

OPERATION MANUAL

VARIABLE FRAME RATE CAMERA **VFC-300**
(1ST EDITION-Rev.2)

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Upon Receipt

Unpacking

VFC-300 cameras and their accessories and options are fully inspected and adjusted prior to shipment. Operation can be performed immediately upon completing all required connections and operational settings.

Check your received items against the packing lists below.

- If you ordered the VFC-300 only (no options):

ITEM	QTY	REMARKS
VFC-300 camera	1	
CD-ROM	1	Contains control software for operation
AC-DC adaptor	1	Supplies 9VDC power to camera
Operation manual	1	

- If you ordered either / both of the options below, verify received:

ITEM	QTY	REMARKS
IEEE1394 enable	1	Software option. Installed at customer request
Extended memory	1	Parts option. Installed at customer request

Check

Check to ensure no damage has occurred during shipment. If damage has occurred, or items are missing, inform your supplier immediately.

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1. Prior to Starting

1-1. Welcome

Congratulations! By purchasing VFC-300 Variable Frame Rate Camera you have entered the world of FOR-A and its many innovative products. Thank you for your patronage and we hope you will turn to FOR-A products again and again to satisfy your video and audio needs.

FOR-A provides a wide range of products, from basic support units to complex system controllers, which have been increasingly joined by products for computer video based systems. Whatever your needs, talk to your FOR-A representative. We will do our best to be of continuing service to you.

1-2. About the VFC-300

The VFC-300 variable frame rate camera is designed to accurately and clearly capture detailed pictures for use in a variety of systems. Applications include factory automation review, machinery monitoring, R & D image based analysis, medical systems use, sports training and review, and educational support among other possible uses. In addition, the versatile design of the VFC-300 can either capture high speed or slow speed camera material as needed.

Features

- High resolution results; selectable image range from 200 x 200 pixels, 300 frame / sec. up to 512 x 512 pixels, 90 frame / sec.
- Record images up to 10 sec. at 300 frame / sec. with standard version. Record images up to 20 sec at 300 frame / sec with optional expanded memory.
- Max. rate of 1/100,000 each sec. during high speed electronic shutter operations.
- Select up to 60 sec. between image captures when slow speed (time elapse) recording.
- Computer control camera operations and image processing (no I/F board needed) or 'stand alone' camera.
- CCD technology used to ensure proper filtering and display of RGB primary colors during image processing.
- Display capture speed, capture time / date and numbers of frames recorded when reading and processing capture video.
- Simultaneous record of analog data linked to capture video also possible.
- Synchronize image captures when camera takes controlled from more than one station.
- Lightweight and miniaturized design allows camera mounting in limited space or covert observation areas.

1-3. System Requirements

In order to PC install and use the application control software received with your VFC-300, you must have at least the following items.

- CD-ROM (containing VFC-300 application) received with this manual.
- IBM or compatible computer (w/ monitor) meeting / having the following:
 - ◆ Pentium III or better CPU (700MHz or faster processor).
 - ◆ At least 128MB or more free internal memory. (192 MB or more recommended.)
 - ◆ At least 40 MB free hard disk space available to install control software program.
 - ◆ At least 20GB or higher HDD support.
 - ◆ Windows™ 2000 Professional (w/ service pack 2 or higher) installed as your OS.
 - ◆ At least one CD-ROM disk drive for use when installing VFC-300 software.
 - ◆ Display monitor with a resolution of 800 x 600 or higher and full range color capable.

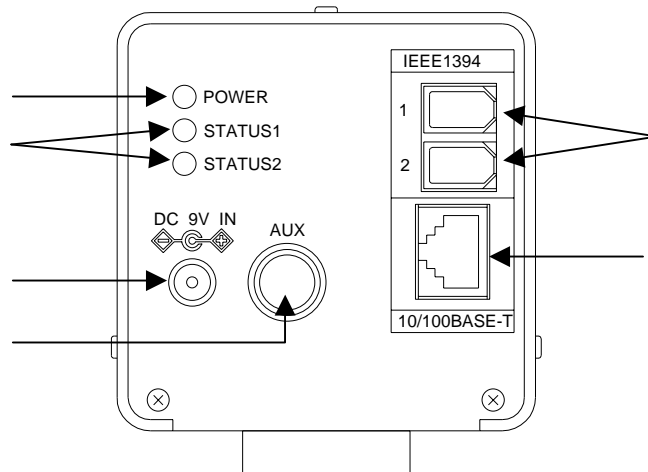
1-4. About This Manual

This manual is intended to help the user easily operate the VFC-300 and make full use of its functions during operations. Before connecting or operating your unit, read this operation manual thoroughly to ensure you understand the product. After reading, it is important to keep this manual in a safe place and available for reference.

2. Descriptions and Connection

2-1. Camera Panel

Connectors and indicators located on the camera panel of the VFC-300 are as shown and described in the figure and text below.



POWER Indicator

Lights green to indicate when power is ON and applied to the camera. (Power cable from accessory AC-to-DC adaptor connected to DC 9V IN and power supplied via AC source.)

STATUS 1 / STATUS 2 Indicators

Used to indicate camera status during operation. Indicator will briefly go to red for several seconds when power is applied to the camera then go to unlit if operation is normal.

DC 9V IN Connector

Used for connection to AC power source via supplied accessory AC-to-DC adaptor. Camera operates on 9VDC power input.

AUX Connector

Used for master/slave connection to synchronize operations when more than one camera is configured and used. Also used for trigger input / output, strobe output and analog signal data input. See sec. '2-3. AUX Connector' for details on related signals, pin assignments and connector circuitry.

IEEE1394 Connector (Option)

Used for IEEE1394 operational signal connection between camera and system computer. (This connector will be disabled unless software option installed.)

10/100BASE-T Connector

Used for 10BASE-T or 100BASE-T between camera and computer. Cross-wired LAN cable must be used when directly connecting between 1 ea. camera and computer. Straight-wired LAN cable must be used when multiple cameras / computers connected via hub network. See sec. '2-4. Connection Examples' for details connection configurations.

IMPORTANT

IEEE1394 and 10/100 BASE-T connectors cannot be same time used. Connection is only possible to one connector at any given time.

2-2. Cable and Camera Related

Information on cabling and camera parts (lens, tripod) used with the VFC-300 is as noted in the following sub-sections.

2-2-1. Camera Cable

Camera cable **connection can be made to either** the standard 10/100BASE-T camera connector **or** to the optional use IEEE1394 connector. Both connectors cannot be used at the same time.

If using LAN connector:

Must be category 5 or better cable.

If directly connecting one camera to one computer:

LAN cable used must be cross-wired type. 1 ea. required for connection.

If connecting more than one camera / computer:

LAN cable used must be straight-wired. Connection between devices must be via hub network. A max. of 8 cameras / computer can be hub configured.

IMPORTANT

When LAN connecting via switching hub, full-duplex transmission should be used. If half-duplex transmission is used, camera communication errors may occasionally occur and interrupt system operations.

If using IEEE1394 connector:

Compatible transfer rates are 100, 200 and 400 (IEEE 1394 to 1995, 1394a specs). (IEEE 1394b transfer rates are not supported.)

Fire wire connectors for IEEE 1394 connection cable:

Cable needs 6-pin socket connector at VFC-300 side. Computer side connector needs to be either 4-pin socket (when using laptop computer) or 6-pin socket (when using desktop computer).

IMPORTANT

IEEE1394 connector required optional software installed to be enabled.

2-2-2. Auxiliary Cable

The AUX connector is used to support several signal operations; master / slave operation, trigger in / out, strobe out, and analog data input. See sec. '2-3. AUX Connector' following for details on connector appearance, pin assignments and signals supported.

2-2-3. Lens

Compatible camera lens for the VFC-300 is a 1/2 inch or larger C mount type lens capable of supporting and capturing mega pixel color images.

IMPORTANT

Aperture from F1.4 and up (F2.0, F2.8, etc.) needed for correct imaging.

If F1.0 or F1.2 used, ghosting may occur at top and / or left part of image.

Ghosting can also sometimes occur when F1.4 or above depending on the type of lens used.

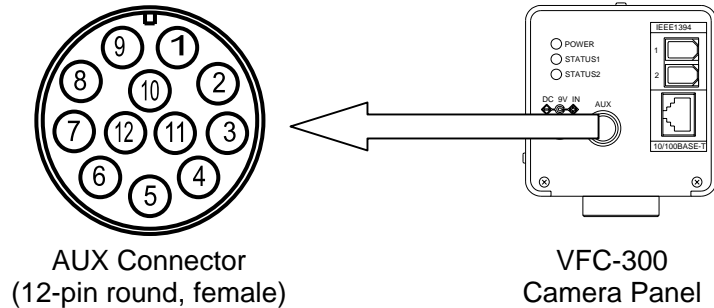
2-2-4. Tripod

The VFC-300 camera tripod mount has screw holes for both 1/4 and 3/8 inch type mounting screws. Standard photography type tripods cannot be used. Only professional studio type tripods that are properly weighted are useable.

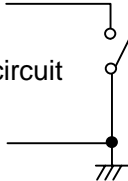
When using a tripod, leg length can be extended up 60 cm. However, tripod must be properly balanced and stationed so that neither the tripod or camera are subject to vibrations or other factors that would cause movement of the camera during imaging operations.

2-3. AUX Connector

Appearance, pin numbering pattern, pin assignments and signals supported are as shown in the figures and table below.

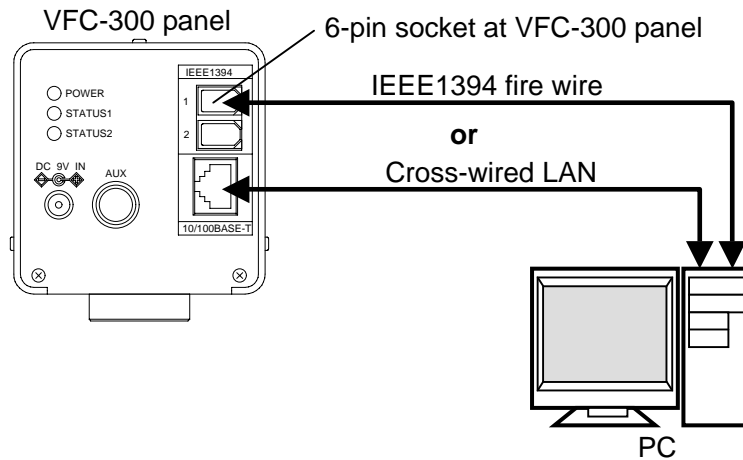


Pin Assignments and Signals:

Pin No.	Use	Signal	Description
1	M/S IN (Master / slave camera sync input)	TTL negative input	V sync input. Not input to master, input to all slaves to reset / sync to master.
2	M/S OUT (Master / slave camera sync output)	LVTTTL (level) negative output	Output by master camera to sync all slave cameras used.
3	TRIG IN (Trigger input)	TTL negative input or make contact	Trigger input to master camera. Initiates sync output from master to slave cameras. 
4	TRG OUT (Trigger output)	LVTTTL (level) negative output	Trigger output to combine multiple sync operations.
5	STR OUT (Strobe output)	TTL (level) negative output	
6	Not used		
7	ANLG GND (Analog signal GND)		Contact GND for pin 8.
8	ANLG IN (Analog signal input)	0.3 - 4.7V input	
9	ANLG GND (Analog signal GND)		Contact GND for pin 8.
10	GND		
11	GND		
12	GND		

2-4. Connection Examples

2-4-1. One Computer to One VFC-300

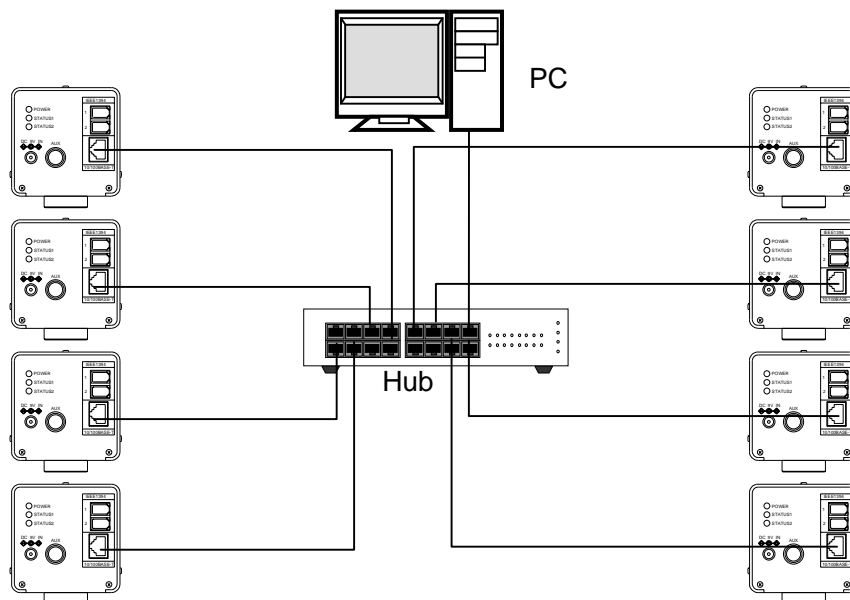


IMPORTANT

IEEE1394 option software must be installed for connector to be enabled.
LAN and IEEE1394 connectors cannot be same time connected.

2-4-2. One Computer to Multiple VFC-300s

Multiple VFC-300 cameras (up to 8 max.) must be connected to the control computer via a network hub. (LAN cables used for VFC-300 connection should be straight wired type.)



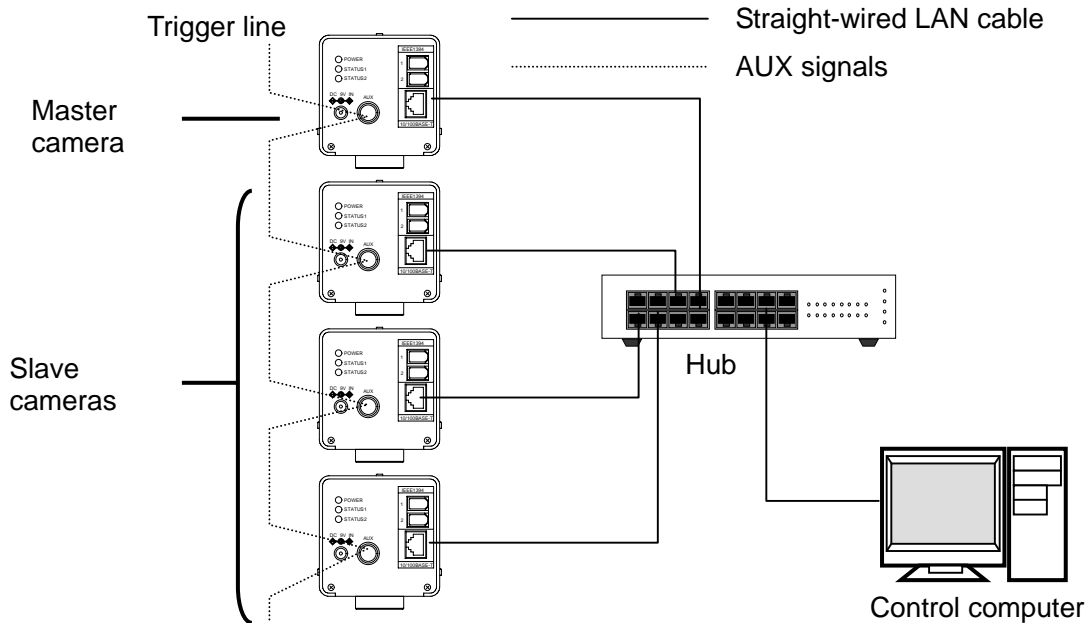
IMPORTANT

Before making connection above, each camera must first be individually connected to the hub and an IP address assigned. After that, connection above can be completed. **See sec. 4-2** for IP address setting procedure.

2-4-3. Master-Slave Connection

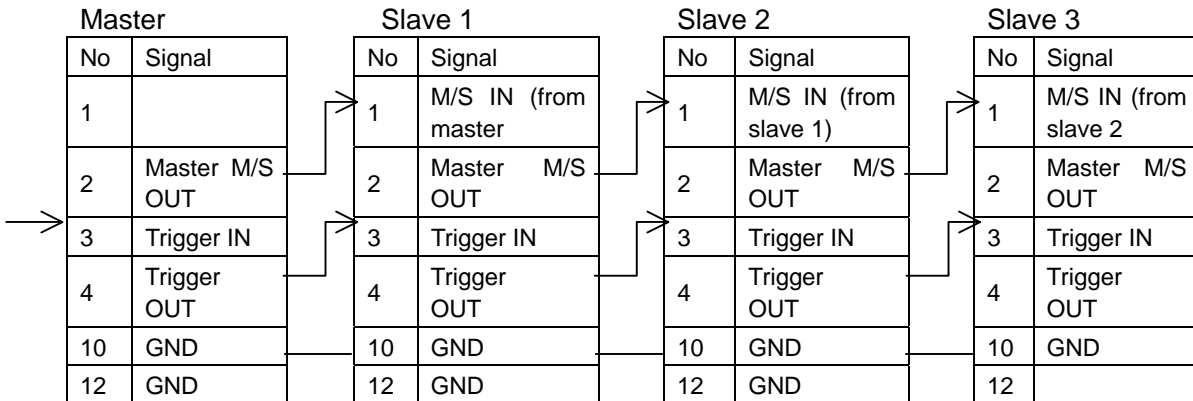
In the case of master-slave connection both LAN and AUX cabling connections must be made between all configured devices in order to sync operation between multiple cameras. Examples of each operational connection line (LAN + AUX) are as shown below.

Master-Slave Configuring 4 Cameras:



AUX Connector Signal Line Diagram:

For sync between configured cameras during image operations. (**Where:** No. = pin number at AUX connector where signal appears.)



Related Operational Points:

1. Up to 1 master + 7 slaves can be configured. (8 ea. VFC-300.)
2. Initial trigger IN signal to sync cameras input directly to master only.
3. Operation of all cameras can be controlled from same computer. A separate IP address must be set for each configured device when you do this. Operational setup at all cameras must be to same image size, frame rate, trigger mode, etc. for master / slave operation to be possible.

(Continued following page.)

4. To input trigger to master during operations, click on TRIGGER button in the master camera control GUI in the VFC-300 applicational software once it is installed to your computer.
5. AUX connector signal connection is only necessary when master-slave configuring cameras as above. AUX connection is not needed for independent camera operation.
6. Master-slave operational settings will also need to be made in the VFC-300 software for the above system to be used. Refer to sec. '2-4-3. Master-Slave Connection' and sec. '5-9. Master / Slave Mode' for further details.
7. Master-slave synchronous camera operation is not possible during slow speed photography operations. Do not configure cameras as shown when this type of operation is required.
8. Cable for AUX connector must be user fabricated. At each cable end use a connector assembly that is same or equivalent to the HR10A-10P-12P manufactured by Hirose Electronics. See sec. '2-3. AUX Connector' for pin assignment and signal information.

3. Software Installation

3-1. To Install

To install your VFC-300 application program to your computer, proceed as follows.

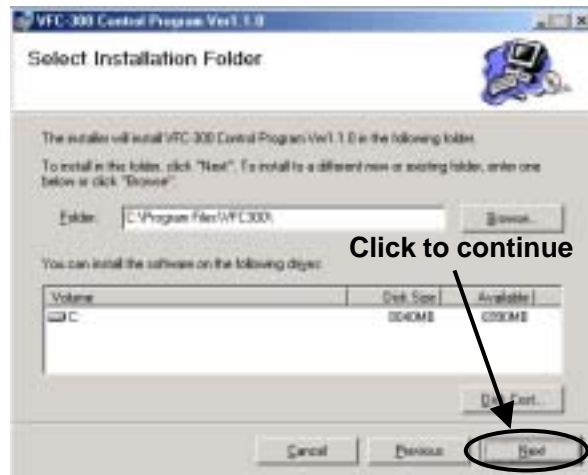
1. Start your Windows™ OS system. Insert the VFC-300 application disk into your computer CD-ROM drive.
2. Open the CD-ROM drive containing your application software disk. (For example, drive 'D' if that is the designation of the CD-ROM drive containing the disk.)
3. Click on 'VFC-300.msi' file of the CD-ROM to begin installing the VFC-300 software.
4. When the setup program window at right opens, click on 'Next' to begin installation.

(Note that the Ver. 1.1.0 Setup Wizard figure shown at right is for example only. Actual version displayed when you install your software may be different.)



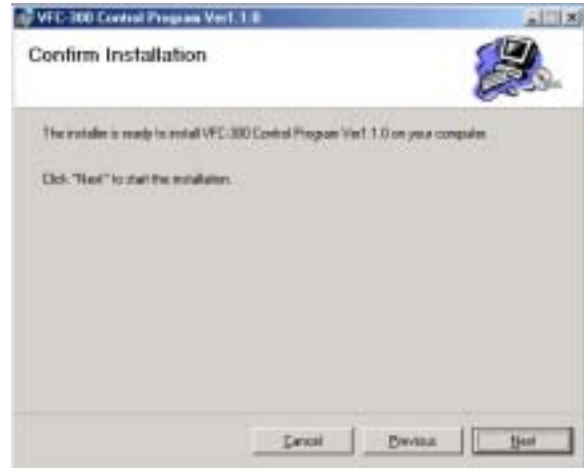
5. When installation Folder window at right opens, either click on 'Next' to install to default folder shown **or** click 'Browse' to change the destination folder.

Once an install folder is selected, click on 'Next' to continue the installation.

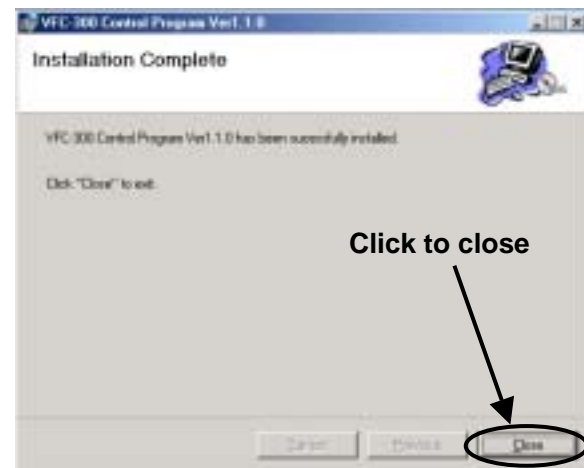


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6. After you click on 'Next', an install process box similar to at right will open. The install process messages will guide you through everything needed to install your application. Just follow the instructions as given.



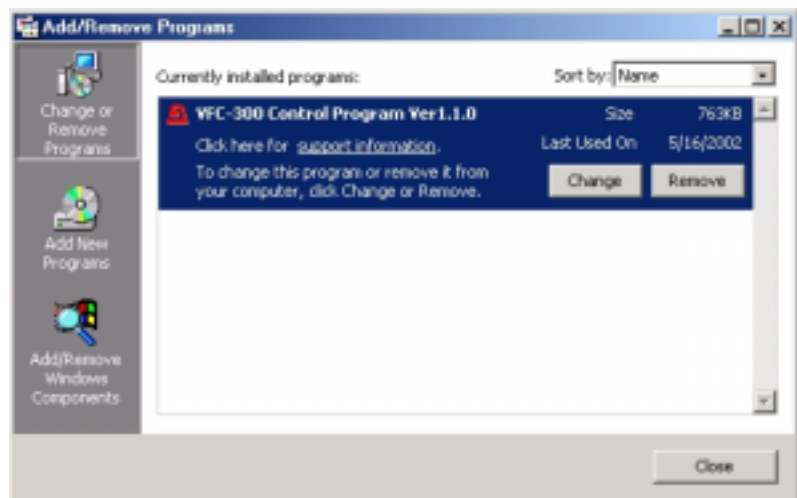
7. When installation is finished, the window at right will be displayed. Click on 'Close' to quit installation and return to normal operation.



3-2. To Uninstall

To uninstall the VFC-300 applicational program, follow the procedure below.

1. Click on 'Start' menu in desktop task bar. Next, click on 'Control Panel'
2. When 'Control Panel' box opens, click on 'Add / Remove Programs'. A box similar to one at right should open. In box at right, click on 'Change or Remove Programs'.
3. Next select the VFC-300 Control Program in the window. Click 'Remove' button to uninstall.



4. System Setup

Network setting examples for both single VFC-300 and multiple VFC-300 configurations are given in the sections following. **All related communication and network settings will need to be made before using your VFC-300 for imaging operations.**

4-1. LAN Configuring One VFC-300

NOTE

VFC-300 operations are best supported when a dedicated LAN is configured. If it is configured within a LAN that is also running other applications, the time required for image download, upload, etc. operations will increase proportional to how heavy overall traffic on the network is.

To LAN configure one computer to one VFC-300, make the settings below:

1. After verifying all required cabling connections are in place and securely connected, apply power to the VFC-300. Power is supplied via the accessory AC-to-DC adaptor.

This should be connected to the camera and power to ON at the adaptor. Verify that green POWER indicator at the camera is lit green to show power is applied to the camera. **Note that it will take about 10 sec. for camera to finish initialization after power is ON.**

2. Make TCP/IP settings at control computer side as follows:

- a.) Open the TCP/IP properties window. To do this, access the following items in the sequence given: [START] [SETTINGS] [CONTROL PANEL] [NETWORK & DIAL-UP CONNECTION] [COMPUTER LOCAL CONNECTION] [PROPERTIES] [INTERNET CONTROL (TCP/IP)] [PROPERTIES].

NOTES

- 1.) When you make your network settings it is recommended that you write them down. They may be needed to remake the settings in the future if your LAN setup is changed or problems occur.
- 2.) Refer to your Windows OS manual for additional network settings information when TCP/IP connection is set differently than above.

< TCP/IP related settings currently made for your computer can be noted here >

IP Address				
Sub-network mask				
Default gateway				

- b.) After making the settings given in the table below, click on 'OK' to apply. Restart computer if required to apply new settings.)

IP Address	192	168	0	10
Sub-network mask	255	255	255	0
Default gateway	192	168	0	1

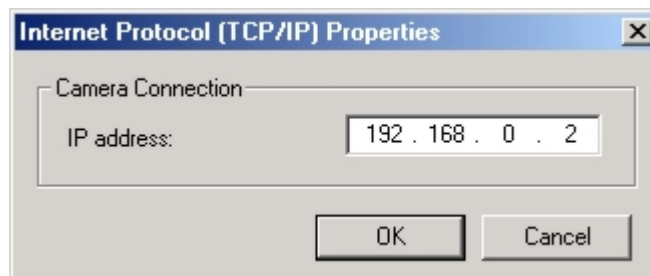
Setting here can be from 3 to 254. 10 is given as an example. Use the correct setting for your network system if 10 invalid.

(Continued following page.)

3. Open your VFC-300 control application. The main window for your control software should appear similar to below.



4. First specify IP address assigned to your VFC-300. To do this, click on 'Change IP' in the window shown above. When the settings box shown below in this step appears, input the IP address shown below (192. 168. 0. 2) if not already displayed. Click on 'OK' to input setting.



5. Verify computer and VFC-300 are connected and able to communicate. To do this, click on 'Connect' in window shown below.



If communication connection has been correctly made, character on selections in the Operations and Settings sections will change from grey to black to show that computer and VFC-300 are communicating. (See note regarding connection during record operation on following page.)

(Continued following page.)

IF CONNECTION FROM MAIN WINDOW FAILS

Check to see if camera IP address has been correctly input. Also confirm that all LAN cable connections are securely and properly made. Once this is done, click on 'Connect' again to see if communication now occurring.

IF CONNECTION SUDDENLY FAILS DURING OPERATION

Note that connection can be suddenly lost due to com error or other network related factors. If this happens, an error message will be displayed informing the user that connection to the controlled camera has been lost.

If this happens, first close the error message. After closing the error message you will have to reopen the main window for the camera that lost connection. Reconnect by clicking on the 'Connect' button again.

Also see sec. '5-5. Recording Images' following for additional details related losing communication during record operations.)

4-2. LAN Configuring Multiple VFC-300s

Up to 8 VFC-300 cameras can be controlled from one computer when LAN configured. A different IP address must be assigned to each VFC-300 in order to correctly communicate with all the configured cameras. **All VFC-300 cameras are given the same default IP address at the factory.** This will have to be changed on all but one of the configured cameras.

IMPORTANT

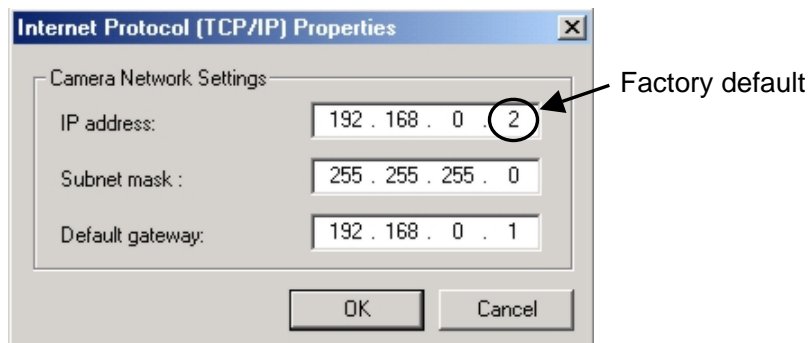
Cameras to be configured must be hub connected one at a time, and a different IP address set for each, before all cameras are connected to the hub as a group. It is also recommended that other devices be configured on the same hub with the cameras and control computer.

To LAN configure multiple VFC-300 cameras, make the settings below:

1. After verifying first camera is securely connected to hub, apply power to that camera and verify power indicator is lit green same as in step 1 of procedure given in sec. 4-1 previous. **Note that it will take about 10 sec. for camera to finish initialization after power is ON.**
2. Make TCP/IP settings for first camera at control computer side as follows:
 - a.) Open the TCP/IP setting box by clicking on 'TCP/IP' in the Setting section of the window shown below.



- b.) The Internet Properties (TCP/IP) box shown below should open. If you have not made settings here before, the IP Address displayed will be the factory set default of '2'. This can be applied to the first VFC-300 that is currently connected to the hub.



(Continued following page.)

3. Click on 'OK' to apply IP address setting. When the main VFC-300 application window returns, click on 'Connect' and verify communication is occurring between the camera and the computer. (Same as in step 5 of the sec. 4-1 procedure given previously.)

IMPORTANT

Do not exit the TCP/IP settings box without clicking on 'OK'. **If you exit any other way, the IP address setting just made will not be applied** to the connected camera.

11 to 254 can also be used to make IP address setting in addition to 2 to 9 if needed due to certain IP addresses already being assigned.

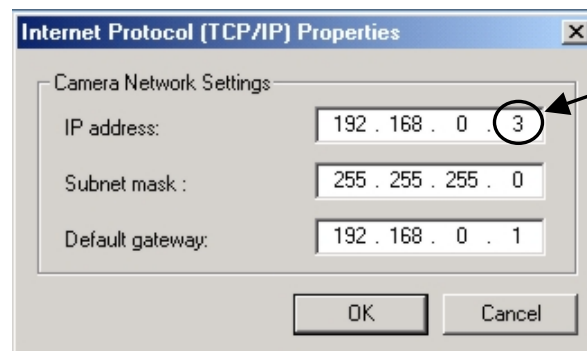
IF CONNECTION FROM MAIN WINDOW FAILS

Check to see if camera IP address has been correctly input. Also confirm that all LAN cable connections are securely and properly made. Once this is done, click on 'Connect' again to see if communication now occurring.

Additionally see note at end of this sec. on connection loss during operations for information on reconnection to cameras.

4. After verifying communication connection can be made, disconnect current camera from hub. **Restart your computer before proceeding to set IP address for the next camera in your system.**
5. After restarting your computer, connect second VFC-300 you will be configuring to the network hub. Repeat steps 1 through 3 previously given in this procedure.

In this case, change the factory set default of '2' as the last number in the IP address line to a different number. Say '3' as shown below. It is recommended to use 2 through 9 when configuring the max. of 8 ea. VFC-300 cameras.



Change to '3' for example

Continue connecting single cameras, setting a different IP address at each and verifying communication until all cameras have been assigned addresses.

IMPORTANT

Do not make the same IP address setting for any two or more cameras. Every address setting must be different for operation to occur correctly!

6. Once all cameras have different IP addresses, set hub to connect all cameras to the control computer as shown in system connection sec. '2-4-2. One Computer to Multiple VFC-300s'.

(Continued following page.)

IMPORTANT

- 1.) Only one VFC-300 control software program is required when you are connecting one camera to one computer.
- 2.) When connecting multiple cameras to one computer each camera must be controlled via its accessory control program. (Separate control windows must be opened for each camera.)

This means if you configure 8 cameras, you will need to open 8 each VFC-300 control program windows if you want to use all cameras at the same time.

See sec. '5-1. Communication Connection' for details on making settings that determine which program controls which camera.
- 3.) **If you have the IEEE1394 connector enable option installed**, and are connecting via its fire wire connector, refer to the instruction manual received with that option for details on making connection.

IF CONNECTION SUDDENLY FAILS DURING OPERATION

Note that connection can be suddenly lost due to com error or other network related factors. If this happens, an error message will be displayed informing the user that connection to the controlled camera has been lost.

If this happens, first close the error message. After closing the error message you will have to reopen the main window for the camera that lost connection. Reconnect by clicking on the 'Connect' button again.

Also see sec. '5-5. Recording Images' following for additional details related losing communication during record operations.)

5. Operation

Once IP addresses are assigned at each camera, you will need to make basic operational settings **within the control software for each camera** that determine how each of your cameras performs during image record operations.

You will also have to set which camera each control software program controls and verify that each program is connected and communicating with the camera.

Remember! You cannot make these settings for all configured cameras from one control program! Each program only effects the operation of one camera within your configuration.

5-1. Communication Connection

Before proceeding with camera operations, first set which camera each VFC-300 program controls and verify that communication connection can be made between the program and its assigned camera. (**Note that procedure given is for normal LAN configuration use only.** IEEE 1394 connector communication setup is different!)

To do this, proceed as below.

1. After assigning an IP address to each camera (see sec. '4-2. LAN Configuring Multiple VFC-300s') and completing connection of your hardware configuration (see sec. '2-4-2. One Computer to Multiple VFC-300s'), turn power on (all devices). Open one VFC-300 control program.
2. When you open the program, the main window below should appear. The IP address for the camera that the displayed program can control is shown in the Camera IP box of the TCP/IP COM section.



3. Assume you have configured 4 cameras, and camera '1' has the Camera IP address shown in the figure above. (Address shown is factory default in all VFC-300 control programs and the default assigned to all cameras at time of shipment.)

To make communication connection between the camera (having the IP address shown) and your PC (via this program), click 'Connect'.

If communication connection correctly made, character on all selection buttons in the Operations and Settings sections will change from grey to black (buttons enabled) to show computer and VFC-300 are in communication. Leave program open.

(Continued following page.)

IF CONNECTION FROM MAIN WINDOW FAILS

Check to see if camera IP address has been correctly input. Also confirm that all LAN cable connections are securely and properly made. Once this is done, click on 'Connect' again to see if communication now occurring.

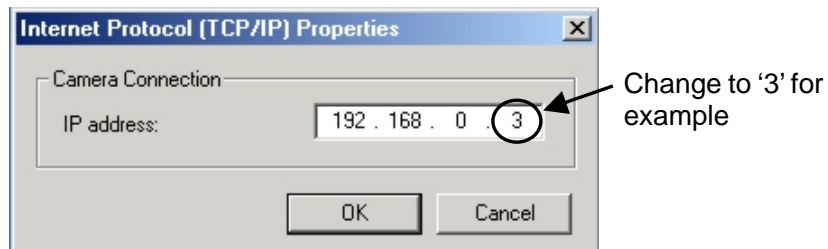
- Next, you will need to connect camera '2' in your 4-camera system to the computer. To do this, open a second VFC-300 control program. When the second program opens it will also display the default Camera IP (192.168.0.2). **Do not click on Connect at this time!**

IMPORTANT

If you have more than one VFC-300 control program open, and two or more programs have the same Camera IP displayed, only one of the same IP programs can be connected to the related camera.

If communication connection is already made to one control program, and connection is initiated from a different program with the same communication IP setting, an error message will be returned and no connection will be made.

- Before making communication connection in the second program click on the 'Change IP' button in the TCP/IP COM section. When the settings box shown below appears, input the IP address for camera '2'. For example purposes, assume that this is 192.168.0.3. Click on OK after inputting the new IP address setting.



- Verify that Camera IP box in TCP/IP COM section now displays a different IP (3 shown below) than the first control program you opened. **With the window appearing as below, now click on Connect.**



(Continued following page.)

7. If communication connection had been correctly made to the second camera in your system, character on all selection buttons in the Operations and Settings sections will change from grey to black (selection buttons enabled) to show computer and VFC-300 are in communication.



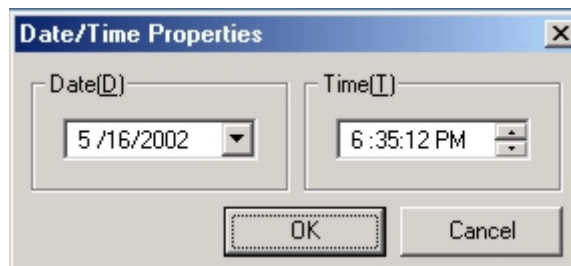
8. Continue opening control programs, changing Camera IP settings in opened programs and connecting to cameras. Verify that all cameras in your system are communicating with the control program displaying their IP address.

5-2. Date / Time Settings

Settings given in the following sections are made within each control software program used. They can be changed at any time after initial camera connection and prior to starting record operations. Setting will only be applied to the camera that the given program controls. (See sec. '5-1. Communication Connection' previous for details on assigning (connecting) one control program to each configured camera.)

To make time/date setting in each control program, follow the procedure below.

1. Open the VFC-300 control program for the camera you want to make settings for.
2. Click on 'Date/Time' in the Settings section of the window. A box similar to the one below should open.



3. Make date / time settings as needed for your system. Click 'OK' to apply the settings and return to main window. Date and time formats in your Windows™ 2000 system are applied to the Date / Time Properties shown above. See next page for procedures for changing Date / Time formats.
4. Repeat procedure for each camera in their separate control programs until date / time is synchronized for all cameras.

NOTE

Date / Time setting procedure given above cannot be performed once record operation has been started for any given camera and any existing data in the record memory. ('Date /Time' button in main window disabled.)

If you need to change a date / time setting in this case, clear the record memory ('Clear' in Data section) before closing the Record window.

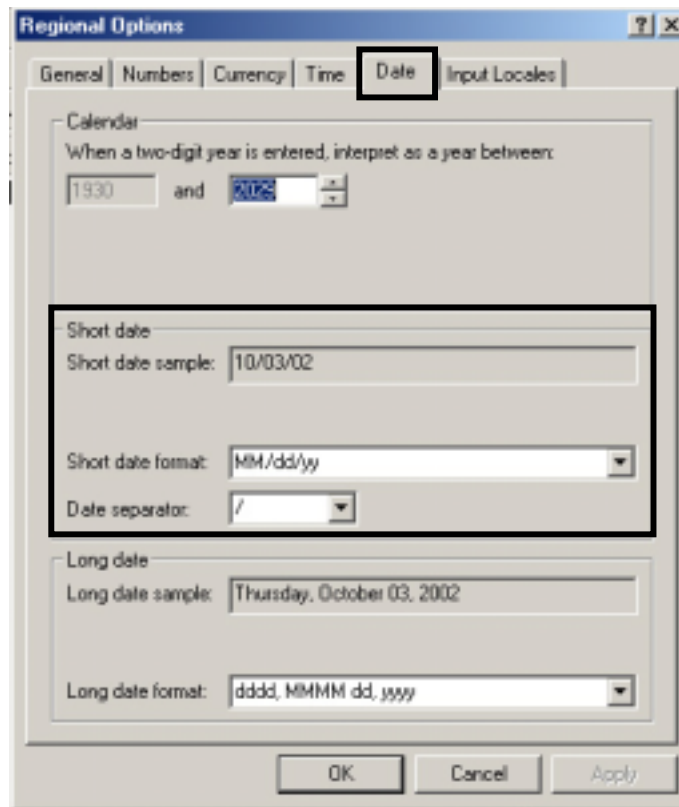
Once the record memory is cleared, 'Date /Time' button will be enabled when you go to the main window again.

IMPORTANT

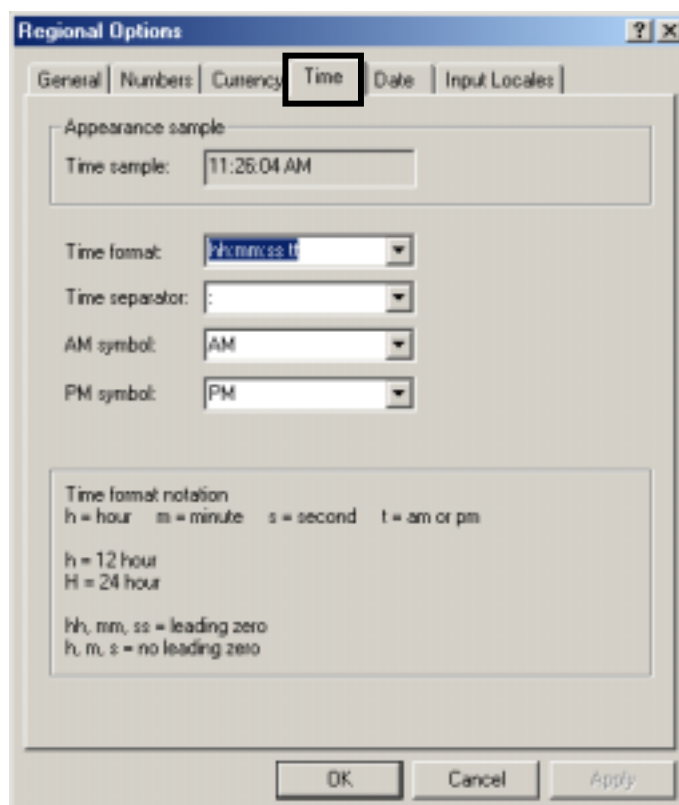
Clock for time/date settings is battery powered. The battery has a service life of approx. 5 years and will have to be replaced upon depletion. Consult your FOR-A sales agent or FOR-A about replacement.

In Date and Time formats in Date / Time Properties shown above the formats set in your Windows™ 2000 are applied. If you want to change their formats, you have to set them in Time and Date tab windows of the Regional Options window in your Windows™ 2000. To do this, access the following items in the sequence given: [Start] -> [Settings] -> [Control Panel] -> [Regional Options] -> [Date] or [Time]. The figures shown on the next page will be open.

In Short date section of the Date tab window select desired date format and separator. Then push 'OK' to apply settings. Refer to Windows OS manual for more details on setting date.



In the Time tab window select desired time format, separator and symbols. Then push 'OK' to apply settings. Refer to Windows OS manual for more details on setting time.



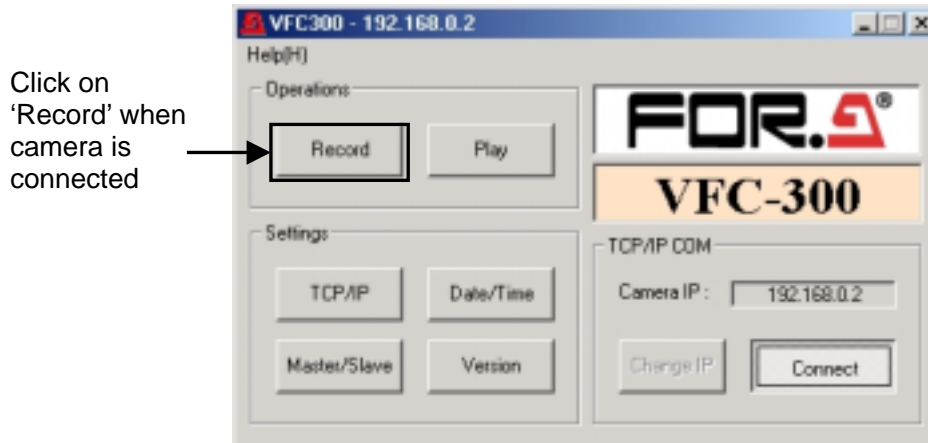
(Continued following page.)

5-3. Record Setup

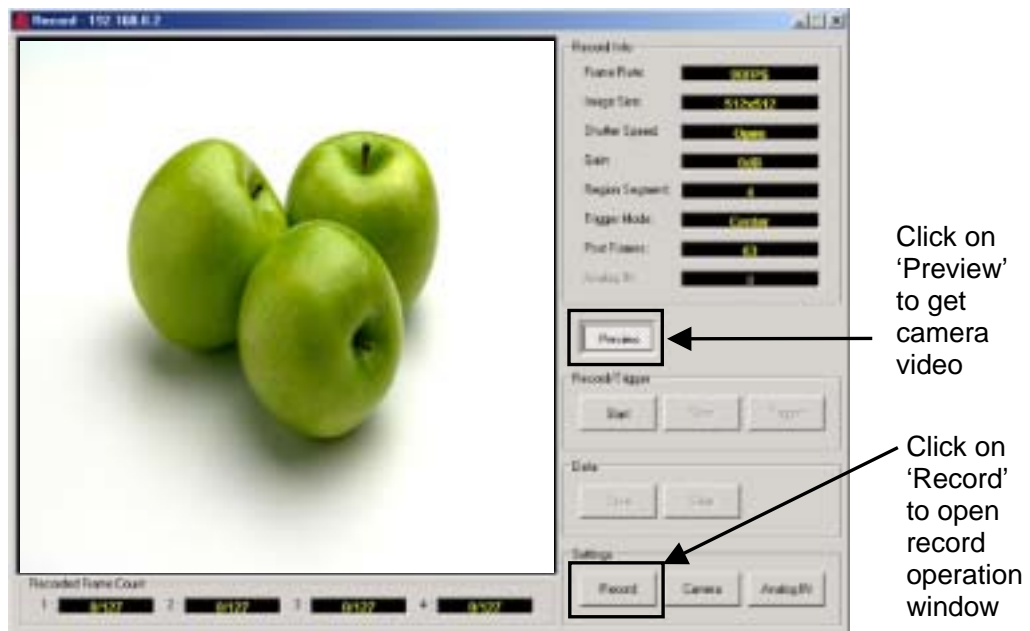
Record settings determine how a camera responds and processes images during take (image record) operations. These settings should be made as required prior to each record session. (Camera operation should also be adjusted if needed. See sec. '5-4. Camera Setup' following.)

To make record operations settings, proceed as follows.

1. Open the VFC-300 control program for the camera you want to make record settings for. When the main control window opens, verify it appears as below and camera / computer are communicating. Click on 'Record' in the Operations to open the Record window.



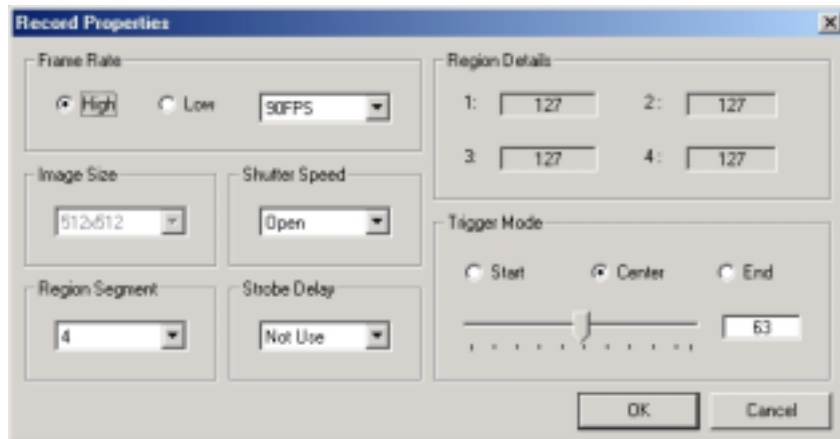
2. In the Record window, click on 'Record' in the Settings section to open the camera settings window shown in step 3 following.



Note that camera video will be needed when making camera setups. (See sec. '5-4. Camera Setup' following.) However, **once you click on 'Record', no video will be displayed here.**

(Continued following page.)

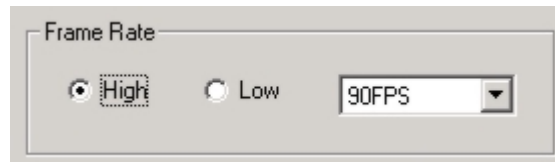
3. When you click on 'Record', The Record Properties window shown below should open.



IMPORTANT

Region segment assign / following record settings can only be made when enough memory is available for related record to be performed.

4. The High, Low selections in the Frame Rate section determines the image take mode the camera will operate in.



- High: Images taken at high speed and can be replayed at slower speeds.
- Low: Each image taken over an extended time period and can be replayed faster.

5. The frames / sec. (FPS) or sec. / frame setting in Frame Rate determines how often image take is performed by the camera. Setting also depends on whether High or Low is set.

- If High: This setting determines the number of the image frames taken per one second. Size will be auto set based on the Frame Rate setting made. Refer to the table below regarding which setting(s) auto sets which size(s).

Frames / Sec (FPS)	Valid Image Size Settings
300, 150, 100	200 x 200
240, 120	256 x 256
160, 80	512 x 256
90, 45, 30	512 x 512

- If Low: The setting determines how many seconds each image frame is taken over. Frame Rate and Size can be set independently. Refer to the table below for available sec. / frame and image size settings.

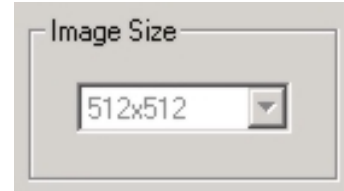
Sec / Frame (SPF)	Valid Image Size Settings
1	200 x 200, 256 x 256, 512 x 256, 512 x 512
2	
5	
10	
60	

(Continued following page.)

BE CAREFUL! There are other related factors that will effect how your cameras and computer software perform during imaging operations. See sec. '5-12. Additional Operational Notes' for more information on other operational points that need to be considered.

6. Image size setting should be made according to whether High or Low is set in the Frame Rate section. (See step 5 previous.)

If high is selected, Image Size here will be auto set according to the FPS setting made. Setting selection will be disabled as at right and user cannot change.



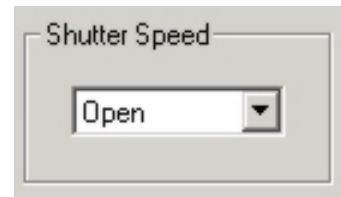
A size setting of 512 × 512 will give the highest resolution but decrease how much you can record. A setting of 200 × 200 increases how much you can record but gives you the lowest resolution level.

You can change size any time prior to starting record operations. Size settings should also be made prior to performing camera setups given in sec. '5-4. Camera Setup' following.

NOTES

Note that if you change image size here, the camera image may appear off center when you start camera setup. If this happens, you will need to readjust camera position to again center on the image.

7. The shutter speed setting determines how the camera shutter operates during imaging operations. Which shutter speed settings are valid will depend on the image size settings made within this window. (See sec. '6-1. Operation-al Specifications' for details on what shutter speeds can be set for which sizes.)

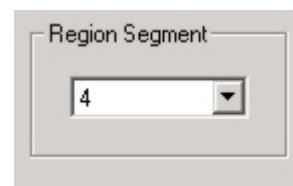


If 'Open' is set here, the shutter will basically be in continuous operation and several frames will be taken each second. This setting will not be valid if Low is set in the Frame Rate section of this window.

As to the setting itself, one example is given below:

If speed set to 150FPS, shutter speed would normally be set to 1/150 sec.

8. Camera memory is a segmented memory. How the segmented memory is used during image record is set at Region Segment, which is marked in the figure below.



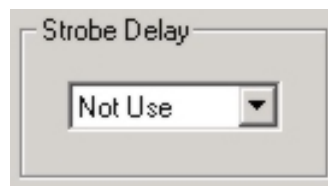
The number setting made here sets memory use as below.

- 1: All region segments used at the same time during image record. This allows the max. number of frames to be recorded.
- 2, 3, or 4: Region segments used independently. In this case, the number of frames that can be recorded per region segment is limited by region size.

(Continued following page.)

Information for 2, 3 or 4 regions (follows setting made) will be displayed at the bottom of the record window. Further note character color here will indicate operational status. See sec. '5-5. Recording Images' and sec. '5-7. Saving Images' for information.

9. **If Shutter Speed has been set to Open when Frame Rate to High**, a setting can be made at Strobe Delay that will sync an electrical flash to camera take operations during high speed imaging.

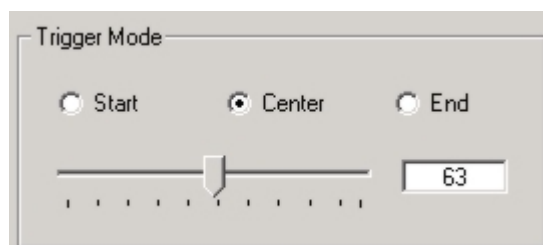


If this setting is made, AUX cable connection must also be made to the camera to support trigger signal input and output. (See sec. '2-3. AUX Connector' previous for trigger in/out pin assignment information.)

Strobe delay can be set from 0 to 7 based on the type of flash lighting being used in your system. How it is arranged around the camera target might also need to be considered.

Strobe setting can be used during Low speed record only if shutter speed has been set to 1/30 sec. Any other setting disables Strobe Delay selection.

10. The trigger setting determines when record operation will jump to the next open region segment of the record memory when 'Trigger' is clicked on during record. There are three available settings; start, center and end.



The setting made here results in the below.

- Start: Record within segment continues after trigger input until overwrite start point reached during loop record. Record operations jump to next segment at that time. (Slider disabled.)
- Center: Record within segment continues after trigger input until specified post trigger record period is finished then record operations jump to next segment.

The number of post record frames after trigger input is set using the slider in the Trigger Mode section of this window. **Note that the slider will only be enabled when Center is selected.**

- End: Jumps record operations jump to next segment immediately after trigger input. (Basically within one or two frames.) (Slider disabled.)

When a segment being recorded to is full, record operation will stop.

As this function is commonly used during record operations, it is explained more later in this manual. See sec. '5-5. Recording Images' following for more information on how the trigger function is used during record sessions.

IMPORTANT

Software trigger input point may not match the exact frame at which you want the trigger to occur because some communication delay between the computer and the camera may exist.

If you wish to avoid this, set trigger to center and make a post trigger record setting that allows for possible time differences between the camera getting the trigger and trigger input at the software side.

(Continued following page.)

RELATED RECORD SETTING NOTES

Settings made will not be applied to the related camera until 'OK' within this window is clicked on. (Software will return to main window.)

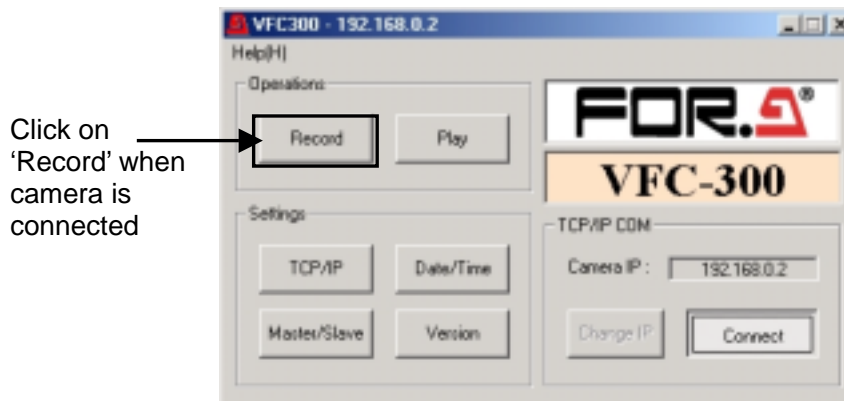
If you need to make new settings, wait at least 10 seconds before trying to return to this settings window. This is because it takes at least 10 seconds for the camera to finish changeover to new settings after 'OK' is clicked.

Further note that if you change image size here, the camera may image off center when you start operations. If this happens, you will need to readjust camera position to again center on the image.

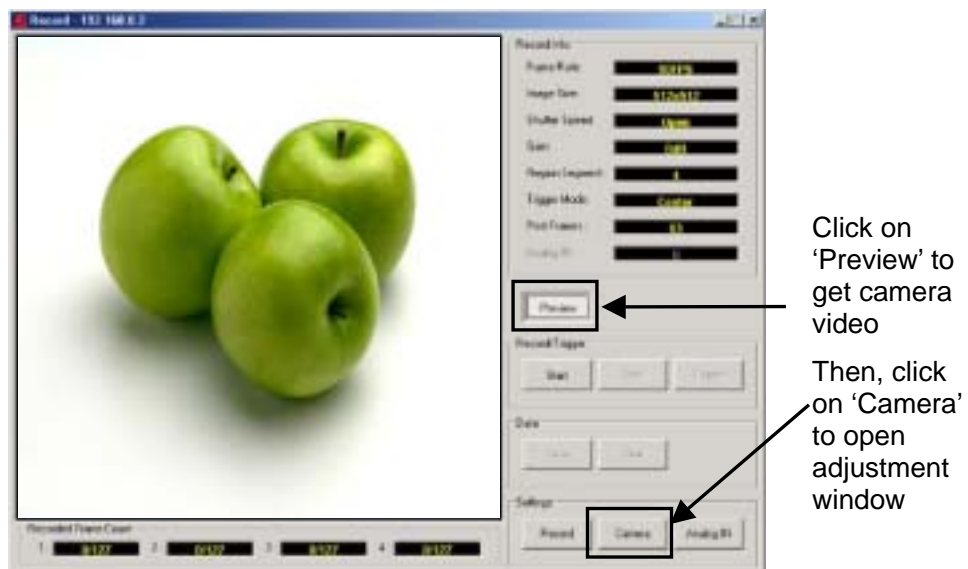
5-4. Camera Setup

Before proceeding with record operations, you will need to adjust your camera for optimum results during your record session. To make these settings, proceed as follows.

1. Open the VFC-300 control program for the camera you want to adjust. When the main control window opens, verify it appears as below and that the camera / computer are communicating. Click on 'Record' in the Operations section to open the Record window.

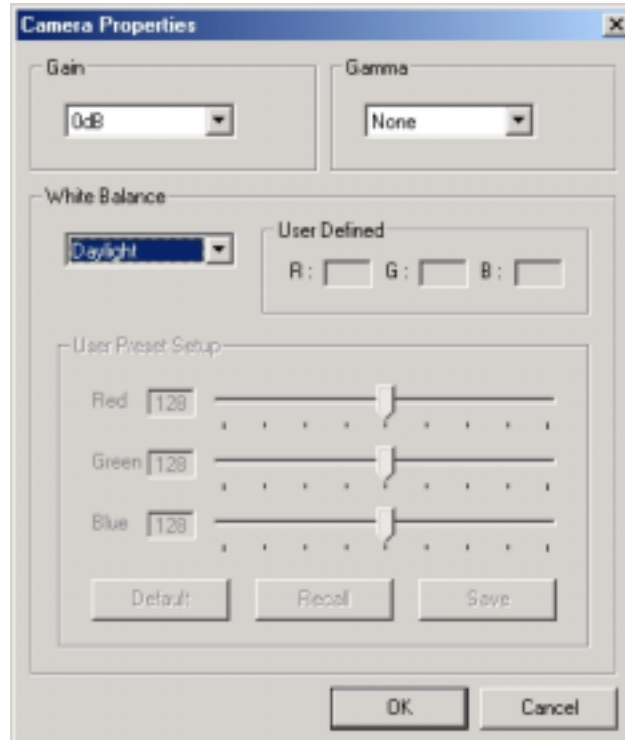


2. In the Record window, click on 'Preview' to obtain live video from the camera. Next click on 'Camera' in Settings to open the camera settings window shown in step 3 following.



(Continued following page.)

3. While observing the live camera video shown in the Record window video display, make settings in the Camera Properties window until results are optimum for your requirements.



4. The gain setting determines gain factor of the camera. Gain can be set in increments of +3dB. If you are imaging in dark areas, gain should be higher. Say to +6dB, or +12dB, +18dB. In this case, the setting would be equivalent to a step 1, 2 or 3 change in the lens aperture ring position. (Settings of +3dB, +9dB, or +15dB can also be made.)

However, increasing gain will also increase the noise factor in the image. To avoid this during high speed imaging an artificial light source may be required to provide enough light so that the gain setting can be lower. (See sec. '5-12. Additional Operational Notes' for additional details related to this situation.)

5. The gamma setting automatically corrects levels within a picture to compensate for unclear darker areas within an image. Note that a setting of 'None' means gamma correction will be linearly performed (= 1).

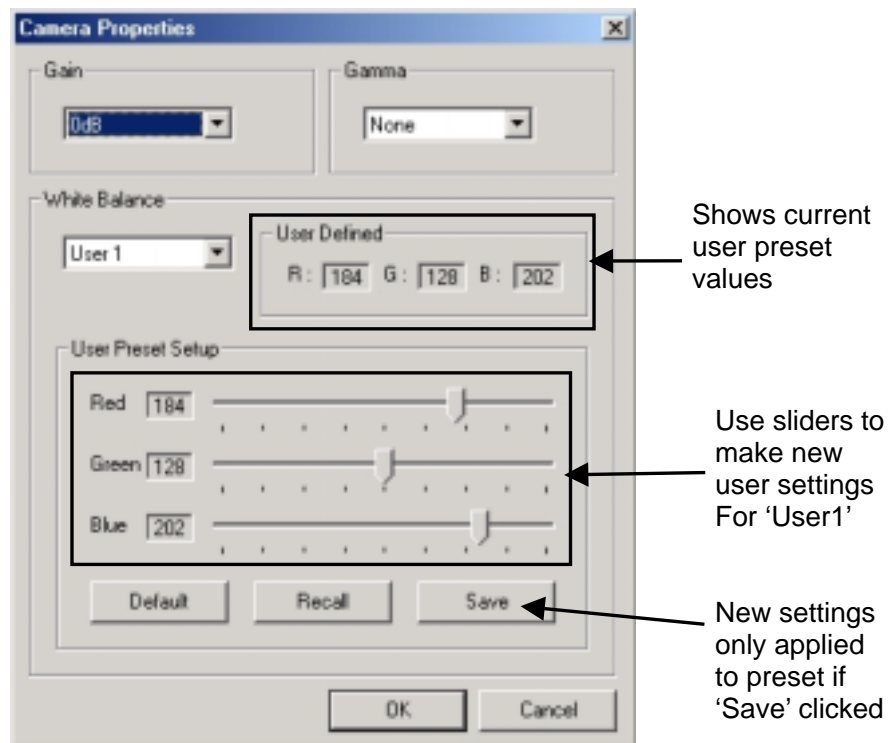
When adjusting gain, observe the camera image on the monitor and set gamma correction to either none (if not needed) or gamma 1, 2 or 3. Gamma 3 setting will apply the most gamma correction to the image. Gamma 1 setting will apply the least.

6. The white balance setting determines how white areas within the image are adjusted based on the type of lighting in the image area. Daylight, fluorescent or halogen light source types can be chosen. In this case, balance will be auto based on the set light source.

Or you can make up to 2 user presets that adjust white balance according to user values input for each color component. Once settings are made for either of the user preset selections, the settings will be memorized and applied whenever that user preset is again selected.

(Continued following page.)

7. If you want to make user presets for White Balance adjustment, first select one of the 'User' settings as below. ('User 1' is shown for example.) When you do this the User Defined and User Preset Setup slides and buttons become active.



Note that whatever settings are made for a user preset are memory saved and will be the same when you return to the same preset. For example, when you change from 'User 1' to 'User 2', the settings last made for 'User 1' will be the same unless you change them.

As to the software buttons in this section:

Default: Returns the currently selected user setting to factory default values.

Recall: Returns the preset to the last settings made before the current ones.

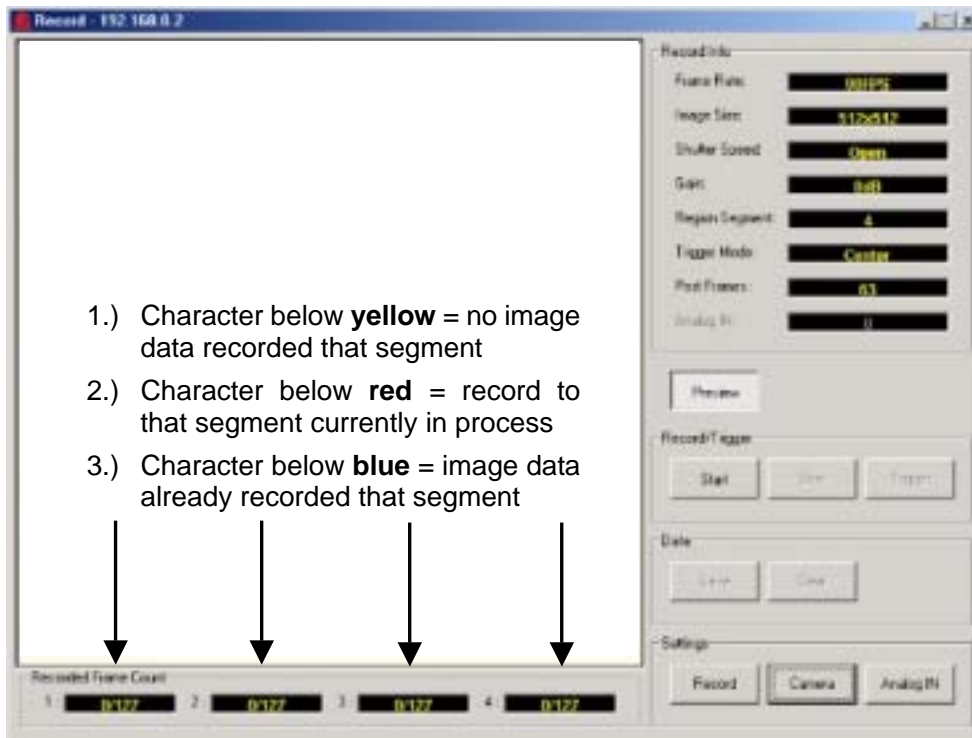
Save: Registers the currently made settings as the selected user preset values.

8. Once all required camera settings have been made, click on 'OK' to apply what is currently set here and return to Record window only.

5-5. Recording Images

Record of camera images is initiated using the Record window shown below. Before starting record, you should have finished camera adjustments and made any record settings that will be needed during your record session. (See sec. '5-3. Record Setup' and sec. '5-4. Camera Setup' previous for details on these settings.)

Note that when you open the record window, information in the Recorded Frame Count section will appear as below in yellow character if no previous record operations have been performed.



NOTES

The example window above will appear when region segmentation has been set to 4. (See sec. '5-3. Record Setup' for region segment setting information.) If region segment to 1 for example, only the first info box in the Recorded Frame Count section will be active. 2 through 4 would be blank. Also remember, **color of character shown in each box in Recorded Frame Count section indicates status of region segment.** Yellow = no data, red = record in progress, blue = record completed.

1. To access this window, open the control program for the camera you will be working with. When the main window opens, verify camera is connected and communicating with your computer. (Or connect camera if operational selection controls in the main window are not enabled.)
2. If camera is communicating, click on 'Record' in Operations section of window to open the Record window shown above

Important! Characters displayed in 1, 2, 3, and / or 4 boxes of the Recorded Frame Count section inform you of the status and capacity of the related record memory segment. Recorded to capacity info is given by the character.

(Continued following page.)

For example, 0 / 127 shown in the previous figure stands for: recorded data (0) / available capacity (127). In this case, the character would be yellow as no image data exists.

3. Before starting record operations, click on 'Preview' to view the scene that the camera is currently monitoring. Verify camera video can be seen in the image display part of the Record window.

Adjust image size to get the optimum results for your purpose. Record speed, frame rate, trigger mode, etc. can also be adjusted at this time. (See sec. '5-3. Record Setup' previous for related information.)

With camera video displayed, adjust lens focus, lens aperture, image white balance and image gamma to get the best image results possible. (See sec. '5-4. Camera Setup' previous for related adjustment information.)

4. When you finish previewing, adjusting and setting record parameters for best results for your purpose, click on 'Start' in the Record/Trigger area of the Record window.

This will initiate loop (endless) recording to the first open region segment. (Segment character will be to yellow in the Recorded Frame Count section of the Record window if segment is open. How many region segments are active will depend on the memory use setting made for the record session. (See sec. '5-3. Record Setup' previous.)

As record proceeds, the number of images being recorded for the region segment will be displayed in red character in the Recorded Frame Count section of the Record window. (If character to blue, segment has been recorded to. If yellow, segment not yet recorded to.)

5. **If you have set 2 or more as the region segment setting, clicking on 'Trigger'** in the Record/Trigger area of the Record window after '**Start**', record will jump record operation to the next region segment. How the jump occurs will depend on the Trigger Mode setting made in the Record Properties window. Available settings are as below.

➤ Start: Record within segment continues after trigger input until overwrite start point during loop record is reached. Record operations jump to next segment at that time.

➤ Center: Record within segment continues after trigger input until specified post trigger record period is finished then record operations jump to next segment.

The number of frames recorded after trigger input before jump to next segment is set using the slider in the Trigger Mode section of this window. **Note that the slider will only be enabled when Center is selected.**

➤ End: Jumps record operations to the next memory segment after trigger is input. (Normally within one or two frames.)

When the segment being recorded to is full, record operation will stop.

IMPORTANT

Note that once record is initiated by clicking on 'Start' in the Record / Trigger section of the Record window, no camera images will be displayed! All image adjustments must be completed before you start actual record operation.

In addition, clicking on 'Preview' after starting record will not return image to software display.

(Continued following page.)

IF CONNECTION SUDDENLY FAILS DURING RECORD

Note that connection can be suddenly lost due to com error or other network related factors. If this happens, an error message will be displayed informing the user that connection to the controlled camera has been lost.

If this happens, first close the error message. After closing the error message you will have to reopen the main window for the camera that lost connection. Reconnect by clicking on the 'Connect' button again.

In the case of failure during record operations, note the following:

- 1.) Once record is started, the camera will continue to record after communication connection was lost.
- 2.) Camera will endless record to region segment it was recording to at communication loss. For example, if record to segment 2 in process at that time, segment 2 will continue to be loop recorded until connection is restored and record is stopped. (Or software trigger jumped to next segment.)

This means that when you reconnect the camera, image contents of the segment still being recorded to may have changed substantially from what was being recorded at time of connection loss.

- 3.) After reconnection, data from recorded memory segments that were completed prior to connection loss can be downloaded and saved as explained in sec. '5-7. Saving Images' following. This may not be possible for data from a segment that was still recording at the time of the connection loss.
- 4.) Losing connection during record operations will cause all 4 or 2 (TCP/IP, Date/Time) of the Settings selection buttons in the main control window to go to disabled status **if image data has already recorded** by the time connection is lost. The conditions at the time of connection loss determine which situation occurs (2 or 4 disabled).

If you need to access the related settings windows after a connection loss during record operations, you will first have to reconnect to the camera. Once reconnected, open the Record window. Next, salvage any camera data you need.

Once you complete data salvage (or if you do not need to data), click on 'Clear' in the Data section of the Record window to clear the record memory.

When you again open the main window for the camera, the Settings section buttons should be again enabled if the communication connection is still established.

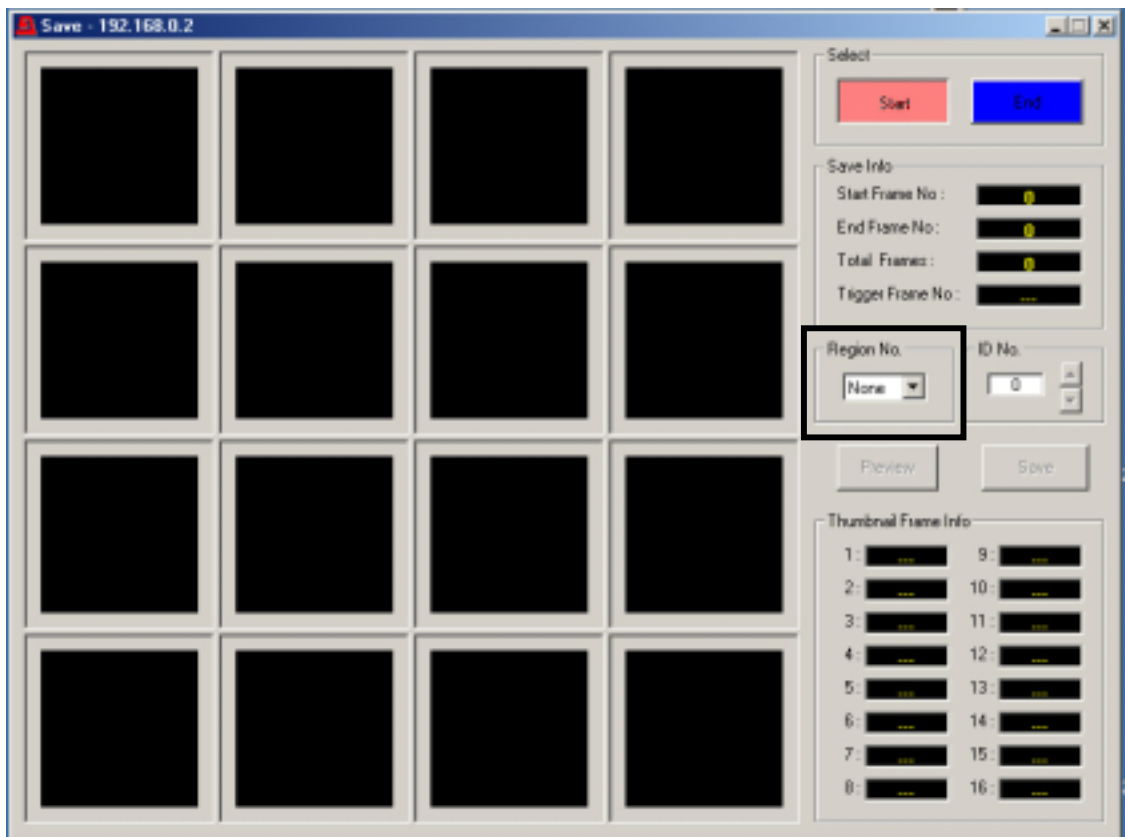
5-6. Previewing Images

Once you click 'Start' to begin recording, you can stop recording operation whenever you want to and immediately preview recorded images. The images can be previewed before saving to PC. By previewing data you can easily verify and select the recorded data frames that you want to save. Image previewing procedures are as follows.

IMPORTANT

VFC-300 doesn't store image data when powered OFF. You can preview images when VFC-300 is ON, but if VFC-300 is powered down or power lost (AC adaptor disconnected), all recorded data will be lost. Image data should be downloaded and saved to PC whenever important data is recorded.

1. After the desired images are recorded, click on 'Stop' in the Record / Trigger section in the Record window to manually stop record operation. Then open the Save window by pushing 'SAVE' button. The figure shown below will open.



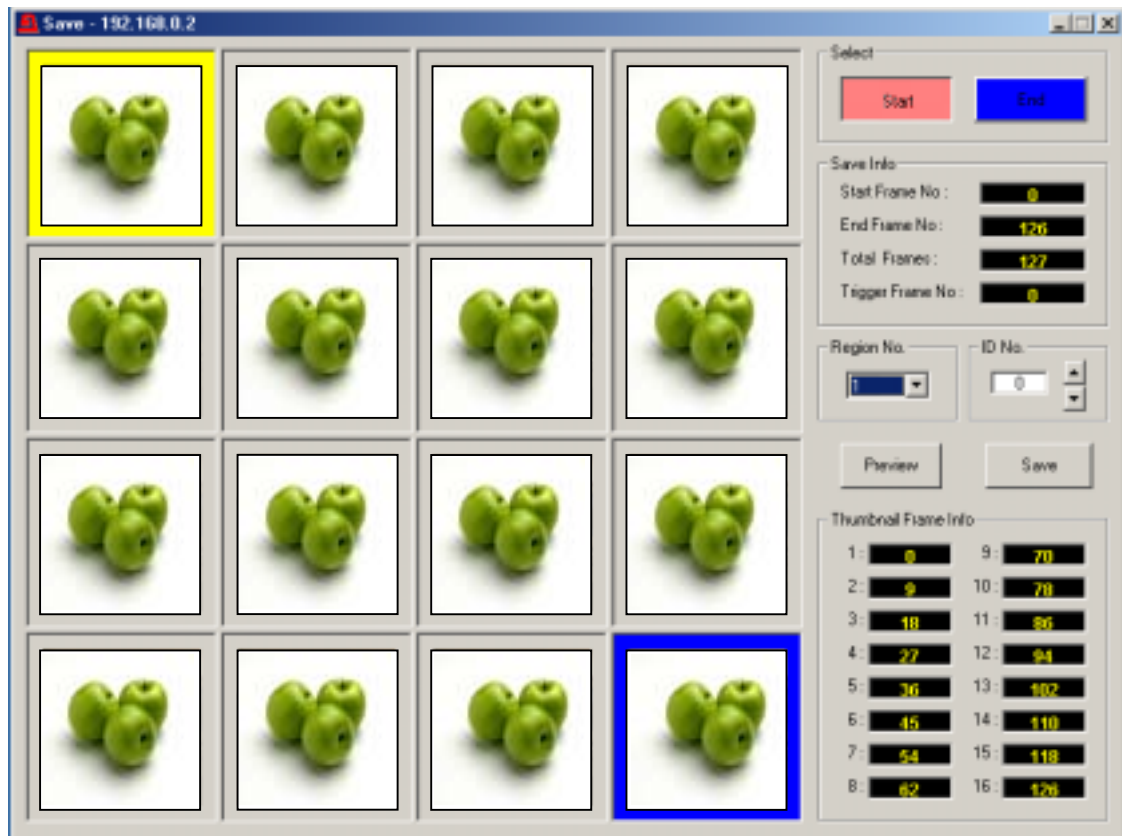
NOTE

You can also use 'Trigger' to stop recording. But if you have 2 or more region segments set, recording operation will not be stopped but it jumps to the next region segment and continues record. In this case click 'Stop' to quit recording.

(Continued following page.)

2. First choose the memory region segment (1, 2, 3 or 4) from which you want to preview recorded images. In the case of the Save window shown below, memory Region No. '1' has been selected. Once a region segment is chosen, related image data will be loaded to the Save window.

IMPORTANT! Note that each 'square' in the Save window equals more than one frame of image data! The Save window can only display 16 frames at a time. When data for a record session is downloaded to the window it will be split into frame groups based on the total number of frames in the recorded data. The contents of the each of the 16 display squares added together = the total frame count of the record session. A yellow character shown in each box of Thumbnail Frame Info section of this window indicates the frame no. for each representative thumbnail.



3. If you want to narrow down preview images, you can set start and end frames for previewing images.

Click 'Start' in the Select section then click on the section in the Preview display showing the representative thumbnail for the data you want save to start from. You can select any of the 16 squares in the display. Frame around the selected square will go to a red indication.

Next click 'End' in the Select section then click on the section in the Preview display showing the representative thumbnail for the data you want preview to end at. You can select any of the 16 squares in the display. Frame around the selected square will go to a red indication.

Also note that information related to the data section you have selected will be displayed in the Save Info section of this window. It tells you which frame save will start from, which it will end at, and the total number of frames contained in the data to be saved.

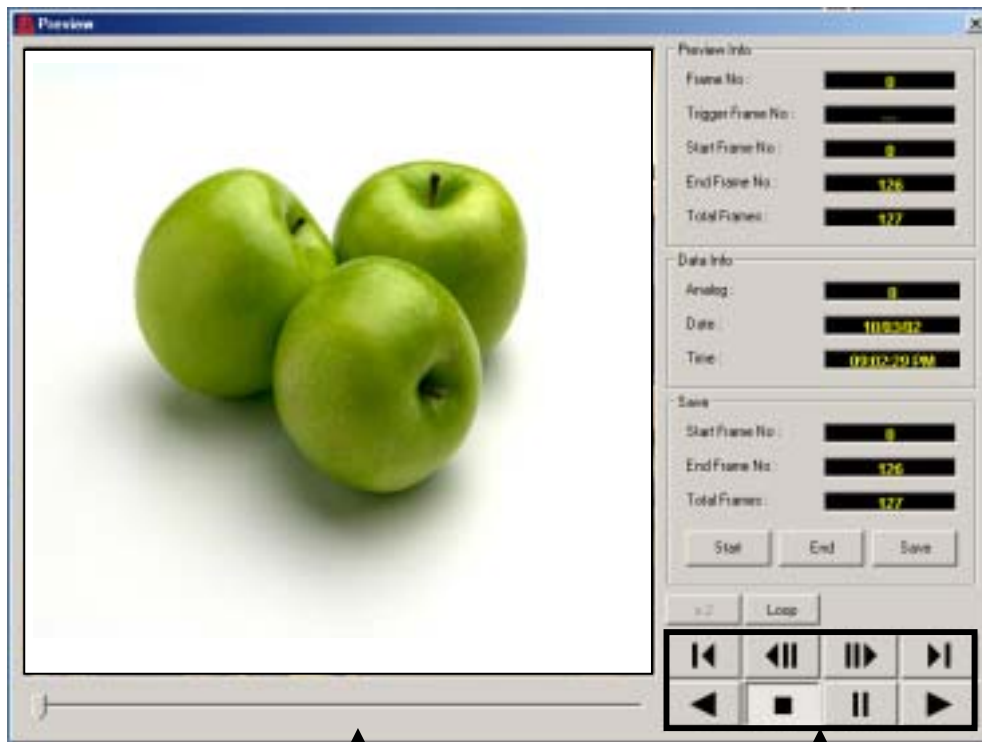
(Continued following page.)

It will also tell you at which frames trigger input occurred during the record session during which the image data was recorded. Squares containing these frames are outlined in green.

Before proceeding further, note that all color frames shown in the Preview window indicate a frame status to the user. All possible color indications are as listed in the table below.

Color	Status Indicated
Red	Point from which recorded data will be saved.
Blue	Point at which recorded data will stop being saved.
Green	If a trigger input occurred in that frame interval during record.
Magenta	If selected start and end for save both same square. (Only total frames related to one display square saved.)
Yellow	If trigger input occurred during record of selected save start.
Cyan	If trigger input occurred during record of selected save end.
White	If selected start and end for save both same square and trigger input also occurred within that frame interval.

4. After preview start and end is set in the display, click on 'Preview' in the Save window. The Preview window as shown below will open.



Slider indicates play direction, speed

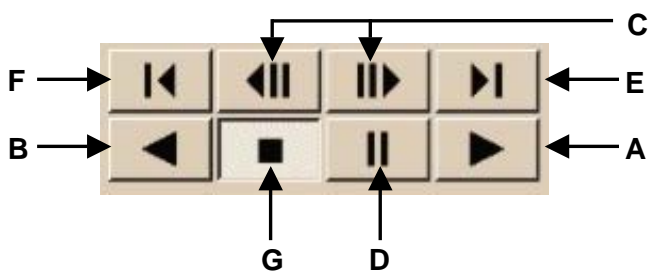
Play controls

5. When the Preview window opens, the first frame set in the previous page will be displayed in the video window and information related to the displayed data will be displayed in the Preview Info section shown at right.

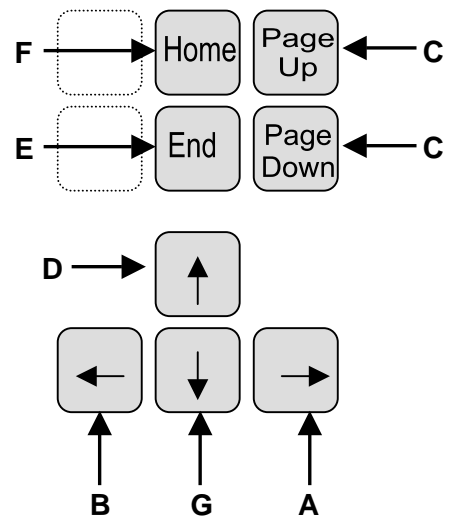
The information shown here details record settings made at the time the data was recorded. Also shows camera settings, analog input, trigger used during record plus time / date when recorded. (See sec. '5-4. Camera Setup', '5-5. Recording Images' and '5-10. Adding Analog Record Input'.)

(Continued following page.)

6. The play controls below are used to view the image data contained in the camera. Related operations are as described below. Besides the play controls in the preview window you can also use 'hot keys' in the PC keyboard.



Controls in the Preview window



PC Keyboard

A	Starts standard speed forward play of image.
B	Starts standard speed reverse play of image.
C/D	Starts forward or reverse frame-by-frame play of images. In this case, clicking on either forward/reverse button will forward or reverse play, respectively, 1 frame each click. D also auto selected same time. Clicking on D first, allows selection of either forward/reverse button but will not allow selection of other controls.
E	Jumps play to first frame in file.
F	Jumps play to last frame in file.
G	Stops play, returns display to first frame in file.

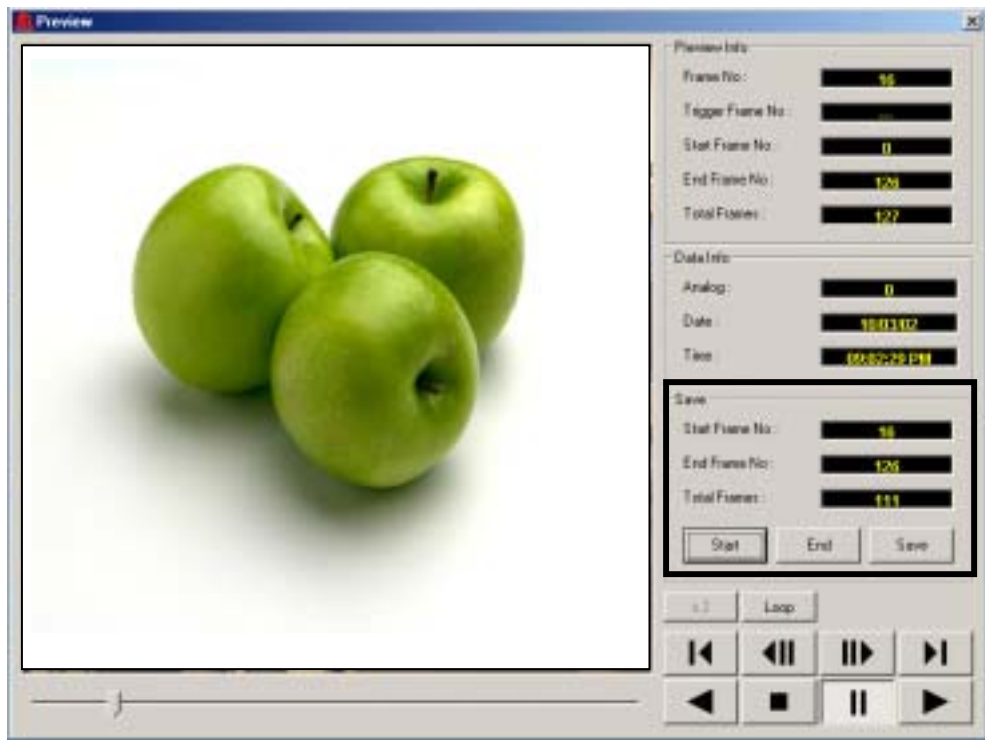
Slider shows play direction and position on playtime displayed image appears at.

7. You can download and save data to PC by clicking 'Save' in the Save section. Selected preview images will be saved to the PC. You can discard unneeded data saved to PC in the Preview window.

To do this, click 'D' above to pause viewing whenever you want save to start from, then click 'Start' in the save section to set the start frame. Start frame in the save window will be changed. Then click 'A' above to start viewing.

Next click 'D' above again to pause viewing whenever you want save to end, then click 'End' in the save section to set the end frame. End frame in the save window will be changed.

(Continued following page.)



After selecting the frames to be saved, click 'Save' in the Save section. When the Destination Folder window opens, choose a destination for the data to be saved to and input a name for your file. Image data must be saved as .dat format. See step 8 and later in sec. '5-7. Saving Images' for more details.

5-7. Saving Images

IMPORTANT

VFC-300 doesn't store image data when powered OFF. If VFC-300 is powered down or power lost (AC adaptor disconnected), all recorded data will be lost. Image data should be saved to PC whenever important data is recorded.

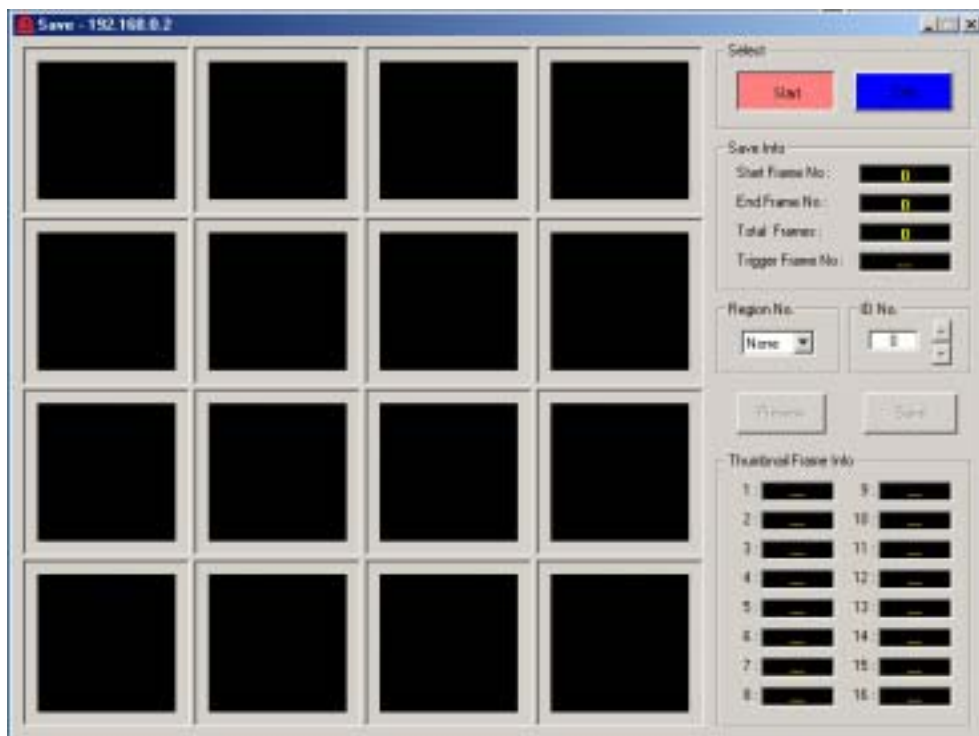
Once you have image data in the record memory, the image data can be downloaded to the control software and then saved to the computer hard drive for later play / processing and conversion to either AVI or DIB sequence data. (See sec. '5-8. To Play and Convert Image Files' following this section of the manual.)

1. If you have only one region segment to record, click on 'Trigger' in the Record/Trigger area of the Record window to stop recording images. Once recording operations have finished, you can begin downloading data to PC.

If you have 2 or more region segments set, click on 'Trigger' to stop recording in the current region, the record operation jumps to the next region segment. When you click 'Trigger' at the last region segment, recording will be stop and you can begin downloading data to PC.

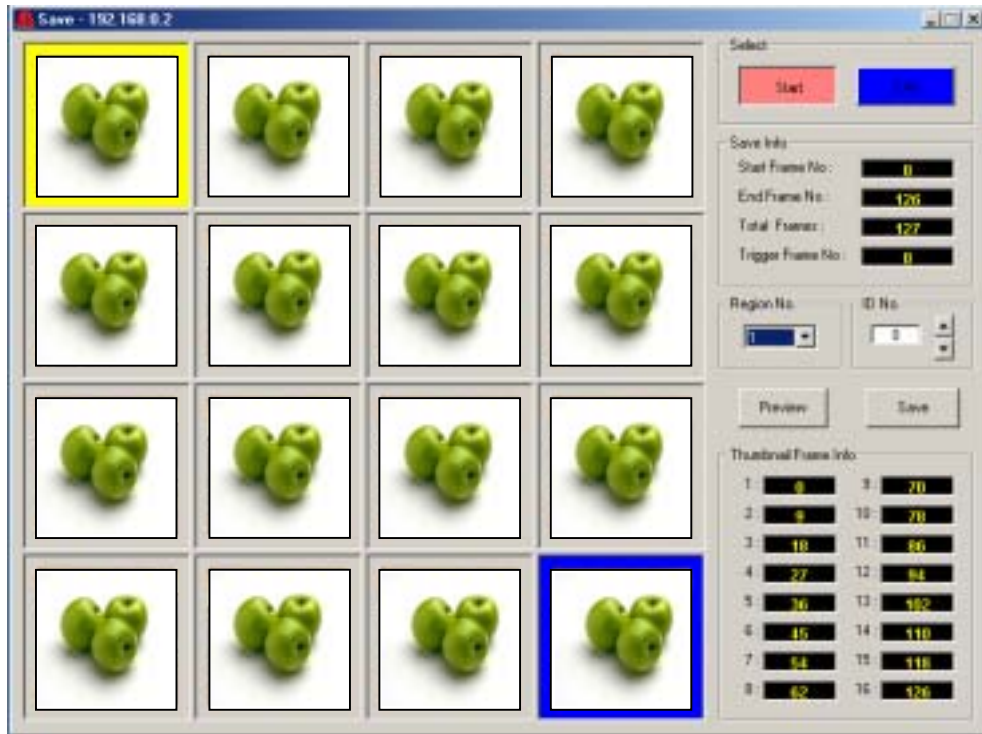
If you want to download data to PC before all segments have finished recording images, click on 'Stop' in the Record/Trigger section to manually stop record operation. Once record is stopped you can begin downloading data.

To download data, click on 'Save' in the Data section of the Record window. This will open the Save window shown below. You will have to download the camera recorded image data before it can be saved to hard drive. You can also select what part of the downloaded data needs to be saved.



(Continued following page.)

2. First choose the memory region segment (1, 2, 3 or 4) from which you want to save recorded images. In the case of the Save window shown below, memory Region No. '1' has been selected. Once a region segment is chosen, related image data will be loaded to the Save window.



Note that only region segments that have been recorded to will be available for selection regardless of region segment mode setting in the Record Properties window. For example, if you have set 4 segments in Record Properties, but only recorded to 2 of those, selections at Region No. 3, 4 will be empty.

If you select none here, no image data will be displayed in the Save window.

3. Select an ID no. for data you are saving if you want. (ID no. will be displayed when this image data is recalled from hard drive and played.) Available ID no. settings range from 0 to 99. Default setting is 0.

Note **ID setting is not necessary to complete saving operation.** It is a convenient function to allow the user to identify the saved data later during play and conversion.

4. Click on 'Start' in the Select section to start selecting which part of the downloaded data you want to start save from.
5. Next click on the section in the Save display showing the representative thumbnail for the data you want save to start from. You can select any of the 16 squares in the display. Frame around the selected square will go to a red indication.

IMPORTANT! Note that each 'square' in the Save window equals more than one frame of image data! The Save window can only display 16 frames at a time. When data for a record session is downloaded to the window it will be split into frame groups based on the total number of frames in the recorded data. The contents of the each of the 16 display squares added together = the total frame count of the record session.

(Continued following page.)

For example, one record session may mean each Save display square shows the head frame for say 15 sequential frames. So frame displayed top left corner square would be 0, next square to right 15, then next 30, etc. The results of another record session will be different if image size and other related record settings are changed. A yellow character shown in the each box of Thumbnail Frame Info section indicates the frame no. for each representative thumbnail.

- Next, click on 'End' in the Select section to set which part of the downloaded data you want end to save at. When you initiate save operation, only the frames contained in the section of the record data defined by the 'Start' (red) and 'End' (blue) data squares will be saved.

Also note that information related to the data section you have selected will be displayed in the Save Info section of this window. It tells you which frame save will start from, which it will end at, and the total number of frames contained in the data to be saved.

It will also tell you at which frames trigger input occurred during the record session during which the image data was recorded. Squares containing these frames are outlined in green.

Before proceeding further, note that all color frames shown in the Save window indicate a frame status to the user. All possible color indications are as listed in the table on the next page.

Color	Status Indicated
Red	Point from which recorded data will be saved.
Blue	Point at which recorded data will stop being saved.
Green	If a trigger input occurred in that frame interval during record.
Magenta	If selected start and end for save both same square. (Only total frames related to one display square saved.)
Yellow	If trigger input occurred during record of selected save start.
Cyan	If trigger input occurred during record of selected save end.
White	If selected start and end for save both same square and trigger input also occurred within that frame interval.

- After save start and end is set in the display, click on 'Save' in the Save window. When the Select Destination Folder window opens, choose a destination for the data to be saved to and input a name for your file. Image data must be saved as .dat format data during the save process.
- Click on 'Save' in the Select Destination Folder window to start image save to your computer hard drive. Note that save operation will require about 2 min. to complete (when standard version and 100BASE-TX connection used for image data transfer) if memory has not been set to non-segmented (region segment setting to '1').

Further note that the estimated 2 min. save time is approximate. Factors such as the specifications of the control computer being used, data transfer connection and data traffic load (if other devices configured) can affect the total time required for data save to complete.

- To download images recorded to other memory sections after your save operation is complete, repeat the previous steps in this procedure.
- When all data download and save operations are finished, close the Save window and return to the Record window. In the Record window, click on 'Clear' in the Data section to clear recorded image data from memory.

(Continued following page.)

IMPORTANT

After saving image data to PC, the image data remains in the VFC-300. When memory segment regions become full, you cannot record new images. Clear data before performing new recording operations. If there are any empty segments remaining, you can begin recording without clearing previous data. Note that when data is cleared, all memory segment data will be erased.

11. Once the image data is saved as .dat file data, the Play window of the control software can be used to recall and view the contained images. It can also be used to convert saved .dat files to either AVI or DIB sequence (bitmap of each frame) data.

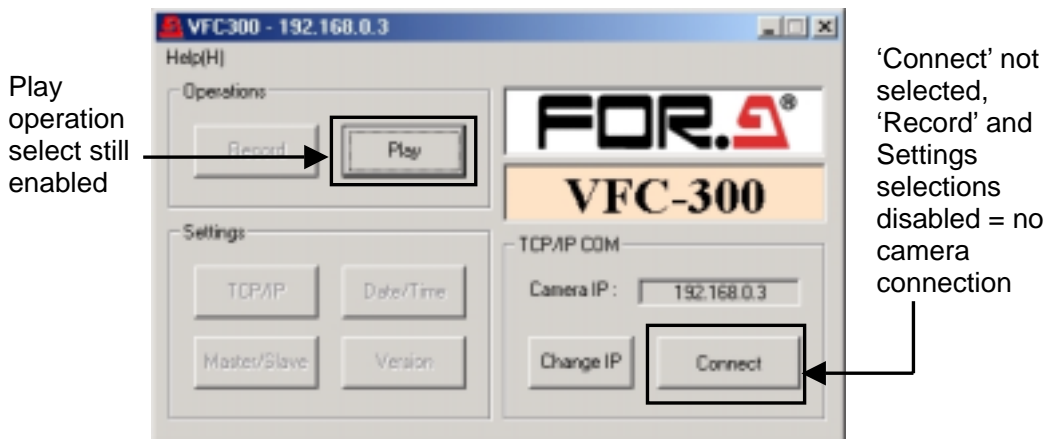
5-8. To Play and Convert Image Files

Once camera image data is computer saved in .dat format, images can be playback viewed and files converted to either AVI or DIB Sequence data by the following procedure.

Related playback and conversion operations are initiated using the Play window shown below.



1. To access this window, first open any main control program. After camera data has been saved to computer hard drive as .dat data it can be recalled without any camera connection (or camera IP address reference) needed.



2. When the main window opens, click on 'Play' in Operations section of window as shown below. This will automatically open a file select window. Select the .dat file that you want to play, view and possibly convert.

After you select the file and click on 'Open' in the file select window, the Play window will automatically open.

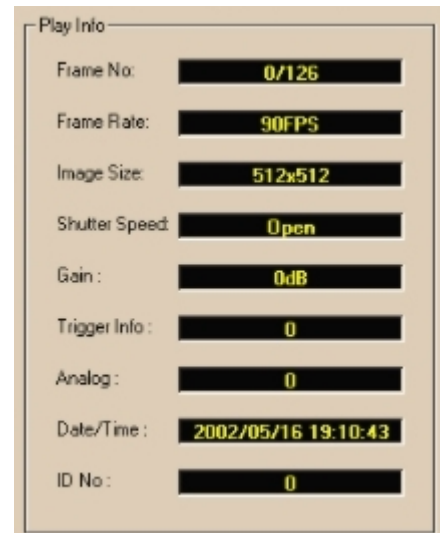
(Continued following page.)

- When the Play window opens, the first frame in the recalled image data .dat file will be displayed in the video window and information related to the displayed data will be displayed in the Play Info section shown at right.

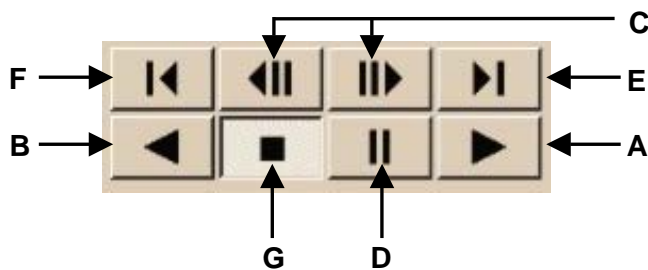
The information shown here details record settings made at the time the data was recorded. (See sec. '5-3. Record Setup', '5-5. Recording Images'.)

Also shows camera settings, analog input, trigger used during record plus time / date when recorded. (See sec. '5-4. Camera Setup', '5-5. Recording Images' and '5-10. Adding Analog Record Input'.)

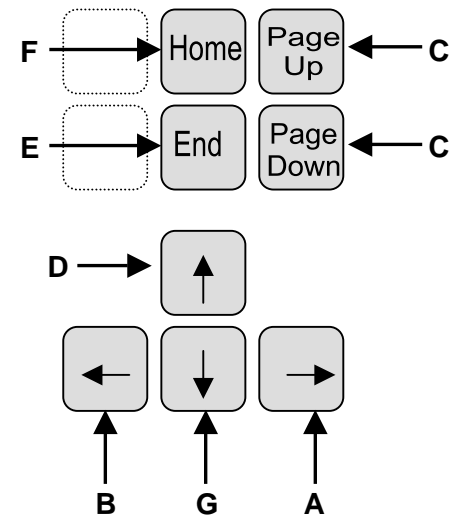
The ID No. setting shows which ID no. setting was made for the data (if any) when saved to hard drive.



- The play controls below are used to view the image data contained in the currently displayed .dat. Related operations are as described on the following page. Besides the play controls in the preview window you can also use 'hot keys' in the PC keyboard.



Controls in the Preview window



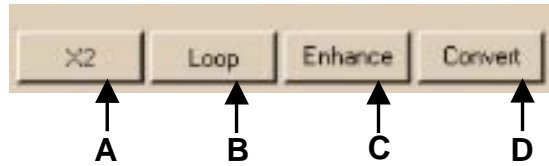
PC Keyboard

A	Starts standard speed forward play of image.
B	Starts standard speed reverse play of image.
C/D	Starts forward or reverse frame-by-frame play of images. In this case, clicking on either forward/reverse button will forward or reverse play, respectively, 1 frame each click. D also auto selected same time. Clicking on D first, allows selection of either forward/reverse button but will not allow selection of other controls.
E	Jumps play to first frame in file.
F	Jumps play to last frame in file.
G	Stops play, returns display to first frame in file.

Slider shows play direction and position on playtime displayed image appears at.

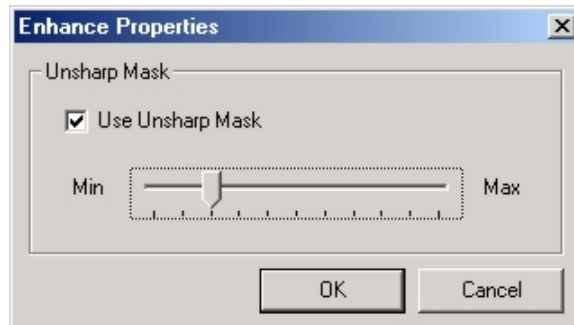
(Continued following page.)

5. Selection buttons shown at right select operations given in the table below the figure.



A	This can only be chosen when image size is either 256 x 256 or 200 x 200. In this case viewed size becomes 2 times 512 x 512, 400 x 400.
B	Play through of images repeated again from start frame after play of end frame is completed.
C	Allows unsharp mask to be applied to playback image if results are too poor and enhancement of the image is needed during playback.
D	Used to convert data to AVI file or DIB sequence. Explained later within this section.

In the case of 'Enhance' above, the window below will open if you click on this control. This can be used to apply an unsharp mask to enhance images. The slider determines to what degree the unsharp process is applied.



6. When you are ready to convert data, it can be converted to either AVI file or DIB sequence (sequential bitmap (.bmp) file data). It is recommended to use the 'Enhance' function before conversion to ensure the data you save has the best resolution possible for your use.

You also must have Windows Media Player™ or other similar program installed on your computer that supports AVI data conversion if you are converting to AVI file. DIB sequence save requires no special support software as each frame in the image is saved as a single bitmap file. These can be opened in any graphics program with bitmap compatibility.

7. When you click on 'Convert' to start the conversion process, the Conversion window shown at right will open.

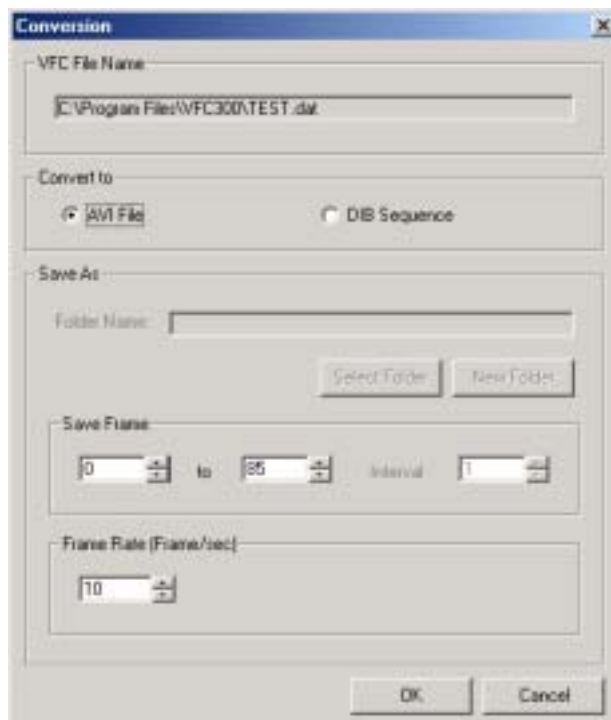
If you are converting to AVI, 'AVI File' must be selected in the Convert to section as shown at right.

Before initiating conversion make save from/save to settings in the Save Frame section. Also make an Interval setting if this setting is enabled. (See step 9 following for more information on this setting.)

Also set a play speed for the specified save frames in the Frame Rate (Frame/sec) section.

(Continued following page.)

When all this is done, click on 'OK' to start conversion to AVI file data.



8. If you are converting to DIB sequence, 'DIB Sequence' must be selected in the Convert to section as shown at right.

Before initiating conversion in this case, click on 'Select Folder' to store to a previously made folder. **Or** click on 'New Folder' to start a new folder of sequential bitmap files. Also make save from/save to settings in the Save Frame section. Also make an Interval setting if this setting is enabled. (See step 9 following for more information on this setting.) When all this is done, click on 'OK' to start conversion of video frames to DIB sequence files.



9. As regards the Interval setting in the Save Frames section of the Conversion window, this determines which frames in the play back data are actually saved to the converted file.

Available settings here are 1, 2 or 3. How each setting effects which frames are converted is illustrated by the bar examples below.

Actual frames played

1	2	3	4	5	6	7	8	9	10	11	12	13
---	---	---	---	---	---	---	---	---	----	----	----	----

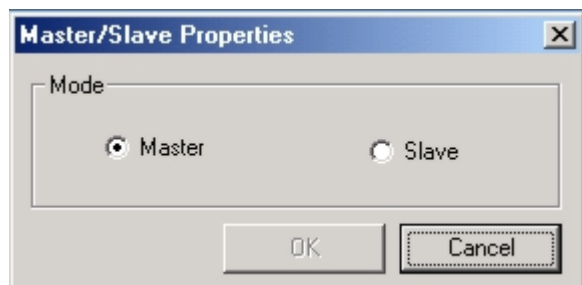
Frames in playback data converted to new file in grey

Set 1	1	2	3	4	5	6	7	8	9	10	11	12	13
Set 2	1	2	3	4	5	6	7	8	9	10	11	12	13
Set 3	1	2	3	4	5	6	7	8	9	10	11	12	13

5-9. Master / Slave Mode

If you are using more than one camera, and want to sync camera operations so that they are used as a group (change view angle, etc.), you will have to set which VFC-300 is the master camera and which cameras operate as slaves. This is done by the procedure below.

1. Open the VFC-300 control program for the first camera you want to make the master/slave setting for. When the main window opens, verify camera is connected and communicating with your computer.
2. To do this, click on 'Connect' in window shown below. If communication connection has been correctly made, characters on all selections in the Operations and Settings sections will change from grey to black (all buttons enabled) to show computer and VFC-300 are in communication.
3. If camera is communicating, click on 'Master/Slave' in the Settings section of the window. A Master / Slave Properties window similar to the one at right should open.



4. If the first camera is to be the master, select 'Master' mode as shown in the figure above. Click on 'OK' to make setting and return to main window. **Note that once you set a camera to master, all others can only be set to slave.**
5. Open each control program for the remaining cameras in your configuration. Repeat steps 1 through 3 but set 'Slave' mode at step 4.

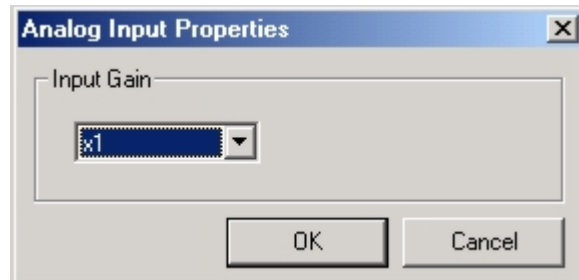
IMPORTANT

Master/slave operation also requires AUX cabling between all cameras. See sec. '2-4-3. Master-Slave Connection' previous for cable information.

5-10. Adding Analog Record Input

It is also possible to sync an external analog input to the camera video and same time record by the procedure below.

1. First open the control program for the camera you will be working with. When the main window opens, verify camera is connected and communicating with your computer. ('Connect' in TCP/IP COM section to grey indication.)
2. If camera is communicating, click on 'Analog IN' in Settings section of Record window to open the Analog Input Properties setting box shown at right.



IMPORTANT

Note that input range for analog signal is 0.3VDC to 4.7VDC. Analog input operation also requires AUX cable connection. See sec. '2-3. AUX Connector' previous for related pin information.

3. The Analog Input Properties setting determines the gain factor of the analog signal. Available gain setting range is x1 through x4 or none (if no gain factor needs to be applied).

Applied gain for analog signal input can also be noted and adjusted during preview of camera video in the Record window. (See sec. '5-4. Camera Setup' previous in this manual.)

5-11. Exiting Control Program

When you finish using your VFC-300 program for any given camera, exit program operation as follows.

1. In control program for the camera you are working with, click on 'X' close mark in upper right corner.
2. Turn off power to camera to finish shutting down operations.

5-12. Additional Operational Notes

The VFC-300 is designed for both high speed and slow speed imaging. The additional operational points will help you to better use your camera for these types of operations.

Points related to both high and slow speed operations:

- **Lens:** Camera gain can be set to +3dB, +6dB, +9dB, +12dB, +15dB, or +18dB to offset overly dark imaging conditions by allowing more light to enter the lens. (See sec. '2-2-3. Lens' previous.)

IMPORTANT

Aperture from F1.4 and up (F2.0, F2.8, etc.) needed for correct imaging. If F1.0 or F1.2 used, ghosting can occur at the top and / or left part of the image.

Ghosting can also sometimes occur when F1.4 or above depending on the type of lens used.

- **External Trigger:** External trigger input must be TTL negative polarity or make contact. Signal must be input to cameras via pin 3 / pin 10 of AUX connector on VFC-300. (See sec. '2-3. AUX Connector' previous for related pin information.)
- **Internal Trigger:** This trigger is initiated from the Record window of your control program for each camera. Note that when the internal trigger is used during record operations, the point in the record timeline at which the trigger appears may differ from when it was input due to communication lag between the camera and the computer.

If you want to use the trigger function during record, and want to offset this delay, it is recommended to set trigger mode to either 'center' or 'end'. (See sec. '2-3. AUX Connector' and sec. '5-3. Record Setup' previous for related information.)

Points related to high speed operations:

This type of imaging is suitable for analysis use in situations where events occur at high speeds. For example, when a batter swings at a ball during a baseball game and you want to slow view the related movements made by the batter at a latter date.

- **Record Speed:** FPS setting may need to be to one of the highest settings to offset light problems within the viewed scene. Make the speed setting that gives you the most visible results while previewing the live camera video.
- **Shutter Speed:** Exposure time to 1 frame. A shutter speed setting from 1/ 300 seconds to 1/ 5000 seconds per each 1 frame exposure is the best speed at which to avoid frame blur.
- **Light Level:** When shutter speed is set to the speeds mentioned above, image luminance can downgrade. One of the 3 operations following can be used to help compensate for this.

(Continued following page.)

Halogen

If you are using 500W halogen lights placed at intervals to illuminate the image area, this setting should be made. (Using only one 500W halogen light will not be sufficient to adequately illuminate the camera target. You must use enough multiple lights to obtain adequate illumination and position them so as to minimize shadows.) Note that while this type of lightning can make the image more viewable, flicker may occur during high speed recording.

Strobe

Strobe flash devices can be synchronized with camera record operations to illuminate the image while record is occurring. TTL output via pin 5 / pin 11 of AUX connector on VFC-300 is needed to sync strobe device operation to camera record. (See sec. '2-3. AUX Connector' previous for related pin information.)

Further note that strobe operation will not be enabled (no strobe delay setting can be made) unless Shutter Speed is set to Open. (See sec. '5-3. Record Setup' previous for more on Strobe setting.)

Fluorescent

This setting is when a 100Hz / sec. (US areas) or 120Hz / sec. (European areas) fluorescent is used illuminate the image area. Note that these settings are not suitable for use during high speed record as flicker will occur.

Points related to slow speed operations:

This type of imaging is suitable for analysis use in situations where events occur over a long period of time. For example, when a flower sprouts and then blooms and you want to high speed view the entire cycle in a short time frame.

- Record Speed: A longer speed must be set. For slow speed imaging, a setting from 1 sec. / frame to 60 sec./ frame. is recommended.
- Shutter Speed: Exposure time should be set to 1/30 sec. If set higher, say to 1 sec., image record cannot be performed.
- Light Level: If 100Hz / sec. fluorescent (US areas) is used for lighting, shutter speed should be set to either 1/ 50 or 1/ 100 second.

If 120Hz / sec. fluorescent (European areas) is used for lighting, shutter speed should be set to either 1/ 60 or 1/ 120 second.

If you are using syncing flash devices and using them for illumination, AUX connector connection is required and strobe must be set as the illumination mode.

Strobe signal is TTL output via pin 5 / pin 11 of AUX connector on VFC-300. (See sec. '2-3. AUX Connector' previous for related pin information.)

Further note that strobe operation will not be enabled (no strobe delay setting can be made) unless Shutter Speed is set to Open or 1/30. (See sec. '5-3. Record Setup' previous for more on Strobe setting.)

6. Specifications and Dimensions

6-1. Operational Specifications

Camera elements	CCD 1/3 type, lattice, RGB color filter
Base size	4.65 μ m x 4.65 μ m
Pixel area	512 x 512 (max.)
Scan area	2.38mm x 2.38mm (max.)
Scan format	Progressive

Image size / Take speed / Shutter speed	200 x 200	High speed (frame / sec.)	300, 150, 100	1/frame, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000, 1/100000
		Low speed (sec. / frame)	1, 2, 5, 10, 60	1/30, 1/50, 1/60, 1/100, 1/120, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000, 1/100000
256 x 256	High speed (frame / sec.)	240, 120	1/frame, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	
	Low speed (sec. / frame)	1, 2, 5, 10, 60	1/30, 1/50, 1/60, 1/100, 1/120, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	
512 x 256	High speed (frame / sec.)	160, 80	1/frame, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	
	Low speed (sec. / frame)	1, 2, 5, 10, 60	1/30, 1/50, 1/60, 1/100, 1/120, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	
512 x 512	High speed (frame / sec.)	90, 45, 30	1/frame, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	
	Low speed (sec. / frame)	1, 2, 5, 10, 60	1/30, 1/50, 1/60, 1/100, 1/120, 1/300, 1/500, 1/1000, 1/2000, 1/3000, 1/5000, 1/10000, 1/20000, 1/40000	

Max. record time (When segmented memory mode)	non-	Image Size	Standard		Option	
		200 x 200	300fps	10 sec.	300fps	20 sec.
			150fps	20 sec.	150fps	40 sec.
			100fps	30 sec.	100fps	60 sec.
			1spp	55 min.	1spp	110 min.
			2spp	110 min.	2spp	220 min.
			5spp	275 min.	5spp	550 min.
			10spp	550 min.	10spp	1100 min.
		256 x 256	240fps	8 sec.	240fps	16 sec.
			120fps	16 sec.	120fps	32 sec.
			1spp	34 min.	1spp	68 min.
			2spp	68 min.	2spp	136 min.
			5spp	170 min.	5spp	340 min.
			10spp	340 min.	10spp	680 min.
			60spp	2040 min.	60spp	4080 min.

Where: fps = Frames / sec., spp = Sec. / frames

	Image Size	Standard		Option	
		Max. record time (When segmented memory mode) non-	512 x 256	160fps	6 sec.
		80fps	12 sec.	80fps	24 sec.
		1spp	17 min.	1spp	34 min.
		2spp	34 min.	2spp	68 min.
		5spp	85 min.	5spp	170 min.
		10spp	170 min.	10spp	340 min.
		60spp	1020 min.	60spp	2040 min.
	512 x 512	90fps	5 sec.	90fps	10 sec.
		45fps	10 sec.	45fps	20 sec.
		30fps	15 sec.	30fps	30 sec.
		1spp	8 min.	1spp	16 min.
		2spp	16 min.	2spp	32 min.
		5spp	40 min.	5spp	80 min.
		10spp	80 min.	10spp	160 min.
		60spp	480 min.	60spp	960 min.

Where: fps = Frames / sec., spp = Sec. / frames

Record modes	Endless (Loop record), Trigger input (selectable: start, center, end), Trigger from computer control program, (External trigger via AUX connector)
Gain	0dB, +3dB,+6dB, +9dB, +12dB, +15dB, or +18dB selectable
Gamma	None, gamma1, gamma 2 or gamma 3 selectable
White Balance	Daylight, fluorescent light, halogen light, user 1 or user 2 selectable (User preset can be set for each RGB component)
Image download	Download transfer time is about 2 min. for standard version (full capacity) or about 4 min. for expanded option (full capacity). (Actual time will depend on computer specs as well as network traffic load)
Display indications	[During Record / Playback] Frame no., image size, record speed, shutter speed, gain, record interval, ID number [Playback Controls] Forward play, reverse play, stop, jump to start frame, jump to end frame, frame-by-frame forward, frame-by-frame reverse
Preview	2 frames / sec. (During image and camera focus adjustment)
Interfaces	Ethernet 10base-T/100base-TX (std.), IEEE1394 (software option required)
External Trigger input	Stop record (Negative TTL or make contact)
Master / slave input	TTL negative logic, same sync frame sent to all slave cameras (No input made to master)
Master / slave output	TTL negative logic, output to first slave camera in cascade connection
Analog data input	0.3 V to 4.7V analog data sample synced to each frame during image record (8-bit)
Strobe output	TTL negative logic (8 preset phase difference settings possible)
Lens and mount	1/2 inch compliant, C-mount to camera
Resolution	350TV standard (when image size 512 x 512)
Sensitivity	1200 I x F4 (no gamma correction, sensitivity 0dB, 30 frames/sec.)
Vibration Endurance	19.6m/s ² (2G)
Power	9VDC ± 5% (supplied via accessory AC-to-DC adaptor)

Consumption	0.6A
Ambient Temperature	0 to + 40
Storage temperature	- 5 to + 45
Condensation	10% to 95% (no condensation)
External dimensions	75(V) x 75 (H) x 172 (D) mm
Weight	Approx. 1kg

6-2. External Dimensions

(All dimensions shown in mm.)

