

# INCA2 User Manual

Picture Perfect Measurements™



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## Specifications

### **Computer system:**

- Intel 266 Mhz Pentium II CPU
- 32 MB RAM (expandable to 128MB)
- 4 MB Flash Memory (Rugged, solid-state)
- 10/100 MBPS Base-T Ethernet
- PCMCIA Interface - Dual Type II or Single Type III capacity
- Available Interfaces:
  - Removable Hard Disk (520MB current maximum)
- External RS-232 interface
- Internal fast local bus (for camera interface)

### **Camera (including computer system):**

- Size: 7.5" wide, 5" high, 6" deep (not including lens and strobe)
- Weight: less than 8 pounds (not including lens and strobe)
- Power: 6.5-15 volts DC, 35watts peak, 18 watts idle (with RCS)

### **Available digital cameras:**

- Kodak MegaPlus 6.3 camera - 6.3 million pixel (3,072H x 2,048V)
- Kodak MegaPlus 4.2 camera - 4.2 million pixel (2,044H x 2,048V)

### **Other:**

- Status Indicators:
  - 4 line by 20 column compact LCD display
  - LED (Power(3), Status(1))
  - Buzzer
- Switches for:
  - Power, Trigger, Delete Picture, Mode setting(2)
- Connections for:
  - Power, Flash Sync, Remote Control (RS232)
  - Remote Control Strobe, Projector

### **Temperature Range:**

0-35° Celsius. **Exceeding this temperature range may damage the camera.**

**NOTE: Due to ongoing product improvements, specifications are subject to change.**

## The INCA2 Camera

### Overview

GSI's INCA2 camera is the second generation of the Intelligent Camera. It consists of a high-resolution digital camera integrated with a compact, but powerful industrial PC. The PC has an external PCMCIA interface that allows the user to plug in removable hard disks used to store pictures. The camera can also be connected to a network via the "one cable" interface port. The camera is well suited to hand-held or remote control operation.



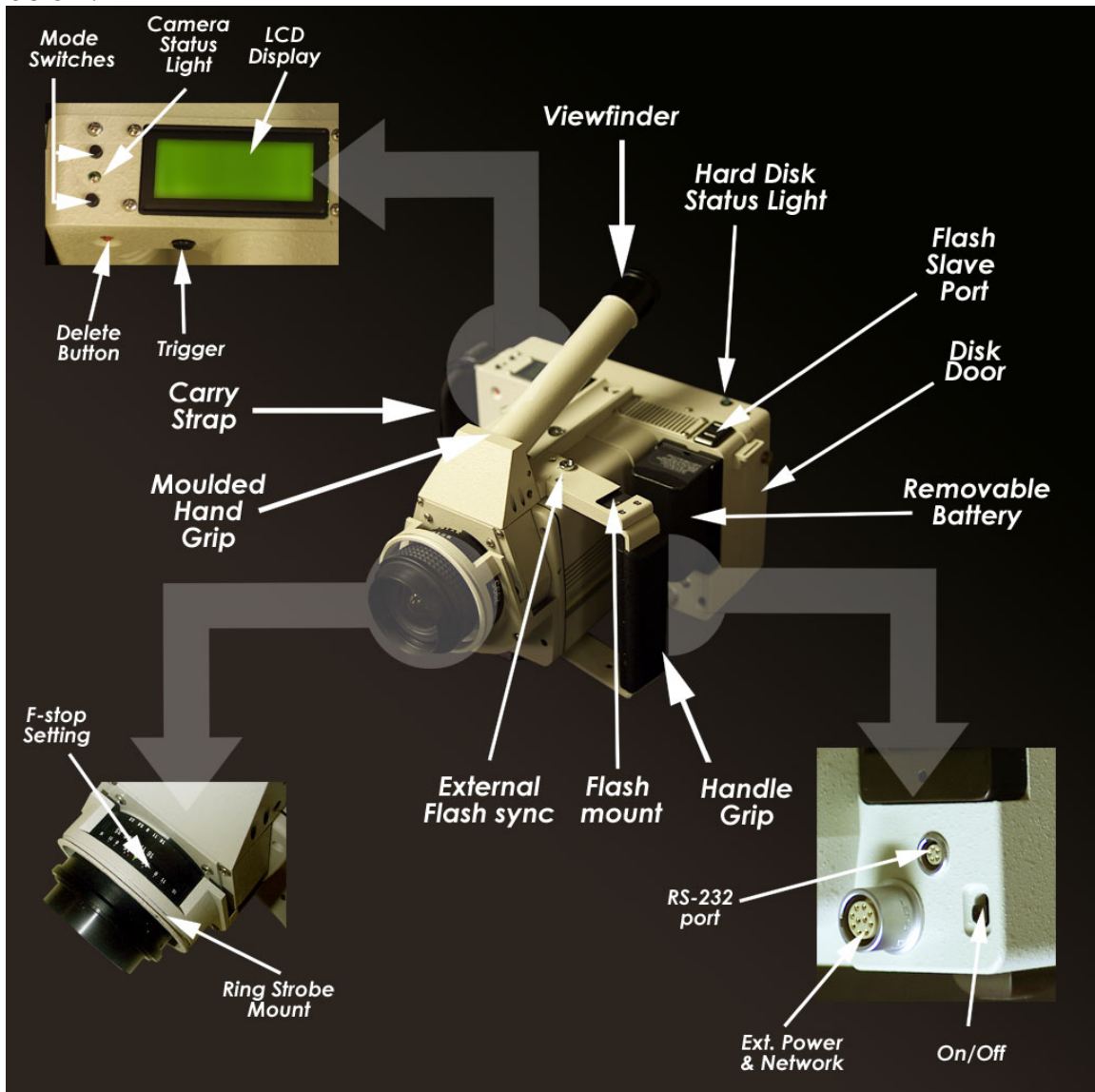
### Models

The INCA2 camera currently comes in two models. One model uses the Kodak MegaPlus 4.2 digital camera. The other model uses the Kodak MegaPlus 6.3 digital camera. Both cameras come standard with a 17mm lens. The cameras are identical in appearance. The main features of the cameras are provided below:

Main Features of INCA2 Camera					
Camera	Antiblooming	Image Size (mm)	Sensor Resolution (pixels)	Lens Focal Length (mm)	Field of View (width x height)
INCA2 4.2	NO	18.2 x 18.4	2023 x 2044	17	56° x 56°
INCA2 6.3	YES	18.4 x 27.6	2044 x 3072	17	56° x 76°

## Description

The main controls, connections, and displays of the INCA2 camera are shown below:



The camera has the following switches:

1. A power switch. (On/Off)
2. A take picture (trigger) button.
3. A delete picture button.
4. Two mode switches. These are used to select camera settings.

In addition to the PCMCIA interface, the camera has the following connections:

1. An online Power/Communication connector (External power and network)
2. A battery power connector. The camera uses 7.2 Volt DC power.
3. A "sync" connector that provides a signal to synchronize the camera to external flash devices such as the PRO-SPOT target projector.
4. An RS-232 connector to support external devices.
5. An intelligent flash connector that connects to the Remote Control Strobe (RCS).

The camera has the following indicators:

1. A LCD display with four rows of 20 characters per row. The LCD has a backlight so it can be read in the dark.



2. A LED to display camera status.
3. A Card Busy Light to indicate when data is being written to the PCMCIA card.
4. A buzzer to indicate camera status.
5. Three voltage status LEDs used for diagnostics. These are situated just below the battery.



## Handling

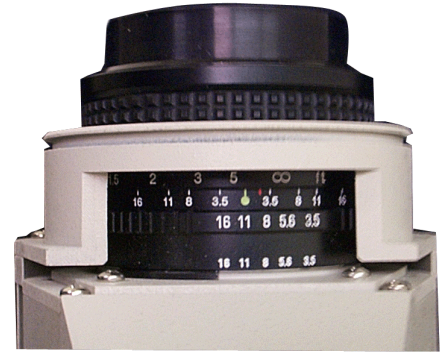


The INCA2 camera is extremely rugged and well built. However, it is also a precise measuring instrument. You should store it in its carrying case and keep it in a clean and dry environment when not in use. The camera can be used from -10°C to 40°C (14°F to 104°F). Hold the camera with both hands when possible, and always use the hand strap when holding the camera. The camera is also equipped with four rubber feet on the base used for resting the camera on its back.



## Lens Handling

The INCA2 camera uses a standard 17mm lens. The lens is fixed focus so there is no need to ever adjust the focus. The lens f-number can be adjusted, but it is strongly recommended that you leave the lens at the default setting of f11. This will give you the best results, and will make exposure easier.



## Checking and Cleaning the Lens

The camera lens must be kept clean to achieve the optimal system accuracy. Follow the guidelines below to ensure the lens is clean.

1. Keep the lens cap on the lens when the camera is not in use. Always place the lens cap in the camera case so you do not lose it.
2. Avoid touching the glass parts of the lens. The lens has a "snoot" attached to the end that protects it from accidental touching.
3. Visually, check the lens for dirt, dust, smudges, etc. before use.
4. If necessary, clean the lens. First, use a clean, dry air source (such as an air gun) to blow any particles off the lens. If this does not work, use a clean, dry lens cloth (several are provided with the system) to gently clean the lens. The surface of the lens is optically coated. **Do NOT** use tissues or napkins to clean the lens as they may damage the coating. **Do NOT** use alcohol or other solvents as this will also damage the coating. Rub the lens gently using circular motions until the lens is clean. You should not clean the lens unless it is necessary. Excessive cleaning can eventually damage a lens.
5. If the lens will not clean up, you can use the lens, but accuracy may suffer depending on the extent of the damage. A damaged lens should be replaced as soon as possible.

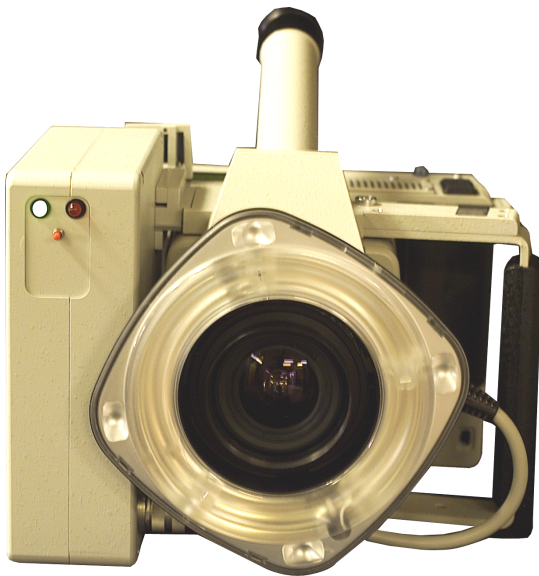
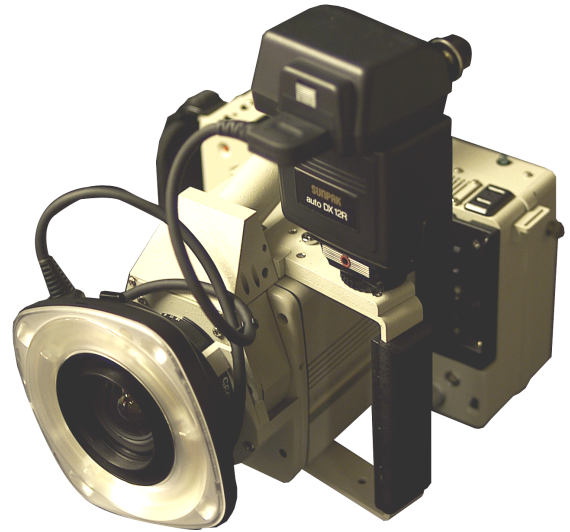




## INCA2 Strobes

### Description

A strobe illuminates the retro-reflective targets used with the system. Two strobe systems are currently available. The Hand-held strobe is a lightweight, battery operated unit whose intensity is controlled by a dial on the back of the power pack. The unit uses AA batteries that must be replaced when depleted. However, the batteries have enough capacity (over 1000 flashes typically) for single-camera measurements. The strobe's power pack is normally attached and detached from the camera every time the camera is used. The Hand-held strobe is mostly used with the single-camera V-STARS/S system for either off-line or on-line operation.



The Remote Control Strobe (RCS) is a larger strobe whose intensity can be controlled remotely or from the camera itself. It uses a high-capacity battery that is continuously recharged by the INCA2 camera. The battery never needs to be replaced, and it has a faster recycle rate than the Hand-held unit. The unit is intended primarily for on-line remote operation, especially with the multiple camera V-STARS/M system.

Although each strobe is optimized for its own applications, either strobe can be used for many applications. The use and operation of the Hand-held strobe and the Remote Control strobe is described in the next section.

## Hand-held Strobe Setup

The V-STARS/S single camera system normally uses the Hand-held strobe. It is used to illuminate the retro-reflective targets used by the system. The strobe is lightweight, portable, and battery powered. It consists of a ring strobe that is left attached to the camera, and a power pack that is connected to the ring strobe. A dial on the back of the strobe power pack controls the power level. There are 11 (0-10) power levels ranging from full to 1/32nd with increments of 1/2 F-Stop.

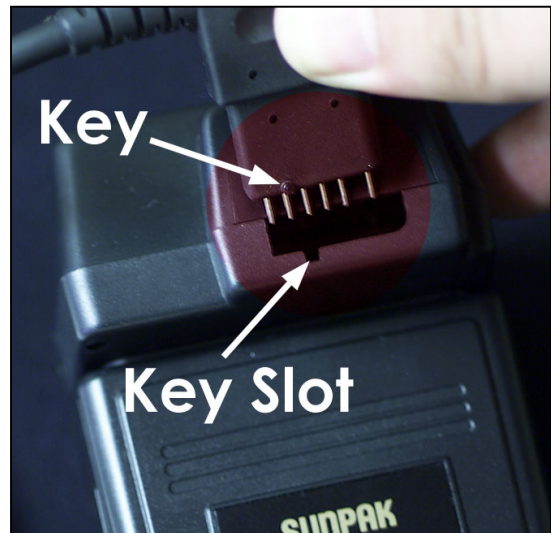


To setup the Hand-held strobe, do the following:

1. If the ring strobe is not attached to the ring mount on the front of the camera do the following:
  - a. Before attaching the ring strobe, wrap the cord around the ring mount once to make sure it does not fall in front of the lens.
  - b. Hold the cord in place with the cord clips provided with the system.
  - c. Place the ring strobe around the ring mount while pressing the two spring loaded buttons on the side of the ring strobe.



- d. Release the buttons so the ring strobe catches on the lip of the lens protection mount.
  - e. Pull on the ring strobe to make sure it is firmly attached. If it is not, try re-mounting it until it is.
  - f. Leave the ring strobe attached when you re-pack the camera. The case has space for this. You will find it easier and more reliable to leave the ring strobe attached when you pack the camera.
2. Remove the strobe power pack from the camera case, and attach it to the mount on the top of the camera handle. The unit's power switch should face the back of the camera.
  3. Slide the unit in until it stops, then turn the locking nut at the bottom of the unit to hold the unit firmly in place.
  4. Plug the connector from the ring strobe into the power pack. The connector is keyed so you cannot insert it the wrong way. Refer to the diagram below:
  5. Slide the power switch to the BATT position. The ready light should come on in ten to twenty seconds. If the ready light takes more than twenty seconds to come on, you should replace the batteries. [See Changing Hand-held Strobe Batteries](#) for how to do this. You can press the ready light to test fire the flash. Remember to turn the power switch to the OFF position when done, to keep the batteries from draining.
  6. Set the power control dial to the correct setting for the job. [See INCA2 Exposure](#) for how to do this.



The Hand-held Strobe is now setup.

## Packing the Hand-held Ring Strobe

To re-pack the strobe:

1. Turn the power pack off, by sliding the power switch from the BATT position to the OFF position.
2. Push the cable "release" button to the up position and remove the cable.
3. Unscrew the mount locking nut and remove the flash from the shoe.
4. Re-pack the strobe into the INCA2 case.
5. Leave the ring strobe attached when you re-pack the camera. The case has space for this. You will find it easier and more reliable to leave the ring strobe attached when you pack the camera.

## Changing Hand-held Strobe Batteries

The Hand-held Strobe uses four AA batteries. If the ready/test light takes more than about 20 seconds to come on after the power is first switched on, they should be replaced.

To replace the batteries:

1. Turn the power pack off, by sliding the power switch from the BATT position to the OFF position.

2. Open the battery holder door on the bottom side of the power pack by pulling down on the door to release the latch. The door is hinged.



3. Remove the four batteries. Always replace all four batteries.
4. Insert the new batteries. The battery compartment has a diagram showing how to orient the batteries. The adjacent illustration also shows the orientation.
5. Close the door, and push up on it to latch it closed.
6. Turn the power pack on by sliding the power switch to the BATT position. The ready/test light should come on in ten seconds or so.

## **Troubleshooting the Hand-held Strobe**

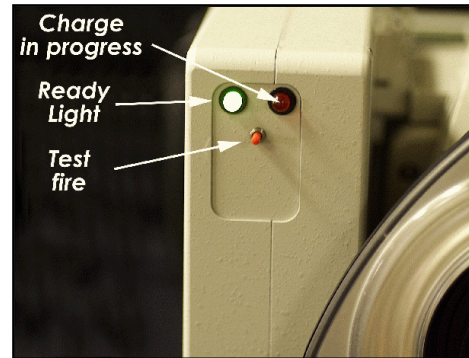
If the Hand-held strobe does not flash when you take a picture, check the following:

1. Is the strobe turned on? The power switch should be set to the BATT position.
2. Is the ring strobe cable connected?
3. Is the ready/test light on? If not, the batteries may be depleted. [See Changing Hand Held Strobe Batteries.](#)

If the strobe still does not work, press the ready/test light to fire the strobe manually. If the strobe still does not flash, the power pack or ring strobe is damaged, and must be replaced. If the ring strobe will flash by pressing the ready/test light, the strobe is ok, but the unit is not receiving the sync signal. Call GSI for assistance.

## Remote Control Strobe (RCS) Setup

The Remote Control Strobe has two status LEDs and one test button. The green LED is lit when the RCS is ready to fire. The red LED indicates that the charging voltage is low; and will dimly flicker while the RCS energy capacitor recharges following each flash. The test button is used to fire the RCS.



The RCS should remain attached to the INCA2 camera. If it is not attached do the following:

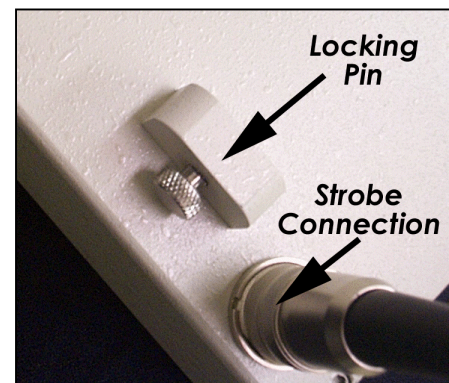
1. Turn the INCA2 camera off.
2. Remove the RCS from the camera case and remove its battery.



3. Align the RCS to the mount of the right side of the camera.

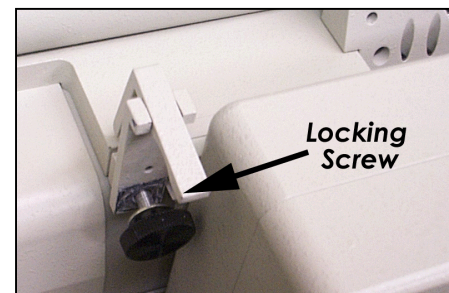
4. Pull on the front locking pin while sliding the RCS into place. Refer to adjacent photographs.

5. Secure the RCS with the locking screw.



6. Plug the connector from the ring strobe into the RCS. The connector is keyed so you cannot insert it the wrong way. Attached the strobe as per the instructions found in the Hand held Strobe section.

7. Replace the battery.

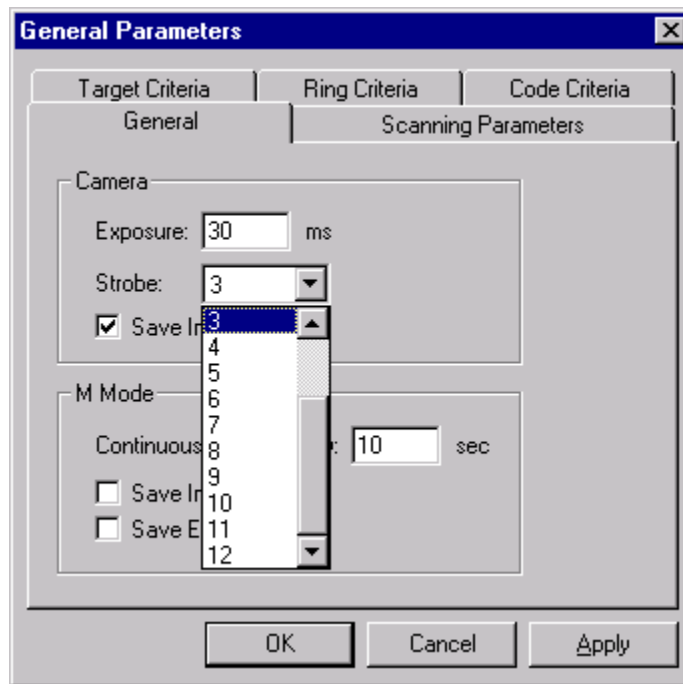


The RCS Strobe level is set via the INCA2 menu. Refer to the INCA Settings menu for details.

## Changing the Remote Control Strobe (RCS) Level in V-STARS

If the INCA2 camera is connected to the system PC via the network you may adjust the strobe setting using the V-STARS software.

1. Select Advanced Edit from the Project menu.
2. Press the General button.
3. The strobe setting is modified by selecting a value from the strobe drop down list.



4. Press OK to save the setting.

## INCA2 Operation

### Camera Operating Instructions

The INCA2 camera can be operated in two modes: off-line, and on-line. Since camera operation is somewhat different in each mode, separate operating instructions are provided for each mode. Instructions for off-line operation are given here. See GSI's V-STARS/M manual for operating instructions for on-line mode.

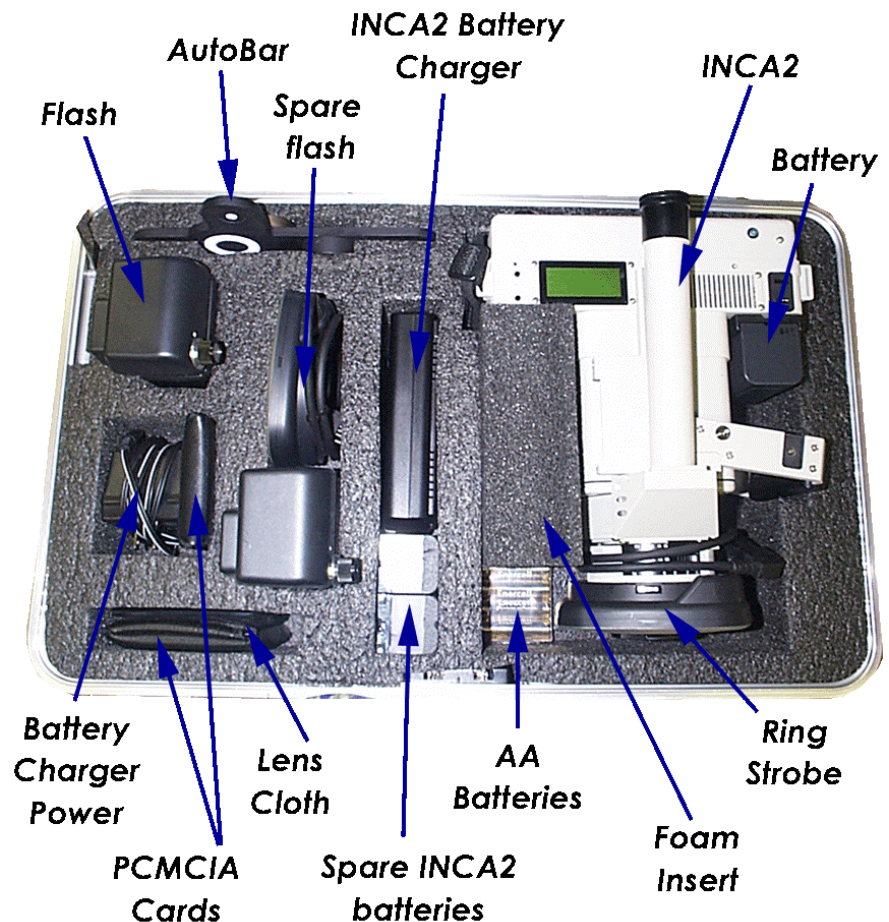
The INCA2 camera incorporates a high degree of on-board automation to simplify its use. Typically the only camera adjustment needed will be that of strobe power setting. Finding the correct strobe setting is described in the INCA2 Exposure section of this manual.

INCA2 is a "point and shoot" camera. That means once you have set the target exposure, you simply have to aim the camera by looking through the viewfinder, and press the trigger on the front of the camera to take a picture. There is no focusing or other adjustment needed.

### Packing and Unpacking

The INCA2 camera case is used to store the camera and its accessories.

A typical case is shown in the adjacent diagram. Your case may appear slightly different depending on the system configuration and accessories purchased.

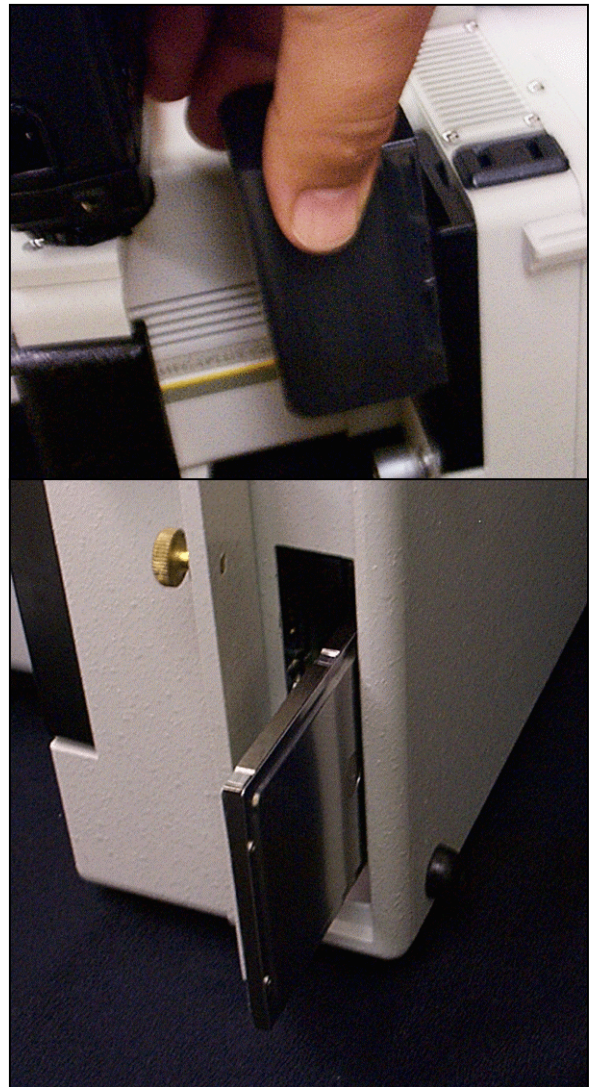




## Camera Setup

To setup the INCA2 camera do the following:

1. Remove the INCA2 camera from the case.
2. Remove the lens cap, and store it in the camera case so you do not lose it. Check the lens for dirt, smudges, dust, etc. [See Checking and Cleaning the Lens](#) if the lens needs to be cleaned.
3. Pull up on the viewfinder tube on the top of the camera until it locks into position.
4. Remove the camera battery from the case. Attach it to the camera as shown in the adjacent diagram. If the battery is discharged, [See Charging the Battery](#) for instructions on charging. The INCA2 battery will power the camera for about one hour of normal use. **Under no circumstances should the battery be connected at the same time as the external power.** This will damage the camera, cable box and the battery
5. For off-line operation, the INCA2 camera stores pictures on a removable PCMCIA hard disk. Insert the PCMCIA disk card. The PCMCIA door is on the side of the camera at the back. The back of the card should face the back of the camera when you insert it. There are two types of cards, the Type II and Type III. The Type II is a thin card and can be inserted into either slot. You can only insert the Type III card into the backmost slot as it is thicker than the Type II card. You cannot insert the card backwards. Do not insert two thin cards at the same time. This will cause unpredictable behavior in the INCA2 computer.



- There is a small push button inside the door that will push out when you fully insert the card. (Press this button when you want to remove the card.) When the card is inserted, close the door. You can insert and remove the card with the camera either powered or powered down. However, you should **not** remove the card (or turn off camera power) while the Card Busy light is on. The INCA2 camera uses proprietary image compression techniques to store the images on the disk. The amount of compression achieved depends on the complexity of the photograph. Images typically take less than 1MB of storage. The typical number of pictures that can be stored on the disk depends on the storage capacity of the disk as shown below:

Disk Capacity	Picture Capacity
170MB	150-250
260MB	250-400
340MB	300-500
520MB	500-800



*Pouch*



*Type II*



*Type III*

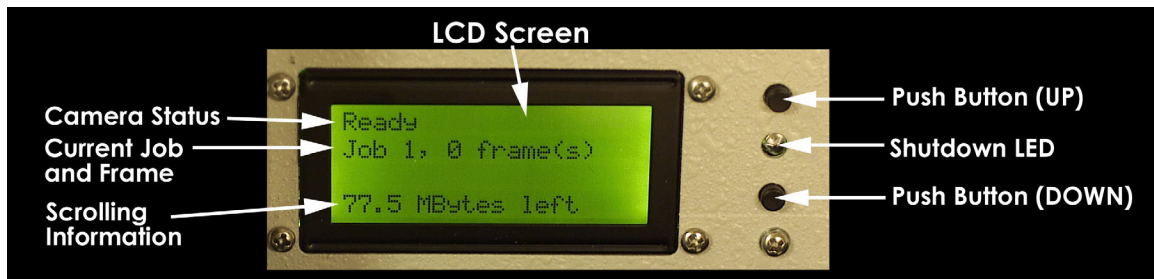
- Add the Hand Held or RCS Strobe to the camera. See the instructions in the [Hand-held Strobe Setup](#) or [Remote Camera Strobe Setup](#).
- Switch the On/Off button to up to switch on the camera and boot the camera. Note that the boot up will take approximately 30 seconds to complete. During this time the LCD screen will appear blank.

The INCA2 camera is now ready to take photos.

## LCD Menu Settings

### LCD Control Panel

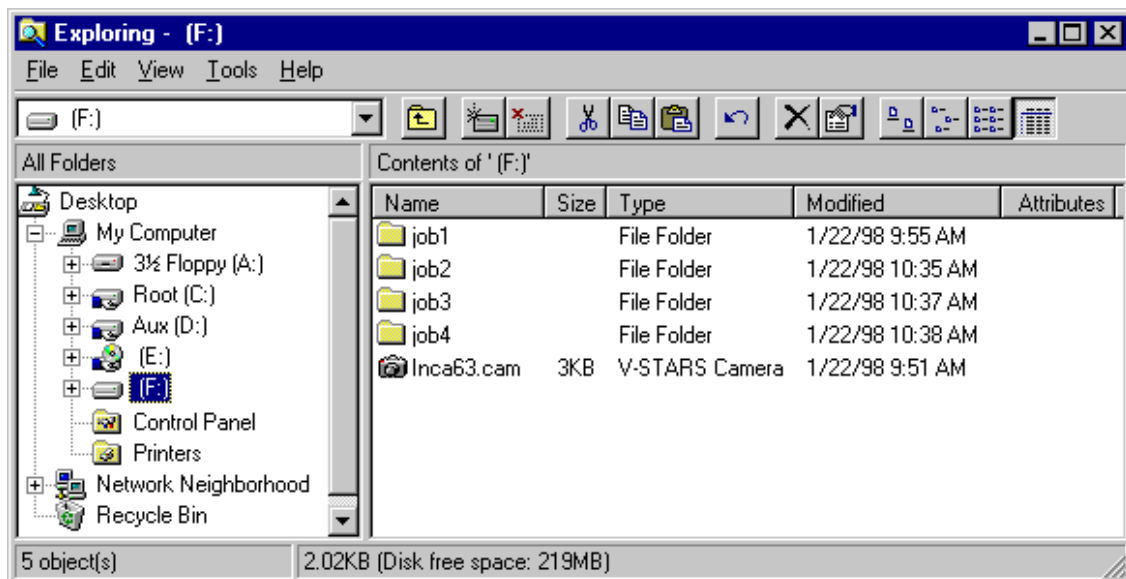
The INCA2's main control panel is located on the top of the camera. The control panel (shown below) consists of an LCD screen, two push buttons, and an LED. It is used to select camera settings and display camera status.



The first line on the LCD screen displays the current camera status. When the INCA2 camera is initially powered on, this line will display "NO CARDS" until you insert a PCMCIA hard disk or until the computer completes reading the disk. When a hard disk card is inserted, the display will read "Ready" when it is possible to take a picture.



After a PCMCIA hard disk is inserted, the second line on the LCD screen displays the current job and picture number (called a "frame"). The pictures taken for a specific job are saved in a specific subdirectory on the hard disk. As pictures are stored on the disk, the INCA2 camera assigns a unique file name that is derived from the picture number.



The camera numbers pictures from 1-999. After reaching 999, the camera picture number recycles back to 1. The camera adds the prefix FRAME to the picture number to produce the file name. All INCA2 picture files have the extension GSI. So picture files are normally named FRAME001.GSI to FRAME999.GSI. For example, if the job number is 1, all the pictures taken will be saved in the subdirectory JOB1 on the PCMCIA hard disk. The files in JOB1 will be called FRAME001.GSI to FRAME010.GSI respectively.

The last line on the LCD screen scrolls every few seconds to display the current status of the following items:

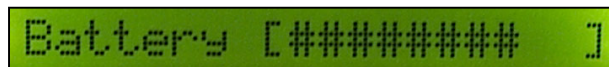
1. Shutter exposure setting.

The shutter time is displayed. If Auto Exposure is selected, the word "AUTO" will be displayed followed by the automatically selected shutter time.

A rectangular LCD display with a black background and green text showing "33 ms exposure".

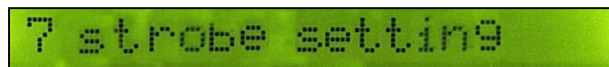
2. Battery status.

The number of # symbols indicate the amount of charge remaining in the battery.

A rectangular LCD display with a black background and green text showing "Battery [##### ]".

3. Strobe Setting

If the RCS is attached the LCD screen will also display the current strobe setting.

A rectangular LCD display with a black background and green text showing "7 strobe setting".

4. Disk Memory

Space remaining on the hard disk in megabytes (MB).

A rectangular LCD display with a black background and green text showing "77.5 MBytes left".

## INCA2 Menu Options

The two push buttons on the control panel are used to select and change camera settings.

The selections are:

1. Set job number.
2. Set shutter exposure time.
3. Set strobe power (providing one is attached).
4. Set measurement mode.

The button closest to the back of the camera is the down button; the other is the up button. Pressing both buttons simultaneously will scroll through the selections. To change the current setting for a selection, press the up or down button.

### Set Job Number

The INCA2 camera has an image management system built-in. Pictures are stored in files that are themselves stored in separate job directories. This allows you to shoot pictures on several projects, and keep them organized and separated for later measurement. Each project has its own job number. The pictures for a job are stored in separate job subdirectories on the disk. To change the current job number, do the following:

1. Press both buttons simultaneously, and release them. The message "Set Job Number" should appear on the display. The current job number will be displayed.
2. Press the up button to increase the job number or the down button to decrease it. Valid job numbers range from 1 to 999.



**Press Both Buttons**



**Push up to increase  
job number**



**Push down to  
decrease job number**

3. When you have the desired job number, you can press both buttons repeatedly to cycle past the other menu options until the normal camera status message is displayed, or the camera will automatically revert to the normal display after a few seconds of inactivity.
4. You can immediately take a picture after setting the job number, you do not have to recycle the display or wait for the camera to do so.

## Set Shutter Exposure

The Shutter Exposure time determines how much the background is exposed. [See INCA2 Exposure](#) for a description of the correct setting.

To change the current shutter exposure time, do the following:

1. Press both buttons simultaneously, and release them. The message "Set Job Number" should appear on the display.
2. Press both buttons simultaneously again, and release them. The message "Set Exposure" should appear on the display. The current shutter exposure will be displayed.



3. Press the up button to increase the exposure time or the down button to decrease it. Valid exposure settings are AUTO and 8 milliseconds to 8000 milliseconds (or 8 seconds). AUTO is the default setting and is normally recommended. The following settings are available:

8ms, 14ms, 17ms, 24ms, 33ms, 67ms, 125ms, 250ms, 500ms, 1000ms, 2000ms, 4000ms, 8000ms and AUTO

When AUTO is selected, a test exposure is made at the beginning of the job to determine the correct exposure setting. The first time you press the trigger on a job, the camera will take one or more test pictures. The test picture or pictures are not saved to disk.

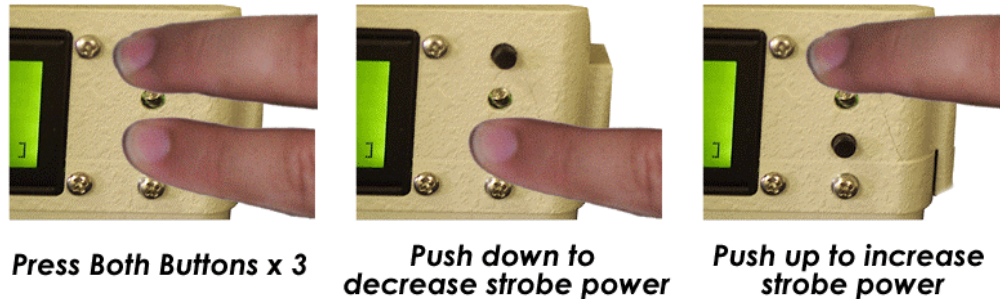
You should take the first picture in a representative location for the job and the camera should be aimed at the object. A long single beep will follow a successful test picture. A long double beep indicates that the camera reached one of its exposure limits and that the current exposure setting may not be set to an optimum value. When done, the selected shutter time will be shown on the display.

You can immediately take a picture after setting the shutter exposure, you do not have to recycle the display or wait for the camera to do so. If AUTO Exposure is selected, the camera will automatically set the shutter speed whenever the job number is changed (even if it was changed, and then changed back to its original setting), and whenever the camera is powered on.

## Set RCS Strobe Level

If the RCS is attached you can set the strobe power using the menu:

1. Cycle through the INCA2 menus using the push buttons until you reach the Set Strobe menu.



2. Press the up button to increase the strobe setting or the down button to decrease it. Valid strobe settings are OFF and 0 - 12. The settings 0 - 10 correspond to the intensity settings on the Hand-held strobe.
3. The RCS is now setup. You are now ready to take pictures.

## Set Measurement Mode

The INCA2 camera has a built-in powerful, microprocessor that allows it to quickly do some image processing of the picture. If measurement mode is off, no image processing is done; when it is on, the camera scans each picture for the AutoBar, and any coded targets, and displays the number of each that it found. If an insufficient number of codes (<4) and no AutoBar is found the camera will display a warning message and beep twice. The following situations will cause an error message:

1. Lens cap left on camera
2. No flash firing
3. Insufficient coded targets (<4) and no AutoBar

If there is no warning the INCA2 will display a message citing the number of codes found and the occurrence of an AutoBar.

To change the measurement mode, do the following:

1. Cycle through the INCA2 menus using the push buttons until you reach the "Measurement Mode" menu. The message "Measurement Mode" should appear on the display with the current mode (ON or OFF) displayed in the line below



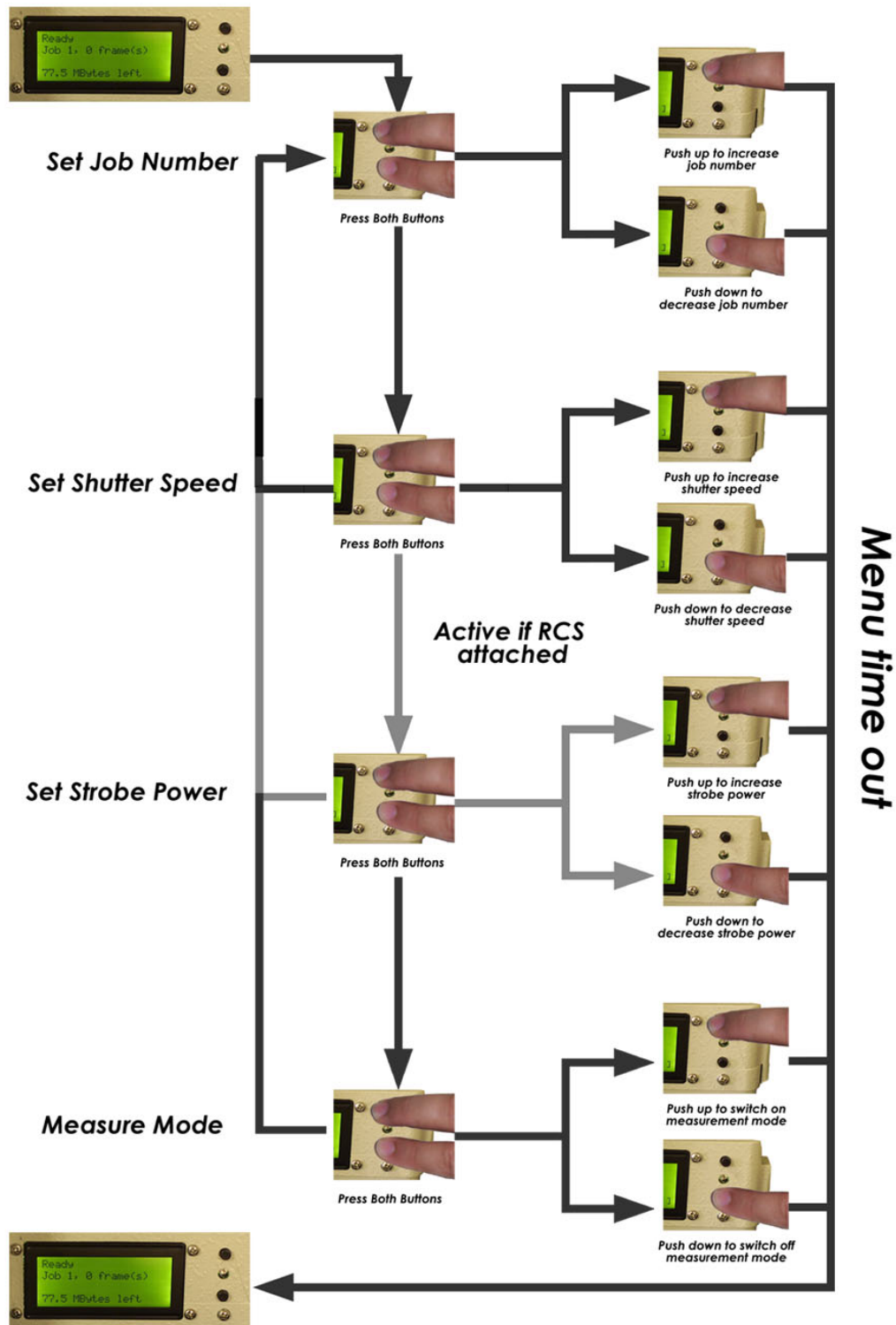
2. Press either the up or down button to change the mode.

Even if Measurement mode is ON, a picture will be measured only if the INCA2 camera has calibration and system files installed. You can immediately take a picture after selecting the measurement mode, you do not have to recycle the display or wait for the camera to do so.



## Menu Overview

The following diagram is an overview of the INCA2 menu system:



## Taking Pictures in Off-line Mode

If you have not already setup the INCA2 Camera, [See Camera Setup](#). If you have not already setup the strobe, [See Hand-held Strobe](#) or [RCS Setup](#). Once the camera and strobe are setup, you can take pictures.

To do so, do the following:

1. Connect the battery.
2. Turn on the camera power by sliding the camera power switch to the on position. The camera will take approximately 30 seconds to initialize. When ready, the camera will display a message. If no disk card is present, the display will read "NO CARDS". If you have already inserted a disk, the Card Busy light will come on briefly, and the display will read "Ready". [See LCD Control Panel](#) section for a description of the display.
3. If you have not already inserted the disk, you must do so before you can take pictures. [See Camera Setup](#) for how to do this.
4. Before taking pictures you must set the Job number and shutter exposure. [See LCD Control Panel](#) section for instructions on how to do this. It is normally recommendable to use the automatic shutter exposure feature; this is the default.

You normally take the actual pictures by doing the following:

1. Look through the viewfinder to frame the picture. The center circle represents the center of the frame.
2. Press the trigger to take the picture. The shutter will open (you will hear a slight click sound), and the strobe will flash.
3. When the camera is ready for another picture it will beep once and display a "Ready" message. If the Measure Mode is active and an error was found, the camera will beep twice and display an "Error" message. If there is no warning the INCA2 will display a message citing the number of codes found and the occurrence of an AutoBar.

If the strobe does not flash, [See Troubleshooting the Hand-held Strobe](#).

## **Deleting Pictures from the INCA2 Camera**

You can delete one or more pictures from the disk card. This is a useful feature if you have just taken some unneeded pictures and want to get rid of them. To delete picture(s) do the following:

1. Push in the red DELETE button located on the front of the camera until the camera displays "Delete Frame" on the top display. The picture number of the most recently taken picture will be displayed.
2. While the Delete Frame message still appears in the display, press the DELETE button again. The most recent picture will be deleted from the disk. The Card Busy light will flicker and the display of the number of pictures on the disk will decrease by one.
3. Press the DELETE button again as many times as you like to delete additional pictures.

Be careful when using this feature. Once an image is deleted, there is no way to recover it.

Deleting a picture also decrements the INCA2 picture number counter. For example, if you delete FRAME004.GSI, the next picture will be named FRAME004.GSI.

## **Removing the PCMCIA Card**

When you are done taking pictures, you can remove the disk for processing by doing the following:

1. Open the PCMCIA door.
2. Push the black button at the top of the disk. The card should eject.
3. Remove the card.
4. Close the door.

You do not have to turn camera power off to remove (or insert) the disk. However, you should not remove the disk (or turn camera power off) until the Card Busy light on the top of the camera goes out indicating all data has been written to the disk, otherwise you can lose data and possibly corrupt the disk.

## Turning off and Packing the INCA2 Camera

When you are done using the camera, turn off the camera power using the power switch, and disconnect the camera battery.

Once again, make sure the Card Busy light on the top of the camera is out before you turn off camera power (or remove the disk) or else you will lose data and possibly corrupt the disk.

To pack the system, reverse the strobe and camera setup procedures. [See Hand-held Strobe Setup](#), and [Camera Setup](#) for these instructions. Remember to leave the ring strobe attached to the camera when you pack it back in the case.

When removing the strobe connector from the power pack be sure to press and pull up on the connector release button.

## **INCA2 Exposure**

### **Camera Exposure**

For photogrammetry purposes it is desirable to set the targets bright and the background dim. When retro-reflective targeting is used, the target and background exposures are almost completely independent of each other. The target exposure is completely determined by the flash power while the background exposure is determined by the ambient illumination. The amount of background exposure is controlled by the shutter time.

Totally eliminating the background exposure makes the targets easier to find and measure. However, if there is no background image whatsoever, trying to figure out which target is which can be difficult. Usually, a compromise is reached and the background exposure is set so the object is dim enough to not interfere with target measurement, but still bright enough that it can be seen when enhanced.

### **Background Exposure**

The shutter time is used to control the background exposure. When the camera is off-line, the shutter time is selected using the mode switches that are located on the top of the camera next to the display. In on-line operation, the shutter time is selected using the V-STARS software. The available shutter times range from 8 milliseconds to 8 seconds.

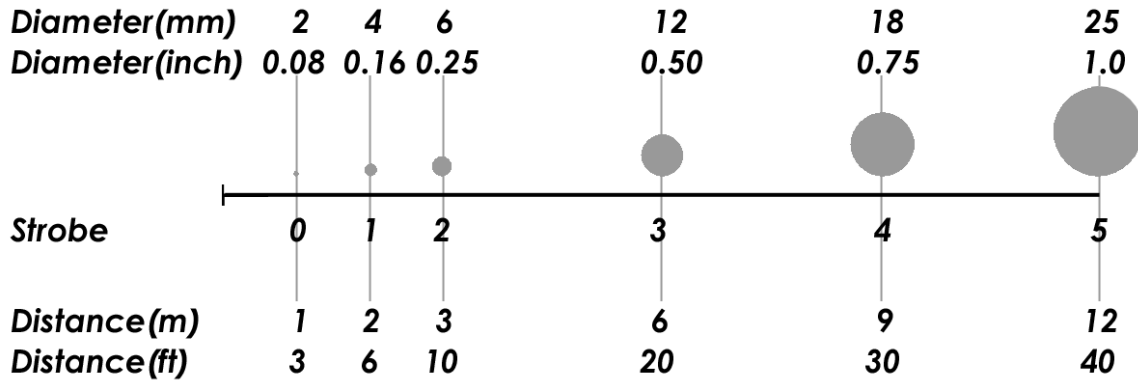
The INCA2 camera has an AUTO Exposure feature that can be used to automatically set the shutter speed. The default setting is to use the AUTO Exposure. If AUTO Exposure is selected, the shutter exposure is set automatically the first time you take a picture on a job.

### **Target Exposure**

The flash power setting for the target exposure depends on the distance from the camera to the targets, and the target size.

The following diagram gives recommended flash power settings at varying distances. If you are shooting the object in sections, use the size of the sections. The tables assume the recommended target size (which is also listed) is used. If the targets are smaller than this, you may want to increase the flash power setting one step to help compensate.

The tables assume the default lens f-number is used so it is important to check the lens and make sure it is set to f11, the default setting for the lens.



If you are shooting the object in sections, use the size of the section.

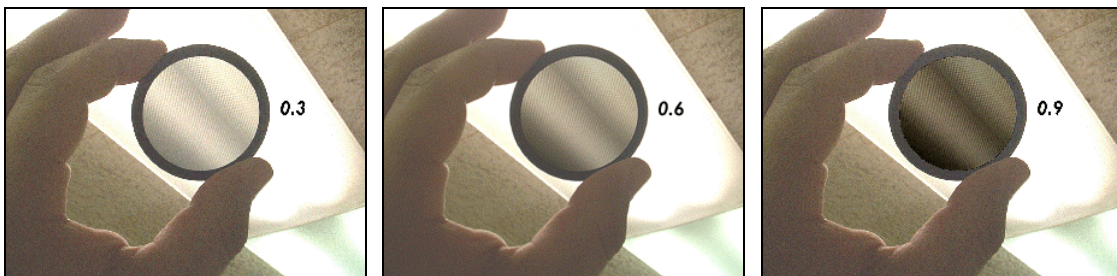
### Neutral Density Filters



In bright conditions or outdoors Neutral Density (ND) filters can be used to reduce the amount of light that reaches the sensor. The filter is screwed into the lens snoot. Only used GSI approved filters as some filters will cause degradation in system accuracy.



The ND filters are rated logarithmically. The common filters are a 0.3, 0.6 and a 0.9. A 0.3 filter will let in 1/2th the light, 0.6 1/4 the light and 0.9 1/8th the light. If a filter or a combination of filters is used then the flash intensity needs to be increased accordingly. Each number on the flash represents a 1/2th F-Stop. You must increase the intensity setting by 2 for the 1/2 filter, 4 for the 1/4 filter and 6 for the 1/8 filter.



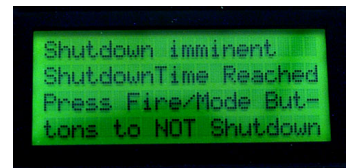
## INCA2 Power

### Power Conservation Modes

If the camera is inactive for a period of time, it will go into a sleep mode to conserve battery power. When the camera is in this mode, the camera status line on the LCD screen will read "Sleeping". Pressing the camera trigger will wake the camera up. The camera will take about two seconds to wake up. In "Sleep" mode, the camera draws about half the normal power.

If the camera is left inactive for a period of time while it is sleeping, it will automatically shutdown to further conserve battery power. When the camera powers down in this manner, the LCD display will be blanked, and the shutdown LED on the display panel will be on. Similar to sleep mode, pressing the trigger will wake up the camera. In this mode, the camera will take about 4 to 6 seconds to wake up. In "Shutdown" mode, the camera is still draining the battery, but at about 1% of the normal power. Always remember to turn off the power and disconnect the battery when not using the INCA2 camera.

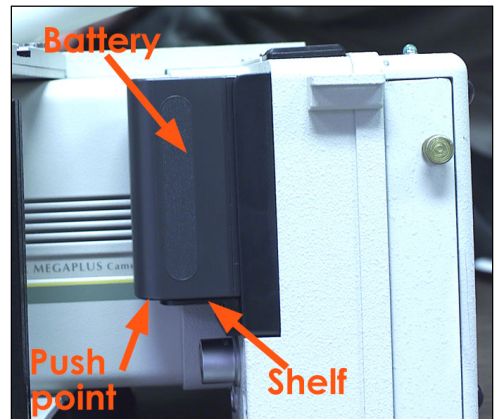
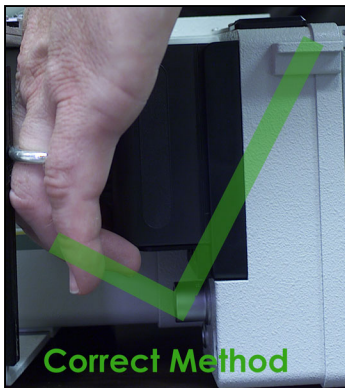
If the PCMCIA disk is removed and the camera is not switched off the camera will display a shutdown warning after a few minutes. To prevent shutdown the disk should be replaced or the FIRE button pressed.



### Removing the INCA2 Battery

To remove the INCA2 battery:

1. Place hand on the underside of the battery
2. Slide fingers until they move past the end of the battery support shelf
3. Push up gently.



**WARNING:** Pushing up on the support will damage the shelf. Always take care that pressure is applied to the battery and not the shelf

## Charging the Battery

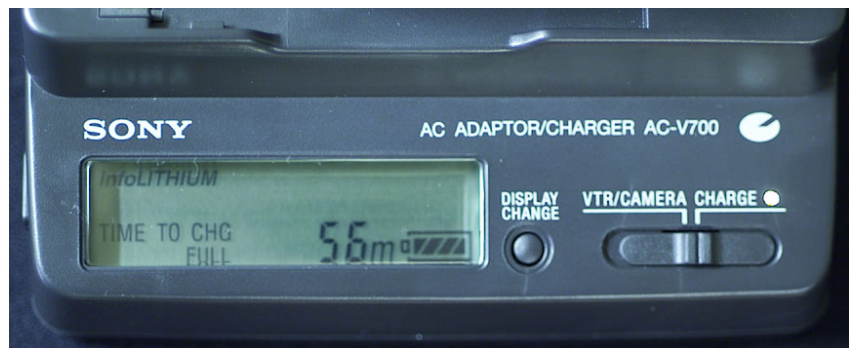
The INCA2 camera monitors the camera battery level. When the battery power is low the camera will start to beep. The frequency of the beep will increase as the battery approaches a critical shutdown level. The battery should be changed prior to this to prevent a shutdown during disk writing.

To charge the battery, do the following:

1. Unplug the camera battery.
2. Plug the battery charger into AC power. The unit has a universal power input so it can be used anywhere in the world.



3. Plug the battery into the charger unit.
4. After a few moments the charger LCD screen will display the amount of charge left in the battery and the estimated time needed to charge the battery.
5. Once charged remove the battery.





## INCA2 Summary

### Checklist

The checklist below has been prepared to help with photography using the INCA2 camera for off-line measurements. It is advisable to use it on every project until it has been memorized.

#### *INCA2 Picture Checklist*

1. Camera Checklist
  - a. Check default settings.
  - b. Check battery level.
  - c. Check disk.
  
2. Lens Checklist
  - a. Inspect Lens (Clean, if necessary).
  - b. Check F-number (normally not changed).
  
3. Strobe Checklist
  - a. Connect strobe.
  - b. Check battery level.
  
4. Set the background exposure (dark, but not too dark, use AUTO mode normally).
  
5. Set the target exposure (bright, but not too bright).
  
6. Take pictures (distance back is about the same as the viewing area).
  
7. Wrap-up
  - a. Attach lens cap.
  - b. Re-pack camera.

## Error Messages

**Camera errors are checked for and if found** an error number will be displayed. The error numbers and their cause are listed below. If you get such a message, call GSI for further troubleshooting.

Hardware Errors (gsihw)

- 1 A buffer was specified (to store the image in) which does not exist or is out of bounds. This error can also be caused by a NULL pointer assignment for image storage in the interrupt handler.
- 2 A NULL pointer was detected for the shared memory with the daughter card (interrupt handler).
- 3 Pixel overflow in the FIFO daughter card. There are more pixels left after the entire image has been retrieved. This can be caused by putting the wrong camera/software version in an INCA2 (i.e. - a 6.3 camera in a 4.2 INCA2).
- 4 The hardware (daughter card, etc...) was reset while in the process of taking a picture.
- 5 Failed to construct/attach a proxy for an interrupt event. This will only occur when operating resources are low.
- 6 An error occurred triggering the exposure (toggling exposure line, etc...).
- 7 Pixel underflow in the FIFO daughter card. Some pixels were received, but not enough to make an entire image. This can be caused by putting the wrong camera/software version in an INCA2 (i.e. - a 4.2 camera in a 6.3 INCA2).
- 8 The FIFOs on the daughter card overflowed and image data has been lost. This could occur if the 486 computer does not service the interrupt routine to drain the daughter board FIFOs in time.
- 10 The exposure time specified to the hardware was too small (less than 1ms).
- 11 An exposure was timed out when no data was received. This is usually caused by a low battery (the Kodak camera dies before the computer does), or the Kodak camera not being connected to the daughter board. This can also be caused by a faulty daughter card or wiring to the 486 computer.
- 100 If the hardware driver failed to start successfully, this error can occur. Usually you will get another error (more specific) instead of this one.
- 101 An unknown message was sent to the hardware driver. The driver does not know how to handle this message and will just ignore it.

## System Errors (gsisys)

-500 If the system driver failed to start successfully, this error can occur. Usually you will get another error (more specific) instead of this one.

-501 Failed to send a message to one of the subtasks in the system (the hardware, display, or disk driver processes). This could be caused by one of the subtasks crashing or hanging.

-502 Failed to save an image to disk. This is an error in response to an error from the disk driver subtask.

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