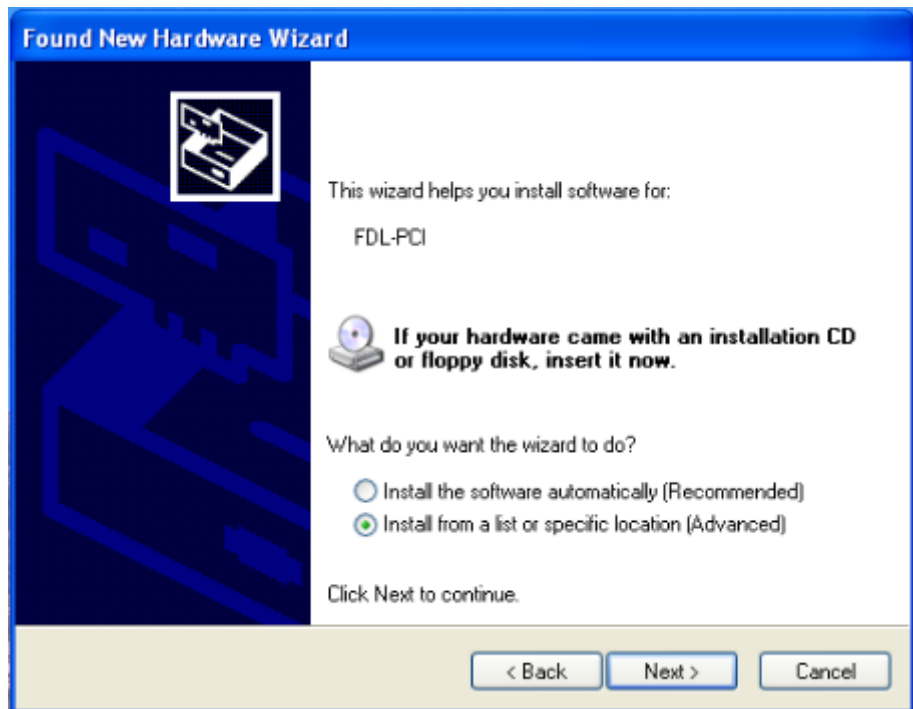
Once you turn the system on for the first time with the FDL-PCI interface on, you will be asked to specify where the available drivers are. Follow the steps on the basis of your Operative System.

WINDOWS XP

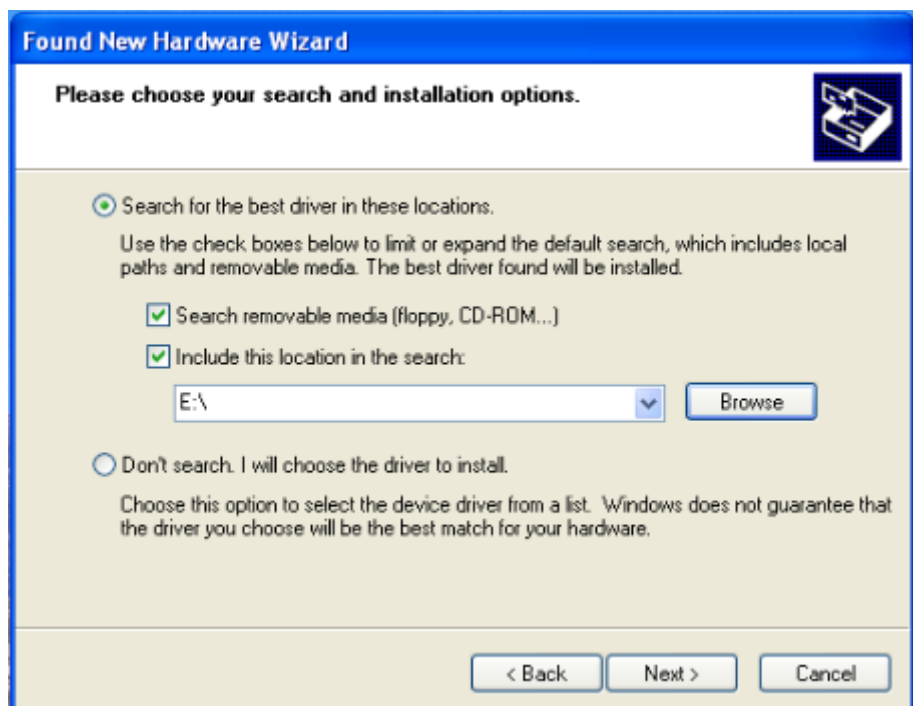
Insert the FDL-PCI card into the slot of the motherboard and turn the PC on. As soon as the system gets started, a window (like the one shown below) will appear, noticing you a new hardware was found. You'll be requested to connect for Windows update, let select: "No, not at this time".



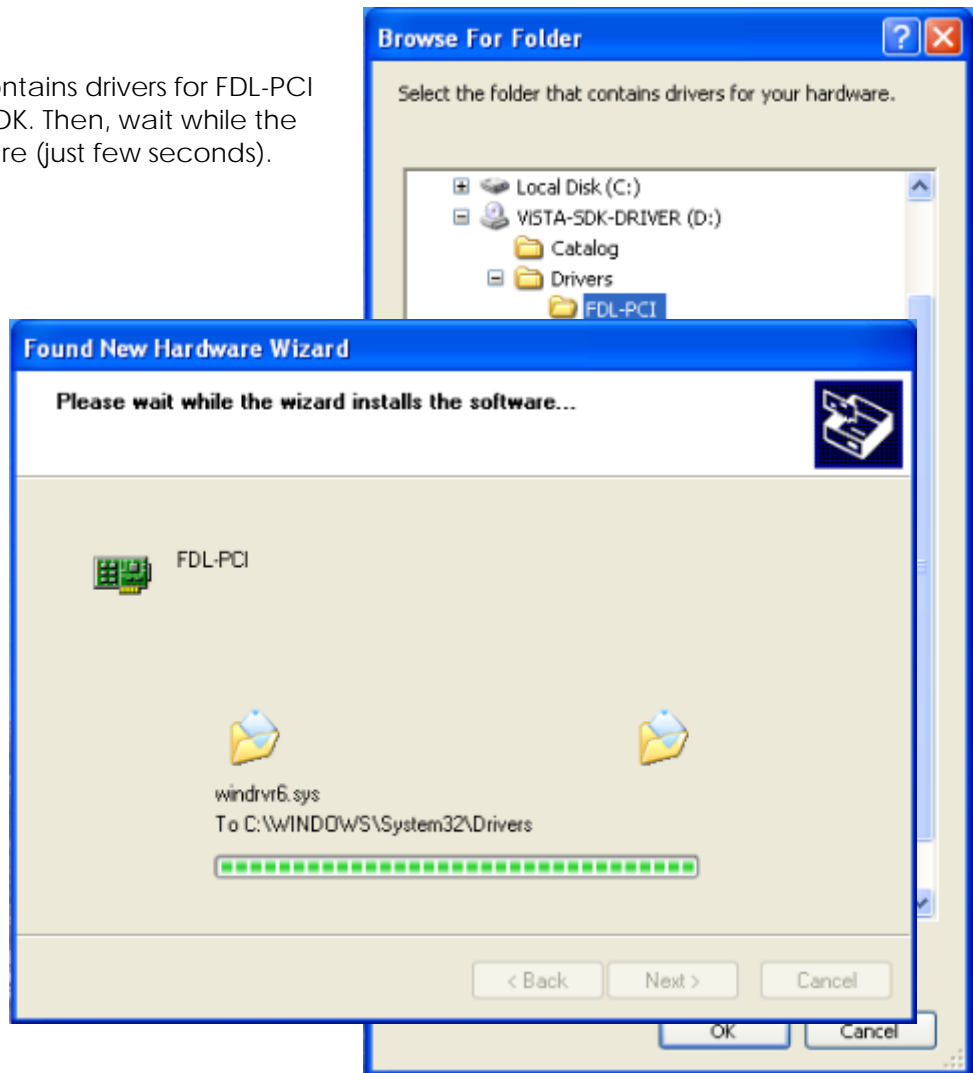
Insert the "ViSTA" CD into the CD-ROM reader, close the "Quick Install" (it may open due to the CD autorun). Select the option "Install from a list or specific location (Advanced)" (recommended choice). Then click on "Next" to continue the installation.



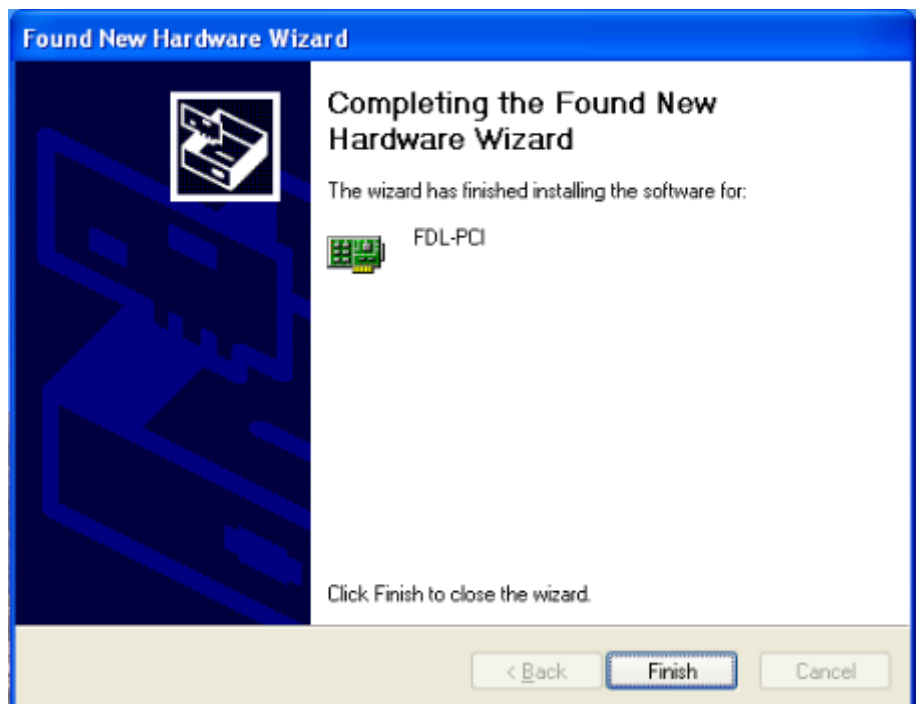
Check the function selected in the window (recommended choice) below (in this case, E:\ indicates the CD-ROM drive) and click on next to continue. The PC will start to search for the most suitable driver to the peripheral.



Select the folder that contains drivers for FDL-PCI hardware and click on OK. Then, wait while the wizard installs the software (just few seconds).



When the installation has been completed, a window like the one below will appear. Click on finish to close the wizard and restart the PC (recommended choice).



B4) SOFTWARE INSTALLATION PROCEDURE

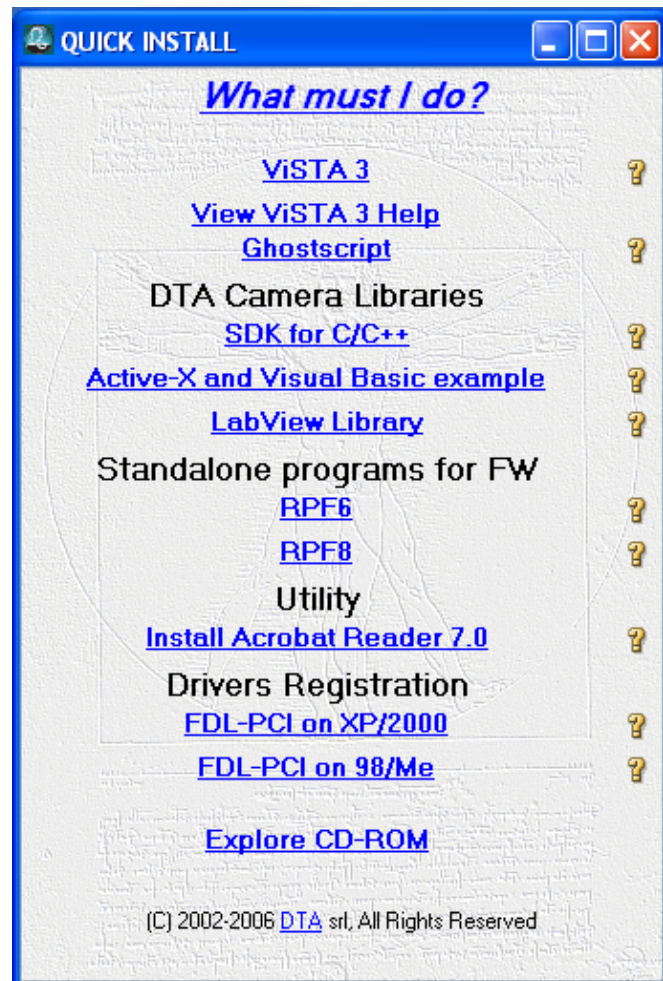
When you use the camera for the first time, you must install the ViSTA software.

Insert the ViSTA 3 CD-ROM, provided with the camera, into the CD-ROM reader, wait a few seconds so as to allow the PC to load the "QUICK INSTALL" menu.

Let click on ViSTA 3 and QUICK INSTALL will start and take you through the process of installing the software.

The default settings will install the full software package and all options.

You may be asked to reboot the PC if certain files in use by Windows needs to be updated.



B5) LINUX

System Requirements

- Linux 2.0.31 or higher (can be embedded Linux or Linux 2.4x)
- An x86 processor.
- Any 32-bit development environment supporting C (such as GCC).

Preparing the system for installation

In Linux, kernel modules must be compiled with the same header files that the kernel itself was compiled with. Since WinDriver installs the kernel module **windrvr6.o**, it must compile with the header files of the Linux kernel during the installation process.

Therefore, before you install WinDriver for Linux, verify that the Linux source code and the file **versions.h** are installed on your machine:

Install linux kernel source code

- If you have yet to install Linux, please choose **Custom** installation when performing the installation and then choose to install the source code.
- If Linux is already installed on the machine, you must check to see if the Linux source code was installed. You can do this by looking for linux in the **/usr/src** directory. If the source code is not installed, you can either reinstall Linux with the source code, as described above, or you can install the source code by following these steps:
 1. Login as super user.
 2. Type:
`/$ rpm -i <source location>/ <Linux distributor>/RPMS/kernel-source-<version number>`
(For example: to install the source code from the Linux installation CD-ROM, for RedHat 7.1, type:
`/$ rpm -i /mnt/cdrom/RedHat/RPMS/
kernel-source-2.4.2.-2.i386rpm)`
TIP!
If you do not have an RPM with the source code, you may download it from:
<http://rpmfind.net/linux/RPM/>.

Install version.h

- The file **version.h** is created when you first compile the Linux kernel source code. Some distributions provide a compiled kernel without the file **version.h**. Look under **/usr/src/linux/include/linux/** to see if you have this file. If you do not, please follow these steps:
 1. Type:
`/$ make xconfig`
 2. Save the configuration by choosing **Save and Exit**.
 3. Type:
`/$ make dep.`

Before proceeding with the installation, you must also make sure that you have a linux symbolic link. If you do not, please create one by typing:

```
/usr/src$ ln -s <target kernel>/ linux
```

(For example: for Linux 2.4 kernel type:

```
/usr/src$ ln -s linux-2.4/ linux)
```

Installation

1. Insert the **DTA SDK CD** into your Linux machine CD drive or copy the downloaded file to your preferred directory.
2. Change directory to your preferred installation directory (your home directory, for example):
/\$ **cd ~**
3. Extract the file **WDxxxLN.tgz** (where xxx is the version number):
~\$ **tar xvfz /<file location>/WDxxxLN.tgz**
For example:
 - o From a CD:
~\$ **tar xvfz /mnt/cdrom/LINUX/WDxxxLN.tgz**
 - o From a downloaded file:
~\$ **tar xvfz /home/username/WDxxxLN.tgz**
4. Change directory to WinDriver (this directory gets created by tar):
~\$ **cd WinDriver/**

NOTE:

From version 5.x and above this directory gets created by tar, but in versions preceding 5.x the WinDriver directory does not get created by the extraction. Therefore, when working with versions preceding 5.x (version 4.33, for example) first create a directory (e.g., WinDriver) before proceeding with the installation.

(/\$ **mkdir ~/WinDriver**)

5. Install WinDriver:
 - a. ~/WinDriver\$ **make**
 - b. Become super user:
~/WinDriver\$ **su**
 - c. Install the driver:
~/WinDriver# **make install**
6. Create a symbolic link so that you can easily launch the DriverWizard GUI
~/WinDriver\$ **ln -s ~/WinDriver/wizard/wdwizard/ usr/bin/wdwizard**
7. Change the read and execute permissions on the file **wdwizard** so that ordinary users can access this program.
8. Change the user and group ids and give read/write permissions to the device file **/dev/windrvr6** depending on how you wish to allow users to access hardware through the device.
9. You can now start using WinDriver to access your hardware and generate your driver code!

Restricting Hardware Access on Linux

CAUTION:

Since **/dev/windrvr6** gives direct hardware access to user programs, it may compromise kernel stability on multi-user Linux systems. Please restrict access to the DriverWizard and the device file **/dev/windrvr6** to trusted users.

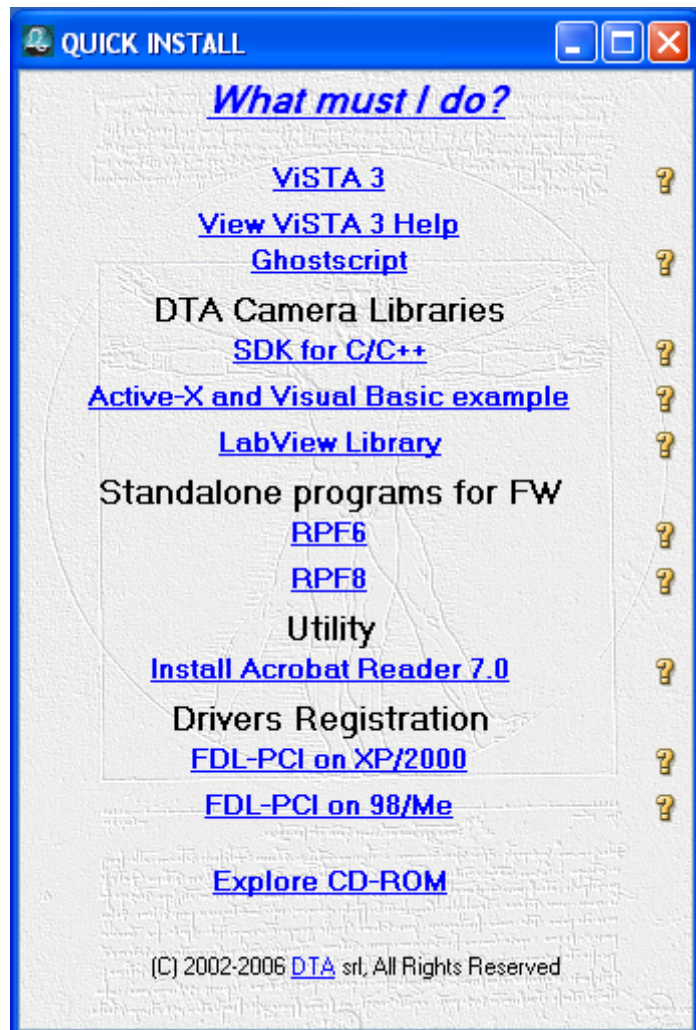
For security reasons the WinDriver installation script does not automatically perform the steps of changing the permissions on **/dev/windrvr6** and the DriverWizard executable (**wdwizard**).

B6) WINDRIVER REGISTRATION

After the installation of the drivers for the FDL-PCI card, we need to record the files to make them work properly. Insert the "VISTA 3" CD into the CD-ROM reader, wait a few seconds so as to allow the PC to load the "QUICK INSTALL" menu.

Once the PC has loaded the "QUICK INSTALL" menu, follow the steps below:

- Register the drivers according to your Operating System, clicking on the proper **Drivers Registration** field:
 - FDL-PCI on XP/2000** (for WINDOWS XP/2000)
 - FDL-PCI on 98/Me** (for WINDOWS 98/Me)
- Install ViSTA 3 just clicking on the proper field

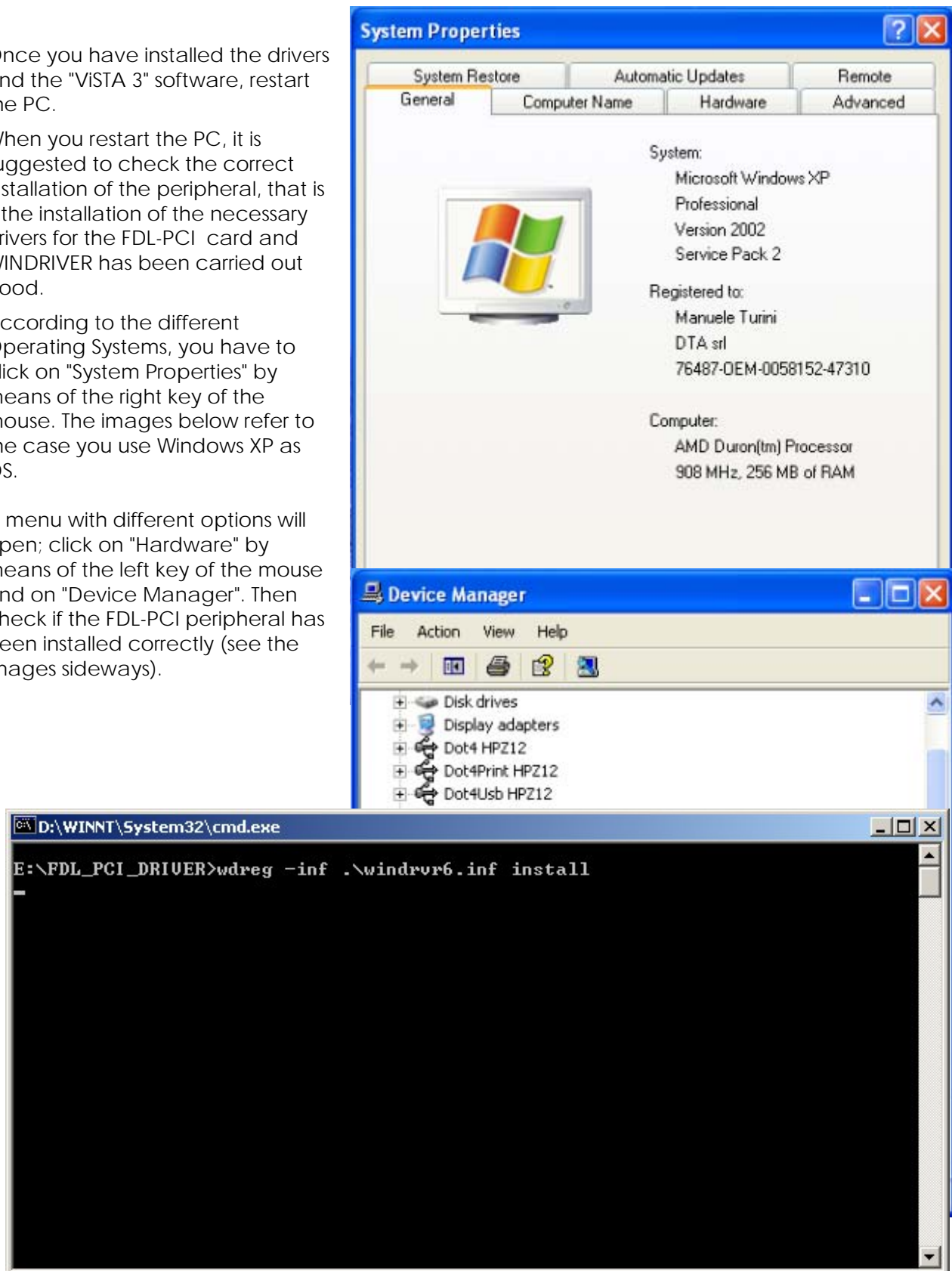


Once you have installed the drivers and the "ViSTA 3" software, restart the PC.

When you restart the PC, it is suggested to check the correct installation of the peripheral, that is if the installation of the necessary drivers for the FDL-PCI card and WINDRIVER has been carried out good.

According to the different Operating Systems, you have to click on "System Properties" by means of the right key of the mouse. The images below refer to the case you use Windows XP as OS.

A menu with different options will open; click on "Hardware" by means of the left key of the mouse and on "Device Manager". Then check if the FDL-PCI peripheral has been installed correctly (see the images sideways).



The tests have been carried out with the following OS's:

WINDOWS 98 SECOND EDITION

WINDOWS 2000 WITHOUT SERVICE PACK

WINDOWS 2000 WITH SERVICE PACK 3/4/5

WINDOWS ME

WINDOWS XP WITHOUT SERVICE PACK

WINDOWS XP WITH SERVICE PACK 1/2

B7) CONNECTING THE HIRES V

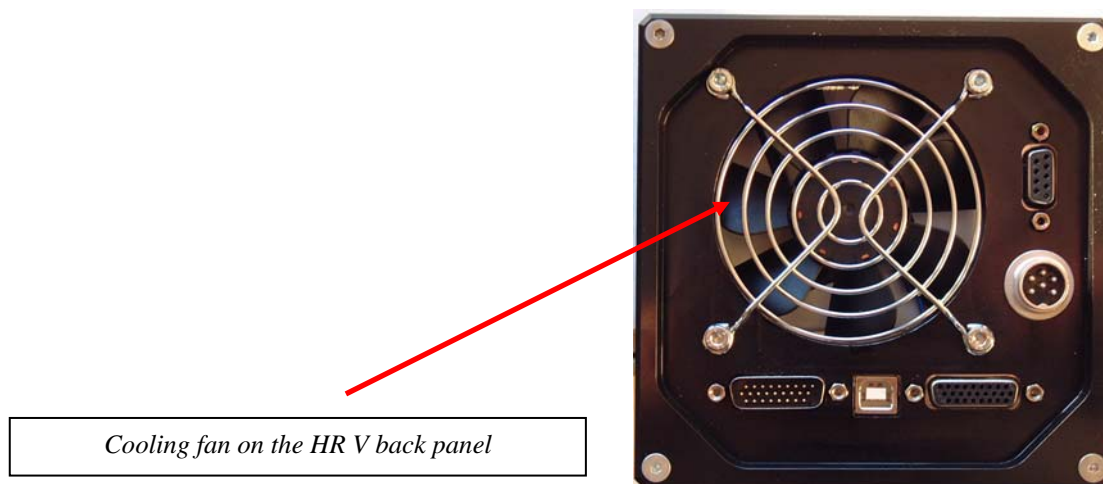
To connect your hardware platform to the FDL-PCI interface, follow the steps below:

PAY ATTENTION: before making any connection, **make sure that the PC and every peripheral are switched OFF and the HR V is not powered!**

- ⇒ Connect the parallel cable (supplied with a standard length of 2,5 mt) to the “parallel” port on the HR V back panel and to the interface card **FDL-PCI** previously mounted on PC.
- ⇒ In case you have purchased the model with the serial connection on optic fiber link (FOL), you’ll be provided even of a serial decoder for the connection of the camera to the FDL-PCI by FO. In this case, insert an end of an optic fiber cable into the TX connector of the FDL-PCI interface and the other one into the RX connector of the serial decoder, then insert an end of an optic fiber cable into the RX connector of the FDL-PCI interface and the other one into the TX connector of the serial decoder.

NOTE: the two vitric optic fiber cables, mod. 62/125, are optional and a length up to 4 Km is available upon request.

Warning: once the platform has been installed, make sure there are at least 2 cm of clear space behind the cooling fan (showed by the red arrow in the figure on the right), so that this can efficiently work.



DESCRIPTION OF THE HIRES PLATFORM BACK PANEL

Here below is shown the connectors present on the back panel of the HR V platform. They allow the connection of the camera to the PC and to the power supply.



HR V Back Panel

Let's see in details the description of the connectors on the back panel, starting from the ones in the right lateral side:

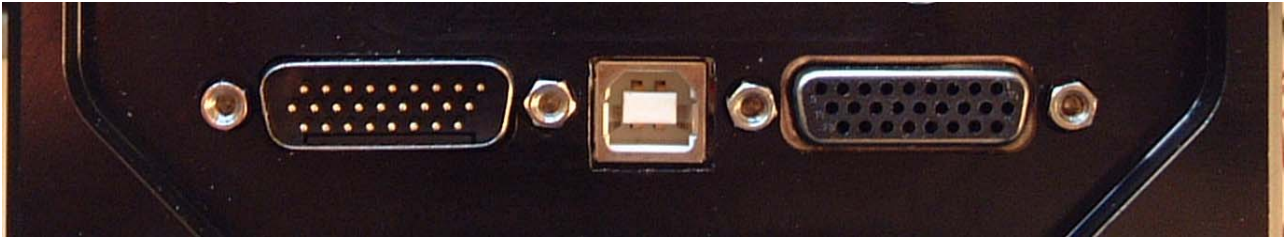


Connectors on the right lateral side

Starting from the left, you can see the following connectors:

- 9-pin female serial connector for the configuration of the camera by a serial port.
- Power connector: 6-pin male connector

Here below the connectors placed on the bottom of the HiRes V back panel:



Connectors on the bottom side

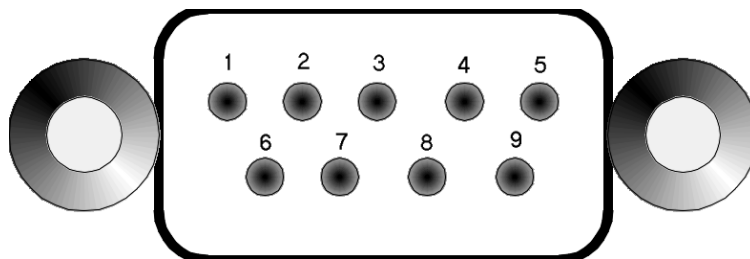
Starting from the left, you can see the following connectors:

- **PARALLEL:** High Density 26-pin male connector for the parallel communication at 16 bits with the FDL-PCI interface card.
- **USB connector**
- **USER PORT:** high density 26-pin female connector for the connection and the communication with the auxiliary devices such as *filter wheel, image intensifier, focuser,* and so on, manufactured by **DTA**.

DETAIL OF THE BACK PANEL CONNECTORS

In the following paragraph, we will list the signals on the connectors' pins of the HR IV platform front panel.

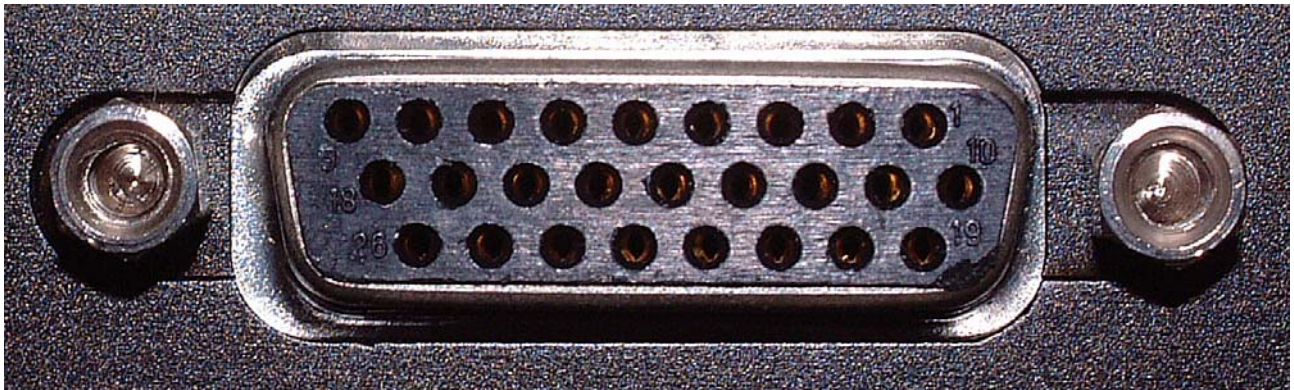
9-PIN CONNECTOR



1	-	2	RX0	3	TX0	4	-	5	GND
6	-	7	-	8	TX1	9	RX1	-	-

- **2-RX0:** receiving data, channel 0
- **3-TX0:** transmitting data, channel 0
- **5- GND:** ground.
- **8-TX1:** receiving data, channel 1
- **9-RX1:** transmitting data, channel 1

26-PIN USER PORT CONNECTOR

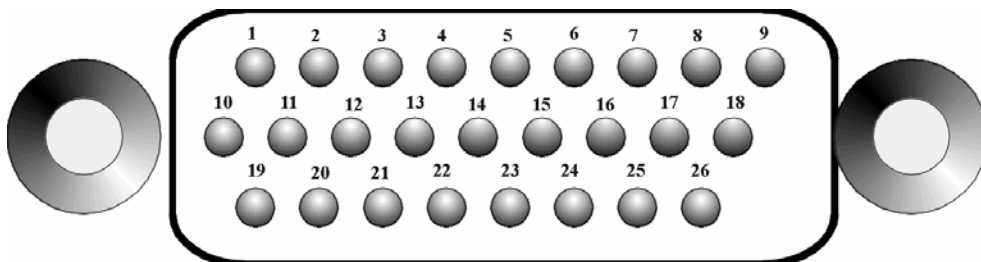


1	+3V	2	PA0	3	PA1
4	PA2	5	PA3	6	PA4
7	PA5	8	PA6	9	PA7
10	PB0	11	PB1	12	PB2
13	PB3	14	PB4	15	PB5
16	PB6	17	PB7	18	INAD0
19	INAD1	20	INAD2	21	INAD3
22	SHUT IN	23	TRIG IN	24	TRIG OUT
25	SHUTTER	26	GND	-	-

- **PA[0:7]** : bidirectional user port.
- **PB[0:7]** : bidirectional user port.
- **INAD[0:3]**: digital analogical input channel, 0-2.5V.
- **SHUTTER**: shutter TTL output, for the control of a second external shutter.
- **SHUT IN**: by means of this signal, the user can directly control the shutter (by keeping it at 1 the shutter stays open, otherwise it is closed).
- **TRIG IN/OUT**: bidirectional pin for the trigger signals transmission from and to the camera.
- **GND**: ground.

NOTE: all signals are TTL compatible, except for INAD[0:3]

26 PIN PARALLEL PORT CONNECTOR



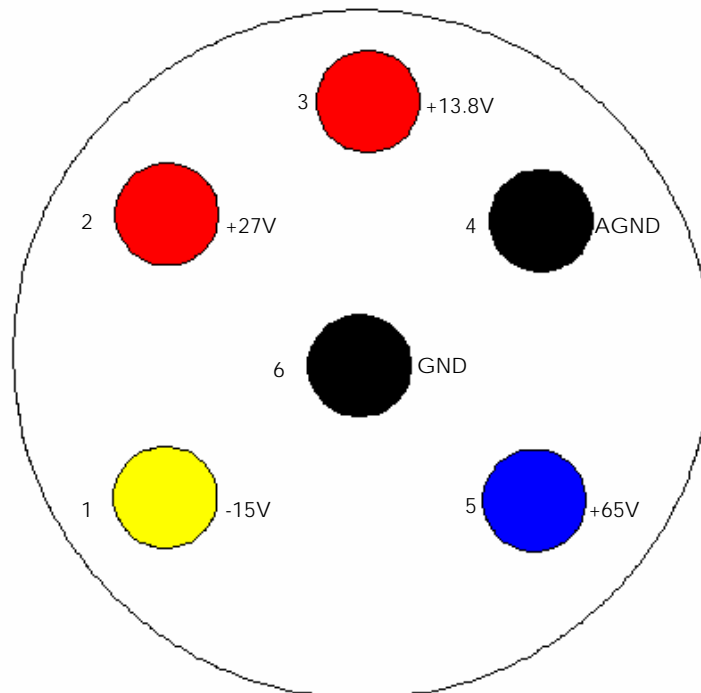
1	PI00	2	PI03	3	PI06
4	PI09	5	PI12	6	PI15
7	IACK	8	IRW	9	GND
10	PI01	11	PI04	12	PI07

13	PI10	14	PI13	15	+5V
16	IREQ	17	ISTB	18	GND
19	PI02	20	PI05	21	PI08
22	PI11	23	PI14	24	+5V
25	ICD	26	GND	-	-

- **PI[0:15]**: bidirectional CAMERA BUS.
- **IACK/IRW/IREQ/ISTB/ICD**: hand shake signal
- **GND**: ground.

NOTE: All signals are TTL compatible.

POWER SUPPLY CONNECTOR:



View of the male connector from the side of the mounting: it is shown the pins and the relative voltages

OPTICAL WINDOW CLEANING

Both the optical window and the CCD cleaning are carried out in the clean room by means of a 30-magnifying power microscope. This procedure removes any dust which can otherwise bring about unmistakable marks on the image you have taken. In particular such spots increase as the focal ratio gets wider. In other words an image may not show any mark at f/5.6 but it can be clearly noted at f/32 because of an obvious geometrical problem of projection. Due to the shutter or elapsed time, the external surface of the optical window may gather dirty particles that may be easily removed.

To perform such task we use a compressed air cylinder specifically designed for optical cleaning.



Be careful !!! There are similar products that, instead of using compressed air, use a liquefiable gas : at ambient pressure it quickly gassifies, thus "triggering" an air-compressed-effect. You do **not absolutely have to use these products : they may give rise to heavy marks or rings on the windows itself.**

A product we can recommend is DUST-OFF provided by EDMUND-OPTICS. Thanks to DUST-OFF (or any other similar product) it is very easy to get rid of any microparticles : keep the shutter open for a few seconds (by the camera control program) and spray some air blast. We kindly advise you against using cloths, optical paper and cleaning liquids because the dirt will be only mixed up or, even worse, increased. The risk is to finally damage the coating of the optical window itself !

SPECIFICATIONS:

SHUTTER:

Electromechanical. Exposure time: from 0.01 s to 9999 s

A/D CONVERTER:

Selectable: 12, 14, 16 bits

SETTABLE GAINS:

64

READ OUT SPEED:

up to 1Mpix/s

INTERFACE:

- USB 2.0 (standard)
- FDL-PCI 32 bit (on request)

COOLING:

- Double stage Peltier + air stage > 50°C ΔT below ambient
- Double stage Peltier + liquid stage up to 55°C ΔT below liquid temperature

CCD TEMPERATURE CONTROL:

± 0.1 °C

OPTICAL WINDOW:

Fused Silica

FILTER WHEEL:

External

BACKFOCUS:

17.5/22.5 mm

MAX TOTAL NOISE:

15 e⁻

MOUNT:

According to different sensors

BINNING:

From 1 x 1 to 8 x 8 or arbitrary

WEIGHT:

2 kg

DIMENSIONS:

130x130x162 mm

POWER SUPPLY

230/115V - 50/60Hz - 0.8A max

OUTPUT VOLTAGES AND CURRENTS:

+13.8V 3A

+50V 50mA

MAX ABSORPTION:

85.3 W

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