Installing Image200

Image200 supports Photometrics Series 200 CCD camera hardware and requires an AT200 Camera Controller installed in your host computer. Before you install Image200, set up the camera system hardware as described in the *AT200 CCD Camera System Hardware Reference Manual*.

If your hardware is already installed, you should not need to reconfigure or reinstall any hardware component to use Image200. In rare circumstances, some work may be necessary.

Host Computer Requirements

The host computer for your AT200 system must be an IBM® PC/AT®-compatible system with:

- An Intel® 80286, 80386, or 80486 CPU with a clock speed of at least 6 MHz
- An AT bus with a clock speed of 8 MHz or less
- One unoccupied 16 bit AT bus slot

All of these are required to run the AT200 system hardware with any Photometrics software package.

To use Image200, your system must also be equipped with:

- A math co-processor (not needed with an 80486 CPU)
- MS-DOS® version 3.3, 4.0, or 5.0
- 640K of main memory
- A high density 3.5" (1.44M) or 5.25" (1.2M) floppy disk drive
- A hard disk with enough room to store programs and images
- EMS memory sufficient for image acquisition
- An EMS Memory Manager compatible with the LIM 4.0 standard
- A mouse and a Microsoft®-compatible mouse driver
- A Western Digital Paradise™, Trident Impact™, or Orchid ProDesigner™ II VGA display card with at least 512K of video RAM installed
- A color VGA monitor

A thorough discussion of these requirements follows. Read it before you begin installation to make sure your system meets the requirements. If you have questions, call Photometrics Customer Service for assistance.

DOS

While Image200 works under MS-DOS versions 3.3, 4.0, and 5.0, some problems with DOS itself can create problems with the Photometrics software. To prevent problems with DOS 3.3 and 4.0, the file `COMMAND.COM` must exist in the root directory on the C: drive.

Under DOS version 4.0, do not include any of the following lines in your `CONFIG.SYS` file:

```
BUFFERS=xx /X
FASTOPEN /X
DEVICE=VDISK.SYS /X
```

The statements themselves are fine, but the `/X` parameter tells DOS to use EMS memory, which it manages improperly. To avoid system-wide problems, leave off the `/X` switch.

Main Memory

Main memory use depends on the display resolution. Image200 requires at least 350K of *free* main DOS memory to run. For a high-resolution (1024 x 768) VGA display, you will need at least 570K *free* main memory. A high-resolution monitor can be run at standard (640 x 480) VGA resolution, with the lower memory requirement.

Expanded Memory

The Expanded Memory Specification (EMS) was developed by Lotus, Intel, and Microsoft to support memory beyond the maximum of 640K allowed by DOS. EMS requires both software (an EMS Memory Manager) and hardware (the memory itself) to be installed in your host computer.

EMS Memory Manager

Image200 supports EMS revision 4.0, often called LIM 4.0, and requires an EMS Memory Manager that conforms to this specification.

EMS Memory Managers are available from several software companies. Although they operate in different ways, they generally require an additional line in your `CONFIG.SYS` file. Most installation programs will automatically insert this line as part of the installation process. Some installation programs will require you to enter the amount of EMS memory you have installed in hardware.

To set up EMS for optimal use by Image200, request the maximum allowable number of "EMS handles" (up to 255) during installation.

If you are using the Quarterdeck Expanded Memory Manager™-386, you should use version 5.13 or later. Earlier versions contain a bug which affects Image200's operation. If you have an incompatible version, call Quarterdeck Technical Support at (213) 392-9701 and ask for the Technical Note *Patching QEMM™-386 5.00, 5.10, 5.11, and 5.12 to resolve problems with programs that resize EMS or XMS handles*. This contains instructions for patching your copy of QEMM-386 to fix the bug.

EMS memory

You can install EMS memory directly on your computer's motherboard, or use a bus memory board such as the Everex RAM 8000.

This table shows how much *free* memory you will need to use Image200.

CCD	Size (serial x parallel)	Recommended free EMS	Minimum free EMS
TH7883	384 x 576	3088K	448K
TK512	512 x 512	3648K	528K
TH7985B	512 x 512	3648K	528K
PM512	516 x 516	3712K	544K
EEV CCD05-10	296 x 1152	4720K	688K
TH7896A	1024 x 1024	14400K	2064K
KAF-1400	1317 x 1035	18672K	2688K
KAF-4200	2033 x 2048	56976K	8160K

The amounts listed are *in addition to* the memory used by the EMS Memory Manager and other software packages using EMS memory. CCDs operated as frame transfer devices will require approximately half the amounts listed.

To use all the features of Image200, you should have the amount of memory listed in the column *Recommended free EMS*. These are worst-case figures for full images; your actual work will probably require much less memory. Memory beyond the recommended amount can be used to store additional images during fast sequence acquisition, as described in Part II of this manual.

Some EMS memory managers may not be able to access more than 32 megabytes of memory. For a system using the KAF-4200 CCD, we recommend 32 megabytes if that is the maximum amount available.

You can still use Image200 with less than the recommended amount of memory, as long as you have at least the amount listed in the column *Minimum free EMS*. You will be able to collect one full CCD image for focusing, region definition, and image acquisition, but you may not be able to use some program features, such as flat field image correction on a full image.

The table above shows all CCDs supported by Image200, but CCD names are determined by the manufacturers and may change over time. The next table shows some common CCD names and the name used in Image200.

Common Name	Name in Image 200
EEV P88131, EEV CCD05-11	EEV CCD05-10
Thomson 512	TH 7895B
TH 31156, Thomson 1K	TH 7896A
Kodak 1K	KAF 1400
Kodak 2K	KAF 4200

If your CCD is not listed, contact Customer Service for assistance.

Mouse

Image200 requires a mouse with a Microsoft-compatible driver.

Supported devices include the Logitech 3-button serial mouse, the Microsoft 2-button serial mouse, and the Microsoft 2-button bus mouse. Drivers supported include the Microsoft mouse driver version 7.0 or later and the Logitech mouse driver version 4.0 or later.

With the Microsoft driver, a mouse moves in 4-pixel steps horizontally.

VGA Display Card

Image200 supports three popular brands of VGA display card:

- Paradise VGA cards from Western Digital Imaging, with 512K of RAM installed
- The ProDesigner II card from Orchid Technology, with at least 512K of RAM installed
- Impact^{II} and Impact^{III} Series cards from Trident Microsystems, Inc., with at least 512K of RAM installed

The Photometrics installation software will automatically recognize each type of display supported and configure Image200 appropriately.

If your VGA card has enough memory, the installation software will ask you to choose between 640 by 480 and 1024 by 768 resolutions. Remember that using a higher-resolution display means Image200 will require more main DOS memory for operation.

The Orchid ProDesigner II card is based on the ET4000 Graphics Controller Chip from Tseng Labs, Inc. Although Photometrics cannot guarantee compatibility, Image200 may also be able to support other VGA cards based on this chip.

Hard Disk

Image200 uses hard disk space on your host computer to store its own executable files and the images acquired from the CCD camera. Image200 occupies approximately 950K on your hard disk.

This table shows the disk space required to save a full CCD image.

CCD	Size (serial x parallel)	Disk space/image
TH7883	384 x 576	432K
TK512	512 x 512	512K
TH7985B	512 x 512	512K
PN512	516 x 516	528K
EEV CCD05-10	296 x 1152	672K
TH7896A	1024 x 1024	2048K
KAF-1400	1317 x 1035	2672K
KAF-4200	2033 x 2048	8144K

The figures are for 16-bit images containing pixels acquired from the camera. Image math may create 32-bit images, which require twice as much space.

Image200 also uses hard disk space for temporary buffers. For the best performance, you should have free hard disk space at least equal to the recommended amount of free memory listed earlier.

Installation

Once you have confirmed that your host computer configuration meets all the requirements listed, you are ready to install Image200.

Before You Install

The installation process varies slightly, depending on what Photometrics hardware and software have been installed in your system previously. Read the instructions under the heading that describes your situation, then proceed to the instructions in the section *Installation Procedure*.

You are installing the AT200 in your computer for the first time

Press the reset button on the AT200 as described in the hardware manual.

The AT200 is installed and working with other Photometrics software

Don't press the reset button on the AT200.

Instead, you will look up the AT200's base address. The base address tells Image200 where to find the AT200 in your host computer. It can be a hexadecimal number, a decimal number, or a controller ID from 0 to 31.

If you have the base address written down, look it up.

If you are upgrading from an earlier version of Image200 or another Photometrics application package, find the directory where that program is installed. A configuration file in that directory contains the base address.

The AT200 is installed, but you can't find a configuration file

Press the reset button on the AT200 as described in the hardware manual.

You will have to re-install your AT200.

You may also need to re-install your other Photometrics software. This should be necessary only if you have changed the host system hardware configuration since that software was first installed.

Installation Procedure

Image200 is provided on both 3.5" and 5.25" high-density floppy disks. The contents of the disks are identical.

Image200 comes with an installer program, `INSTALL`, which checks the host system hardware and software configuration, finds the AT200 base address, and installs the Image200 software. `INSTALL` describes each step in the installation process and informs you of any problems.

Do not simply copy files from the Image200 disk to your hard disk.

Leave the Image200 disk write-enabled as you install. `INSTALL` creates a configuration file which includes the board base address, and saves a copy of that file on the Image200 disk for future use. After you have installed Image200, write-protect the Image200 disk so this information will not be overwritten accidentally and will be available for future installations.

To install Image200:

1. Turn on the host computer system and insert either Image200 disk into a floppy disk drive.
2. Check for a file called `README` on the Image200 disk. This file contains any newly available information about Image200, including corrections and additions to this manual.

Read the file `README`, print it out (for instance, using the DOS `type` command), and keep the printout with this manual. If the file disagrees with this manual, follow the instructions in the file. Failure to follow the most recent instructions may result in loss of valuable images.

3. Run the Photometrics installer program by typing the floppy drive letter, a colon, and INSTALL, then pressing ENTER. For instance:

```
C:>A:INSTALL
```

4. INSTALL inspects your host system for:

- A supported Microsoft-compatible mouse driver
- An Extended Memory Manager that supports LIM 4.0
- A supported VGA card with sufficient video RAM

If these requirements are not met, INSTALL lists the missing item(s) and returns you to the DOS command line.

5. If INSTALL detects a VGA display card which can support either high-resolution (1024x768) or low-resolution (640x480) display, you are asked to choose the default resolution mode for Image200.

You will be able to switch display resolution for a particular Image200 session.

High-resolution display will require more DOS main memory.

6. INSTALL looks for an AT200 that has been reset by pressing the reset button and tries to automatically set the address of the board.

If automatic addressing doesn't work, contact Photometrics Customer Service. They will help you install your board safely.

7. If INSTALL can't find a reset AT200, you get a different choice:

- *Get the controller address from another application*—If a Photometrics application package is installed on your host computer, enter the full DOS pathname to the directory where it is installed. INSTALL extracts the board address and other information from the configuration file for that program.
- *Manually enter a known controller address*—If you are using a Photometrics development package, you can enter the base address directly.
- *Quit now to install your controller in the computer*—If the other choices don't apply to you, make sure the AT200 is installed properly and press the reset button. When you run INSTALL again, it will set the board address.

8. INSTALL now knows the board address and will show it to you. Make sure it is written down in the space provided in the AT200 hardware manual.

9. INSTALL prompts you to enter the DOS path where Image200 should be installed. If you enter the a path to a directory that does not exist, the program attempts to create that directory.

If a previous version of Image200 exists in the path, it is overwritten.

If you opened a configuration file to get the base address, the settings from that file will be used to create the new Image200 configuration file.

10. INSTALL quits. Eject the Image200 disk and write-protect it.

Files Installed

The files installed in the Image200 directory include program files and a set of diagnostic utilities.

Program files

ACQUIRE.EXE
ARCHIVE.EXE
ANALYZE.EXE
CALIB.EXE
EXPORT.EXE
FOCUS.EXE
IMAGE.EXE
IMPORT.EXE
MAINMENU.EXE
REGNEDIT.EXE
SETUP.EXE
image.cfg

The image.cfg file is the configuration file for Image200; information about your hardware and software setup is stored in this file.

Diagnostic utilities

BLOCKDIR.EXE
EMMVIEW.EXE
EMSDIR.EXE
SETBLOCK.EXE
UNLOAD.EXE
VIEW.EXE

These programs are included to provide diagnostic support for Photometrics Customer Service. If you call Customer Service with an Image200 problem, they may ask you to use one or more of these utilities to help identify and solve the problem.

Other files on the Image200 disk

INSTALL.EXE	Installation program
README	Additional information not included in this manual

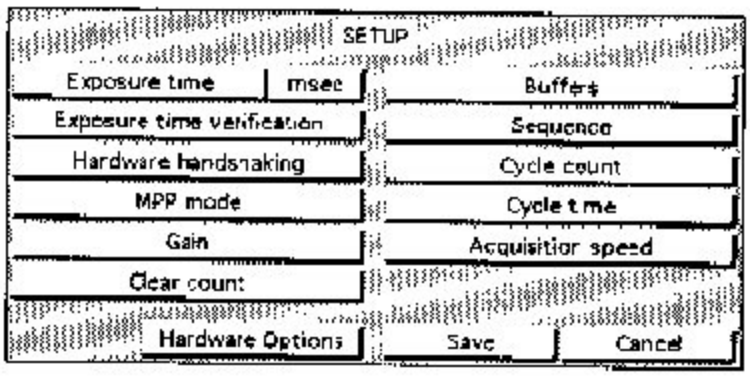
Configuring Image200

Before you can acquire images with your CCD camera, Image200 must be configured appropriately. This chapter covers the Setup dialog box, which determines the operating parameters of Image200.

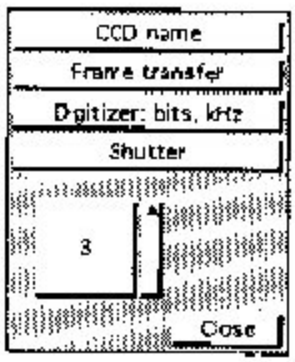
Hardware Options

To set up Image200 to match your hardware environment, choose Setup from the Configure menu on the Main screen.

(You can also press function key F2.) The Setup dialog box appears.



The buttons in this dialog box allow you to set parameters for acquisition of images and exposure sequences. To set Image200 hardware options, click Hardware Options. The Hardware Options dialog box appears.



The Hardware Options dialog box allows you to easily change broad groups of internal parameters by specifying basic hardware components. Initial settings may be determined by Photometrics and stored in the configuration file delivered with your system. The first time you use Image200, you should check that all parameters are set correctly and make a note of the settings. You may never have to change your settings, unless you make a change in system hardware.

As you check the settings, you may wish to consult the *Final Test Report* delivered with your camera system. This important report lists all components of your system and gives the results of performance tests conducted on your equipment at Photometrics. Keep the report with this manual for reference.

CCD Name

The CCD name button

shows the CCD installed in your camera head. To change the CCD setting, click the button; it cycles through all CCDs currently supported by Image200. The CCD dimensions and other internal parameters are set automatically.

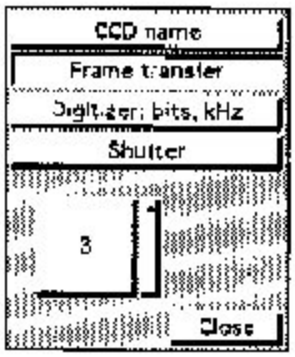
Device names are determined by the manufacturers and may change over time. Here are some common CCD names and the names used in Image200:

Common Name	Setting on CCD Name Button
EEV P88131, EEV CCD05-11	EEV CCD05-10
Thomson 512	TH 7895B
TI 31156, Thomson 1K	TH 7896A
Kodak 1K	KAF 1400
Kodak 2K	KAF 4200

If your CCD is not listed, contact Customer Service for assistance.

Frame Transfer

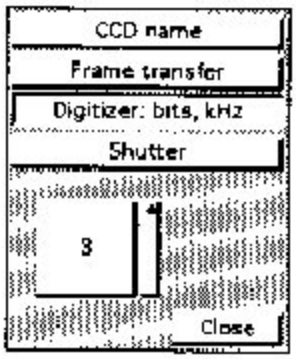
If your CCD is available as either a full-frame device or a frame-transfer device, the **Frame transfer** button will be available.



As explained in the *AT200 CCD Camera System Hardware Reference Manual*, a frame-transfer CCD contains an image array and a storage array to allow simultaneous acquisition and readout. The button is set to correspond to the CCD in your camera head. Frame transfer devices behave differently during image acquisition, as described in the chapter *Acquiring and Viewing Images*.

Digitizer

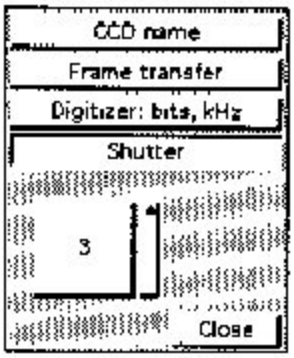
The **Digitizer** button



shows the pixel resolution and data transfer rate of the Analog Processor Card in your CE200A Camera Electronics Unit. The possible settings correspond to the analog processor cards available from Photometrics, as described in the *AT200 CCD Camera System Hardware Reference Manual*.

Shutter

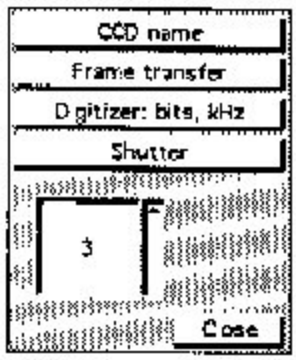
The **Shutter** button



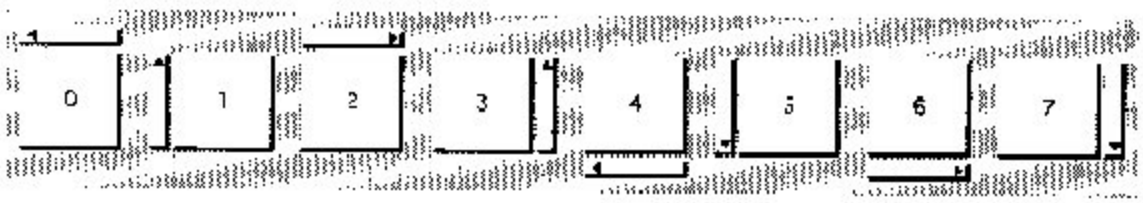
shows the shutter installed in your camera head; the shutters available are discussed in the *AT200 CCD Camera System Hardware Reference Manual*. This setting determines internal timing parameters to allow the shutter to open and close for an exposure.

Display Orientation

The display orientation button



sets the CCD orientation for display purposes. (The keyboard equivalent is "O," for orientation.) The large square represents the CCD's parallel register and the adjacent rectangle represents its serial register; the output node is at the end marked by the arrow. There are eight possible display orientations:



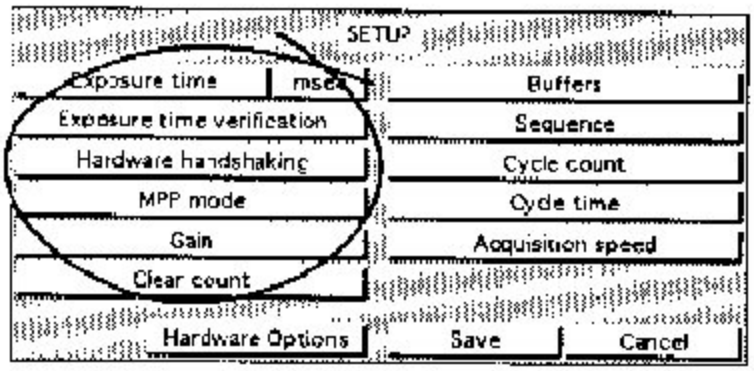
These cover all combinations of rotation and inversion.

The display orientation affects only the current image and can be changed at any time; it does not affect acquisition. Acquisition orientation depends on the orientation of the CCD *inside* the camera head, and the orientation of the camera head relative to the subject. Image200 cannot know this information.

The button is originally set to provide a right-reading display for your CCD.

Acquisition Options

Now that you have checked the camera system hardware parameters, click Close to return to the main Setup dialog box.



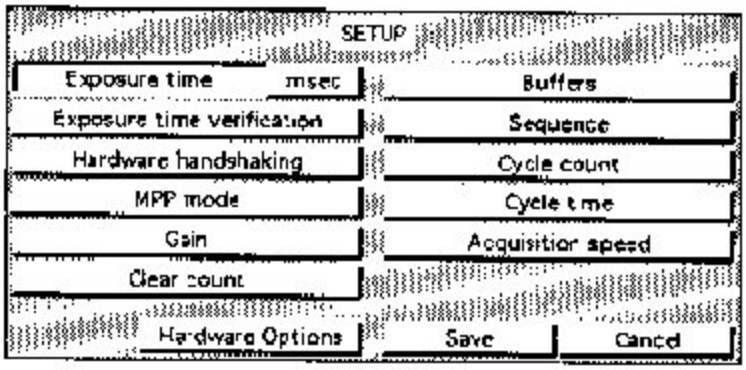
The buttons on the left side of the Setup dialog box set acquisition parameters which apply to every image acquired from the CCD. The rest of this chapter describes how these settings affect hardware and software operation.

Each section ends with a suggested parameter setting, to help you get started with focusing and acquiring images.

The buttons on the right side of the Setup dialog box set sequence parameters; they are discussed in the chapter *Defining and Acquiring Exposure Sequences*.

Exposure Time and Verification

The **Exposure time** button is used to set the length of CCD integrations.



The exposure time is used for the image acquisition commands on the Acquire menu and for the **Capture** commands on the Focus and Region Edit screens.

When you click the button, an entry box appears showing the current time.

You can leave this setting unchanged or enter a new exposure time. The entry box accepts only integer and exponential notation (for instance, `1.45e4`). Decimal portions of a non-exponential entry are ignored.

A small button next to the **Exposure time** button sets the units for displaying the exposure time. It cycles through three settings: milliseconds, seconds, and minutes. (The keyboard equivalent is "U," for units.)

Image200 stores all exposure times in milliseconds, whatever the display units. For the most precise specification of exposure times, enter the number in milliseconds, using integer or exponential notation.

If you enter an exposure time of 4200 milliseconds then switch the display units to seconds, the time will be displayed as 4 seconds. The actual exposure time will remain 4200 milliseconds.

Exposure time verification lets you verify or change the exposure time before each timed acquisition. When you click the **Exposure time verification** button, verification toggles on or off.

When **Exposure time verification** is on, an entry box will appear before each timed acquisition in Image200. You can use this entry box to check the exposure time you set, or to enter a new time. A new exposure time entered in the

Focus and Region Edit screens is saved in the Image200 configuration file as the new default value. A new exposure time entered in the Main screen is used for the current acquisition only.

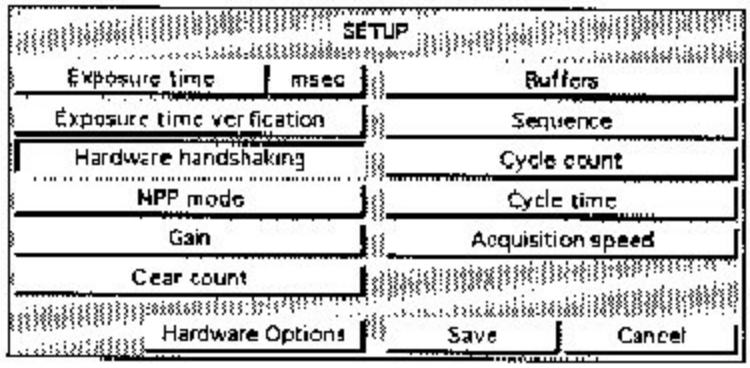
When **Exposure time verification** is off, all timed acquisitions will proceed immediately; no entry box will appear.

To start...

- Set **Exposure time** to 200 msec
- Set **Exposure time verification** to On

Hardware Handshaking

Hardware handshaking lets you synchronize external equipment with camera system operation. When you click the **Hardware handshaking** button, handshaking toggles on or off.



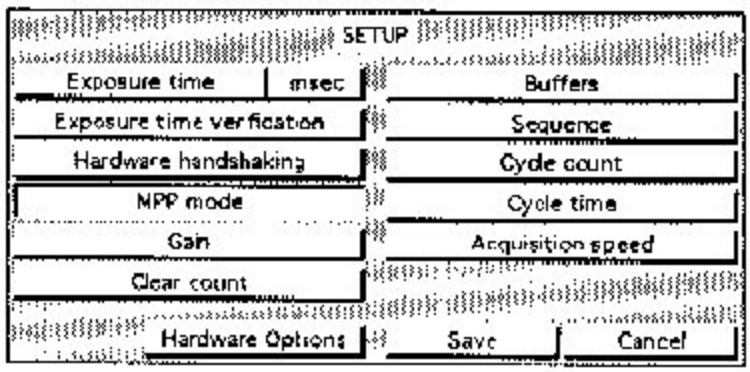
Hardware handshaking uses the User I/O connector on the AT200 controller, as described in the *AT200 CCD Camera System Hardware Reference Manual*. When **Hardware handshaking** is on, the signal on bit 0 (User I/O pin 5) will provide basic information about camera operation. The meaning of the signal depends on the sequence parameters, discussed in the chapter *Defining and Acquiring Exposure Sequences*.

To start...

- Set **Hardware handshaking** to Off

MPP Mode

If your CCD is capable of MPP (multi-pinned-phase) operation, you can choose whether or not MPP inversion is used for image acquisitions. When you click the **MPP mode** button, MPP mode toggles on or off.



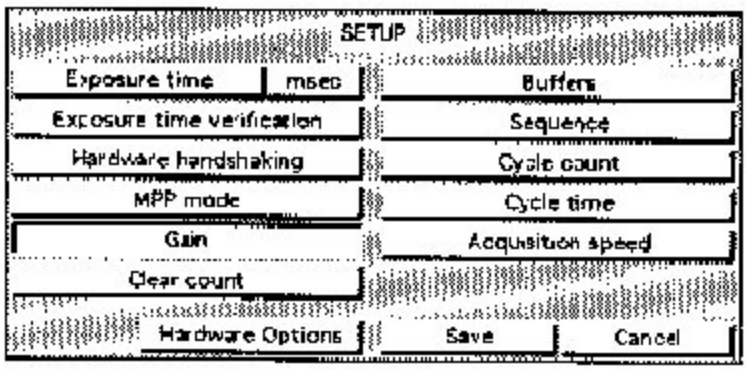
The **MPP mode** button is only available for MPP-capable CCDs. MPP operation is explained in the *AT200 CCD Camera System Hardware Reference Manual*.

To start...

- If the button is available, set **MPP mode** to On

Gain

Gain allows you to adjust the amplification of the digital signal generated by charge on the CCD. When you click the **Gain** button,



the setting toggles between 1X and 4X gain factors.

As discussed in the *AT200 CCD Camera System Hardware Reference Manual*, the Camera Electronics Unit converts electrons on the CCD into digital intensity levels according to a hardware-dependent base gain value. The base value is multiplied by the gain factor set with the **Gain** button.

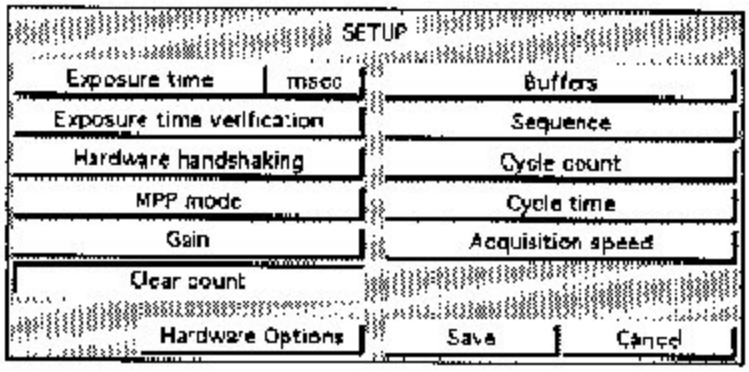
A 4X gain setting increases the signal generated by each electron for better definition of images, but the A/D converter reaches saturation sooner, effectively decreasing the functional range of the CCD.

To start...

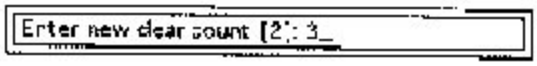
- Set **Gain** to 1X

Clear Count

The CCD parallel register can be cleared before each acquisition to remove current which has built up on the CCD. The **Clear count** button lets you specify how many times the parallel register is cleared. When you click the button,



an entry box appears showing the current clear count setting.



You can leave this setting unchanged or enter a new number.

Clearing occurs immediately before the acquisition timer starts, or immediately before the shutter opens for a shuttered exposure. When **Clear count** is non-zero, the CCD will also be cleared continually between acquisitions.

Clear count is especially important for frame transfer CCDs, or any other situation where the shutter is held open for the duration of an acquisition sequence. If you do not clear the CCD between frames (by setting the **Clear count** parameter to at least 1), charge will build up on the exposed CCD.

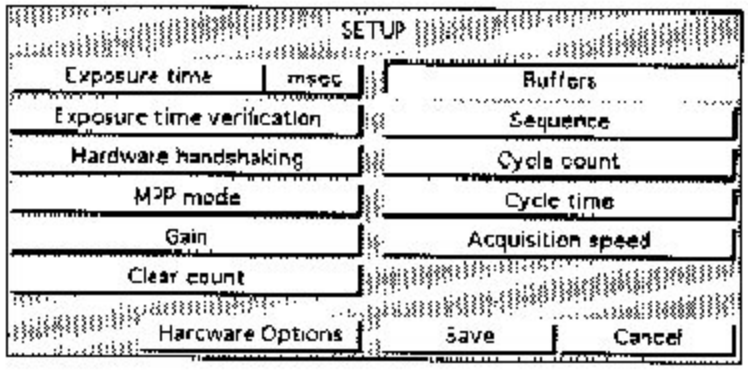
Clearing during an exposure sequence acquisition is discussed in the chapter *Defining and Acquiring Exposure Sequences*.

To start...

- Set **Clear count** to 1

Buffers

Image200 uses temporary buffers to store the current image and other information. The **Buffers** button lets you specify whether these buffers are created in EMS memory or on your hard disk. When you click the **Buffers** button,



it toggles between memory- and disk-based buffers.

When buffers are in memory, the current, reference, and flat field images are stored in EMS memory.

When buffers are on the hard disk, the current, reference, and flat field images are stored in temporary files on your hard disk.

Choosing a Setting

When buffers are in memory, Image200 can access data quickly, for the fastest display and data correction operations. However, since the acquisition buffer is always in memory, memory buffers can limit the space available for image acquisition.

Operations involving disk buffers are much slower than the same operations with memory buffers. Disk buffers also require more free space on your hard disk, in return for lower EMS memory requirements.

In general, *use memory buffers whenever possible.* If your host computer meets the recommended figures for EMS memory listed in the chapter *Installing Image200*, you should be able to use memory buffers for all single-image operations. Even if your computer doesn't meet the recommendations, memory buffers should work in all but extreme cases.

If your computer meets only the minimum requirements for EMS memory, you should be able to acquire a single image with memory buffers. You may need to switch to disk buffers for some operations.

If you switch the buffer setting with an image displayed on the main screen, there may not be enough space for the current image in the new buffer location. Image200 will inform you of the problem.

Space requirements depend on many factors:

- Number and size of regions
- Binning
- Data resolution
- Math and data correction operations
- Sequence size and acquisition speed

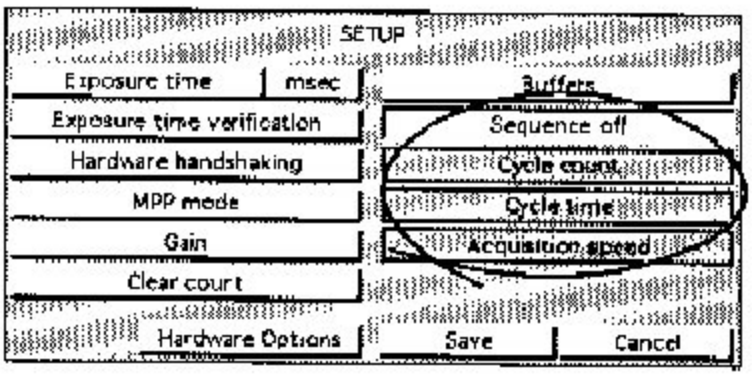
The use of buffers during an exposure sequence acquisition is discussed in the chapter *Defining and Acquiring Exposure Sequences*.

To start...

- Set **Buffers** to Memory

Sequence

Image200 can acquire multiple exposures with a single command. The **Sequence** button and the **Cycle count**, **Cycle time**, and **Acquisition speed** buttons below it control sequence acquisition.



The use of sequences is discussed in the chapter *Defining and Acquiring Exposure Sequences*.

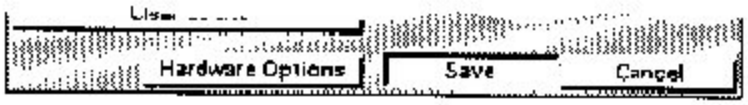
When **Sequence** is off, the other buttons are dimmed.

To start...

- Set **Sequence** to Off

Save the Configuration

When you have set all the parameters in the Hardware Options and Setup dialog boxes, click the Save button.



The new hardware and acquisition settings are saved in your configuration file and you return to the Main screen.

If you made a mistake and want to leave the Setup dialog without saving, click the Cancel button.

If you have made *any* changes since you opened the Setup dialog box, Image200 will ask whether you want to save your changes.

If you click the No button, *all* changes to the Setup and Hardware Options dialogs are discarded. If you click the Yes button, your changes are saved, just as if you had used the Save command.