APPLICATION NOTE

PC Configuration Tips
PCI Frame Grabbers

18 AUGUST 2025

For use with:
EPIX® Imaging Hardware
EPIX® Imaging Software

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Image Processing Products
For Research and Industry

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1. PCI/PCIe Card Resources and BIOS Plug & Play

1.A Required Bus Resources

"Plug & Play" compatible EPIX® imaging products are assigned bus resources, such as register addresses and interrupts (IRQ), automatically by BIOS or the operating system. The Plug & Play compatible EPIX® frame grabbers, current and superseded models, are:

Hardware	Card Type	Uses IRQ's	Bus Master	Vendor ID	Device ID
PIXCI® A	PCI	Yes	Yes	10E8	82B1
PIXCI® A110	PCI Express	Yes	Yes	165A	A110
PIXCI® A110	PCI Express	Yes	Yes	165A	A117
PIXCI® A310	PCI Express	Yes	Yes	165A	A310
PIXCI® CL1	PCI	Yes	Yes	165A	C100
PIXCI® CL1	PCI	Yes	Yes	165A	C10A
PIXCI® CL2	PCI 64-bit	Yes	Yes	165A	C200
PIXCI® CL3SD	PCI	Yes	Yes	165A	C300
PIXCI® CL3SD	PCI	Yes	Yes	165A	C301
PIXCI® D	PCI	Yes	Yes	10E8	80D6
PIXCI® D24	PCI	Yes	Yes	10E8	80D6
PIXCI® D32	PCI	Yes	Yes	10E8	80D6
PIXCI® D2X	PCI	Yes	Yes	165A	D200
PIXCI® D2X	PCI	Yes	Yes	165A	D201
PIXCI® D2X	PCI	Yes	Yes	165A	D20A
PIXCI® D3X	PCI	Yes	Yes	165A	D300
PIXCI® D3XE	PCI Express	Yes	Yes	165A	ED30
PIXCI® D2XE	PCI Express	Yes	Yes	165A	ED20
PIXCI® DVO	PCI	Yes	Yes	10E8	817F
PIXCI® E1	PCI Express	Yes	Yes	165A	E001
PIXCI® E1	PCI Express	Yes	Yes	165A	E0A1
PIXCI® E1DB	PCI Express	Yes	Yes	165A	ED01
PIXCI® E1DB	PCI Express	Yes	Yes	165A	EDA1
PIXCI® E4	PCI Express	Yes	Yes	165A	E004
PIXCI® E4DB	PCI Express	Yes	Yes	165A	ED04
PIXCI® E4G2-2F	PCI Express	Yes	Yes	165A	E504
PIXCI® E4G2-4B	PCI Express	Yes	Yes	165A	E704
PIXCI® E4G2-F2B	PCI Express	Yes	Yes	165A	E604
PIXCI® E4TX2-2F	PCI Express	Yes	Yes	165A	E512
PIXCI® E4TX2-4B	PCI Express	Yes	Yes	165A	E712
PIXCI® E4TX2-F2B	PCI Express	Yes	Yes	165A	E612
PIXCI® E8	PCI Express	Yes	Yes	165A	E008
PIXCI® E8CAM	PCI Express	Yes	Yes	165A	E0C8
PIXCI® E8DB	PCI Express	Yes	Yes	165A	ED08
PIXCI® E8SCIM	PCI Express	Yes	Yes	165A	E8C8
PIXCI® E8SCIMD	PCI Express	Yes	Yes	165A	E8C9

Hardware	Card Type	Uses IRQ's	Bus Master	Vendor ID	Device ID
PIXCI® e104x4-2f	PCI Express	Yes	Yes	165A	E204
PIXCI® e104x4-4b	PCI Express	Yes	Yes	165A	E404
PIXCI® e104x4-f2b	PCI Express	Yes	Yes	165A	E304
PIXCI® EB1	PCI Express	Yes	Yes	165A	EB01
PIXCI® EB1G2	PCI Express	Yes	Yes	165A	EB13
PIXCI® EB1-PoCL	PCI Express	Yes	Yes	165A	EB11
PIXCI® EB1G2-PoCL	PCI Express	Yes	Yes	165A	EB14
PIXCI® EB1mini	PCIe mini	Yes	Yes	165A	EB21
PIXCI® EB1mini	PCIe mini	Yes	Yes	165A	EB31
PIXCI® miniH2B	PCIe mini, M.2	Yes	Yes	165A	EB22
PIXCI® miniH2F	PCIe mini, M.2	Yes	Yes	165A	EB23
PIXCI® miniH2x4F	M.2 M-Key	Yes	Yes	165A	EB25
PIXCI® mf2280	M.2 M-Key	Yes	Yes	165A	EB26
PIXCI® mf2280D	M.2 M-Key	Yes	Yes	165A	EB28
PIXCI® mf2280D	M.2 M-Key	Yes	Yes	165A	EB29
PIXCI® EB1miniTg	PCIe mini	Yes	Yes	165A	EB43
PIXCI® EB1tg	PCI Express	Yes	Yes	165A	EB41
PIXCI® EC1	ExpressCard/54	Yes	Yes	165A	EC01
PIXCI® EC1	ExpressCard/54	Yes	Yes	165A	ECF1
PIXCI® ECB1	ExpressCard/54	Yes	Yes	165A	ECB1
PIXCI® ECB1-34	ExpressCard/34	Yes	Yes	165A	ECB3
PIXCI® ECB2	ExpressCard/54	Yes	Yes	165A	ECB2
PIXCI® EL1	PCI Express	Yes	Yes	165A	F001
PIXCI® EL1	PCI Express	Yes	Yes	165A	F0A1
PIXCI® EL1	PCI Express	Yes	Yes	165A	F0F1
PIXCI® EL1DB	PCI Express	Yes	Yes	165A	FD01
PIXCI® EL1DB	PCI Express	Yes	Yes	165A	FDF1
PIXCI® ELS2	PCI Express	Yes	Yes	165A	F002
PIXCI® SI	PCI	Yes	Yes	165A	C000
PIXCI® SI	PCI	Yes	Yes	165A	C001
PIXCI® SI1	PCI Express	Yes	Yes	165A	C011
PIXCI® SI2	PCI Express	Yes	Yes	165A	C002
PIXCI® SI2	PCI Express	Yes	Yes	165A	C012
PIXCI® SI4	PCI Express	Yes	Yes	165A	C004
PIXCI® SI4	PCI Express	Yes	Yes	165A	C024
PIXCI® SV2	PCI	Yes	Yes	8086	1223
PIXCI® SV3	PCI	Yes	Yes	8086	1223
PIXCI® SV4	PCI	Yes	Yes	109E	0350
PIXCI® SV5	PCI	Yes	Yes	109E	036E
PIXCI® SV5	PCI	Yes	Yes	109E	0878
PIXCI® SV5A	PCI	Yes	Yes	109E	036E
PIXCI® SV5A	PCI	Yes	Yes	109E	0878
PIXCI® SV5B	PCI	Yes	Yes	109E	036E
PIXCI® SV5B	PCI	Yes	Yes	109E	0878
PIXCI® SV5L	PCI	Yes	Yes	109E	036E
PIXCI® SV5L	PCI	Yes	Yes	109E	0878
PIXCI® SV6	PCI	Yes	Yes	14F1	8800
PIXCI® SV7	PCI Express	Yes	Yes	165A	EA02
PIXCI® SV8	PCI Express	Yes	Yes	165A	EA03
PIXCI® TNTX1	PCI Express	Yes	Yes	165A	F0B1

Under the Plug & Play architecture, if all add-in cards are Plug & Play compatible, no resource conflicts should occur. In practice, problems can still occur; although less frequently than with legacy ISA bus cards, and primarily on the earliest PCI compatible motherboards.

1.B ISA Card Interference

The computer's Plug & Play system can perform conflict free configuration only if all add-in cards are Plug & Play; presence of an ISA legacy card can't be detected by Plug & Play, and resources used by the legacy card may be reassigned. The conflicting resource is often an interrupt (IRQ). Computers with support for both Plug & Play and legacy ISA card's typically have BIOS Setup options such as:

```
IRQ 10  Used/Available
IRQ 11  Used/Available
```

These allow manually marking as ''Used'' for all IRQ's utilized by an ISA card; any IRQ's not so marked may be assigned and/or shared among the Plug & Play cards. (Circa 1995?)

1.C Insufficient Resources

The Plug & Play system is designed to automatically assign resources in a non-conflicting manner. However, resources are still limited, and there is no guarantee that every card will have its requirements fulfilled. Systems differ in how they notify the user of insufficient resources. If a Plug & Play card can't be detected by its software, try removing other Plug & Play cards to free various resources. (Circa 1995?)

1.D PCI Express Card not Found on Fast Booting Computers

The PIXCI® A110, A310, D3XE, E1, E1DB, EB1, EB1−PoCL, EB1mini, EC1, ECB1, ECB1−34, ECB2, EL1 (x1 gen1 version), EL1DB (x1 gen1 version), SI1, SI2, SV7, and SV8 frame grabbers, and PIXCI®E EB1tg frame generator, require a fraction of a second to initialize after power up, before it can identify itself to the operating system. On some fast-booting computers, the operating system may not see the card, and won't load the card's driver.

On some computers, the PIXCI® frame grabber may not be detected after a ''hard'' reboot (cycling computer power), but will be detected after a ''soft'' reboot (without cycling computer power). On some others, the frame grabbers will not be detected even after a soft reboot.

On some computers with Windows 10, and with updated PIXCI® firmware, the PIXCI® frame grabber may be detected after a soft restart, but not a hard reboot. Disabling Windows' ''Fast Startup'' (under Control Panel, Power Options) will allow detection after a hard reboot. (circa Jan. 2017).

2. Drivers and Plug & Play

2.A PCI/PCIe Vendor and Device ID Conflict

The Windows 95, 98, ME, 2000, XP, Vista, 7, 8, 10, and 11 Plug & Play utilizes a PCI/PCIe card's Vendor and Device ID to select a driver and associate the driver with a card. The DOS and Windows NT operating systems do not select a driver via Plug & Play, but rather the loaded driver searches for eligible and compatible cards. The PIXCI® SV2, SV3, SV4, SV5, SV5A, SV5B, SV5L, and SV6 frame grabbers share their PCI Vendor and Device ID with other cards, by other manufacturers, which use similar multimedia chipsets. This may cause confusion under any of those operating systems.

The PIXCI® driver may be associated with a non-PIXCI card. Attempts by XCIP or XCAP software to open non-PIXCI multimedia cards, which the PIXCI driver interprets as a PIXCI® SV2, SV3, SV4, SV5, SV5A, SV5B, SV5L, or SV6, typically results in a ''Can´t access 18V8/16LV8'' error. If the PIXCI® frame grabber(s) are removed and the same error occurs, then it is almost certain that other cards using similar multimedia chipsets are present.

Alternately, a non-PIXCI driver may be associated with a PIXCI® frame grabber. Under Windows 95, 98, ME, 2000, XP, Vista, 7, 8, 10, and 11, only one driver can be associated with a card and XCIP or XCAP software will therefore not be able to open the PIXCI® frame grabber; a typical error is ''Driver not installed ... or frame grabber not installed''. Under Linux, both drivers may have the frame grabber open, but interrupts (IRQ) may not occur; or, the PIXCI® frame grabber driver may report a ''DDrequest_(mem)_region'' error, if the multimedia driver has already opened the PIXCI® frame grabber.

2.B Windows 2000, XP Error: ´Drivers Not Installed´

If in response to Windows initial detection of a PIXCI® frame grabber and subsequent query for a driver, Windows 2000, or XP finds a Windows 95 or 98 driver, that driver will be loaded but not work properly. Windows 2000, and XP will no longer query about loading PIXCI® drivers, but the Device Manager will report that drivers are not installed, typically with an error code of ''28''.

To remedy: a) Delete the system copies of the PIXCI® driver's .inf and .pnf files, b) Using the Device Manager, uninstall the driver associated with the PIXCI® entry, c) Using the XCAP Driver Assistant, uninstall the PIXCI® driver, d) Reboot, or using the Device Manager initiate a scan for hardware changes, e) When the PIXCI® frame grabber is detected advise Windows that a specific driver ''location'' will be specified, but do not select CDROM, f) Specify the location as the DRIVERS\WIN2K or DRIVERS\WINXP folder under the XCAP installation folder, g) Reboot.

2.C Windows 2000, XP Error: ´Invalid Data´

On some Windows 2000 and XP Dell systems, after Windows Plug & Play detects the PIXCI® frame grabber and queries for a driver, Plug & Play may report an ''Invalid Data'' error. This occurs when Windows has erroneously marked the PCI/PCIe slot in the registry as ''READ ONLY''.

To remedy: (a) Click Start, Run, and ''regedt32'' (using the alternate ''regedit'' editor will NOT work). (b) Navigate to:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\ENUM\PCI
```

(c) Select a VEN_xxxx&DEV_xxxx.. entry which corresponds to the PIXCI® frame grabber being used (see list above). (d) Right click and select ''Permissions''. (e) Click ''Allow''. (f) Close regedt32 and continue with driver installation (i.e. Start, System, Control Panel, Add New Hardware, etc.).

2.D Windows XP Error: ´Required section was not found in the INF´

Under some Windows XP installations, attempts to install the PIXCI® driver result in a Windows ‘‘Required section was not found in the INF’’ error. This is not a PIXCI® specific problem. A Windows registry key is missing, namely:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Class\{6BDD1FC6-810F-11D0-BEC7-08002BE2092F}
```

Instructions for correcting the Windows registry can be found at:

```
http://h10025.www1.hp.com/ewfrf/wc/genericDocument?lc=en&cc=us&docname=c00206488
```

(Circa 2005?)

2.E Windows XP Error: ´The class installer has denied the request to install or upgrade this device´

Under Windows XP, attempts to install the PIXCI® driver result in a Windows ‘‘The class installer has denied the request to install or upgrade this device’’ error. This is not a PIXCI® specific problem. The error is typically caused by a computer virus attacking and modifying the Windows registry. The virus may still be present, or the virus may have been destroyed; but the effects of the changes to the registry remain.

Use ‘‘regedit’’ to remove the

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\EPIXXCW2
```

entry, reboot, and then use Windows’ Device Manager to reinstall the PIXCI® driver. XCAP’s PIXCI, PIXCI Open/Close, Driver Assistant, Uninstall PIXCI Driver can be used instead of ‘‘regedit’’. (Circa 2005?)

2.F Windows 8/10/11: Shutdown versus Restart

After installing a driver, installing an updated driver, or changing frame buffer memory allocation settings, under Windows 8, 10, or 11, the system’s Restart, not Shutdown, must be used for the changes to have effect! (Circa 04-Dec-2012).

2.G Windows 8/10/11 Error: ´Drivers Not Installed´ or ´Frame Grabber not Found´

XCAP/XCLIB V3.8 software reports that the PIXCI® driver is not installed, but the Windows Device Manager shows that the V3.8 PIXCI® driver is installed and working properly.

A change was made to the driver so as to pass Microsoft’s `verifier.exe` tests regarding ‘‘style’’ issues; previous versions of the driver used older kernel API functions that the verifier found objectionable. The newer driver requires use of a newer XCAP/XCLIB DLL; the newer DLL is backwards compatible can can operate with the older driver.

Either update to a newer release of the XCAP/XCLIB V3.8 software. Or set the ‘‘Windows´ Symbolic Link for V3.8.0 Driver Compatibility’’ option (XCAP, PIXCI, PIXCI Open/Close, Advanced) so that the driver operates in a compatibility mode. (Circa May 2015)

2.H Windows 10 Error: ´Drivers Not Installed´ or ´Frame Grabber not Found´

XCAP/XCLIB software reports that the PIXCI® driver is not installed, but the Windows Device Manager reports that the PIXCI® driver is installed and working properly.

On Windows 10, the Windows Device Manager, after installing PIXCI® driver, doesn’t always prompt for Windows to be restarted; rather it incorrectly reports that the driver is working normally. (This has only been observed under unusual circumstances; such as after using the Device Manager to explicitly uninstall the PIXCI® frame grabber, and then, later, restart Windows, find the PIXCI® frame grabber, and reinstall the driver).

Restart Windows to resolve problem. (Circa Feb 2022)

2.I PCIe/104 Error: ´Drivers Not Installed´ or ´Frame Grabber not Found´

PCIe/104 slots can be configured in two different ways: a) As one x16 bus, or b) As bifurcated into two x8 buses. The PIXCI® e104x4 requires the bifurcated configuration. If the bus is not bifurcated, the frame grabber might not be detected by the operating system, or additional PCIe/104 devices cannot be added above the frame grabber in the stack.

Refer to the motherboard documentation about implementing bus bifurcation. (Circa 2016).

2.J Windows Vista/7: Invalid Driver Digital Signature & Error Code 52

Microsoft has changed the behavior of Windows 7 and later so as to require the new SHA−2 style digital signature on any driver which is dated Jan 2016 or later. The Windows Device Manager may report ‘‘code 52’’ and ‘‘Windows cannot verify the digital signature of the drivers required for this device’’ if a driver with an incorrect signature is installed.

EPIX, Inc. now supplies drivers with both SHA−1 and SHA−2 signatures, as well as supplying drivers signed only with SHA−1 for compatibility with older systems.

However, Windows 7 may require an update to use drivers signed with SHA−2; see Microsoft's:

```
Microsoft Security Advisory 2949927
Microsoft Security Advisory 3033929
```

Windows Vista may also require an update; see:

```
Microsoft Article ID 2763674
```

Synopsis: Updating Windows with all Service Packs is necessary for reliable loading of any drivers dated Jan 2016 or later. (Circa 2016)

2.K Windows 10/11 64-Bit: Driver Digital Signature & Error Code 52

Newer releases of Windows 10 64-bit require drivers to be signed with Extended Validation (EV) signatures and countersigned by Microsoft. The Windows Device Manager may report ‘‘code 52’’ and ‘‘Windows cannot verify the digital signature of the drivers required for this device’’ if a driver with an incorrect signature is installed.

PIXCI® drivers released April 2017 comply with these requirements for desktop operating systems.

Older drivers can be used by disabling Windows' requirements for signatures, such as via:

```
bcdedit /set TESTSIGNING ON
```

or by holding left-shift while clicking restart, then (after navigating through several screens, accessing ‘‘Driver Signature Enforcement’’.

Windows 11 has the same requirements for Extended Validation (EV) signatures. (Circa 2017, 07-Oct-2021)

2.L Windows 10/11 64-Bit: Driver Digital Signature & Error Code 52

Newer releases of Windows 10 64-Bit, and Windows 11, require drivers to be signed with Extended Validation (EV) signatures and countersigned by Microsoft. The Windows Device Manager may report ‘‘code 52’’ and ‘‘Windows cannot verify the digital signature of the drivers required for this device’’ if a driver with an incorrect signature is installed.

Use the Windows file browser and check the digital signature of:

```
c:\Windows\System32\Drivers\epixxc6.sys
```

under its Properties. The driver should be signed by EPIX, Inc. and countersigned by Microsoft.

Under some conditions, early releases of Windows 10 may incorrectly report a driver's valid signature as invalid; update Windows with all Service Packs.

A driver for an older version of Windows, using a different digital signature, may have been installed; this may happen if, on initial installation, the Device Manager is allowed to search for a driver and selects a driver with, perhaps, Windows 7 style signatures. Use the Device Manager, select the PIXCI® imaging device, ‘‘Properties’’, ‘‘Driver’’, click ‘‘Uninstall Device’’, and restart Windows. The Device Manager should prompt for a driver; do not let it search, instead point it to:

```
c:\Program Files\...\EPIX\XCAP\Drivers\Win11x64
```

or

```
c:\Program Files\...\EPIX\XCAP\Drivers\Win10x64
```

(The actual path may vary depending on Windows configuration and options used when installing XCAP; if necessary, use Windows' File Explorer to search for ''XCAP''). (Circa 26-Jul-2018, 07-Oct-2021)

2.M Linux: Driver Compilation and Installation Issues

For Linux kernels 2.6 and later, Linux requires that each driver be compiled ''against the kernel'' on which the driver is to be used: same version, subversion, sub-subversion, etc. As new Linux kernels are released daily (if not more often!), it is impractical to provide a pre-compiled driver for each kernel. Instead, XCAP provides a ''driver recompilation kit'', sufficient to recompile the driver on the host system.

Driver compilation requires that compilation tools and kernel build files have been installed; these are provided as part of the Linux distribution — they are not provided with XCAP.

A compilation error such as ''make: not found'' or ''gcc: not found'' suggests that compilation tools were not installed. Install the tools from the Linux distribution; on Ubuntu systems, the:

```
apt-get install build-essential
```

might suffice.

A compilation error such as ''/lib/modules/NAMER/... not found'', where ''UNAMER'' is the result of the ''uname -r'' command, suggests that kernel build files were not installed. Install the kernel build files from the Linux distribution; on Ubuntu systems, the:

```
apt-get install linux-headers-UNAMER
```

might suffice (again, replacing ''UNAMER'' with the current kernel version).

An installation error such as ''Invalid Module Format'' suggests that installation of a driver of incorrect version was attempted (such as by installing a pre-compiled driver).

An installation error of ''Key was rejected by Service'' suggests that Linux is configured to require signed drivers, while the freshly compiled driver is unsigned. On i386 or x86-64 systems, disable *SecureBoot* via UEFI/BIOS; some systems may not have an explicit ''Disable'' option — instead, delete the keys. Or, request assistance from your local IT group with disabling *SecureBoot*, or request digital credentials and assistance with signing the newly compiled driver.

The errors quoted above are generated by Linux, not XCAP; the error text may differ. (Circa 17-Jul-2023)

2.N Windows 11 64-Bit: Kernel DMA Protection & Error Code 55

The Windows Device Manager may report ''code 55'' and ''This device is blocked from starting while the user is not logged in''.

Disable:

```
Kernel DMA Protection
```

and/or:

```
Virtualization
```

in UEFI/BIOS. (Circa 18-Aug-2025)

3. PCI/PCIe Interrupts (IRQ)

3.A IRQ Sharing

The Plug & Play system may assign multiple PCI/PCIe cards to share the same interrupt. Depending on the characteristics of the two (or more) devices sharing an interrupt, and the characteristics of the selected operating system, one or both devices may always work, may never work, or may work intermittently.

IRQ sharing is a concern for cards using the older PCI bus w. IRQ pins, but not for PCI Express using its Message Signaled Interrupts (MSI).

Test for IRQ sharing by using XCAP:

```
PIXCI®
PIXCI® Open/Close
Advanced
Allow Shared IRQ: Uncheck
OK
Open
```

If the Open succeeds, then the IRQ was not being shared. If the Open does not succeed and a ‘‘Configuration Error or Fault’’ dialog is shown with a message such as ‘‘Bad or conflicting IRQ’’, then the IRQ was being shared with another device. This tests for conflict, but does not resolve the conflict.

IRQ sharing may or may not work, depending upon the various devices involved. On some motherboards, IRQs are assigned by physical slot; try moving the PIXCI® frame grabber to a different slot. On other motherboards, the UEFI/BIOS Setup may allow assigning IRQs to different slots; or may at least allow specifying which IRQ’s are to be parceled out amongst all slots.

3.B Linux: Interrupts (IRQ) Inoperative

The measured video frame rate is zero; for Camera Link, serial communication does not work.

Some Linux systems require

```
pci=nomsi
```

to be added to the kernel boot command line for PCI or PCIe interrupts to function correctly. (Circa 23-Jan-2018).

Newer PCIe PIXCI® frame grabbers, along with newer drivers, support use of Message Signaled Interrupts (MSI) and thereby avoid having to specify ‘‘pci=nomsi’’. (Circa 08-Oct-2024).

4. PCI/PCIe Bus Master (DMA) & Bus Bandwidth

4.A Bus Mastering

Imaging boards without on-board memory use PCI/PCIe bus master mode (i.e. DMA) to transfer image data to the PC's memory in real time. The available bandwidth of PCI/PCIe motherboards differs widely; not all PCI/PCIe motherboards can support continuous, full field, real time capture into PC memory.

Some motherboards may not support Bus Mastering in every PCI/PCIe slot; the motherboard's documentation should describe which slots may be used. Also, some older motherboards may have PCI/PCIe slots, but are not Plug & Play compatible; the BIOS Setup screens may require manual enabling of master mode and assignment of IRQ's for each PCI/PCIe slot:

```
Device Select:      Slot 0
Enable Device:      Enabled
Enable Master:      Enabled
Device IRQ Line:    IRQ 11
```

Older motherboards may initialize with PCI Burst Mode deactivated; other motherboards may not support PCI Burst Mode at all. PCI Burst Mode is critical to utilizing the full bandwidth of the PCI bus. Some versions of BIOS Setup allow enabling PCI Burst Mode:

```
PCI Burst Mode      Enabled
```

Older graphic display (S/VGA) cards may not operate properly with Burst Mode enabled; consult the graphic display (S/VGA) card manufacturer for updated drivers which allow use of Burst Mode. (Circa 1995?)

4.B BIOS - Memory Parity Error (MPE)

See **Windows - Blue Screen of Death (BSoD)**, below.

4.C Windows - Blue Screen of Death (BSoD)

The PIXCI® PCI Express and ExpressCard frame grabbers (D3XE, E1, E1DB, E4, E4DB, E4G2−2F, E4G2−4B, E4G2−F2B, E8, E8CAM, E8DB, e104x4−2f, e104x4−4b, e104x4−f2b, EB1, EB1−PoCL, EB1mini, miniH2B, miniH2F, miniH2x4F, mf2280, mf2280D, EC1, ECB1, ECB1−34, ECB2, EL1, ELS2, EL1DB, SI1, SI2, or SI4), and frame generators (EB1tg or EB1miniTg), require:

```
PCI SERR# Generation    Disable(d)
```

to be set in the BIOS. Otherwise, a BSoD or MPE (Memory Parity Error) may occur when the PIXCI® imaging card is opened. For some motherboards, this option may not exist and is, by default, disabled.

The PIXCI® PCI Express and ExpressCard frame grabbers require:

```
ASSERT NMI on SERR      Disable(d)
```

Otherwise, a BSoD or MPE may occur when the PIXCI® imaging card is opened. On some motherboards, this option is a jumper rather than a BIOS setting.

4.D Bus Mastering: Insufficient Bandwidth

A bus mastering (DMA) type of PIXCI® frame grabber transfers video across the PCI/PCIe bus; high resolution, high bit depth, and/or high frame rate all contribute to increased use of PCI/PCIe bus bandwidth.

The PCI/PCIe bus bandwidth of a given computer motherboard is not dependent on the speed of the CPU, but on the

attributes of the PCI/PCIe and memory controller chipsets, and whether the connection between the former and latter is routed through other chipsets (bridges) and bottlenecks.

Often the problem is resolved by updating the motherboard BIOS, motherboard firmware, and graphic display driver (even on relatively new computers), along with disabling power conservation.

4.D.1 PCI

For PCI (not PCIe), each group of PCI slots - by design - shares memory bandwidth. The PCI bus bandwidth available for video capture depends on what other devices are utilizing PCI bandwidth. PCI versions of graphic display (S/VGA) cards and PCI based disk controllers all consume PCI bandwidth. The on-board (i.e. built onto the motherboard) graphic display (S/VGA) feature or disk controllers may also be internally attached to the PCI bus and consume PCI bandwidth.

Using an AGP or PCI Express type graphic display (S/VGA) card, or an PCI Express disk controller, may help alleviate PCI bus bandwidth limitations.

4.D.2 PCIe & Motherboard Selection

Unlike PCI, the PCIe design can provide full bandwidth from each PCIe slot. However, how the motherboard routes PCIe data may introduce bottlenecks and reduce bandwidth.

Typically, Intel and other major brand motherboards provide full PCIe bandwidth and their ‘‘high-end’’ motherboards. Lesser motherboards often cut corners, perhaps expecting that the average desktop PC user rarely plugs anything into the PCIe bus.

For Intel motherboards, circa 2022, avoid lower tier ‘‘H’’ and ‘‘B’’ chipsets which route PCIe data through the southbridge along with other data. The ‘‘Z’’ chipsets connect the PCIe slots directly to the MCH (memory controller hub).

4.D.3 Windows Configuration

With some Intel S/VGA drivers circa 2010, use of Windows’ ‘‘Aero’’ mode may cause the ‘‘PCI FIFO Overflow’’ error message. Disable the Windows Aero mode.

4.D.4 Power Conservation & UEFI/BIOS Configuration

Circa 2010 and later motherboards may implement aggressive power conservation, reducing the available bandwidth on the PCI/PCIe bus for video rate data transfer.

In UEFI/BIOS, disable the:

```
CPU C-State
```

option. Other common terminology & features in UEFI/BIOS related to power conservation that can impact PCI/PCIe bandwidth are:

```
C3/C6/C7/EIST
C3/C6 State Support
CPU Power Management
CPU Dynamic Voltage Management
CPU Enhanced Halt (C1E)
Renderer Standby (RC6)
Idle Power Savings
Extended Idle Power Savings
```

and should be disabled, while:

```
High Performance
```

should be enabled.

Other common options & features in UEFI/BIOS that might impact PCI/PCIe bandwidth are:

```
Intel Enhanced Speed-Step Technology (EIST)
Speed-Step Technology
Turbo Mode
Turbo Boost
Wifi Network
Wireless Connectivity
```

and should, experimentally, be disabled.

Some systems may not have a suitable UEFI/BIOS option, or the UEFI/BIOS option may be ignored.

If using Linux, disabling all of ACPI (Advanced Configuration and Power Interface) as a boot time option should disable the C−State option (add ‘‘acpi=off’’ to the kernel boot command line). Or, disabling PCIe’s ASPM (Active State Power Management) as a boot time option (add ‘‘pcie_aspm=off’’ to the kernel boot command line). Other possible Linux boot options are:

```
processor.max_cstate=1
intel_idle.max_cstate=0
```

Some laptop computers may enable C−State when using battery power, and disable C−State when using external power.

In Windows 7, selecting:

```
Power Plans: High Performance
```

should disable C−State; however tests with Windows 7 and various motherboards show inconsistent results.

4.D.5 ExpressCard, M.2, and Thunderbolt

Frame grabbers with ExpressCard and M.2 interface are using PCIe, albeit with a different form factor; suggestions regarding motherboard bottlenecks and MCH, and UEFI/BIOS configuration, above, are applicable.

Frame grabbers with Thunderbolt(tm) interface are using PCIe, albeit as a signal carried by Thunderbolt; suggestions regarding motherboard bottlenecks and MCH, and UEFI/BIOS configuration, above, are applicable.

4.D.6 Computer Configuration

Aside from trying a different motherboard: a) Use PCI Express style graphic display (S/VGA) card instead of a PCI or on-board style graphic display (S/VGA) card, b) Set the graphic display (S/VGA) to lower resolution, c) Upgrade the mother-board’s microcode - especially for motherboards or computers purchased soon after release of a new design, d) Reduce the size of the image display window during live capture, e) Select half video rate capture and display, the so-called Alternate Snap & Display mode (in XCAP: View, Display, Live Mode) so that video capture and image display alternates, and/or f) Try a different PCI or PCIe (or ExpressCard, M.2, or Thunderbolt) slot of the motherboard.

4.E PC Halts or Reboots

Generally: If the PC halts or reboots after the PIXCI® frame grabber has been opened but is not yet capturing video, the problem may be an IRQ or other resource conflict; see **IRQ Sharing**, above. For PCI Express PIXCI® frame grabbers, also see **Windows - Blue Screen of Death (BSoD)**, above.

If the PC halts or reboots only after a bus mastering (DMA) type of PIXCI® frame grabber is capturing video, the problem may be insufficient bandwidth on the PCI/PCIe bus. See **Bus Mastering**, above, and check that burst mode is enabled. See **Bus Mastering: Insufficient Bandwidth**, above. Also, in XCAP, use:

```
PIXCI
PIXCI Video Setup
```

and reduce the horizontal resolution (i.e. data pixels per line) to (approximately) 1/4 or 1/10 of the previous value. If video can be successfully captured (ignoring the truncated appearance), then PCI/PCIe bus bandwidth was likely insufficient.

4.F Asus/VIA P4X266A

Asus motherboards and VIA PCI chipsets, such as P4X266A (circa June 2002) do not implement DMA transfers properly. An unofficial patch by George Bresse (see www.tech-report.com/onearticle.x/3280) improves performance of these chipsets but does not entirely fix the problem.

4.G x4 & x8 PCI Express Slots

On some motherboards (circa 2009), the x4 or x8 PCI Express Slot is intended only for a S/VGA card - providing high bandwidth transfers from PC memory to the PCI Express card, but only supporting low bandwidth transfers from the PCI Express card into PC memory. The latter mode is required by PIXCI® frame grabbers.

XCAP may, or may not, be able to explicitly warn the user if a PIXCI® E4, E4DB, E4G2−2F, E4G2−4B, E4G2−F2B, E8, E8CAM, E8DB, e104x4−2f, e104x4−4b, e104x4−f2b, or SI4 is used in such a slot, depending on how the motherboard implements the bandwidth reduction.

4.H x1 & x4 PCI Express Slots

On some motherboards with x4 PCI Express slots, UEFI/BIOS provides options as to whether the slot is configured as a single x4 PCI Express slot, or as four x1 PCI Express slots (using an adapter to ‘‘break-out’’ the necessary signals to four x1 PCI Express cards. A x4 PCI Express card can be used with the slot configured to the four x1 PCI Express slot mode, but the slot will not provide the bandwidth expected of a x4 PCI Express slot. (Circa 24-Jan-2012).

4.I Linux: Bus Mastering (DMA) Inoperative

The camera appears to operate correctly, the measured video frame rate and capture frame rate are correct, no errors are reported by XCAP. But the frame buffer retains its previous pixel data (typically black); a test pattern drawn by XCAP (use XCAP’s Modify, Patterns) is displayed properly and not overwritten by pixel data. There may be errors reported via Linux’ ‘‘dmesg’’ related to ‘‘DMA’’ (Direct Memory Access), ‘‘IOMMU’’ (Input/Output Memory Management Unit), or ‘‘PTE’’ (Page Table Entries), such as:

```
DMA Write NO_PASID
PTE Write Access is not set
```

Some Linux systems may require:

```
iommu=soft
```

to be added to the kernel boot command line for PCI or PCIe Bus Mastering (DMA) to function correctly. (Circa 09-Sep-2022).

On Linux systems with hardware Virtualization Support, it may prevent DMA from operating correctly; disable Virtualization Support via UEFI/BIOS. (Circa 27-Jul-2023)

Alternately, select the new ‘‘Per-Unit’’ allocation option, instead of ‘‘Common Pool’’ allocation, of frame buffer memory. (01-Jul-2025)

5. Graphic Display (S/VGA) Settings

5.A Windows - Colors & Grey Levels

The XCAP program for Windows display's imagery on the computer's graphic display (S/VGA) monitor. The quality of the displayed images is dependent on Window's settings and operation of the graphics display (S/VGA) card.

A ''High Color (16 bit or 65536 Color)'', ''True Color (24 bit or 16777216 Color)'', or ''True Color (32 bit)'' setting for the graphic display (S/VGA) adapter is required for proper display of images and overlay graphics; the ''True Color (24 bit or 16777216 Color)'' or ''True Color (32 bit)'' is suggested for higher quality, and quicker, display of images and overlay graphics. in Windows 2000, under ''Control Panel'', ''Display'', ''Effects'', the ''Show window contents while dragging'' should be disabled. Or in Windows XP, under ''Control Panel'', ''Appearance & Themes'', ''Display'', ''Appearance'', ''Effects'', the ''Show window contents while dragging'' should be disabled.

5.B Windows - S/VGA Accelerators

There are reports of problems with later releases XCAP V2.2 using Java 1.3.1 and some S/VGA cards under Windows 2000, causing XCAP to lock up the PC (whether or not the PIXCI® frame grabber is installed or open). Disable the S/VGA Accelerator by using Start, Control Panel, Display, Settings, Advanced, Troubleshooting and set the Hardware Acceleration to None. (Circa 2000)

5.C Linux - Colors & Grey Levels

Under Linux, for best image display quality and display rate, the graphics display system (S/VGA) should be in TrueColor or DirectColor mode. (Circa 2002)

5.D Graphics Display Resolution

For flat panel LCD and other ''discrete'' graphics display systems, set the resolution specified in the operating system identical to the display's physical resolution. Other choices cause the display system to interpolate pixels, causing aliasing, poor graphics, and hard to read text.

6. Memory Resources

6.A Frame Buffer Memory Allocation

Under Linux and under Windows NT and later operating systems, a computer can be populated with 4 GiBytes of memory. Under 64-bit operating systems, a computer can be populated with more than 4 GiBytes of memory. The Intel architecture overlaps BIOS, PCI configuration space, and other resources onto the high end of the 4 GiByte address space; the memory at the high end of the 4 GiByte address space is inaccessible to the operating system and can't be used as frame buffer memory.[1] Some 64-bit motherboards provide a

```
Remap memory above 4GB
```

BIOS option so that memory which overlaps BIOS, PCI configuration space, and other resources is ''moved'' above 4 GiBytes and is not lost.

The address space ''takeaway'' is of special concern when using forceful memory allocation. The operating system is instructed to use less than the available memory (e.g. only the first 1 GiByte of 4 GiByte), and the PIXCI® frame grabber must be instructed to use an explicit address and size of frame buffer memory (e.g. starting at the 1 GiByte address and using 2.5 GiByte). Or under 64-bit operating systems where the PIXCI® frame grabber can be instructed to use an explicit address and size of frame buffer memory and an explicit exclusion for the ''takeaway'' (e.g. on a computer with 8 GiByte of memory, starting at the 1 GiByte address and using 7 GiByte excluding the 0.5 GiByte ''takeaway'').

If the PIXCI® frame grabber is instructed to use forceful memory allocation with frame buffer memory overlapping ''takeaway'' address space: displaying frame buffers which overlap may result in all white or random pixel values, capturing frame buffers which overlap may result in no effect on the contents of the frame buffer, or may severely degrade operation of the computer system.

BIOS typically reports how much physical memory is installed, and how much is available after ''takeaways''. Note that motherboards with PCI Express support tend to have much larger ''takeaways'' than older motherboards with 32 or 64-bit PCI support. The XCAP, Driver Assistant, Set Frame Buffer Memory Size feature can't automatically determine the ''takeaway'', but takes an educated guess and sets:

```
BIOS Reserved Memory Hole Size
```

appropriately. The user should review the default ''takeaway'' size and correct as needed.

The Intel Dynamic Video Memory Technology (DVMT) (circa 2006) may cause similar problems when using forceful memory allocation, as it uses 8 MiByte or more allocated by BIOS at the high end of physical memory. When the computer has less than 4 GiByte of memory and this ''takeaway'' occurs at, for example, immediately below the 2 GiByte address, the PIXCI® frame grabber must be instructed to use an explicit address and size of frame buffer memory (e.g. starting at the 1 GiByte address and using 1016 MiByte) so as to exclude the memory used by DVMT.

The Intel vPro Technology (circa 2010?) may cause similar problems when using forceful memory allocation, as it uses memory between the 768 MiByte and 1024 MiByte addresses. The PIXCI® frame grabber must be instructed to use an explicit address and size of frame buffer memory (e.g. starting not lower than the 1024 MiByte address) so as to exclude the memory used by vPro.

---

1. See the Intel white paper, Intel Chipset 4 GB System Memory Support, dated February 2005.

6.B Frame Buffer Memory vs. S/VGA Memory Space

When trying to configure a computer for the maximum amount of frame buffer memory and the maximum amount of frame buffers, using a S/VGA card with the minimal amount of S/VGA memory is often beneficial. The S/VGA memory is mapped into the computer's memory space, reducing the amount of accessible computer memory (even if not reducing the amount of physical computer memory), and thereby reducing the amount of available frame buffer memory. (Added 19-Jan-2012).

6.C Using a 32-bit Frame Grabber or 32 bit Application on 64-bit O.S.

A 32-bit frame grabber, such as the PIXCI® D2X, CL1, or SV5 can't access frame buffer memory above the 4 GiB address. Use on a 64-bit system with more than 4 GiB of memory might fail, depending on the location of memory provided by the O.S., showing the ''Unable to access 64-bit frame buffer memory w. 32-bit frame grabber'' error.

A 32-bit application, using 32 bit XCLIB, has a similar restriction. Use on a 64-bit system with more than 4 GiB of memory might fail, depending on the location of memory provided by the O.S., showing the ''Frame buffer memory extends above the 4 GiB address limit with 32-bit XCLIB on 64-bit O.S.'' error.

Set the ''Restrict Non-Forceful Memory to be below 4 GiByte'' (in PIXCI®, PIXCI® Open/Close, Advanced) option followed by reboot.

Alternately, on Windows systems without XCAP: Use ''regedit'', and navigate into:

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\EPIXXCW6
```

Edit the ''PIXCI'' key; if it doesn't exist, create it with ''String'' type. If the ''PIXCI'' key's value doesn't have a ''-WT'' flag, append a space and:

```
-WT 0x80
```

to the key's value; alternately, modify the numeric value following ''-WT'' so as to set the ''0x80'' (base 16) bit. Reboot.

7. Desktops & GUI's & Privileges

7.A Linux: Running XCAP as ´root´

Generally, XCAP need not be run as ''root'' or with ''super-user'' status.

The Driver Assistant in XCAP provides a convenient GUI for configuration tasks such as installing drivers, or configuring frame buffer memory. But use of the Driver Assistant feature requires that XCAP be run as ''root'', or with ''super-user'' status. On most Linux distributions, this is easily done by opening a ''terminal'', using ''sudo'' to obtain super-user status, and then running XCAP from the ''terminal''.

On openSUSE, Java based GUI programs (such as XCAP) can't be run via ''terminal'' and ''sudo''. The error may state ''Unsatisfied Link Error'' and reference ''awt_FreeDrawingSurface''. This problem is not specific to XCAP.

Advice from the Linux community is to use ''xdg−su'', ''kdesu'', or ''gnomesu''. Or use ''su -'' instead of ''sudo''. (Circa Jan-2018)

Some systems may prevent any GUI programs from running via the terminal with super-user status. Typical error is ''No Protocol Specified''. This problem is not specific to XCAP.

Advice from the Linux community is to use:

```
export DISPLAY=:0
```

or

```
export DISPLAY=:0.0
export XAUTHORITY=~/.Xauthority
```

before running the GUI program, such as XCAP.

Other advice suggests executing:

```
xhost:localhost:root
```

before using ''sudo'' and running the GUI program. (Circa Apr-2017)

Some systems will run the GUI program, but restrict its access to external utility programs.

Newer releases of XCAP, in conjunction with many Linux distributions supporting the ''gnome terminal'' or ''xterm'', allow using XCAP's Driver Assistant without running XCAP as super-user. XCAP's Driver Assistant will instead, as needed, prepare a shell script, open a ''terminal'' window, use ''sudo'' to prompt the user for the appropriate password, and have ''sudo'' execute the shell script. On some systems ''gnome terminal'' can't be started from XCAP; installing ''xterm'' is recommended, such as via:

```
apt-get install xterm
```

(on systems using ''apt-get''). (Circa Jan-2021)

7.B Linux SUSE Error: ´xcb_xlib_unlock: Assertion c->xlib.lock failed´

On distributions of openSUSE 10.x an error:

```
xcb_xlib_unlock: Assertion 'c->xlib.lock' failed
```

may occur (reported on stderr) when running a Java application, such as XCAP. This problem is not specific to XCAP.

Workaround:

```
export LIBXCB_ALLOW_SLOPPY_LOCK=1
```

before running the GUI program, such as XCAP. The workaround can be added to the `/usr/local/bin/xcap` or to the `/usr/local/xcap/xcaplnx` shell scripts. (Circa 2007)

7.C Linux Error: ´Cannot restore segment prot after reloc´

Selected releases of Linux have enabled new security extensions called ‘‘SELinux’’. The SELinux may prevent loading of XCAP’s `libjpxiplhl_i386.so` file, and perhaps other shared objects. These problems are not specific to XCAP.

Disable SELinux by editing `/etc/selinux/config` and setting

```
SELINUX=disabled
```

Or prevent SELinux from loading by using the

```
chcon
```

command on each file to which SELinux objects. (Circa 2007)

7.D Linux Error: ´Cannot execute .bin file(s)´

Attempt to execute a `.bin` file, such as a self contained software installer, may result in a ‘‘file can´t be found’’ error.

Some versions of the `.bin` files expected the ‘‘Linux Standard Base (lsb)’’ libraries which may not be automatically installed with all Linux distributions.

Install the ‘‘Linux Standard Base (lsb)’’ libraries with a command such as:

```
apt-get install lsb-base
```

although the specific command may differ on various Linux distributions.

Alternately, using:

```
readelf -a software.bin | grep interpreter:
```

should yield something similar to:

```
    /lib/ld-lsb.so.3              (for 32-bit pgms)
or  /lib64/ld-lsb-x86-64.so.3     (for 64-bit pgms)
```

(which, parenthetically, is the loader file that ‘‘can´t be found’’). Do:

```
    chdir /lib                    (for 32-bit pgms)
or  chdir /lib64                  (for 64-bit pgms)
```

it should contain an existing loader such as:

```
    ld-linux.so.2                 (for 32-bit pgms)
or  ld-linux-x86-64.so.2          (for 64-bit pgms)
```

Create a symlink:

```
ln -s {existing loader} {loader expected by software.bin}
```

(Circa 2013)

7.E Linux Error: ´Cannot execute .bin file(s)´

Attempt to execute a `.bin` file, such as a self contained software installer, may result in a ‘‘command not found’’ error.

This will occur when attempting to execute a program in the current directory using its (simple) name:

```
software.bin
```

Instead, execute with:

```
./software.bin
```

(Circa 2005?)

7.F Linux Error: ´Cannot execute .bin file(s)´

Attempt to execute a `.bin` file, such as a self contained software installer, may result in a ‘‘permission denied’’ error.

This often occurs after downloading an executable program, or copying an executable program from CD/DVD; as the necessary file ‘‘mode’’ bits don’t survive up/downloads and aren’t supported on CD/DVD media.

Change the file mode:

```
chmod a+x software.bin
```

before executing:

```
./software.bin
```

(Circa 2005?)

7.G Linux Error: ´Unsatisfied Link Error: libjawt.so´

When running a Java application, such as XCAP, with Java OpenJDK-11 an error:

```
Unsatisfied Link Error: libjawt.so
```

may occur (reported on stderr). This problem is not specific to XCAP.

This error does not occur when using XCAP on i386 and x86−64 platforms when using the JRE included with XCAP. This error occurs more often on ARM platforms, for which XCAP does not include a preferred copy of the Java JRE.

Workaround: Find the location of `libjawt.so`:

```
find /usr -name libjawt.so -print
```

and set:

```
export LD_LIBRARY_PATH='...'
```

to the proper location before running the GUI program, such as XCAP. The workaround can be added to the `/usr/local/bin/xcap` or to the `/usr/local/xcap/xcaplnx` shell scripts.

On most systems with as single installed Java, using:

```
LIBJAWT=$( find /usr -name libjawt.so | sed -e s:/libjawt.so:: )
export LD_LIBRARY_PATH=$LIBJAWT
```

or on most systems with typical installation of multiple Java’s, using:

```
LIBJAWT=$( find $( readlink -f /usr/bin/java | sed -e s:/bin/.*:: ) -name libjawt.so | sed -e s:/libjawt.so:: )
export LD_LIBRARY_PATH=$LIBJAWT
```

will automate the process. On newer releases of XCAP, these lines are provided in `/usr/local/xcap/xcaplnx`, as comments. (Circa 2018)

Newer releases of XCAP implement a workaround for this issue; editing `/usr/local/xcap/xcaplnx` is not required. (Circa July 2021).

7.H Linux Error: ´Assistive Technology not found: org.GONE.Accessibility.AtkWrapper´

When running a Java application, such as XCAP, with Java OpenJDK−8, an error:

```
java.awt.AWTError: Assistive Technology not
found: org.GONE.Accessibility.AtkWrapper
```

may occur (reported on stderr). Or, a Java stack trace, incorporating:

```
...
at org.GNOME.Accessibility.AtkUtil.invokeInSwing(AtkUtil.java:68)
at org.GNOME.Accessibility.AtkObject.hashCode(AtkObject.java:234)
at org.GNOME.Accessibility.AtkWrapper.emitSignal(Native Method)
...
```

may appear in XCAP’s Message Log. This problem is not specific to XCAP.

One solution is to disable assistive technologies. Edit the accessibility.properties file for OpenJDK−8:

```
sudo gedit /etc/java-8-openjdk/accessibility.properties
```

Find line:

```
assistive_technologies=org.GNOME.Accessibility.AtkWrapper
```

and comment out the line by prepending a "#", such as:

```
#assistive_technologies=org.GNOME.Accessibility.AtkWrapper
```

(Circa 2020)

7.I Linux Error: ´ld.so assertion failed´

When running a Java application, such as XCAP, with Java OpenJDK−11, an error:

```
Inconsistency detected by ld.so: dl-lookup.c: 111:
check_match: Assertion 'version->filename == NULL
|| ! _dl_name_match_p (version->filename, map)' failed!
```

may occur (reported on stderr).

Disable XCAP's use of "XWindows/X11 API" for rendering of images and video, in favor of the "AWT API". Either by editing `xcap.ini` to disable auto open of the frame grabber on startup, allowing an opportunity to configure "API" options in the *Utility*, *Program Setup*. Or by editing `xcap.ini` and set:

```
api.display.awt=1
api.display.x11=0
```

Or, use OpenJDK−8 instead of OpenJDK−11. (Circa 2021?)

7.J Linux Error: ´Key was rejected by service´

Kernels compiled for Secure Boot and with Secure Boot enabled in UEFI/BIOS, will refuse to install drivers lacking an appropriate digital signature. Either disable Secure Boot in UEFI/BIOS. Or, (a) On Ubuntu and similar distributions, use

```
update-secureboot-policy --new-key
```

to create digital certificates:

```
/var/lib/shim-signed/mok/MOK.der
/var/lib/shim-signed/mok/MOK.priv
```

and enroll with:

```
update-secureboot-policy --enroll-key
```

Or, on other systems, create digital certificates with `openssl` and enroll via `mokutil`. (b) When using XCAP to compile and install the driver, select the "Sign Driver with Machine Owner Key (MOK)" option. XCAP allows selecting the pathname of the certificates to be used, defaulting to:

```
/var/lib/shim-signed/mok/MOK.der
/var/lib/shim-signed/mok/MOK.priv
```

(Circa Jan 2025)

7.K Windows Error: ´Data Execution Protection (DEP)´

The Data Execution Protection (DEP) feature may prevent XCAP from starting, or may allow XCAP to start but later abruptly terminate XCAP. The Data Execution Protection (DEP) should be disabled, either in BOOT.INI or via the Windows' Control Panel.

This problem affects many Java based applications and is not specific to XCAP XCLIB and PXIPL are compatible with DEP. (Circa 2012)

7.L Windows 8/10/11: Running XCAP as Administrator

Generally, XCAP need not be run as with administrator privileges.

The Driver Assistant in XCAP provides a convenient GUI for configuration tasks such as installing drivers, or configuring frame buffer memory. On Windows 8, 10, and 11 - and possibly earlier versions of Windows depending on user access

control settings - use of the Driver Assistant requires that XCAP be explicitly granted with administrator privileges - even if the user's account has administrator privileges.

For newer versions of XCAP V3.8 (Jan 2021 and later), XCAP's Driver Assistant will open a User Account Control (UAC) dialog, asking the user for permissions as needed.

Alternately, for older versions of XCAP, right click on XCAP's shortcut and select ''Run as Administrator''. The newer versions of XCAP can still be run as Administrator; which may be more convenient when installing or configuring several of the Driver Assistant's features so as to avoid a UAC prompt for each use and feature.

7.M Windows: Anti-Viral Software with Registry Protection

McAfee anti-viral software with registry protection, circa 2008, prevents users - even those with Administrator privileges - from editing the registry. This is, by itself, only a minor annoyance when trying to change PIXCI® frame grabber parameters.

However, the registry protection may also prevent Windows Service Packs from installing properly (specifically reported with Windows XP SP3), causing all kinds of mischief and problems. For example, the PIXCI® driver's ''Unable to Map Image Memory (DDK MmMapIoSpace)'' error may be intermittently reported. (Circa Dec-2008)

7.N Windows & XCAP: ´Bad module(s) signature!'

Upon startup, XCAP may report ''Bad module(s) signature!'' and exit. Most often, the ''Bad module(s) signature!'' is the result of using a combination of files from two different XCAP releases; such as might occur if an XCAP update is interrupted and incomplete. The error can also occur if XCAP's installed files have been modified, such as by a virus or by anti-viral software. (Circa Dec-2020)

7.O Windows: TrendMicro Security Anti-Viral Software

With TrendMicro Security security enabled, the Windows Device Manager may show the PIXCI® driver as disabled. The PIXCI® driver can be manually enabled; but a moment later will be disabled.

The TrendMicro application (a background process) disables drivers that it dos not recognize. See TrendMicro's instructions for adding driver(s) to its ''White List'' of recognized and authorized drivers. (Circa Feb-2023)

7.P Windows: DRIVER VERIFIER DMA VIOLATION BSoD

On Windows 10 or 11, upon opening the PIXCI® frame grabber (and prior to attempting to capture and DMA data), Windows displays a Blue Screen of Death (BSoD) and ''DRIVER VERIFIER DMA VIOLATION''.

This has been observed when Windows Virtualization Support is enabled in conjunction to using Cisco Security. Disable one or the other. (Circa Apr-2023)

Alternately, select the new ''Per-Unit'' allocation, instead of ''Common Pool'' allocation, of frame buffer memory. (01-Jul-2025)

8. Camera & Capture Issues

8.A Capture Issue: Pixel Data is Black

The camera appears to operate correctly, the measured video frame rate and capture frame rate are correct, no errors are reported. But the frame buffer retains its default, black, pixel data.

Check whether a test pattern drawn by XCAP (using XCAP's Modify, Patterns) is displayed properly, and whether it is replaced by a black image upon capture of video. If so, the most likely explanation is that the camera is sending black pixels. Check the camera's gain & exposure settings, whether the lens aperture is closed, and whether the lens cap has been left in place!

8.B Capture Issue: Pixel Data not Captured

The camera appears to operate correctly, the measured video frame rate and capture frame rate are correct, no errors are reported. But the frame buffer retains its default pixel data (typically black or green); a test pattern drawn by XCAP (using XCAP's Modify, Patterns) is displayed properly and not replaced upon capture of video.

See **PCI/PCIe Bus Master (DMA) & Bus Bandwidth**, above.

8.C Digital Camera Capture Issue: Pixel Data not Captured

The camera appears to operate correctly, the measured video frame rate and capture frame rate are correct, no errors are reported. But the frame buffer retains its default pixel data (typically black or green); a test pattern drawn by XCAP (using XCAP's Modify, Patterns) is displayed properly and not replaced upon capture of video.

Many digital cameras allow setting an Area of Interest (AOI), so as to output a sub-area of the full image. Independently, the PIXCI® frame grabber has options to allow capturing a sub-area of the image output by the camera - regardless of whether then camera supports AOI.

When using a camera AOI, the PIXCI® frame grabber's pixel width and height should be set to the camera AOI's width and height; the PIXCI® frame grabber's H-Offset and V-Offset should typically be zero - and NOT the same as the camera AOI's left and top offset. If both offsets are set, all of the image data may be skipped.

For example, a 1280x1024 camera might be set to capture the lower right corner: width=320, height=256, left-offset=960, top-offset=768 and output an image of 320x256. If the frame grabber's H-Offset and V-Offset are also set to 960 and 768, respectively, it would skip the first 960 pixels of each line and skip the first 768 lines output by the camera. Between camera and frame grabber settings, all of the image data is skipped.

8.D Camera Link Capture Issue: Pixel Data not Captured

The camera appears to operate correctly, the measured video frame rate and capture frame rate are correct, no errors are reported. But the frame buffer retains its default pixel data (typically black or green); a test pattern drawn by XCAP (using XCAP's Modify, Patterns) is displayed properly and not replaced upon capture of video.

Selecting the ‘‘Use DVAL’’ option in XCAP (Generic Camera Link, Capture & Adjust dialog) in conjunction with a camera that does not assert the optional DVAL signal prevents any pixel data from being captured. No error is reported, as the imaging card, camera, and software are operating correctly as per the selected configuration of DVAL. (Circa Jan-2017).

8.E Camera Link Capture Issue: Measured Frame Rate Incorrect and/or Pixel Data Garbled

8.E.1 Medium/Full/Deca Modes

The two Camera Link cables, one for Camera Link Base mode, one for Camera Link Medium, Full or Deca modes, use different signal & wire assignments; control signals in one are data bits in the other. Interchanging cables will often yield an extremely high and fluctuating frame rate, or a zero frame rate, Serial communication will not work, and will often report ''Framing Error'' or ''Overrun''. Attempt at video capture may report ''PCI FIFO Overflow'' or ''PCI Adrs Overflow''; any pixel data captured will be garbled.

Check that the Base connector of the camera is connected to the Base connector of the PIXCI® frame grabber, and that the Medium, Full or Deca connector of the camera (often labeled ''Full'', or unlabeled but implied given that the other connector is labeled ''Base'') is connected to the same connector of the PIXCI® frame grabber.

8.E.2 Poor Quality Cables

Use of cables that do not meet the Camera Link specification, or are longer than allowed by the specification for the camera's clock rate, or have been spliced in a such a manner that the assembly no longer meets the Camera Link specification, will yield incorrect frame rates and garbled pixel data. Serial communication will typically work, as the requirements for the signals & wires used for serial communication are not as stringent as for pixel data.

8.F Capture Error: ´Video not captured! (PCI FIFO Overflow)´

A bus mastering (DMA) type of PIXCI® frame grabber transfers video across the PCI/PCIe bus; high resolution, high bit depth, and/or high frame rate all contribute to increased use of PCI/PCIe bus bandwidth. If sufficient PCI/PCIe bus bandwidth is not available during capture, XCAP software reports a ''PCI FIFO Overflow'' error message.

The PCI/PCIe bus bandwidth of a given computer motherboard is not dependent on the speed of the CPU, but on the attributes of the PCI/PCIe and memory controller chipsets.

See **PCI/PCIe Bus Master (DMA) & Bus Bandwidth**, and specifically **Bus Mastering: Insufficient Bandwidth**, above, for suggestions regarding motherboard selection and configuration.

8.F.1 Frame Grabber Configuration

The PIXCI® SV2, SV3, SV4, SV5, SV5A, SV5B, and SV5L frame grabbers are, by default, configured for capturing color pixels. For monochrome cameras, using:

```
PIXCI
PIXCI Open/Close
Camera & Format
```

to specify RS−170 format (or CCIR where appropriate) will reduce the bandwidth requirements (and, by disabling color burst filtering actually improve image sharpness!). Also note that in color mode the PIXCI® SV4, SV5, SV5A, SV5B, and SV5L frame grabbers transfer 3 bytes per pixel (RGB); they can be reconfigured to transfer 2 bytes per pixel (UYVY) decreasing PCI bandwidth requirements, albeit at the expense of increasing CPU overhead when the image is rendered or saved.

For PIXCI® A110, A310, CL2, D2XE, D3XE, E1, E1DB, E4, E4DB, E4G2−2F, E4G2−4B, E4G2−F2B, E4TX2−2F, E4TX2−4B, E4TX2−F2B, E8, E8CAM, E8DB, e104x4−2f, e104x4−4b, e104x4−f2b, EB1, EB1−PoCL, EB1mini, miniH2B, miniH2F, miniH2x4F, mf2280, mf2280D, EC1, ECB1, ECB1−34, ECB2, EL1, EL1DB, ELS2, SI1, SI2, SI4, SV7, and SV8 frame grabbers can, depending on camera, be configured to capture 8 or more bits per pixel value. In 10 or 12 bit mode the frame grabber can use two bytes per value; or ''pack'' four 10 bit values into five bytes or two 12 bit values into three bytes. Use of the ''Bit Packing'' option will reduce PCIe bandwidth requirements by 3/8 for 10 bit values or by 1/4 for 12 bit values, albeit at the expense of increasing CPU overhead when the image is rendered or saved. The PIXCI® EB1tg and EB1miniTg frame generators also provide a ''Bit Packing'' option, reducing PCIe bandwidth when generating 10 or 12 bit pixel values.

8.F.2 Camera Cabling

For systems using Camera Link or Parallel LVDS, the ‘‘PCI FIFO Overflow’’ can be caused by excessive cable length (relative to the camera’s pixel clock frequency), poor quality cables, or cable connectors not tightly fastened in place, causing degradation of the camera’s pixel clock and data to be ‘‘clocked in’’ at a higher rate than intended.

8.G Capture Issue: Measured Frame Rate is Zero

The measured video frame rate is zero, no errors are reported.

8.G.1 Camera

For PIXCI® SV2, SV3, SV4, SV5, SV7, and SV8 frame grabbers, the video rate will be non-zero with, or without a camera attached. But for other frame grabbers, if the camera is not attached, the camera not powered on, or the camera in trigger mode w/out being triggered, the measured frame rate will be zero.

8.G.2 Interrupts (IRQ)

Measurement of the video rate, as does video capture, depends upon interrupts (IRQ). See **PCI/PCIe Interrupts (IRQ)**, above.

As an interim solution, polling can be used instead of interrupts. See XCAP’s PIXCI®, PIXCI® Open/Close, Close, Advanced, Interrupts. However, polling is less efficient and is primarily intended to help diagnose interrupt issues.

8.H Camera Link Issue: Serial Communication Failure

Serial communication depends upon interrupts (IRQ).

See **PCI/PCIe Interrupts (IRQ)**, above.

Check that the baud rate selection matches the camera’s baud rate. Some cameras have selectable baud rate and its current baud rate may not match the default rate specified in camera documentation; experiment with different baud rate selections.

As an interim solution, for cameras using slower baud rates, polling can be used instead of interrupts. See XCAP’s PIXCI®, PIXCI® Open/Close, Close, Advanced, Interrupts. However, polling is less efficient and is primarily intended to help diagnose interrupt issues.

9. Miscellaneous Topics

9.A XCAP Startup Issues

By default, XCAP automatically opens the PIXCI® frame grabber, automatically displays an image, and automatically (optionally) captures live video. To help determine the cause of a startup problem, such as software hangup or abort, it is helpful to separate these actions.

Edit file:

```
xcap.ini
```

in XCAP's installation directory. Change line:

```
videosetup.xc.autoopen=1
```

to:

```
videosetup.xc.autoopen=0
```

and change line:

```
videosetup.xc.autolive=1
```

to:

```
videosetup.xc.autolive=0
```

Start XCAP to see if it crashes w/out having tried to display an image or open the PIXCI® frame grabber.

In XCAP, do:

```
Images
New Image
OK
Modify (in Image View Window)
Patterns
OK
```

If XCAP crashes, it is likely a problem with the API used to display images. Restart XCAP and try:

```
Utility
Program Setup
API's
GDI API?
```

to select a different API for image display and again try:

```
Images
New Image
..
```

When Images, New Image operates correctly, use:

```
PIXCI
PIXCI Open/Close
Open
```

to explicitly open the PIXCI® frame grabber, then use:

```
Capture
Live
```

to explicitly start live capture.

9.B XCAP/XCLIB Error: ´Can't access 18V8/16LV8´

The "Can´t access 18V8/16LV8" error normally indicates a hardware problem on a PIXCI® SV2, SV3, SV4, SV5, SV5A, SV5B, SV5L, or SV6. The same error can also occur if the PIXCI® driver has been associated with a non-PIXCI card; see **PCI/PCIe Vendor and Device ID Conflict**, above.

The same error may also occur under Windows Vista, 7, 8, 10, or 11 after awaking from hibernation or sleep mode. Disabling Sleep and Hibernation modes in Windows is recommended. An updated driver, circa 6/2015, (a) Will prevent Windows from sleeping while the PIXCI® frame grabber is in use, and (b) Has an option to enable recovery after Windows sleeps w. the PIXCI® frame grabber not in use.

Under Windows 10 or 11, the same error may occur with Windows' "Fast Startup" option enabled; disabling the option is recommended. (Circa 2009, 2015, 2022)

9.C XCAP/XCLIB Error: ´Data path error´

The "Data path error" error normally indicates a hardware problem on a PIXCI® A110, A310, D3XE, CL1, CL2, E1, E1DB, E4, E4DB, E4G2−2F, E4G2−4B, E4G2−F2B, E4TX2−2F, E4TX2−4B, E4TX2−F2B, E8, E8CAM, E8DB, e104x4−2f, e104x4−4b, e104x4−f2b, EB1, EB1−PoCL, EB1mini, miniH2B, miniH2F, miniH2x4F, mf2280, mf2280D, EC1, ECB1, ECB1−34, ECB2, EL1, EL1DB, ELS2, SI1, SI2, SI4, SV7, or SV8 frame grabber, or on a PIXCI® EB1tg or EB1miniTg frame generator.

The same error will also occur under Windows Vista, 7, 8, 10, or 11 after awaking from hibernation or sleep mode. Disabling Sleep and Hibernation modes in Windows is recommended. An updated driver, circa 6/2015, (a) Will prevent Windows from sleeping while the PIXCI® frame grabber is in use, and (b) Has an option to enable recovery after Windows sleeps w. the PIXCI® frame grabber not in use. Less often, the hibernation or sleep problem may be reported as "Invalid register base address", with the same remedy.

On Windows 10 or 11, the same error can occur with the Windows' "Fast Startup" option enabled; disabling the option is recommended. (Circa 2009, 2015)

On Windows 10 or 11, the same error can occur with the Windows' "Power Button does ..." option set to "Hibernate" or "Sleep"; use of "Shutdown" is recommended. (circa 2018)

The same error can occur due to EMI interference with the PCIe signals - especially when the PIXCI® frame grabber is used with a bus extender or bus extension cable. (circa 2022)

Generally, the error will persist until the computer is restarted.

9.D XCAP/XCLIB Error: ´Drivers Not Installed´ or ´Frame Grabber not Found´

Under Windows (XP & later) and under Linux, a bus manager or bus driver is responsible for configuring the PCI Express slot, detecting the PIXCI® frame grabber, and (indirectly) loading the appropriate PIXCI® driver (or setting conditions so that the driver remains loaded).

After an application reports that the PIXCI® driver isn't available, it is often helpful to distinguish whether the PIXCI® frame grabber is not present, or whether the frame grabber is present but the driver is missing.

Under Linux, the

```
lspci
```

command lists all detected PCI and PCI Express cards - regardless of whether a card-specific driver is installed.

Under Windows, the Device Manager (i.e. "devmgmt.msc") lists all detected PCI and PCI Express cards - regardless of whether a card-specific driver is installed. Although, without an installed driver the PIXCI® frame grabber may not be listed by name under "Imaging Devices", but may appear as an unnamed card under the "Unknown" or "Coprocessor" sections; determine whether the unnamed card is a PIXCI® frame grabber via: (a) Power-off computer, remove card, reboot, observe whether the Device Manager list has changed, or (b) In the Device Manager, under a suspected device's "Properties", "Details" select and compare the "Hardware IDs" to the PIXCI® frame grabber's Vendor and Device ID as listed under **Required Bus Resources**, above.

If the PIXCI® frame grabber does not appear via "lspci" or the Device Manager, then tweaking PIXCI® driver options or trying different versions of the PIXCI® driver won't help.

Suggested remedies are to check that the card is firmly seated in the PCI or PCIe slot, check BIOS for options which may enable/disable PCI/PCIe slots, and/or consult the motherboard documentation.

The PIXCI® miniH2B, miniH2F, and miniH2x4F frame grabbers are not powered from the motherboard, but require a separate +12V power supply. For those cards, also check that the +12V is connected and powered-on before, or at the same time, as the computer; otherwise, the PCI Bus Manager, run during operating system initialization, will not to detect the card.

9.E Use of M.2 Interface Adapters

PIXCI® frame grabber's designed for PCIe mini slots can use a M.2 slot via a third party adapter. M.2 slots can support either the PCIe or SATA interface, as selected by pin 69 (grounded for SATA, or N/C for PCIe). If the PIXCI® frame grabber isn't found by the O.S. (i.e. doesn't appear in Device Manager or ''lspci''), check the specifications of the adapter and/or check whether the adapter's pin 69 is grounded. (Circa 2019)

9.F Thunderbolt Error: ´Drivers Not Installed´ or ´Frame Grabber not Found´

The PIXCI® mf2280c consists of a PIXCI® mf2280 frame grabber and a Thunderbolt adapter card.

In a successful installation under Windows the Device Manager will show a ''Thunderbolt(tm) Controller'' under section ''System Devices''. After the ''Thunderbolt(tm) Controller'' is detected and its driver installed (usually automatically) will the Device Manager detect the PIXCI® mf2280 frame grabber, prompt for the PIXCI® driver (if not already installed), and show a ''PIXCI(R) mf2280'' under section ''Imaging Devices'' as a PCIe device. The Windows' ''Thunderbolt Control Center'' application will identify the Thunderbolt adapter card as ''WavLink UTE02'' and allows enabling or disabling the Thunderbolt adapter.

In a successful installation under Linux, a ''lspci'' will show: (a) A ''Thunderbolt Bridge'', and (b) A ''EPIX Inc Device'' for the PCIe frame grabber.

The Thunderbolt adapter acts as a PCIe hub; only after the Thunderbolt(tm) adapter is detected and operational can the PIXCI(R) mf2280 frame grabber appear in the Device Manager or listed by ''lspci''. If the Thunderbolt(tm) adapter is not detected or is disabled, fiddling with the PIXCI(R) frame grabber, the PIXCI(R) driver, the XCAP application, or the camera, will not help.

If attached to a USB−C port, the Windows Device Manager will report a ''UTE02'' device. The PIXCI® mf2280c will not operate via a USB−C port and will not appear in the Device Manager's list. (Circa 2023)

9.G Mice and Graphics Display (S/VGA) Cards

If the mouse cursor blinks on and off while the mouse cursor is positioned over the live video image display, either:

a. Switch to a graphics display (S/VGA) card that provides hardware mouse cursor support.

b. If the graphics display (S/VGA) card does provides hardware mouse cursor support, contact the graphics display (S/VGA) manufacturer for an improved driver.

c. As a last resort, in XCAP, switch graphics display (S/VGA) display modes from the faster, default ''DirectX API'' to a (possibly slower) alternative:

```
View
Display
API
```

and select:

```
GDI API
```

or

```
Video for Windows API
```

or any selection other than ''DirectX API''.

10. Authorization Keys

10.A Parallel Port Style Keys

Selected versions of EPIX® imaging software are provided with an authorization key which must be connected to printer parallel port 1, 2, or 3. Should software advise that the authorization key is not found:

a. Check that the key is connected to printer parallel port 1, 2, or 3, and not to an RS−232 or other port using the same style connector,[2]

b. For PC's with plug in parallel port adapters which are not Plug & Play: Check that multiple parallel port adapters with the same port number are not installed or enabled,[3]

c. For PC's using DOS, or Windows 95/98 with a dual boot option to DOS: After running the MSD program, use "L" to check whether any LPT ports are configured,

d. Check that the BIOS setting, if any, for the printer port allows PC−AT compatibility. A typical BIOS Setup entry is:

```
Parallel Port Type      Compatible
```

Settings such as:

```
Parallel Port Type      EPP
Parallel Port Type      ECP
```

may prevent recognition of the key, or may prevent reliable printing.

e. On rare combinations of PC's and printers, the authorization key may not be recognized if the printer (connected to the back of the authorization key) is powered off; either disconnect the printer cable or turn the printer on.

f. On certain PC's, the printer port and therefore the authorization key may be improperly reset during boot. Under DOS or Windows 95/98, add:

```
HLRESET.COM     (precede with path name to directory of EPIX® software!)
```

as the last line of AUTOEXEC.BAT to reset the key.

Typically, the authorization key can be "stacked" on the printer parallel port with other authorization keys for other software; however due to the wide variety of key types provided by other companies, there is no guarantee of mutual compatibility. (Circa 1996).

Newer versions of EPIX® imaging software can optionally use a USB version of the authorization for use in conjunction with an operating system with USB support. Use of a USB key eliminates printer parallel port configuration issues.

10.B Parallel Port Keys vs. Xilinx Keys

The JTAG programming tools key from Xilinx should NOT be stacked onto the XCAP authorization key. (Circa 2004).

---

2. Connection to a 25-pin serial (RS−232) port, or to any other interface which happens to use the same style connector, may permanently damage the authorization key and void its warranty.

3. Multiple parallel port adapters set at the same port number may have no adverse impact on printer operation; but an authorization key attached to these ports will not operate correctly. Even though the printer works, the parallel port adapter configuration must still be checked.

10.C 64-Bit Linux Driver for Parallel Port Keys

The driver to support parallel port style authorization keys may not compile on newer 64-bit kernels in which the register_ioctl32_conversion function has been deprecated. Use of the USB style authorization key avoids the problem and is recommended for 64-bit Linux systems. (Circa 2005).

10.D USB Style Blue Keys

It may assist with some system configuration issues to know that the USB Blue key has Vendor ID of 0529 and a Device ID of 0001, and may be variously identified as a Aladdin Hardlock, Aladdin USB Key, Aladdin HASP, Safenet HASP device, Gemalto HASP device, or Thales Sentinal device.

The smaller version of the USB authorization key (approximately 5.2 x 1.6 x 0.8 cm), has a LED visible through the plastic case. The LED illuminates after the key has been connected and identified as a USB device, regardless of whether XCAP is running. An unlit LED typically implies a bad key, a bad USB slot, or the operating system's USB drivers are not (yet) loaded.

On Linux Ubuntu distributions with 2.6.31 and later kernels, the ''usbdevfs'' and ''usbfs'' Linux features used by the authorization key daemon aksusbd as supplied with XCAP V3.0 or V3.7 are no longer supported. A newer aksusbd and its associated hasp.rules and dinst as supplied with XCAP V3.8 (Oct 2013 release) resolves the issue. Those files can be extracted from the V3.8 release for use with XCAP V3.0 or V3.7; however, the authorization key must be installed manually via dinst, the Driver Assistant in V3.0 or V3.7 should not be used.

The Linux aksusbd authorization key daemon for USB keys is a 32-bit program; The Linux IA32 (32-bit compatibility) libraries must be installed. Some 64-bit distributions are not pre-configured to allow running 32-bit programs; use

```
sudo apt-get install ia32-libs
```

to allow running aksusbd.

The aksusbd must be installed as root to work properly; confusingly, it allows itself to be installed as non-root. Check owner of:

```
ls -la /tmp/.aksusb
```

which reflects the (effective) user that was used to install aksusbd.

10.E Windows Remote Desktop & Blue Keys

If the first access to an authorization key is via a program (i.e. XCAP), initiated via a remote desktop connection then the authorization key may not be properly detected.

One workaround is to have XCAP auto-started when Windows boots; running XCAP from a remote desktop connection would no longer be the first access to the authorization key. The XCAP ''Auto Startup: Wait for Drivers'' option should be enabled, as Windows might auto start XCAP before loading the authorization key's driver. (Circa 2008).

10.F Authorization Blue Key Not Found under Windows 2000 and later

The authorization key vendor reports that some USB keys manufactured between 2006 and 2008 may appear to fail. A new authorization driver, Version 4.115.5.55 (Oct 2008), or later, fixes the problem. (Circa 2008).

10.G USB Style Green Keys

It may assist with some system configuration issues to know that the USB Green key has Vendor ID of 07F2 and a Device ID of 0001, and may be identified as a Keylok II. (Circa 2021)

10.H Memory Integrity Error under Windows 11 with Green Keys

Windows 11, which defaults with its Memory Integrity feature enabled, may report a Memory Integrity error. Resolve with an updated Green Key driver, provided with XCAP V3.8 release 16-Jan-2023, or later. (Circa Jan-2023)

10.I Switching to/from Blue vs Green Keys

XCAP, of releases May 2021 and later, supports use of both Blue and Green keys, but will not switch automatically. In XCAP, use Utility, Program Setup, Change Setup to register use of a different key. (Circa May-2021)

11. Archives

11.A DOS4GW - Serial ATA's AHCI Mode

Running an XCLIB DOS4GW application in conjunction with a serial ATA (i.e. hard drive) configured to AHCI mode may cause the computer to crash. Selecting serial ATA Compatibility mode instead of AHCI mode in BIOS appears to eliminate the problem. (Circa Mar-2008)

11.B DOS4GW - (S/VGA) Settings - Colors & Grey Levels

The XCIP program for DOS supports graphic display (S/VGA) cards which include VESA BIOS support. Adapters without VESA BIOS support will be operated in VGA mode. Within MSD[4], the ''V'' command will show whether VESA BIOS support is available. For display cards lacking VESA BIOS support, a TSR (Terminate and Stay Resident program) supplied by the card's manufacturer must be loaded before XCIP is run.

For S/VGA modes which provide 2^{24} colors, (the default choice of XCIP for DOS when used with color video), some S/VGA cards require 2 MiByte of S/VGA memory, but allow switching to this mode even when only 1 MiByte of memory is installed. The symptom is a VGA screen wraparound, which appears about 5 text lines from the top and/or bottom. Additional memory should be added to the S/VGA card, a different S/VGA card used, or XCIP advised to forgo color display by use of the ''−svga 640x480x8'' command line option.

11.C DOS4GW - PCI Bus Master (DMA) - EMM386.SYS Issues

For application programs running under DOS or Windows 95/98, the presence of EMM386 may prevent proper operation of bus mastering PCI cards. The EMM386.SYS should be removed from CONFIG.SYS.

11.D Windows 95/98 - PCI Bus Master (DMA) - EMM386.SYS Issues

For application programs running under DOS or Windows 95/98, the presence of EMM386 may prevent proper operation of bus mastering PCI cards. The EMM386.SYS should be removed from CONFIG.SYS. (Circa 1995)

11.E Windows 95/98 - DOS Box & Bus Mastering

DOS versions of EPIX® imaging software will not work with PCI bus mastering cards when run under a DOS prompt under Windows. Either boot to real DOS, or under Windows 95/98 use ''Start'', ''Shut Down'', and ''Restart the Computer in MS-DOS Mode''. (Circa 1995)

11.F Windows 95/98 - IRQ Sharing

Under Windows 95 and 98, on some motherboards, the Windows Device Manager may be able to change the assigned IRQ. In the Control Panel, System, Device Manager, click ''Computer'', ''Properties'', ''Interrupt Request (IRQ)'' to display a list of devices and their IRQ's. Find the device using the same IRQ as the PIXCI® frame grabber. In the Device Manager, highlight the offending card and click ''Properties'', ''Resources''. Uncheck ''Use automatic settings'', highlight the IRQ, click ''Change Setting'', and select a different IRQ.

---

4. The Microsoft MSD.EXE program, provided with Windows 3.1, DOS 6.0, C 7.0, and other Microsoft programs is a valuable tool for identifying use of memory and other resources.

11.G Windows 95/98 - Drivers - Registry Issues

Under Windows 95 and 98, automatic recognition and installation of PCI cards is dependent upon each PCI card's unique ID, and gets confused if there are two or more different cards with the same ID, even if one of them is no longer installed. For example, the PIXCI® SV2 and SV3 frame grabber ID's are determined by a Philips PCI Bus Interface chip, and thus share the same ID as other cards using the same chip. Similarly, the PIXCI® SV4, SV5, SV5A, SV5B, SV5L, and SV6 frame grabber ID is determined by a Brooktree (Conexant) PCI Bus Interface chip. Before automatic installation of the PIXCI® frame grabber's drivers can succeed, the Windows 95 and 98 registry entries and .INF files for all impostors must be removed:

a. In Windows 95, using REGEDIT, remove folder:

```
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_82B1      (for PIXCI® A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C300      (for PIXCI® CL3SD)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C301      (for PIXCI® CL3SD)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C100      (for PIXCI® CL1)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C10A      (for PIXCI® CL1)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C200      (for PIXCI® CL2)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_80D6      (for PIXCI® D, D24, D32)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D200      (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D201      (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D20A      (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D300      (for PIXCI® D3X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_817F      (for PIXCI® DVO)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C000      (for PIXCI® SI)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C001      (for PIXCI® SI)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0350      (for PIXCI® SV4)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E      (for PIXCI® SV5)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878      (for PIXCI® SV5)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E      (for PIXCI® SV5A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878      (for PIXCI® SV5A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E      (for PIXCI® SV5B)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878      (for PIXCI® SV5B)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E      (for PIXCI® SV5L)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878      (for PIXCI® SV5L)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_14F1&DEV_8800      (for PIXCI® SV6)
```

In Windows 98, using REGEDIT, remove folder:

```
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_82B1&SUBSYS_00000000&REV_**   (for PIXCI® A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C300&SUBSYS_00000000&REV_**   (for PIXCI® CL3SD)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C301&SUBSYS_00000000&REV_**   (for PIXCI® CL3SD)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C100&SUBSYS_00000000&REV_**   (for PIXCI® CL1)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C10A&SUBSYS_00000000&REV_**   (for PIXCI® CL1)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C200&SUBSYS_00000000&REV_**   (for PIXCI® CL2)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_80D6&SUBSYS_00000000&REV_**   (for PIXCI® D, D24, D32)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D200&SUBSYS_00000000&REV_**   (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D201&SUBSYS_00000000&REV_**   (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D20A&SUBSYS_00000000&REV_**   (for PIXCI® D2X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_D300&SUBSYS_00000000&REV_**   (for PIXCI® D3X)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_10E8&DEV_817F&SUBSYS_00000000&REV_**   (for PIXCI® DVO)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C000&SUBSYS_00000000&REV_**   (for PIXCI® SI)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_165A&DEV_C001&SUBSYS_00000000&REV_**   (for PIXCI® SI)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_8086&DEV_1223&SUBSYS_00000000&REV_**   (for PIXCI® SV2, SV3)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0350&SUBSYS_00000000&REV_**   (for PIXCI® SV4)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E&SUBSYS_00000000&REV_**   (for PIXCI® SV5)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878&SUBSYS_00000000&REV_**   (for PIXCI® SV5)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E&SUBSYS_00000000&REV_**   (for PIXCI® SV5A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878&SUBSYS_00000000&REV_**   (for PIXCI® SV5A)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E&SUBSYS_00000000&REV_**   (for PIXCI® SV5B)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878&SUBSYS_00000000&REV_**   (for PIXCI® SV5B)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_036E&SUBSYS_00000000&REV_**   (for PIXCI® SV5L)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_109E&DEV_0878&SUBSYS_00000000&REV_**   (for PIXCI® SV5L)
\HKEY_LOCAL_MACHINE\ENUM\PCI\VEN_14F1&DEV_8800&SUBSYS_00000000&REV_**   (for PIXCI® SV6)
```

where the **'s may be any digits (assigned and created by Windows after detection of the PIXCI® frame grabber).

b. In C:\WINDOWS\INF, remove all .INF files which contain:

```
PCI\VEN_10E8&DEV_82B1                    (for PIXCI® A)
PCI\VEN_165A&DEV_C100                    (for PIXCI® CL1)
PCI\VEN_165A&DEV_C10A                    (for PIXCI® CL1)
PCI\VEN_165A&DEV_C200                    (for PIXCI® CL2)
PCI\VEN_165A&DEV_C300                    (for PIXCI® CL3SD)
PCI\VEN_165A&DEV_C301                    (for PIXCI® CL3SD)
PCI\VEN_10E8&DEV_80D6                    (for PIXCI® D, D24, D32)
PCI\VEN_10E8&DEV_817F                    (for PIXCI® DVO)
PCI\VEN_165A&DEV_D200                    (for PIXCI® D2X)
PCI\VEN_165A&DEV_D201                    (for PIXCI® D2X)
PCI\VEN_165A&DEV_D20A                    (for PIXCI® D2X)
PCI\VEN_165A&DEV_D300                    (for PIXCI® D3X)
PCI\VEN_165A&DEV_C000                    (for PIXCI® SI)
PCI\VEN_165A&DEV_C001                    (for PIXCI® SI)
PCI\VEN_8086&DEV_1223                    (for PIXCI® SV2, SV3)
PCI\VEN_109E&DEV_0350                    (for PIXCI® SV4)
PCI\VEN_109E&DEV_036E                    (for PIXCI® SV5)
PCI\VEN_109E&DEV_0878                    (for PIXCI® SV5)
PCI\VEN_109E&DEV_036E                    (for PIXCI® SV5A)
PCI\VEN_109E&DEV_0878                    (for PIXCI® SV5A)
PCI\VEN_109E&DEV_036E                    (for PIXCI® SV5B)
PCI\VEN_109E&DEV_0878                    (for PIXCI® SV5B)
PCI\VEN_109E&DEV_036E                    (for PIXCI® SV5L)
PCI\VEN_109E&DEV_0878                    (for PIXCI® SV5L)
PCI\VEN_14F1&DEV_8800                    (for PIXCI® SV6)
```

For safety, move these to a new subdirectory (of any name), rather than deleting the files. The Driver Assistant in XCAP can perform the registry cleanup automatically, although it does not save any of the removed files.

c. Reboot the PC. When Windows requests drivers for the PIXCI® frame grabber, specify the directory into which XCIP or XCAP software was previously unpacked.

Alternately, use the manual installation of the driver and modification of the registry, as per the installation instructions.

11.H Windows 95/98 - Frame Buffer Memory Allocation

Under Windows 95 and 98, when using EPIXXC.SYS to allocate large amounts of frame buffer memory, problems may arise if other devices require memory within a specific range of physical addresses. In particular ATI graphic display (S/VGA) cards and some 3COM network interface cards appear to require memory below 64 MiByte. Memory for these needs can be reserved with the:

```
-MH KiByte_to_reserve
```

parameter to EPIXXC.SYS. Using ‘‘-MH 1024’’ is sufficient for ATI cards, using ‘‘-MH’’8192 or ‘‘-MH’’16384 is sufficient for the 3COM 3C900.

11.I Windows 95/98 - BIOS Plug & Play - Other BIOS Issues

Some versions of BIOS may have a setting to select the operating system:

```
Operating System: Windows 95/98
                  Other
```

These systems might run under Windows NT with the wrong BIOS setting, but Plug & Play PCI cards may not operate correctly.

11.J Windows 95/98 - Graphic Display (S/VGA) Settings

The XCIP and XCAP programs for Windows display imagery on the computer’s graphic display (S/VGA) monitor. The quality of the displayed images is dependent on Window’s settings and operation of the graphics display (S/VGA) card. The default Windows 95 installation, for example, may use the 16 Color setting, resulting in poor quality image display! For Windows 95/98 and Windows NT, the settings can be modified in the ‘‘Control Panel’’, ‘‘Display’’, ‘‘Settings’’.

For the XCIP program for Windows, a ‘‘256 Color’’ setting is suggested for display of monochrome images, a ‘‘True Color (24 bit or 16777216 Color)’’ or ‘‘True Color (32 bit)’’ setting is suggested for display of color or pseudo-colored images.

For the XCAP program for Windows, a ‘‘High Color (16 bit or 65536 Color)’’, ‘‘True Color (24 bit or 16777216 Color)’’, or ‘‘True Color (32 bit)’’ setting for the graphic display (S/VGA) adapter is required for proper display of images and

overlay graphics; the ‘‘True Color (24 bit or 16777216 Color)’’ or ‘‘True Color (32 bit)’’ is suggested for higher quality, and quicker, display of images and overlay graphics. Also, in Windows 95, under ‘‘Control Panel’’, ‘‘Display’’, ‘‘Plus!’’, the ‘‘Show window contents while dragging’’ must be disabled (this feature is not present in older versions of Windows 95). Or in Windows 98, under ‘‘Control Panel’’, ‘‘Display’’, ‘‘Effects’’, the ‘‘Show window contents while dragging’’ should be disabled.

After changing the settings a full shutdown and CTRL+ALT+DEL reboot should be used. (The quick restart offered by older versions of Windows 95, and the dynamic graphic display (VGA) reconfiguration performed by newer versions of Windows 95/98, may not re-initialize all devices properly).

11.K Windows NT - PCI Card Resources - Resource Allocation

Later versions of Windows NT may re-allocate PCI resources allocated by BIOS, when it ‘‘moves the PCI device resources on top of another PCI device that has not yet been claimed’’ (see Microsoft article Q152044). This most often causes a problem when multiple PIXCI® frame grabbers are used. It may be prevented by adding the /PCILOCK option to a C:\BOOT.INI entry, for example:

```
[operating systems]
multi(0)disk(0)rdisk(0)partition(7)\WINNT="Windows NT V 4.00"  /PCILOCK
```

Do not copy this new line exactly as is; the first portion of the line must be copied from an existing configuration line in your C:\BOOT.INI file.

11.L Windows NT - Serial Mice versus Cameras w. RS-232 Control

Under Windows NT, the auto configuration performed while booting can incorrectly identify certain cameras with RS−232 controls as a serial mouse. Any COM port incorrectly identified becomes unavailable to all applications, such as XCAP.

A simple solution is to leave the camera powered off or disconnected while booting. Alternately, in Control Panel, Services or Devices, the ‘‘sermouse’’ service can be set to manual. Alternately, the `boot.ini` file can be edited adding:

```
/NoSerialMouse              disable detection on all COM ports
/NoSerialMouse:COMx         disable detection on COMx ports
/NoSerialMouse:COMx,y,z     disable detection on COMx, y, and z ports
```

to the end of any or all boot descriptor lines, such as:

```
multi(0)disk(0)rdisk(0)partition(7)\WINNT="Windows NT ..." /NoSerialMouse
```

Some versions of Windows NT may instead require the:

```
/FASTDETECT
```

option in `boot.ini`; consult your Windows systems administrator for additional guidance. (Circa 1996)