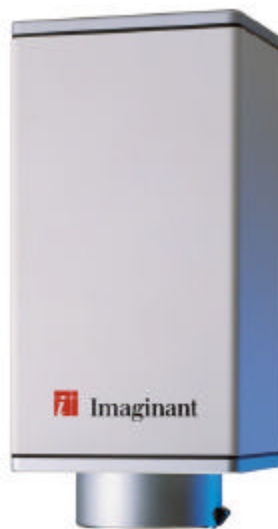


HR Series Digital Cameras

Operator Manual

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Remove Power Cord from any HR series camera before replacing the fuses.

There are no user serviceable parts in the HR series cameras other than the fuse. The cameras should be returned to the manufacturer for any repair.

Enlevez le cordon de secteur du HR avant de remplacer les fusibles.

Il n'y a pas d'utilisateur parties utilisables dans le HR, autrement que le fusible. Les appareils-photo de HR-1100/200 devraient être retournés au fabricant pour n'importe quelle réparation.

Read the operator manual thoroughly and follow all safety related statements before operating the camera.

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1. General Description

Description

HR series digital cameras are designed for high-quality image capture with fast shutter-speed, action-stopping capabilities. These cameras produce photographic quality color images from which high quality hardcopy prints can be created or upon which detailed image analysis may be performed. These cameras offer in-camera image processing with JPEG compression. The HR series cameras connect to a standard, high-speed Gigabit (1000Base-T) Ethernet network and use the network interface for all configuration, setup and image-transfer operations. Application software on the host Workstation provides camera system control.

International certification assures worldwide acceptance of the camera. The camera's universal internal power supply allows operation over all international supply voltages and frequencies.

The HR series cameras accept asynchronous trigger signals and can perform burst image captures synchronized to these trigger signals. The user controls the number and the timing of the image captures that the HR series cameras perform in response to an external trigger signal. The time intervals between the trigger inputs and the moments of image capture are adjustable through the HR series camera's Ethernet Interface. The image capture timing for multiple HR series cameras may be synchronized so as to simultaneously capture scenes from multiple angles, or to capture scenes at higher effective frame rates.

The HR series cameras can generate strobe synchronization signals for controlling strobe lamps or other equipment. The camera has six (6) X-sync strobe trigger outputs that may be flexibly configured to control the firing sequence of up to six strobe lamps. The strobe lamp timing and sequencing is adjustable by the user. The image capture timing of multiple HR series cameras can be synchronized to enable multiple cameras to employ the same strobe illumination.

The HR-200C camera model can capture images as rapidly as 14 frames/second, up to the 15 image capacity of the camera's internal memory. Subsequent images can be captured when memory is freed through the transfer of images to the host Workstation. The average image capture rate is determined by the image transfer rate to the host Workstation.

The HR series cameras accept standard EF-mount lenses and include an electrical interface for lens focus and aperture control. Aperture control allows exposure adjustments beyond those achievable using only the "electronic iris" integration-time control available in most industrial CCD cameras. Aperture control allows the shutter-speed to remain constant over a wider range of ambient light levels.

The primary differences between the HR series camera models are shown in the chart below. The appendices provide detailed specifications for each HR series camera model.

Feature	HR-1100c	HR-200c
Resolution	4032 x 2686	1608 x 1206
Aspect Ratio	3 x 2	4 x 3
Frame Rate (frames per sec)	2.5fps	14fps
Memory depth (#images)	4	15
Preview Resolution	672 x 448	804 x 606

2. Principles of Operation

Camera Operation

The setup and configuration of the HR series cameras are controlled by application software running on the Workstation. This software communicates with the camera through the Ethernet Interface. Upon camera power-up, the camera attempts to link with the Workstation application until a connection is attained. The camera then enters Setup Mode and begins the Setup Sequence during which the Workstation configures the camera's image capture timing parameters. After configuration the camera is ready to capture images and to automatically transfer them to the Workstation.

Images are transferred to the Workstation in either raw TIFF format or as fully processed color images in compressed JPEG format. The JPEG format images may be compressed to a variety of quality levels using the software interface. The user may thus adjust the quality level and, consequently, the file size of the transferred image. The HR series cameras also support a Preview Mode in which reduced resolution images are transferred to the host Workstation at a higher rate for previewing. Preview images are 1 byte/pixel monochrome images, possess no TIFF header, and are reduced in resolution both horizontally and vertically. The purpose of Preview Mode is to continuously display monochrome images for focus, framing and exposure control.

The images captured by the HR series camera are each uniquely identified by an image sequence number. This image sequence number is transmitted to the host Workstation together with each image. The image sequence number is reset to zero at each power-up of the camera, and increments by 1 with each image captured.

An Imaginant Camera Demonstration Application is provided. This is a demonstration Windows application that provides control over the main set of HR series camera features. An HR Camera Software Development Kit is provided for users that wish to write custom applications to take advantage of the full set of HR series camera features. The HR Camera Software Development Kit is easily integrated into user application software.

3. Network Setup

Workstation

Any Workstation connected to an HR series camera must have a properly configured Ethernet card. Workstations that run the Windows operating system must be configured to support the TCP/IP protocol in the Windows software network setup function. HR series cameras are set to an IP Address of “194.194.194.205” and the Workstation must be configured for IP Address “194.194.194.206” with a subnet mask of “255.255.255.0” which will configure the interface for a Class “C” network.

	IP ADDRESS	SUBNET MASK
Workstation	194.194.194.206	255.255.255.0
HR Camera	194.194.194.205	255.255.255.0

To optimize performance it is recommended that the camera and Workstation be the only devices on the subnet network. This is because HR series cameras transfer a large amount of image data to the Workstation following image capture and other network traffic will increase the image transfer times. Although a dedicated camera to Workstation network is recommended, the camera protocol and network activity should be compatible with standard Ethernet network configurations. Thus the camera should successfully co-exist with other network activity although with potentially reduced image transfer rates.

A Workstation connected to an HR series camera that is must also be connected to a network can be configured with two (2) Ethernet cards. In this case, one Ethernet card can be dedicated to the HR series camera while the other Ethernet card can service the network. In order to prevent any routing problems, this second card should typically utilize a different IP Address Class, something other than 194.194.194.X. Follow the Ethernet card manufacturer’s instructions in this regard.

Ethernet Cabling

Ethernet networks typically utilize a “hub” or “router” to connect multiple devices to the network. In this configuration the hub performs a cabling translation by sending the Transmit signals from one device to the Receive input of other devices and vice versa. Since the “hub” performs this translation, the cables that are employed with a hub are wired 1:1 (straight-through cables). This means that the connectors at opposite ends of these cables have the same pins connected together (pin 1 to pin 1, etc).

When a dedicated connection between an HR series camera and a Workstation is employed, a hub is not used. In this case, a Crossover Cable would typically be necessary. A Crossover Cable is wired so as to connect one device’s Transmit signals (output) to the Receive signal (input) of a second device, and vice versa. However, the HR series camera will work with a straight-through cable, as the cameras are capable of automatically swapping the Transmit and Receive signals as necessary. This allows the HR series cameras to be connected directly to the Ethernet card of the Workstation using either standard straight-through cables or using cables that have the Transmit and Receive pairs swapped.

Ethernet Indicator Lights

Two indicator lights are integrated into the Ethernet connector on the rear of the HR series camera. The ACT/Link light is located in the lower right corner of the Ethernet connection socket and the Link Speed light is located in the lower left corner of the Ethernet connection socket. These lamps provide information about the status of the Ethernet connection.

When the HR series camera is connected to an Ethernet network, the lights indicate the following Ethernet network conditions:

Indicator Light	Indication	Meaning
ACT/Link	Green on	The camera is connected.
	Green flashing	Data activity.
	Off	No link.
Link Speed	Off	10 Mbps
	Green	100 Mbps
	Orange	1000 Mbps

4. Installation

Camera Setup

1. Turn off the power and disconnect the power cord from the back of the camera.
2. Attach the EF-style lens to the front of the camera.
3. Mount the camera in the desired location using the standard camera tripod threaded holes.
 - Camera is designed for indoor use only.
 - Do not locate the camera in an explosive area.
 - Do not allow chemicals to come into contact with the camera.
 - Do not mount the camera on an unstable surface.
4. Connect an Ethernet cable between the camera and the Workstation.
5. Make connections to the camera's trigger inputs and strobe outputs as desired (Appendix C).
6. Connect the supplied power cord to the back of the camera and plug it into an appropriate supply with a properly grounded outlet.

WARNING - To reduce the risk of electric shock, connect the main power plug into a properly grounded outlet only.

AVERTISSEMENT - pour réduire le risque de décharge électrique, reliez la prise de forces seulement dans une sortie correctement au sol.

7. Turn on the camera power switch.

Software Setup

The Imaginant Camera Demo Application requires no special installation on the Workstation. The application is described in more detail in the next section, and is also described in a separate user manual.

The Imaginant Camera Demo Application uses the Winsock network services, which should be available in the Windows installation. Please note: Any errors related to Winsock support must be corrected by properly installing and configuring the Windows Operating System.

5. Operation

General Operation

Once the Workstation and camera have been configured, connected, and powered on, the camera will seek to communicate with a Workstation application like the Imaginant Camera Demonstration Application. The order in which the camera is powered up and the application is started does not matter as the application should wait indefinitely for the camera to connect, and the camera will attempt to connect with the Workstation software indefinitely. For convenience, it is assumed in this manual that the camera is powered on before the Imaginant Camera Demo Application is started, although this is not necessary. Note that the Imaginant Camera Demo Application is capable of reconnecting to the camera if the camera power is cycled while the Imaginant Camera Demo Application is running.

Imaginant Camera Demonstration Application

The Imaginant Camera Demonstration Application, “HRDemoApp”, can be used to control HR series cameras and to acquire images from the cameras, saving the images as JPEG files. Refer to the documentation for the HR Demo Application for complete installation and operation instructions.

Preview Mode

The Imaginant Camera Demo Application offers a Preview feature for viewing images from the camera during camera setup. The displayed images are updated about once per second or faster depending on the HR series camera model. This allows the operator to rapidly frame, zoom, focus and adjust the camera. Selecting the “Preview” button (“P”) in the Demo Application enables the Preview Mode after which an image display window should appear on the desktop. The camera will be put into Preview Mode and images will be automatically and continuously captured, read out of the camera, and displayed in the image display window on the Workstation. Preview Mode must be turned off prior to capturing still images from the camera.

Camera Operation

The status lights on the RJ-45 Ethernet connector of the camera indicate Ethernet connection status and activity as well as reflect camera boot activity following the application of power to the camera. Upon power-up, the HR series camera must perform several boot tasks before the connection with the Workstation can be established. These tasks and the related status lights conditions are listed below:

1. On power-up, the LEDs on the RJ-45 connector should illuminate within about 6 seconds.
2. If the camera is properly cabled to a network card in the Workstation the “LINK” LED should illuminate when auto-negotiation is completed.

3. The “Activity” lights should flash briefly about 3 seconds after the “LINK” LED is lit and should continue to flash until a connection with the Imaginant Camera Demonstration application is achieved.
4. The Imaginant Camera Demonstration Application will normally begin communicating with the camera while the “Available Camera List” dialog box is open.
5. At this point the camera has powered-up correctly and is attempting to connect to the application on the Workstation.
6. The “Activity” lights will stop flashing when the camera has linked with the Imaginant Camera Demonstration application. This indicates the camera is connected and configured for communication with the Imaginant Camera Demonstration application.

Imaginant Camera Software Development Kit

A Software Development Kit (SDK) is available from Imaginant at no charge. The SDK allows a system developer to easily integrate the HR series cameras into other software applications.

6. Camera Service

Serviceable Parts

There are no user serviceable parts in the cameras. Cameras must be returned to the manufacturer for repair.

Power Cord Requirements

The camera is supplied with a power cord suitable for North American use that meets all applicable safety requirements. Contact Imaginant for replacement power cords for North American use.

WARNING: Use of the wrong power cord may result in a hazardous condition.

Use the proper cord in compliance with local laws when connecting any Imaginant HR series camera to any 240 VAC supply network.

Power Cords for international applications must meet the safety requirements in the country of use. To maintain the safety certification standards, any power cord used with an HR series camera must meet the minimum specifications listed below.

The power cord must be:

- Flexible
- 3 conductor
- 0.75mm² area conductors
- Less than 4.5m long
- Suitable for indoor use
- Have insulation rated to 60 deg C
- Have an IEC320, sheet C13 type female connector to mate to the camera.

The cord and the plug:

- Must be adequately rated for the voltage and the current
- Must have a protective ground connection
- Must have safety certification based on the applicable EN standard(s)
- Should be compatible with the local receptacle

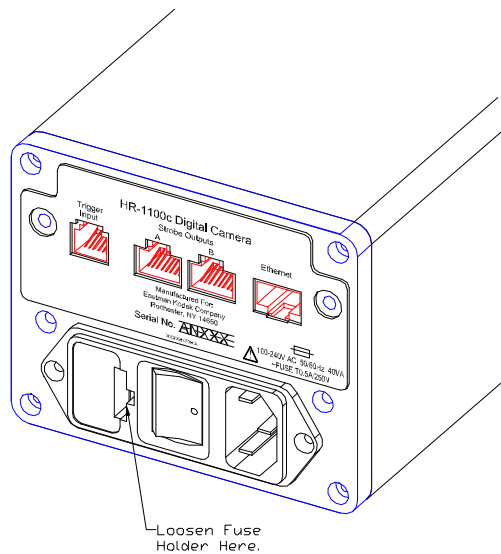
Fusing

“CAUTION: Double Pole/Neutral Fusing”. Both +AC and Neutral power supply lines are fused.



Fuse Replacement

1. Turn off the camera power switch and remove the power cord from the back of the camera.
2. Using a small screwdriver, gently unlatch the fuse holder door from the power inlet module on the back of the camera.



3. Replace the fuses using only the type specified on the nameplate of the camera.
4. Re-install the fuse holder in the original orientation and press it in gently until it latches.
5. Re-connect the power cord and turn on the power to the camera.

7. Appendix A: HR-1100c Specifications

CCD Summary

Image sensor	Kodak KAI-11000 interline transfer progressive scan CCD.
Resolution	4032 (H) x 2686 (V)
Pixel size	9 μ m x 9 μ m
Aspect ratio	3:2
CCD sensor diagonal	Full 35mm format (43mm diagonal)

In-Camera Image Processing

File format supported	JPEG, TIFF
JPEG Quantization tables	Default and user downloadable.
JPEG compression	100 programmable levels.
White point	Automatic and user adjustable white balance.
Color correction	Default and user programmable color correction matrix.
Color reproduction	Default matrix configured for sRGB color space.
Tone correction	Default and user programmable tone correction for sRGB.

System Summary

Shutter speed (Integration time)	1/10,000 sec. – 1/2 sec. Adjustable in 1/10,000 second increments.
ISO	50 – 800, adjustable in <1/3-stop increments.
Bits/Pixel	12 (captured before processing)
Dynamic range	60 dB minimum (peak signal to RMS noise @ 25°C, ISO 100)
Lens control (focus and aperture)	Supports 35mm format electronically controlled EF mount lenses.
Preview mode	1 fps monochrome 672 x 448, continuous readout mode for framing, set-up and adjustment.
Maximum burst capture rate	2.5 images per second.
Sustained capture rate	1 image every 3.5 seconds.
Image storage	4 images maximum
Triggering	Programmable delays from internal and external trigger sources.

Exposure Control

User selectable modes	Manual or automatic
Manual exposure mode configurable parameters:	Integration time (shutter speed) ISO (sensitivity) Lens aperture Flash on, Flash off

Interface Specification

Network connectivity	1000Base-T (Gigabit), 100Base-T or 10Base-T Ethernet interface.
Trigger inputs	Two (2) external trigger inputs, 5-volt logic.
Timing adjustments	Adjustable trigger-to-capture delays from 100 μ seconds to 4.8 seconds.
Strobe outputs	Six (6) contact closure strobe triggers. Strobe outputs are programmable in any desired triggering sequence.
Strobe advance	Programmable X-sync timing to compensate for variable strobe delays.

System Requirements

Host OS support	Compatible with Windows 2000, XP.
Ethernet	Host computer with built-in Ethernet interface or additional card.
Camera Firmware	Field upgradeable through Ethernet interface.

Physical Specifications (without lens)

Weight	2.2 kg (4.75 lbs)
Physical dimensions	225.6mm (8.88") L x 97mm (3.82") H x 104.5mm (4.11") W
Lens mount	Electrical and mechanical EF mounts. (Accepts 35mm SLR lenses.)
Tripod mounts	Two (2) standard 1/4"- 20 threads/inch
Trade-dress	Silver front and rear plates, white center enclosure.

Power Specifications

Power connector	International (IEC 320) AC power input connector.
AC voltage range	100 - 240 VAC
Frequency range	50 - 60 Hz
Power Rating	40 VA (maximum)
Power Consumption (RMS)	15 Watts (maximum)

Environmental Specifications

Operating temperature	-10° to 60°C (14°to 140°F) non-condensing.
Storage temperatures	-40° to 70°C (-40° to 158°F) non-condensing.
Relative humidity	< 95% at all times
Acceleration and shock	3.5g (rms), 5-150Hz sinusoidal vibration or shock ? 20g.

Regulatory Compliance

CSA, CE and FCC Part 15, Class A.

8. Appendix B: HR-200c Specifications

CCD Summary

Image sensor	Kodak KAI-2000 interline transfer progressive scan CCD.
Resolution	1608 (H) x 1206 (V)
Pixel size	7.4µm x 7.4µm
Aspect ratio	4:3
CCD sensor diagonal	14.8mm

In-Camera Image Processing

File format supported	JPEG, TIFF
JPEG Quantization tables	Default and user downloadable.
JPEG compression	100 programmable levels.
White point	Automatic and user adjustable white balance.
Color correction	Default and user programmable color correction matrix.
Color reproduction	Default matrix configured for sRGB color space.
Tone correction	Default and user programmable tone correction for sRGB.

System Summary

Shutter speed (Integration time)	1/10,000 sec. – ½ sec. Adjustable in 1/10,000 second increments.
ISO	125 – 800, adjustable in 1/3-stop increments.
Bits/Pixel	12 (captured before processing)
Dynamic range	60 dB minimum (peak signal to RMS noise @ 25°C, ISO 100)
Lens control (focus and aperture)	Supports 35mm format electronically controlled EF mount lenses.
Preview mode	1 fps monochrome 804 x 606, continuous readout mode for framing, set-up and adjustment.
Maximum burst capture rate	14 images per second.
Sustained capture rate	1 image every 1.2 seconds.
Image storage	15 images maximum
Triggering	Programmable delays from internal and external trigger sources.

Exposure Control

User selectable modes	Manual or automatic
Manual exposure mode	Integration time (shutter speed)
configurable parameters:	ISO (sensitivity)
	Lens aperture
	Flash on, Flash off

Interface Specification

Network connectivity	1000Base-T (Gigabit), 100Base-T or 10Base-T Ethernet interface.
Trigger inputs	Two (2) external trigger inputs, 5-volt logic.
Timing adjustments	Adjustable trigger-to-capture delays from 100 µseconds to 4.8 seconds.
Strobe outputs	Six (6) contact closure strobe triggers. Strobe outputs are programmable in any desired triggering sequence.
Strobe advance	Programmable X-sync timing to compensate for variable strobe delays.

System Requirements

Host OS support	Compatible with Windows NT, 2000, XP.
Ethernet	Host computer with built-in Ethernet interface or additional card.
Camera Firmware	Field upgradeable through Ethernet interface.

Physical Specifications (without lens)

Weight	2.2 kg (4.75 lbs)
Physical dimensions	225.6mm (8.88") L x 97mm (3.82") H x 104.5mm (4.11") W
Lens mount	Electrical and mechanical EF mounts. (Accepts 35mm SLR lenses.)
Tripod mounts	Two (2) standard 1/4"- 20 threads/inch
Trade-dress	Silver front and rear plates, white center enclosure.

Power Specifications

Power connector	International (IEC 320) AC power input connector.
AC voltage range	100 - 240 VAC
Frequency range	50 - 60 Hz
Power Rating	40 VA (maximum)
Power Consumption (RMS)	15 Watts (maximum)

Environmental Specifications

Operating temperature	-10° to 60°C (14°to 140°F) non-condensing.
Storage temperatures	-40° to 70°C (-40° to 158°F) non-condensing.
Relative humidity	< 95% at all times
Acceleration and shock	3.5g (rms), 5-150Hz sinusoidal vibration or shock ? 20g.

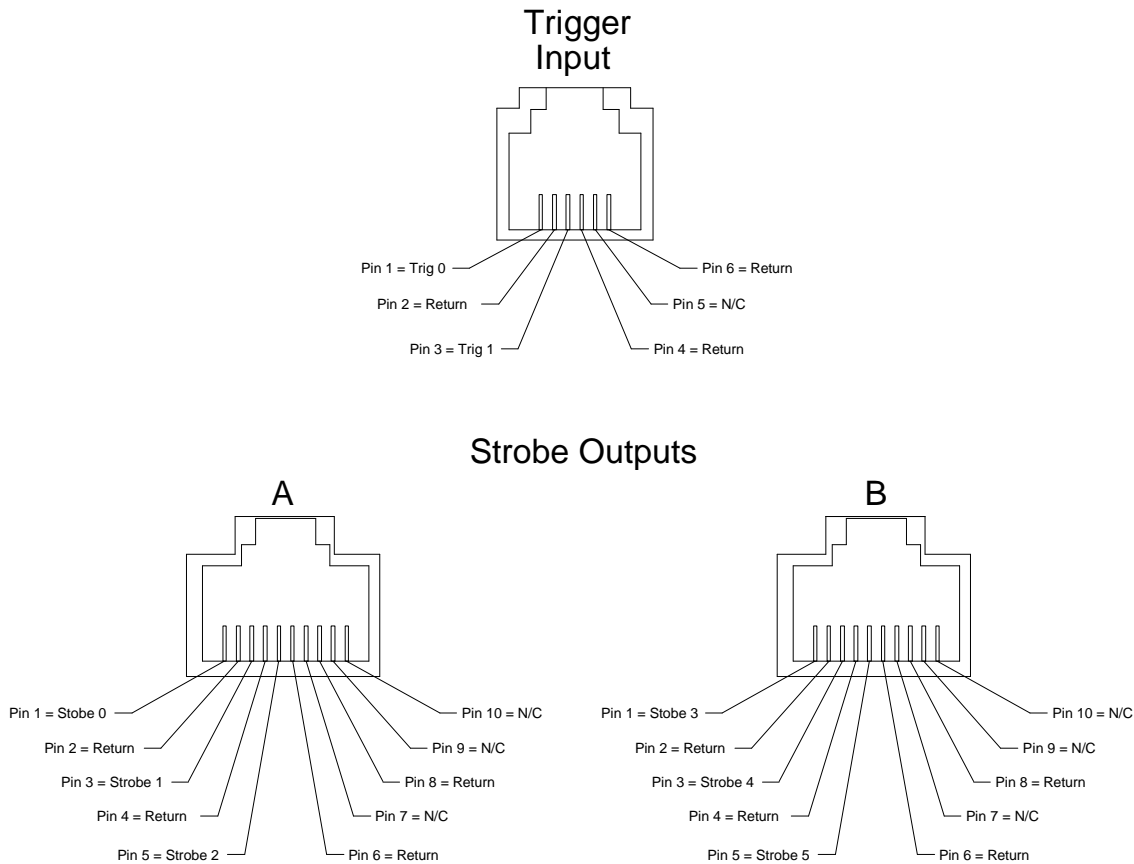
Regulatory Compliance

CSA, CE and FCC Part 15, Class A.

9. Appendix C: Trigger Input & Strobe Output Connections

Pin #	Trigger Input	Strobe Output A	Strobe Output B
1	Trig 0 – Image 0 Trigger Signal	Strobe 0 – Fire Strobe 0	Strobe 3 – Fire Strobe 3
2	Return	Return	Return
3	Trig 1 – Image 1 Trigger Signal	Strobe 1 – Fire Strobe 1	Strobe 4 – Fire Strobe 4
4	Return	Return	Return
5	No Connection	Strobe 2 – Fire Strobe 2	Strobe 5 – Fire Strobe 5
6	Return	Return	Return
7	Not Applicable	No Connection	No Connection
8	Not Applicable	Return	Return
9	Not Applicable	No Connection	No Connection
10	Not Applicable	No Connection	No Connection

Assemblies for both the Trigger Cable and Strobe Cable are available from Imaginant. Please contact us via e-mail at imaginantinfo@imaginant.com to purchase these assemblies.



The Trigger Input accepts 6-position category 3 modular plugs and each Strobe Output accepts 10-position category 3 modular plugs.