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**Meade Instruments Corporation**
*Telescopes · Binoculars · Microscopes*

## Meade Pictor XT-Series CCD Autoguider/Imagers

### Appendix A: Technical Specifications

#### Pictor 208XT Technical Specifications

CCD chip : Texas Instruments TC-255  
 Size : 3.30 mm x 2.40 mm  
 Pixels : 336 x 242  
 Full well : 70,000 e-  
 Dark current : < 8e- per 5sec @ -5C  
 A/D conv. : 8 bit  
 Brightness : 256 level  
 Temp control : thermoelectric  
 Change deg. : (delta)-25 C from ambient  
 Temp accuracy: 1C  
 Shutter : electronic  
 Min exp. time : 4 millisecc.  
 Color capable : no  
 Power req. : 1.0 amp @ 12vDC

With LX200:

AutoFocus : yes  
 AutoMosaic : yes

Telescope reference: (8" f10 scope)

Pixel Size : 1.0 arc seconds  
 Field of View : 5.6' x 4.1'



#### IMPORTANT NOTICE!

**Never use a telescope  
 or spotting scope to  
 look at the Sun!**

**Observing the Sun, even for the  
 shortest fraction of a second,  
 will cause irreversible damage to  
 your eye as well as physical  
 damage to the telescope or  
 spotting scope itself.**

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#### Pictor 216XT Technical Specifications

CCD chip : Texas Instruments TC-255  
 Size : 3.30 mm x 2.40 mm  
 Pixels : 336 x 242  
 Full well : 70,000 e-  
 Dark current : < 8e- per 5sec @ -5C  
 A/D conv. : 16 bit  
 Brightness : 65536  
 Full frame : High res: 1.1 sec; low res: 0.3 sec  
 Temp control : thermoelectric  
 Change deg. : (delta)-25 C from ambient  
 Temp accuracy: 1C  
 Shutter : electronic

Min exp. time : 4 milliseC.  
Color capable : yes (with 616 color wheel)  
Power req. : 1.0 amp @ 12vDC

With LX200:

AutoFocus : yes  
AutoMosaic : yes

Telescope reference: (8" f10 scope)

Pixel Size : 1.0 arc seconds  
Field of View : 5.6' x 4.1'

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### **Pictor 416XT Technical Specifications**

CCD chip : Kodak KAF-0400  
Size : 6.90 mm x 4.60 mm  
Pixels : 768 x 512  
Full well : 85,000 e-  
Dark current : < 1e- per 5sec @ -20C  
A/D conv. : 16 bit  
Brightness : 65536  
Temp control : thermoelectric, 2 stage  
Change deg. : (delta)-40 C from ambient  
Temp accuracy: 0.1C  
Shutter : electro-mechanical  
Min exp. time : 10 milliseC.  
Color capable : yes (with 616 color wheel)  
Power req. : 2.0 amp @ 12vDC

With LX200:

AutoFocus : yes  
AutoMosaic : yes

Telescope reference: (8" f10 scope)

Pixel Size : 0.9 arc seconds  
Field of View : 11.7' x 7.8'

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### **Pictor 1616XT Technical Specifications**

CCD chip : Kodak KAF-1600  
Size : 13.80 mm x 9.20 mm  
Pixels : 1536 x 1024  
Full well : 85,000 e-  
Dark current : < 1e- per 5sec @ -20C  
A/D conv. : 16 bit  
Brightness : 65536  
Full frame : High res: 16 sec; low res: 4 sec  
Temp control : thermoelectric, 2 stage  
Change deg. : (delta)-40 C from ambient  
Temp accuracy: 0.1C  
Shutter : electro-mechanical

Min exp. time : 10 millisecc.  
 Color capable : yes (with 616 color wheel)  
 Power req. : 2.0 amp @ 12vDC

With LX200:

AutoFocus : yes  
 AutoMosaic : yes

Telescope reference: (8" f10 scope)

Pixel Size : 0.9 arc seconds  
 Field of View : 23.3' x 15.6'

## Quantum Efficiency

Display of the typical [Quantum Efficiency logcurve](#) (transmission of light as a function of wavelength) for the TC255.

## The Pictor Mode Diagram

The drawing graphs the various displays and modes in which the Pictor operates. The arrows between the displays show how the Pictor moves from display to display. If no notation appears on the arrow, the Pictor moves from display mode to the next display mode automatically. If the arrow is marked, the action indicated is required to move the Pictor from the first display mode to the next display mode.

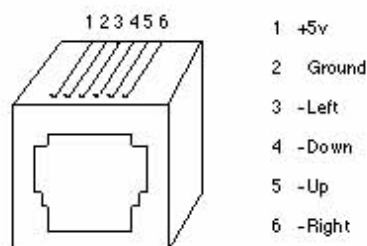
Controlled Shutdown when using the autoguider in standalone mode:

It is important to perform a controlled shutdown even when operating the Pictor XT in standalone mode. To enter shutdown mode, make a long press when the display reads "gd". The display will then read C9 or C8, and begin counting down to C0. It may start at a lower number if the temperature is cool outside. Wait until the display reaches C0 before unplugging the Pictor XT.

## Appendix B: Pinouts

### CCD Connector Pinout:

The pinout of the CCD connector is displayed below:



### CCD Connector

This connector is compatible with Meade LX50 and LX200 CCD ports. It has the following specifications:

- All signals prefaced by a dash (-) are active low.
- Outputs can sink up to 10 mA when active, and can withstand 40 vDC when off.
- +5V is regulated to 20% up to 6 mA, and is diode protected.

## Appendix C: Caring for the Pictor

Properly caring for the Pictor's optics can ensure good performance. Please note the following items:

- A little dust on the optical surface of the Pictor is of little concern, however, if the optics accumulate a great amount of dust, use a photographic grade camel hair brush with very gentle strokes. You can also blow off dust using an ear syringe (available at most pharmacies).
- To clean the optics, we suggest that you make your own lens cleaning solution. Pure isopropyl alcohol (90% or higher) will clean most residual build-up on optical and metal surfaces.
- To remove grease, fingerprints, and most oily residues, use the following solution: 1 part pure isopropyl alcohol, 2 parts distilled water, and one drop of biodegradable dishwashing solution per pint of cleaner. This formula is safe for multi-coated and uncoated optics.
- To dispense cleaning solution, a sprayer bottle is convenient. Use a white "Kleenex"-type tissue to absorb the solution, since many lens cleaning papers contain fiberglass which can scratch the optics. Also avoid lens cloths and chamois.

#### Appendix D: Creating a Centering Tool and Parfocal Eyepiece

This appendix gives instructions for creating a centering tool and parfocal eyepiece. To have one eyepiece that serves both functions, complete both sets of instructions using the same illuminated reticle eyepiece (discussed below).

##### Creating a Centering Tool

The instructions in this section will enable you to create a centering tool. This tool may be used to quickly center an image on your CCD chip, eliminating the time often required to center an object in the chip's field of view. To create a centering tool, complete the following steps:

- 1. Search for a guide star as described in the section on stand alone autoguiding (steps 5 -12). It is best to pick a fairly bright star that is alone in the field of view. If a lone star is not available, pick the brightest easily distinguishable star in the field of view.**
- 2. Remove the Pictor from the eyepiece holder and replace it with an adjustable illuminated reticle eyepiece.**
- 3. Use the adjustment knobs on the eyepiece to center the crosshairs on the star. Note the orientation of the eyepiece in the holder. The crosshairs may not be in the exact center of the field of view, and rotation of the eyepiece will cause the crosshairs to become misaligned with the PictorCCD chip.**

The next time the illuminated reticle eyepiece is inserted (ensuring that the rotation matches the original position), the crosshairs should indicate the center of the Pictor CCD chip. To center a star on the CCD chip in the future, simply adjust the telescope until the star is centered under the crosshairs.

##### Creating a Parfocal Eyepiece

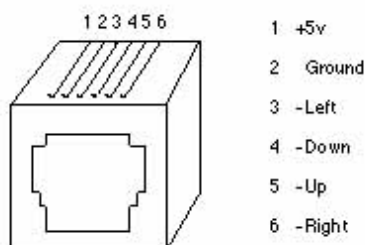
To create a parfocal eyepiece, complete the following steps:

- 1. Locate the eyepiece extension, clamp ring, and set screw shipped with the Pictor.**
- 2. Search for and focus a guide star as described in steps 5 - 12 in the section on standalone autoguiding.**
- 3. When you are satisfied with the level of focus, attach the eyepiece extension to the eyepiece. Secure the extension by sliding the clamp ring over the eyepiece.**
- 4. Remove the Pictor from the eyepiece holder and insert the extended eyepiece in its place. (If you are using an off-axis guider, place the eyepiece in the off-axis viewing position.)**
- 5. Slide the eyepiece in or out of the eyepiece holder until the image is in sharp focus.**
- 6. Tighten the set screw on the clamp ring to secure the eyepiece.**

### Appendix E: Using the Meade 520 Electronic Relay

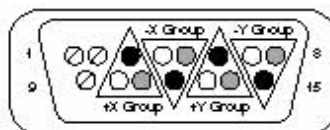
The Meade 520 Electronic Relay enables you to connect a Meade Pictor to another manufacturer's telescope motor or hand controller or any Meade non-LX200/CDS-equipped product with motorized drive correction.

The [Electronic Relay](#) has one RJ12 connector and one DB15 connector .



#### RJ12 Connector

The RJ12 connector is the telephone-style plug with six contact sides. It is designed to connect the Electronic Relay to the Pictor. A cable for this connection is provided with all Pictor models. Connect one end of the cable to the Pictor's guider port, and connect the remaining end to the RJ12 connector on the Electronic Relay.



Note: The Electronic Relay DB15 connector is male. Pinouts for female DB15 connectors will be the opposite of this pinout.

- Key:
- ⊗ Not used
  - Common (CMN)
  - Normally Closed (NC)
  - Normally Open (NO)

#### DB15 Connector

The DB15 connector is designed to connect your telescope's hand controller or drive mechanism. Before attempting to connect your telescope to this connector, determine whether your telescope's hand controller is of a Normally Open (NO) or Normally Closed (NC) design. This information should be given in your telescope's documentation.

The DB15 connector has four signal groups: +X, -X, -Y, and +Y. These signal groups are controlled by the Pictor's -Right, -Left, -Up, and -Down outputs, respectively. Each of the DB15 signal groups consists of three lines: Normally Open (NO), Normally Closed (NC), and Common (CMN). The relationship between the Pictor's output and DB15 signal groups is shown in the illustration and table below.

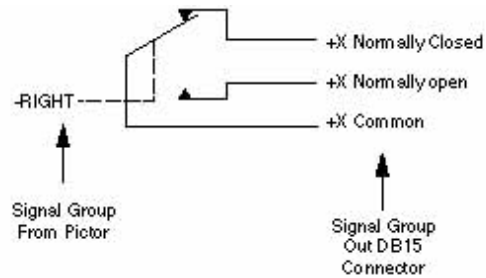
Pictor Output	DB15 Signal Group	Normally Closed Pin	Normally Open Pin	Common Pin
-Right	+X	3	10	11
-Left	-X	12	4	5
-Up	+Y	6	13	14
-Down	-Y	15	7	8

When connecting your telescope to the DB15 connector, you'll need to connect two pins for each [signal group](#). The Common Pin for each signal group is always connected; whether the Normally Open or Normally Closed pin is used with the Common pin depends on the setup of your telescope's hand controller/drive mechanism. If your hand controller has a Normally Closed setup, connect the Common pin and Normally Closed pin for each signal group. If

your hand controller has a Normally Open mechanism, connect the Common pin and the Normally Open pin.

**CAUTION:** Never connect both the Normally Open and Normally Closed pins. This will damage the Electronic Relay.

The relay box's equivalent circuit for each signal group appears in the following figure.



## Technical Specifications

The technical specifications of the Electronic Relay are listed below :

Voltage output relay can withstand if unconnected: 0 - 40 vDC

Maximum current output can pass when connected: 200 mA

Maximum resistance when output is connected: 20 Ohms

## Appendix F: Sample Imaging Checklist

As we have said before, consistency is a major factor in taking good quality images. Included on the next two pages are a sample imaging checklist. Feel free to copy and use these pages, or use them as a guide to developing your own.

### CCD Imaging Checklist

- \* Prepare materials; check CCD chip and telescope lens for excessive dust.
- \* Power on computer. Verify that there is sufficient disk space for your images.
- \* Set up telescope.
- \* Connect camera to telescope and computer. Remember to put camera in the same orientation each time if you are re-using calibration frames.
- \* Connect power to camera. Remember that it is CRITICAL that you plug the power cable into the back of the camera before plugging it into the wall socket.
- \* Plug in camera and start PictorView software.
- \* Connect software to the camera (select Connection, then connect).
- \* Allow 5-10 minutes for temperature to stabilize.
- \* Check that you have the flat fields and dark frames you will need, or prepare to take new ones.
- \* Take calibration frames if needed (or desired)
- \* Begin taking images.
- \* Remember to shut off continuous shooting if it is on.
- \* Disconnect the software (Connection, then Disconnect).

- \* Power off the Pictor (by unplugging it from the wall).
- \* Disconnect all cables and shut down system (or process images).

## Appendix G: Troubleshooting

### Troubleshooting the stand alone autoguider

This section suggests solutions to problems that can occur while using the Pictor autoguider. If you are experiencing problems, please look through the headings and try the suggestions appropriate to the problem you are experiencing.

#### Cannot Find and Focus a Guide Star

The first thing to check if you are having trouble finding a star is to recheck your focus. If this looks good, you should try to increase your exposure time as described under customization. It may just be that your star is too dim for the current exposure setting. A given exposure time is good for a brightness range of 2 to 3 magnitudes. Be sure to try some longer settings.

Be sure to take a new dark frame every time you adjust the exposure to insure maximum accuracy.

If you are still having difficulty finding and focusing on a star, you may wish to practice with a regular diagonal, rather than work with your guider.

Use the telescope focus control to peak the find and focus readout of the Pictor. If the brightness value exceeds 95, reduce the exposure time and continue until best focus is obtained.

Now remove the Pictor and make a parfocal eyepiece as described in Appendix D of this manual.

Reattach your guider to the telescope. Focus the camera attached to the guider. Insert your parfocal eyepiece. Slide the parfocal eyepiece in and out until focus is achieved. Notice how far above the parfocal point the eyepiece sits. Remove the eyepiece and insert the draw tube of the Pictor. Back the Pictor out from the guider by the amount you measured with the parfocal eyepiece and try again to focus.

#### The Pictor Keeps Getting Guiding Errors

If your Pictor keeps losing track of the guide star, there are a number of things to check. The first thing to do is to observe with a guiding reticle through the guider and attempt to guide manually. If you notice that seeing is poor and the guide star is jumping all over the eyepiece, try enabling the Seeing Compensation custom option. Additionally you can use a longer exposure time, and perhaps a fainter star. The longer exposure time will average out the seeing and the Pictor will make fewer random corrections. Undoubtedly, you will find the seeing affects photos taken under these conditions.

If you notice that your telescope drive has large periodic errors, you should retrain you telescope's smart drive option. If your telescope does not have a smart drive option, consult the manufacturer to see how the periodic errors may be reduced.

You should also check the mechanical stability of your telescope mount. If the telescope has a tendency to ring after being touched or pushed by a gust of wind, see what you can do to dampen the vibrations. You might try rubber feet under your tripod and tightening all of the adjustments on the mount.

#### The Pictor Fails to Calibrate Properly

If the Pictor is having trouble calibrating, you need to double check your cables. Make sure they have no broken wires and that they are wired up correctly. Next look through your finder scope, or camera body while the Pictor is calibrating. During the times when the movement displays RT, LF, UP and DN you should see the star moving in your field of view.

If the telescope does not complete the cycle of moves, be sure you use the slow motion controls on your scope to center the star at location (4,4) in the find and focus mode before calibrating. If cycle still does not complete, try reducing the calibration times. It is possible that the movements of the telescope are too large and are walking the star right off the guider's CCD chip. If the calibration cycle completes, but you still have an error, try increasing the

calibration times in the custom settings.

The ideal calibration times can be determined in the Find and Focus mode. While in the Find and Focus mode, press your slow motion controls. Time how long (in seconds) it takes to move the scope 1 unit in the x direction. This is the value you should use as the RA calibration time. Similarly, determine the DEC calibration time as the time required to move the telescope 1 unit in the Y direction.

The Pictor remembers calibration settings even if it is powered off. Once calibrated, you do not need to calibrate again until you change telescope declination.

### **Troubleshooting PictorView**

This section suggests solutions to problems that can occur while using PictorView. If you are experiencing problems, please look through the headings and try the suggestions appropriate to the problem you are experiencing.

#### **No Communications**

1. Check cables; be sure one end has not worked loose.
2. Make sure the Pictor reads PC. If not, unplug the power from the WALL socket, NEVER from the camera.
3. Be sure the baud rate is not set too high for your PC; check your user's manual if you are not sure.
4. Select File, About. Look at the System resources and make sure it is above 60 or so. If not, restart Windows and try again.
5. If the problem persists, make a note of any error conditions and call technical support.

#### **No Visible Image**

Try adjusting the background and range using the arrow keys, also check the histogram and see if there is any image data. If the histogram is very low, increase brightness or retake the image with a longer exposure time.

#### **Cannot Save Image**

1. There are some file formats that PictorView cannot convert from. If you are trying to save a new image as any format, there should be no problems as long as there is enough space on the hard drive.
2. If the problem persists, make a note of the file format you were trying to save (and the original format, if this was not a new image), and call technical support.

### **Appendix H: Technical Support**

If you have a problem that cannot be resolved using the troubleshooting sections in this manual, please contact:

**Customer Service Department  
Meade Instruments Corporation  
16542 Millikan Ave.  
Irvine, CA 92606**

**Ph (714) 756-2291  
Fax (714) 756-1540**

When you report a problem, please give the following information:

- \* Your name, address, and phone number
- \* Meade model number
- \* Description of the problem
- \* Status of the unit when the problem occurred
- \* Any steps you took to resolve the problem, and the results.



***If problem relates to PictorView, also be prepared to give:***

Computer system configuration, including:

- \* manufacturer,
- \* type (laptop or desktop),
- \* CPU (386, 486, Pentium),
- \* amount of RAM,
- \* hard drive size,
- \* video resolution (640x480, 800x600, 1024x768...), and
- \* operating system: Windows 3.1, 3.11, Windows NT, or Windows 95.

**Appendix I: Shortcut Command Keys**

Following is a list of shortcuts to popular commands.

**File Menu Commands:**

- Open: Ctrl + O
- Save: Ctrl + S
- Save: As F2
- Print: Ctrl + P
- Exit: Alt + X

**Edit Menu Commands:**

- Copy: Ctrl + C

**Image Menu Commands:**

- Night Vision: F5
- CCD Vision: F6

**Image Menu Commands: (only available if there is an open image)**

- Process Image: Alt + P
- Background and Range: Alt + R
- Image Information: F10
- Merge Images: Alt + M
- Subtract Dark Frame: Alt + D
- Subtract Bias Frame: Alt + B
- Divide Flat Field: Alt + V

**Camera Menu Commands:**

- Take Image: F7
- Autoguide on User Object: F8
- Autoguide on Brightest: F9

**Help Menu Commands:**

- Help: F1
- Image Checklist: F3
- Processing Checklist: F4

(Note: For those users unfamiliar with Windows, the sequence Ctrl + X means hold down the CTRL key and press x on the keyboard at the same time; likewise, Alt + P means hold down the ALT key and press the p key at the same time.)

**Related Topics:**

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- [Pictor Series CCD Auto guider/Imagers](#)

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