

3640 SERIES ENVIRONMENTAL CAMERA INSTALLATION AND OPERATION MANUAL



Shown with optional sun shield



Figure 1. GUI Controlled Environmental Color Camera

Technical Manual 6X-1049

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COHU
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NOTE: This equipment has been tested and found to comply with the limits for a Class A Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications to this equipment not expressly approved by Cohu Electronics could void the users authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.0 GENERAL DESCRIPTION

This introduction briefly describes the overall characteristics of the Model 3640 Camera (figure 1) related to its installation and operation.

1.1 Electrical Characteristics

The 3640 camera provides a Graphical User Interface (GUI) controlled color CCD Camera in a pressurized environmental housing. All electrical connections are via a single 39 pin rear panel connector. Table 1 lists electrical and mechanical specifications for the 3640 Camera.

Video output may be provided by an optional fiber optic connector added on the rear panel. When this option is selected, the 75 ohm output on the 39 pin connector should not be terminated. Any temporary connections to this 75 ohm output for maintenance purposes should be done with a short 75 ohm coax cable to avoid any "stub" effect on the video.

The Camera operates as either NTSC or PAL format, depending on the model. Both of these formats are available in a high-sensitivity version.

This Camera operates at an internal clock rate of 28.6363 MHz (NTSC) or 28.375 MHz (PAL).

If the phase adjust line option is installed, the vertical interval of the camera is referenced to the 60 Hz for NTSC (or 50 Hz PAL) power input. A six position switch on the rear panel then makes it possible to shift this reference in 60 degree increments so that the camera can be phased with other cameras in the system that may not have the same power line phase reference. This phase difference can occur either because the other cameras are on a different phase of the power source or perhaps because they are connected to a power source operating from a different transformer.

Depending on the version, this camera will operate from either 115 V ac or 24 V ac power. Power is applied to the rear panel connector. Internal heaters cycle on and off at low environmental temperatures to maintain temperature inside the housing at operating levels.

When an optional zoom lens is installed, dedicated pins on the connector provide for control of zoom, focus, and iris. Position location outputs are provided for zoom and focus.

An optional ID generator mounted inside the camera housing provides identification and alarm messages, which can be programmed via RS-422 on the rear panel connector. With this option, internal temperature and pressure can also be made to display on the monitor. Cohu's Win MPC graphical user interface (GUI) software can be used to program these messages. (WinMPC is available at no cost from the cohu-cameras web site.)

Communications with the internal camera module is maintained by RS-422 when the ID generator option is installed or directly by RS-232 when that option is not included.

If either shuttering or a manual gain setting is desired, the setting must be performed before the camera housing is sealed and pressurized. Changing any of these optional settings requires complete disassembly of the camera housing. It must then be re-sealed, purged with dry nitrogen, and pressurized with the dry nitrogen before returning to service.

The following options can be chosen for a the camera:

1. Fiber optic video output
2. ID generator
3. Variable phase line lock
4. Either manual iris lens, auto iris lens, dc iris lens, or zoom lens
5. Sunshield

1.1.1 Sensor Characteristics

Figure 2 shows the typical response characteristic across relevant wavelengths of the sensor. Figure 3 is the response characteristic for the IR cut (blocking) filter permanently mounted in front of the sensor.

These characteristic curves apply to both NTSC and PAL sensors.

A model number interpretation diagram appears in figure 4. That diagram shows the various basic configurations of the Camera.

Table 1. 3640 Specifications

ELECTRICAL	
Format	Interline transfer color CCD operating in field mode 1/2 inch (6.45 × 4.84 mm) standard 1/3 inch (4.88 × 3.66 m) future option
Pixels	768 × 494 NTSC 752 × 582 PAL
Pixel Cell Size	1/2 inch: 8.40 (H) × 9.80 (V) μm NTSC ; 8.60 (H) × 8.30 (V) μm PAL 1/3 inch: 6.35 (H) × 7.40 (V) μm NTSC ; 6.50 (H) × 6.25 (V) μm PAL
Resolution	NTSC: 460 H × 350 TV lines; PAL: 450 X 415
Internal Clock	28.63636 MHz (NTSC); 28.375 MHz (PAL)
Sync	Internal crystal
Frame Rate	30 fps (NTSC); 25 fps (PAL)
Sensitivity, Faceplate	1/2 inch: 3 lux with full video, minimum gain
White Balance	Auto or manual white balance, 2500 to 9500 K
Gamma	Choices of 10 gamma curves (8 power function, 2 linear)
Gain	0 to 32 dB gain control — either agc or menu selected manual adjustment
Shutter	1/60 (1/50 PAL) to 1/50,000 s, in nine steps (menu selected)
S/N	48 dB max; 22 dB S/N with 32 dB gain
Spectral Response	See figure 2 and figure 3
Integration	2 to 510 fields available using menu selection
Video Output	Simultaneous composite and S-video (NTSC or PAL)
Lens Control	5 volt camera: manual iris only 12 volt camera: manual iris, auto iris, or dc iris
Serial Communications	RS-422 with ID generator option or RS-232C otherwise - 19,200 baud (fixed) -
Power Input	115 V ac ±10 % or 24 V ac ±10 %
MECHANICAL	
Dimensions	21 inch long × 5.2 inch high (533 x 132 mm), without sun shield. See figure 4
Weight	10 lb (3.9 kg), less lens
Camera Mount	5 each 1/4-20 threaded holes on mounting base attached to barrel housing
Connectors	39-pin Bendix PT07C-20-39P, Schrader valve for pressure charging with dry nitrogen, pressure relief valve, optional fiber optic connector
ENVIRONMENTAL	
Temperature	-20 to 60 °C (-4 to 140 °F) operating -30 to 85 °C (-22 to 185 °F) non operating
Humidity	Up to 100 % relative humidity
Vibration (less lens)	Sine vibration from 5 to 60 Hz, with 0.082 inch total excursion (15 g's at 60 Hz) Random vibration from 60 to 1,000 Hz, 5 g's rms (0.027 g ² /Hz without damage)
Shock (less lens)	Up to 15 g's, 11 ms, in any axis under non-operating conditions, MIL-E-5400T, paragraph 3.2.24.6
Altitude	Sea level to equivalent of 3,000 meters (10,000 feet) 508 mm / 20 inches of mercury)
Air Contaminants	Withstands exposure to sand, dust, fungus, and salt atmosphere, per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, and 3.2.24.9.
Explosion	MIL-E-5400T, paragraph 3.2.24.10
Acoustical Noise	Greater than 150 dB continuously for 30 minutes
<i>end</i>	

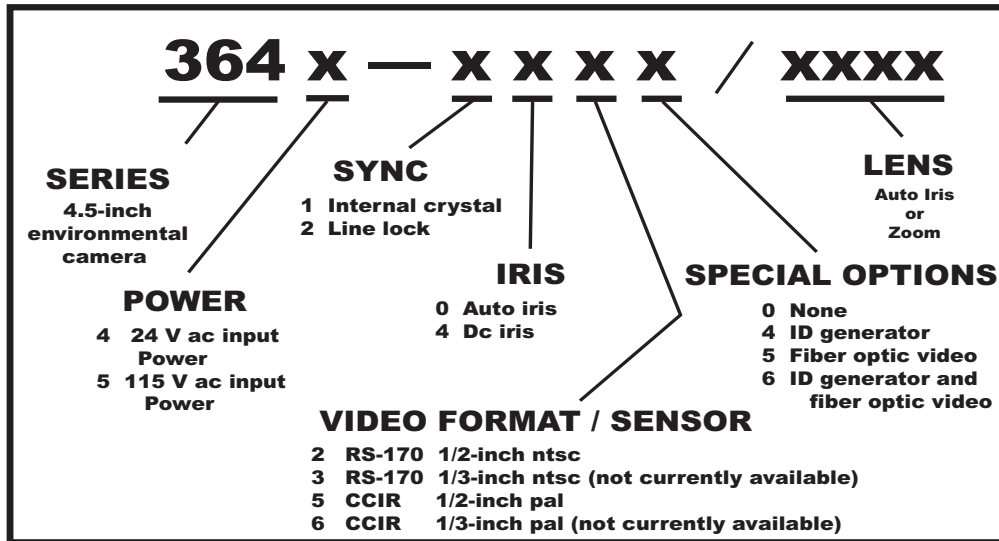


Figure 4. Model Number Interpretation Diagram

1.2 Mechanical Characteristics

Dimensions are shown in figure 5. The Camera consists of a sealed and pressurized 21 inch long barrel housing attached to a mounting base with two stainless steel straps. An optional sun shield can be mounted over the housing to prevent heat build up from direct sun light on the barrel. This sun shield extends beyond the ends of the barrel about three inches at each end and can provide some protection from direct sun exposure on the camera lens in certain situations.

All electrical connections are made via a 39-pin connector located on the rear panel. A fiber optic option makes video available from a fiber

optic connector located on the rear panel. Video from the 39 pin connector, then, should not be used.

A Schrader valve (car tire type valve) on the rear panel provides for pressurizing the housing with dry nitrogen. This valve can be used to occasionally add dry nitrogen as necessary to maintain pressure in the barrel at about 5 psi (35 kPa). A pressure relief valve on the rear panel releases pressure at 20 psi (138 kPa) to prevent extreme over-pressurization of the housing.

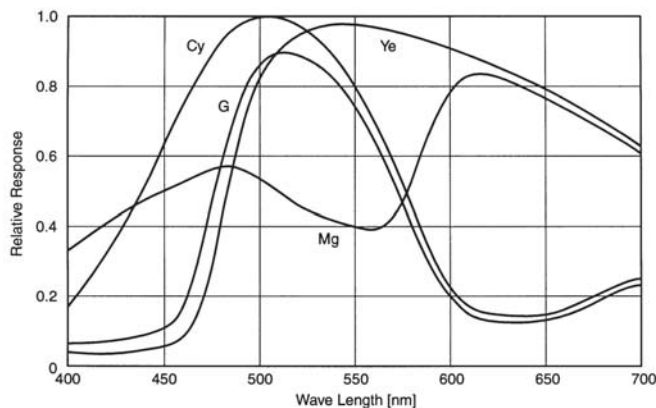


Figure 2. Sensor Color Response Characteristics

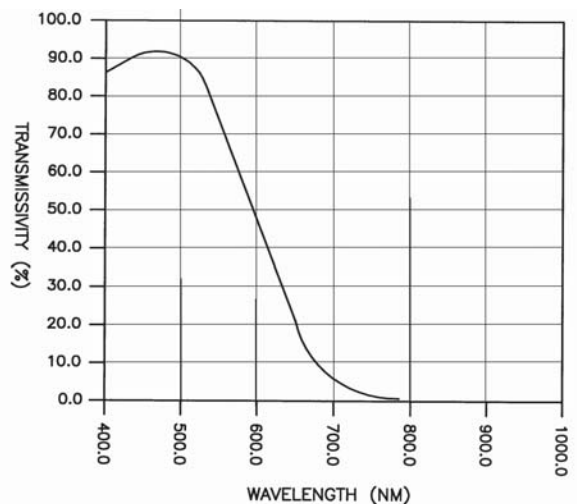


Figure 3. IR Cut Filter Response Characteristics

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The mounting base for the camera has five 1/4-20 holes in line down the center. At least two of these should be used to mount the camera. High quality stainless steel bolts and lock washers should be used.

2.0 INSTALLATION

In addition to the actual installation requirements, this section covers a number of other items including proper shipping and handling of the Camera.

2.1 Unpacking and Receiving Inspection

This item was thoroughly tested and carefully packed in the factory. Upon acceptance by the carrier, they assume responsibility for its safe arrival. Should you receive this item in a damaged condition, apparent or concealed, a claim for damage must be made to the carrier.

If a visual inspection shows damage upon receipt of this shipment, it must be noted on the freight bill or express receipt and the notation signed by the carrier's agent. Failure to do this can result in the carrier refusing to honor the claim.

When the damage is not apparent until the unit is unpacked, a claim for concealed damage must be made. Make a mail or phone request to the carrier for inspection immediately upon discovery of the concealed damage. Keep all cartons and packing materials.

Since shipping damage is the carrier's responsibility, the carrier will furnish you with an inspection report and the necessary forms for filing the concealed-damage claim.

To return the product to the factory for service, please contact the Customer Service Department for a Return Authorization (RA) Number.

2.2 Static Discharge Protection

Procedures in this manual do not require entry into the housing of the Camera. But in the event that a disassembled camera is being handled, the following precautions should be followed:

INSTALLATION AND OPERATION

Table 2. Items Supplied

ITEMS SUPPLIED	
ITEM	DESCRIPTION
1	Camera Barrel
2	Base
3	Stainless steel base-to-barrel attachment straps (2)
Note: These items are supplied as one assembly	

CAUTION

This Camera contains sensitive devices that can be damaged by static discharge. Use appropriate static control methods when working inside the Camera.

Components used in modern electronic equipment, especially solid state devices, are susceptible to damage from static discharge. The relative susceptibility to damage for semiconductors varies from low with TTL to high with CMOS. Most other semiconductors fall between TTL and CMOS in susceptibility to static discharge. As a minimum, therefore, observe the following practices when working inside this or any other electronic equipment:

1. Use conductive sheet stock on the work bench surface.
2. Connect the sheet stock to ground through a 1 megohm or greater value resistor.
3. Use a wrist strap connected to ground through a 1 megohm or greater value resistor when working at the bench.
4. Maintain relative humidity of the room above 30 percent. This may require a room humidifier. Working on circuits with relative humidity below 30 percent requires extraordinary procedures not listed here.
5. Use antistatic bags to store and transport an exposed chassis, circuit boards, and components. Use new antistatic bags. Old, used bags lose their static protection properties.

This list serves as a reminder of the minimum acceptable practices. Be sure that all static discharge devices at the work bench are properly installed and maintained. Standard grounding mats and wrist straps purchased for use at work benches are supplied with leads having current limiting resistors for safety. Never substitute with a grounding lead not having the resistor.

2.3 Equipment Supplied

The camera consists of a single environmental housing with attached mounting base. Cameras intended for use outdoors typically are fitted with an optional sun shield assembly that wraps around the top half of the camera and extends about three inches beyond the housing at each end. This sunshield minimizes heat buildup inside the camera by shielding it from the direct rays of the sun. It can also provide some protection from lens flare in certain situations.

2.4 Equipment Required but Not Supplied

As a minimum the camera requires a source of operating power, a monitor on which to view the scene, an interconnection cable, and a computer running Graphical User Interface (GUI) software for control of the camera if this is desired. Programming the optional ID generator messages requires a GUI software such as the Cohu WinMPC setup and maintenance software. This is available at no cost from Cohu Electronics (www.cohu-cameras.com).

Communications with the camera when the optional ID generator is installed must be RS-422. Since most PC computers have an RS-232 serial output, a 232/422 converter would be required. If the camera is not optioned with the ID generator, then the computer can communicate directly to the camera via RS-232 at 19,200 baud.

The camera will also require mounting bolts and a platform of some type on which to mount it.

2.5 Cabling Requirements

A single 39-pin connector on the rear panel provides all electrical connections for the Camera. If the optional fiber optic connector is mounted on the rear panel, a fiber optic cable must be con-

Table 3. Rear Panel Connector and Mating Cable Plug

REAR PANEL CONNECTOR	MATING CABLE PLUG
Cohu 1310225-004 Bendix PT07C-20-39P	Cohu 1310230-005 Bendix PT06A-20-39S(SR)
	Straight potting sleeve Cohu 1310216-002
	90° strain relief 1310441-001 and straight potting sleeve 1310216-004
<small>Note: Mating Cable Plug requires either the -002 straight potting sleeve or the 90 degree strain relief with the -004 potting sleeve.</small>	

nected to it for the video. See figure 6 for a typical system interconnection cable.

2.6 Power Requirements

The model number determines whether the Camera will operate from 24 V ac or 115 V ac. See figure 4. These voltages are applied to different pins on the rear panel connector.

A line-lock version of the Camera has a six position phase switch on the rear panel. See section 2.8.

2.7 Mounting Requirements

The dimensions shown in figure 5 illustrate all relevant characteristics related to mounting the Camera. Also note that the 1/4-20 threaded holes in the bottom of the mounting adapter base are meant to accept not more than 3/8-inch depth from the mounting bolts. The bolts will bottom out against the camera housing barrel if an attempt is made to thread these bolts deeper than 1/2 inch.

2.8 Line Lock Operation

A line lock version of the Camera relies on an external sync reference derived from the ac power line in place of an internal crystal oscillator reference source.

If the Camera is to be operated in a system arrangement with other equipment it may be necessary for this line-lock source to have a phase shift characteristic. For equipment operating off different phases of the power line or perhaps off a different transformer or other source, a typical step-phase change in 60 degree increments makes it possible to match with the vertical interval of another camera.

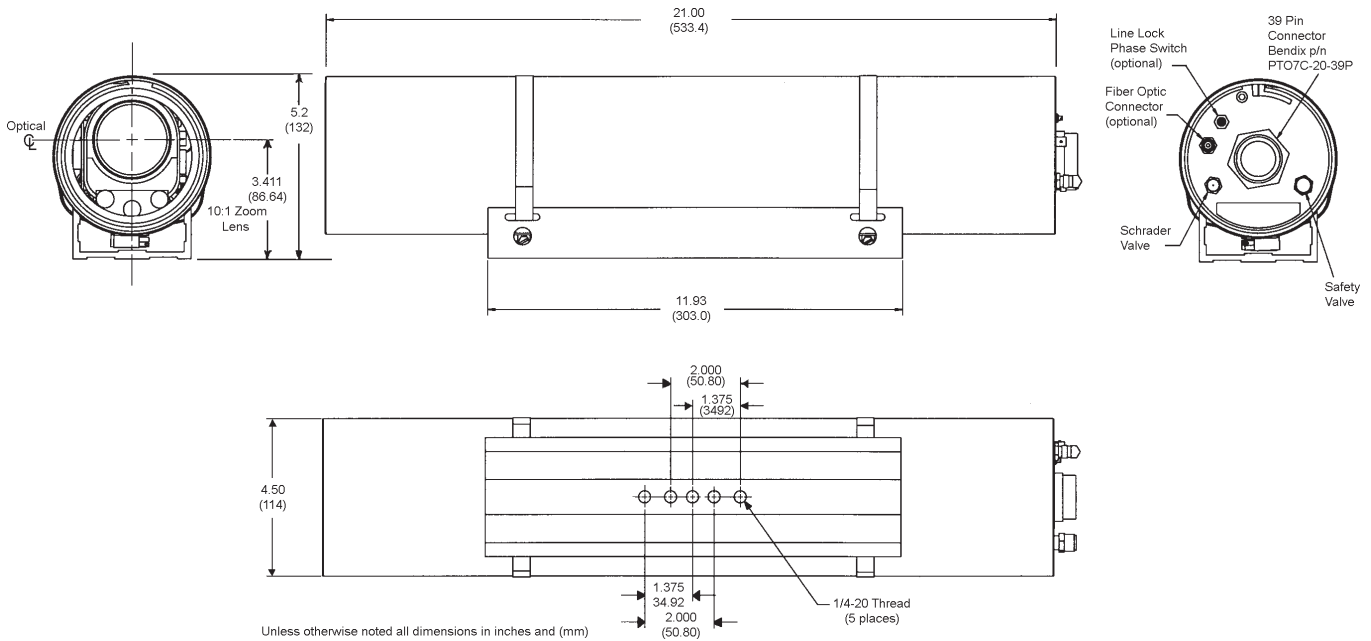


Figure 5. Dimensions, Model 3640 Camera

2.9 Installation Procedure

Installing the Camera is straightforward. If it is known that the internal control functions are properly set, it is only necessary to mount the Camera to a suitable base, mate the rear panel connector and apply power. This assumes the other end of the cable is properly connected to a source of power, a tv monitor, and any other required equipment.

See figure 6 for an illustration of the typical cabling requirements for a Camera. As a minimum, power and a tv monitor would have to be connected to the Camera. Then if an zoom lens were installed, controls for this lens would be required.

2.9.1 ID Generator Messages (Option)

If the optional ID generator is included in the camera the messages it can provide must be entered into its memory. This is done with Cohu's WinMPC graphical user interface (GUI) software. This is available at no cost from the cohu-cameras.com website.

The ID generator messages are entered via RS-422 on the 39-pin rear panel connector. Since

most computers have an RS-232 serial port, a 232 to 422 converter will probably have to be used for this connection. It is recommended that a B&B model 422PP9TB converter be use. There are subtle differences among these types of converters and not all will work in this application.

This GUI can also be used to turn on and off a display of internal housing pressure and temperature when the ID generator option is installed.

Note that if the optional ID generator is not installed in the camera, communications with the 39 pin Bendix type connector is via RS-232.

2.9.2 Rear Panel Features

All interconnections with the camera are via a 39-pin Bendix type connector — unless the fiber optic video option is installed in which case video leaves the camera on an ST type fiber optic connector.

2.9.2.1 39-pin Connector

Table 4 lists all pin functions of this connector. Note that certain pins are not used and others may not be used depending on what options are in-

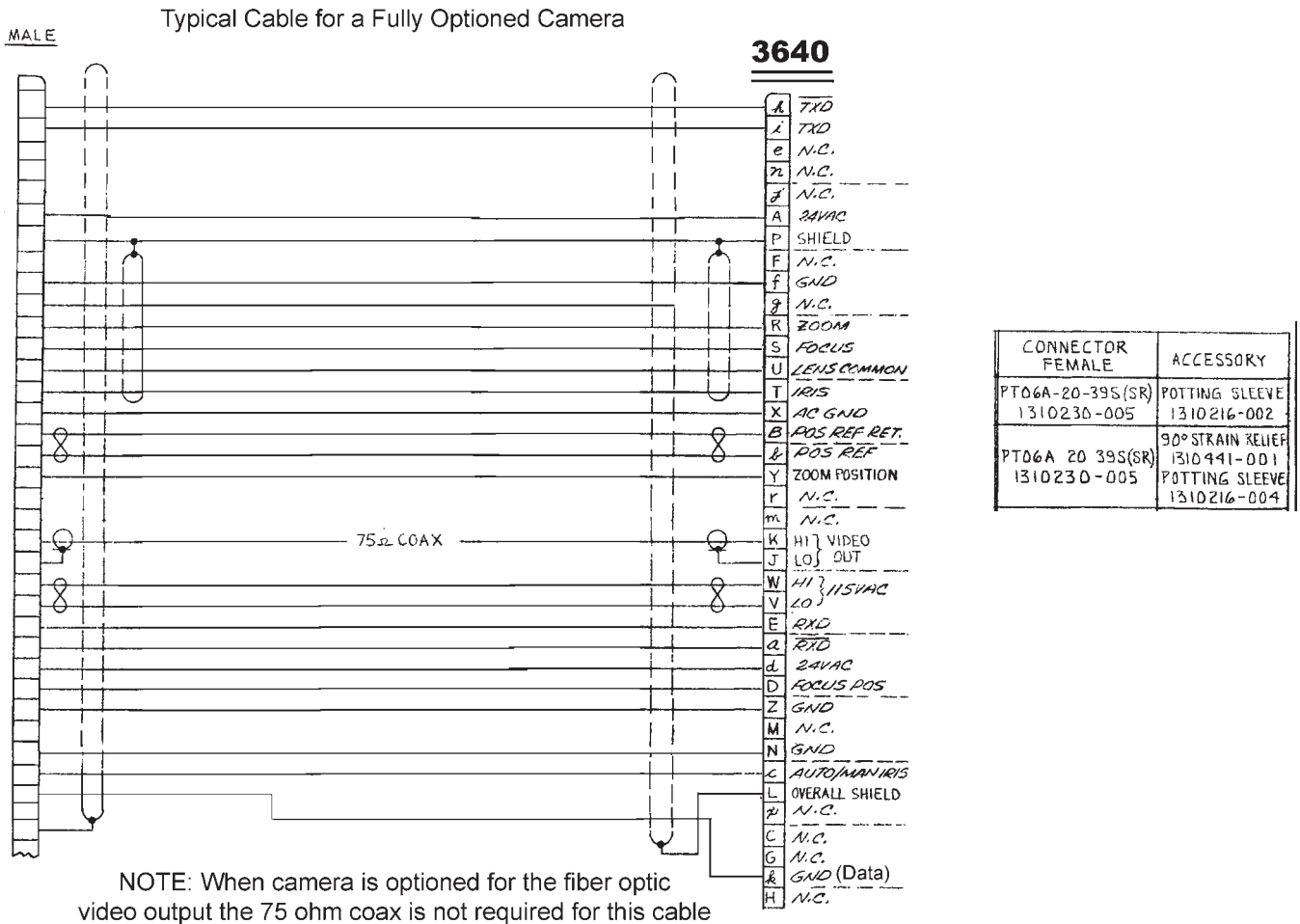


Figure 6 . Typical Interconnection Cable

stalled in the camera. If a zoom lens is not being used, the lens related position return pins are not used. The TXD, TXD (not) and RXD, RXD (not) RS-422 pins are used only when the related ID generator circuit board option is installed. When the optional ID generator is not installed only the TXD and RXD pins are used (RS-232).

The Camera is internally wired for either 115 V ac or 24 V ac — depending on the model.

2.9.2.2 Fiber Optic Connector (option)

An ST type connector is mounted on the rear panel when the fiber optic video output option is

installed in the camera. This connector supports an 850 nm multimode connection.

When the fiber optic video output option is installed in the camera, video from pins K and L on the 39 pin connector cannot be used for system connections. The fiber optic module inside the camera is internally terminated with 75 ohms. Pins K and L could be used during maintenance operations if desired so long as a short cable is connected to these pins and no termination is used. A long cable could act as a “stub” and cause interference with the video signal. If a terminated video connection is made to pins K and L video level drops to about one-half.

Table 4. Pin Functions, Rear Panel Connector

PIN	FUNCTION
A	24 V ac
B	position reference return
C	not used
D	focus position
E	RXD RS-422 or RS-232
F	not used
G	not used
H	not used
J	ground, video out
K	video out, 75 ohm, ntsc or pal
L	ground
M	not used
N	ground
P	shield (zoom lens controls)
R	zoom
S	focus
T	iris
U	lens common (ground)
V	115 V ac low (neutral)
W	115 V ac high (line)
X	ground, ac power (115)
Y	zoom position
Z	ground
a	RXD (not) RS-422
b	position reference
c	auto/manual iris select
d	24 V ac input
e	not used
f	ground
g	not used
h	TXD (not) RS-422
i	TXD RS-422 or RS-232
j	not used
k	ground RS-422 or RS-232
l	not used
m	not used
n	not used
p	not used
r	not used

Note: When an id generator is not installed in the camera, data communications must be RS-232. In this case, pins "a" and "h" are not used.

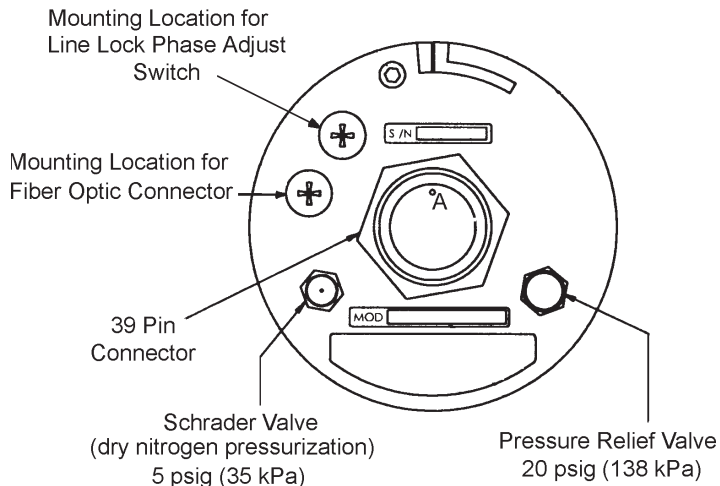


Figure 7 . Rear Panel Features

2.9.2.3 Phase Adjust Line Lock Switch

If the vertical interval of the camera must occur at the same time as other equipment in the system, a six position switch on the rear panel provides for six 60-degree increments of shift when the line lock option is installed. Equipment operating on other phases of the power line or perhaps from a different transformer will typically have phase differences in 60 degree increments.

2.9.2.4 Schrader Valve

A Schrader valve is functionally identical to those used for car tires. But this valve should be used only to introduce dry nitrogen to a camera. During assembly cameras are purged of normal room air (which typically has a high relative humidity) by flowing dry nitrogen into the Schrader valve and out the pressure relief valve. This relief valve is held open to aid in the flow of nitrogen out of the camera. This purging process removes moist room air from inside the camera and provides an internal relative humidity of five percent or less. A camera is typically pressurized to 5 psi (34 kPa). Pressure can be allowed to go below this — even down to one or two pounds so long as the pressure does not ever become zero. An occasional recharge of dry nitrogen can be used to maintain pressure near 5 psi (34 kPa). If pressure continually drops it is an indication of a slow leak. These



Figure 8. Humidity Indicators

pressure references are gauge pressures (psig). They are relative to the altitude above sea level at which they are being measured.

2.9.2.5 Pressure Relief Valve

The pressure relief valve opens at about 20 psi (138 kPa). This valve can be manually lifted off its seat when it is desired to flow dry nitrogen through the camera to purge any moisture laden atmospheric air from the camera.

2.10 Front Window Features

The camera lens is mounted behind the window at the front of the camera housing. Near the bottom of this window are three circular disks inside the camera housing. The disk on the left is labeled 10, the middle one 20, and the one on the right 30. See figure 8.

When relative humidity inside the camera is below 10 percent, all these disks will be blue in color. If humidity inside the camera should for some reason rise above 10 percent, the 10 disk will turn color to pink. Likewise, if relative humidity rises above 20 or 30 percent the related disk will also turn pink. These disks can be used as an indication of the approximate relative humidity inside the camera. It should be below 10 percent and all disks blue in color.

If these disks turn pink it is an indication that pressurization with dry nitrogen has dissipated and moisture laden air has entered. Or it could mean that the camera was not properly reassembled and purged with dry nitrogen during maintenance procedures.

It may be possible to flow dry nitrogen through the camera for several minutes in an attempt to purge moist air from the camera. The Schrader

valve has a length of tubing attached to it inside the camera leading to the front of the housing. This puts introduced dry nitrogen at the front of the camera during purging and pressurization.

When a camera is being assembled, dry warm air is blown across these humidity indicators with a heat gun to turn them pink. Stripping them of moisture by flowing dry nitrogen across them can require far more dry nitrogen than is required to purge moisture laden air from the housing components.

2.11 Preparation for Shipment and Storage

For storage periods exceeding about one month, seal the unit in a vapor-proof bag containing a fresh desiccant pack.

Maintain the Camera storage environment within a range of -30 to 70 °C (-22 to 158 °F).

For shipment, package with enough foam padding or other packing material to prevent damage that can occur during shipping. The original shipping carton is a good container if it has not been damaged or subjected to excessive moisture. For shipping to the factory by Common Carrier, use the following address:

**Cohu Electronics
3912 Calle Fortunada
San Diego, CA 92123-1827**

Please contact the Customer Service Department for a Return Authorization (RA) number before sending any shipments to the factory:

**cst@cohu.com
or
858-277-6700 extension 261**

Prominently display the RA number on the outside of the shipping container(s) and on paperwork contained inside. Give a brief description of why the equipment is being returned and list the symptoms of any problems being experienced with the equipment.

3.0 OPERATION

After the Camera is installed, the actual operation of the Camera is controlled by the related frame grabber and image processing software. Note: The 3640 camera is one camera in a series of cameras designated overall as the



Figure 9. About Screen

3600 series. This section of the manual is related to the control GUI which typically makes references to the 3600 series overall. All references to “3600” are fully applicable to the 3640 version covered in this manual. Also, the GUI is occasionally revised slightly, so the version shown in this manual may not exactly reflect the latest version of the GUI available from the Cohu website.

A manual lens may require some opening and closing of its iris in response to light conditions. The lens may also require refocusing from time to time, but otherwise there is no other attention required for the Camera.

Camera functions are primarily controlled by the GUI interface running on a PC. Figure 9 is the “about” window of this software.

Figure 10 shows the opening window of the 3600 Graphical User Interface (GUI). Most control functions are performed from this window, but two other windows accessible from the Misc area also perform important functions:

1. Lens/Aperture opens the Lens Dialog window (fig. 11)
2. Set AE Window opens the Set Weight window (fig. 12)

3.1. DSP3600 GUI Home Screen (figure 10)

Figure 10 (DSP3600) is the primary control window where all the various functions are acces-

sible. Clicking various buttons in this window causes drop down menus to appear (figure 13). Table 5 lists the various functions and gives a brief description.

Table 8 lists the default settings of the GUI. When any selection is changed, that message is immediately sent to the Camera for implementation.

Any selection of settings in the GUI can be stored to one of the presets. Just select the desired preset number (Preset 1 to Preset 10), then click Download. If it is desired to make those (or some other group of selections) the internal default of the Camera, just click on the EEPROM button. Those settings are then stored in Camera memory and remain as the Camera default settings until other selections are stored by clicking on the EEPROM button again. The GUI will remember the factory default it is necessary to return to reset conditions.

If a frame grabber is used to capture the video output from a Camera, it too will have a GUI interface for manipulation of all its features.

3.1.1 Gamma Control

The gamma selections of the GUI make changes to the luminance (black-white) characteristic (Y-gamma). It can be set to any of 10 response curves.

Selections 0 through 7 are an increasingly nonlinear video response as shown in figure 14. These curves enhance video response in the darker areas of a scene.

Selection 8 (bottom curve in figure 15) is a standard linear video response. This may be the most desirable choice when making measurements where video level is a key factor.

Selection 9 (top curve in figure 15) is also a linear response but with an approximate 15 percent increase in gain. This results in a slight increase of noise in the video.

3.1.2 Freeze Frame

The current scene from a Camera can be stored into internal memory and presented as the output by either of two methods. (1) By checking the Freeze Image box on the GUI screen, or (2) by pulling pin 5 on the rear panel connector of the Camera low (5 V dc versions of the Camera only).

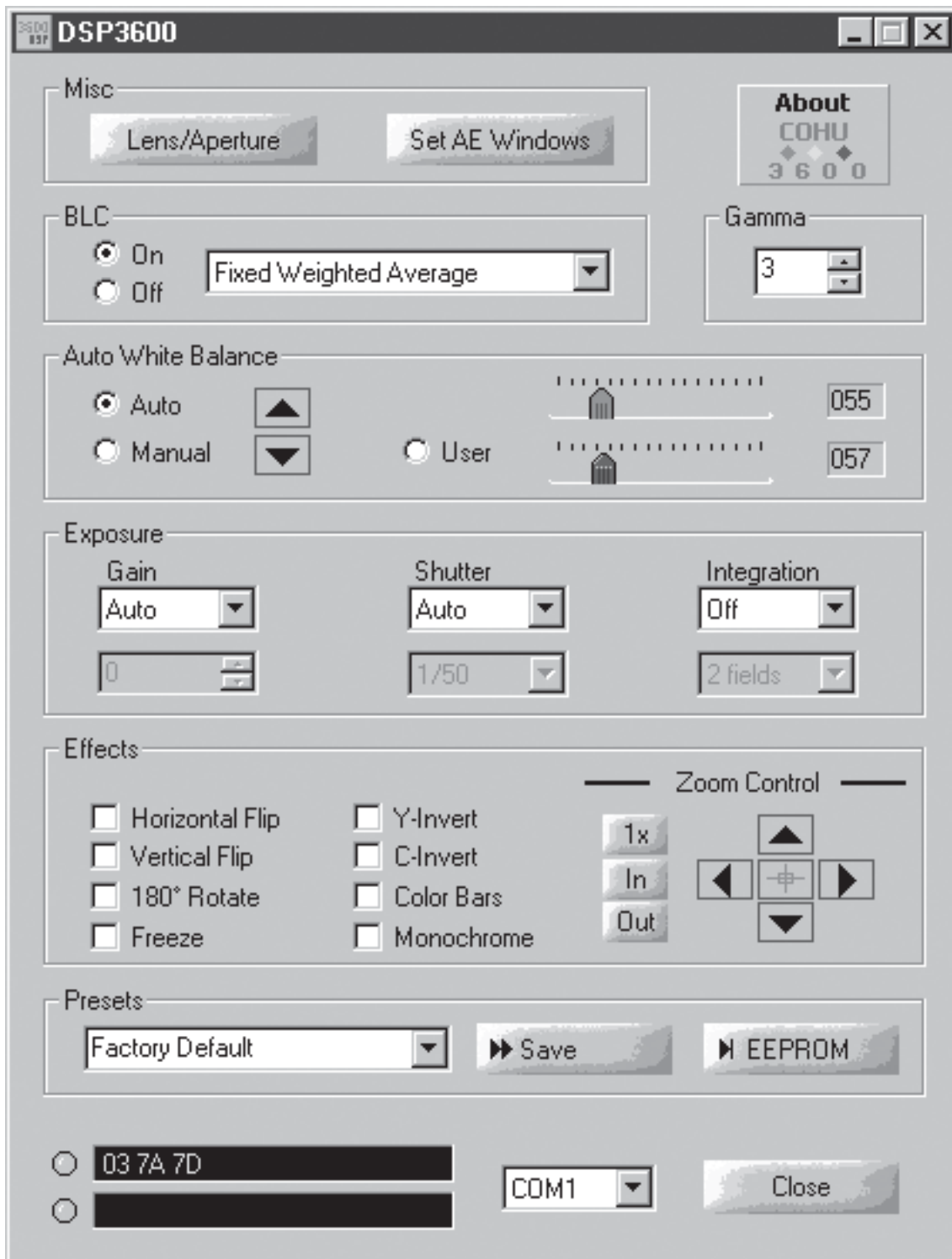


Figure 10. Control (Home) Screen

Table 5. GUI Functional Description

FUNCTION AREA		
NAME	EFFECT	
Misc		
Lens/Aperture	Opens new screen for either lens iris setup or aperture conditions	
Set AE Windows	Opens new screen for setting gain control windows size and locations	
About		
About Cohu 3600	Opens new window identifying program and version level	
BLC (Back Light Compensation)		
On	Fixed Weighted Average	Windowed fixed weighting (5 area)
	Auto Weighted Average	Windowed automatic weighting
	Brightens dark areas	Histogram Integration 1
	Darkens bright areas	Histogram Integration 2
Off	Back light compensation off	
Gamma (figures 13 and 14)		
Preset	0, 1, 2, 3, 4, 5, 6, 7, 8, or 9 can be selected (0 is least curve amount of curve, 7 is maximum curve). Gamma 8 is standard linear response. Gamma 9 is a linear response but with about 15% increased output — at the expense of additional noise	
AWB (Auto White Balance)		
Auto	Camera automatically adjusts white balance response curve	
Manual	Up / Down buttons adjust white balance response curve manually	
User	Activates red (top) and blue (bottom) sliders to right	Red slider changes red response curve
		Blue slider changes blue response curve
Exposure		
Gain	Auto / manual selectable	In manual: 0 through 7 selectable
Shutter	Auto / manual selectable	In manual: 1/50, 1/100, 1/250, 1/500, 1/1,000 1/2,000 1/4,000, 1/10,000, 1/20,000, 1/50,000 sec
Integration	Off / on selectable. When On, Gain & Shutter are set to Auto	2, 3, 4, 5, 10, 20, 40, 80, 160, 320, 510 fields available when On selected
Effects		
Horizontal Flip	Swaps the left and right of scene (not top and bottom)	
Vertical Flip	Swaps the top and bottom of scene (not left and right)	
180° Rotate	Rotates scene so top right becomes bottom left	
Freeze	Captures the current scene and continues to output it	
Y-Invert	Inverts the luminance signal	
C-Invert	Inverts the chroma signal	
Color Bars	Provides color bars at the output	
Monochrome	Removes chroma from the output	
Zoom Control	1x	Removes any digital zoom in effect
	In	Digitally zooms in
	Out	Digitally zooms out
	Tilt up button	Moves up in the scene
	Tilt down button	Moves down in the scene
	Pan right button	Moves right in the scene
	Pan left button	Moves left in the scene
	Center button	Returns to the center of the scene

Continued on next page

Table 5 (continued)	
FUNCTION AREA	
NAME	EFFECT
Presets	
Preset drop down menu	Choose from factory default or presets 1 through 7
Save	Saves preset 1 through 7 settings
EEPROM	Saves current entries to the eeprom
Message and COM Area	
Transmitt Indicator and transmitted data line	Indicator lights when data is being transmitted and hex code of data sent is shown
Receive Indicator and data received line	Indicator lights when data is being received and hex code of data received is shown
COM	Select from COM1 though COM3
Close	Closes the DSP3600 screen
<i>end</i>	

With either method, the scene is placed into memory at the end of the current vertical interval. That scene will continue to be presented until the freeze mode is ended. When the GUI Freeze Image box is unchecked or pin 5 is released to go high again, the new scene begins with the next vertical interval.

3.1.3 Back Light Compensation (BLC)

When the scene being viewed has a darker image in front of a bright background (such as a subject standing in front of a window at midday) a backlight condition results. The Camera has four BLC modes to select from when confronted with this situation. Two of these modes are based on a luminance comparison of different parts of the scene using windowing (3.4.1 and 3.4.2 below). Two others are based on a histogram analysis of the scene luminance (3.4.3 and 3.4.4 below). If both the foreground and background must show detail, a gamma curve can be used to make the foreground part of the scene brighter. This works best with the Darken Bright Areas mode (histogram 2).

3.1.3.1 Fixed Weighted Average (Window 1)

Select this compensation when the subject of interest is a backlighted dark image that does not move. The foreground subject will gain detail as a result of being made brighter, but the backlight area behind the subject will have a loss of detail

due to this overall increased brightness level. In this mode, each of the window areas of the scene have fixed values assigned to them for determining how to render the overall scene.

3.1.3.2 Automatic Weighted Average (Window 2)

Select this compensation when the subject of interest is a backlighted image moving against the bright background. The foreground subject will gain detail as a result of being made brighter, but the backlight area behind the subject will have a loss of detail due to this overall increased brightness level. In this mode, the weighting values are automatically controlled in response to the light intensity detection window.

3.1.3.3 Brighten Dark Areas (Histogram 1)

This selection enhances details of a darker foreground subject that is backlighted. The bright backlighted area will be made even brighter with a resulting loss of detail.

3.1.3.4 Darken Bright Areas (Histogram 2)

Use this selection to enhance detail in the backlighted area of the scene. The foreground image is made even darker, but use of a gamma curve can maintain detail of the foreground part of the image if this is necessary.

Table 6. Lens Dialog Screen

FUNCTION AREA		
NAME	EFFECT	
Lens		
Level	Setting range	Adjustment range from 109 to 149
DC Servo	For dc iris lens	Sets the dc iris drive stage for the lens being used
Video Servo	For auto / video iris lens	Sets the auto iris video drive stage for lens used
Manual	For manual iris lens	Level setting grayed out when in manual
Aperture Correction		
HAPGL	Horizontal Aperture Gain Low	0, 1, 2, & 3 available for selection
HAPGH	Horizontal Aperture Gain High	0, 1, 2, & 3 available for selection
VAPG	Vertical Aperture Gain	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 available for selection
VHAPG	Vertical / Horizontal Aperture Gain	0, 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224, 240, & 255 available
Close		
Close	Click button	Closes the Lens Dialog window
<i>end</i>		

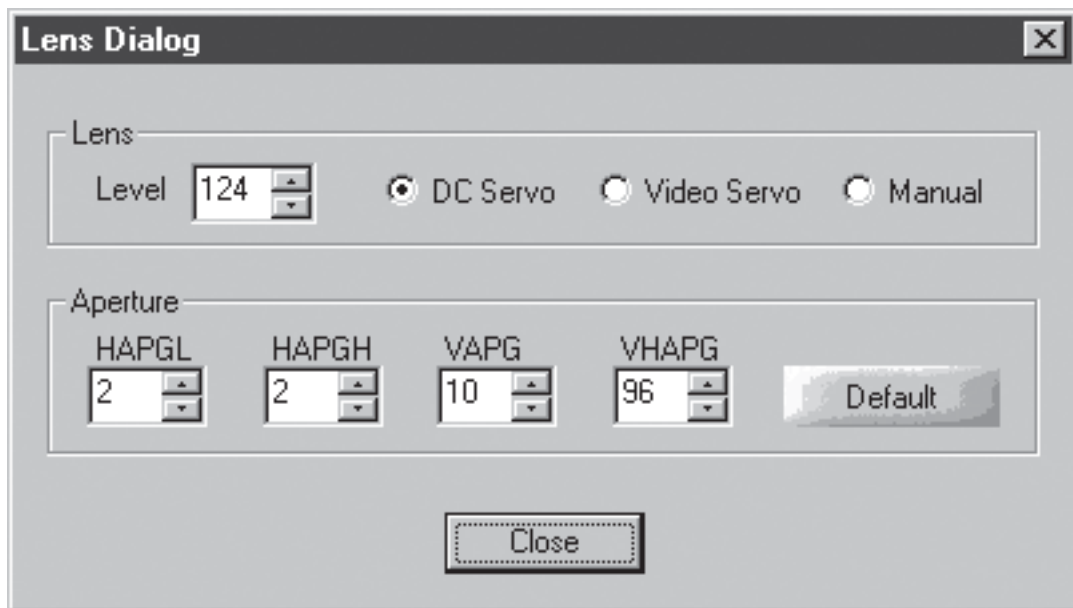


Figure 11. Lens Dialog Screen

Table 7. Set Weight Screen

FUNCTION AREA		
NAME	EFFECT	
Show Windows		
0	Physical locations of click buttons corresponds to corresponding window areas shown above	Click 0 to place this window into scene video
2		Click 2 to place this window into scene video
4		Click 4 to place this window into scene video
3		Click 3 to place this window into scene video
1		Click 1 to place this window into scene video
All	Show all windows in video	Click to place all windows into scene video
None	Show no window in video	Click to remove all windows from scene video
Reset to Default	Resets size and location of windows to the factory default	
Close		
Close	Click button	Click to close the window
<i>end</i>		



Figure 12. Set Weight Screen

Table 8. GUI Defaults

FUNCTION	DEFAULT SELECTION			
Port	COM1 (baud rate must be 19,200)			
BLC	On	Fixed Weighted Average		
White Balance	Manual			
User	(not checked)	Red slider (top)	055	
		Blue slider (bottom)	057	
Exposure	AE Mode			
Aperture Correction	HAPGL 2	HAPGH 2	VAPG 10	VHAPG 96
Preset	Factory Default			

3.1.4 Download Button

Clicking the Download button sends the current GUI selections to the Camera. It will also store them into any GUI Preset (1 to 10) that may currently be selected — other than in the Factory Default selection. If Factory is the active preset, then the current selections are not stored by the GUI. (Also, clicking the download button is not required to send menu selections to the Camera. This occurs immediately when a menu selection is changed.)

3.1.5 EEPROM Button

Clicking the EEPROM button stores the current GUI settings in the Camera memory. This then becomes the Camera default settings until new settings are entered by pressing the EEPROM button again with different selections.

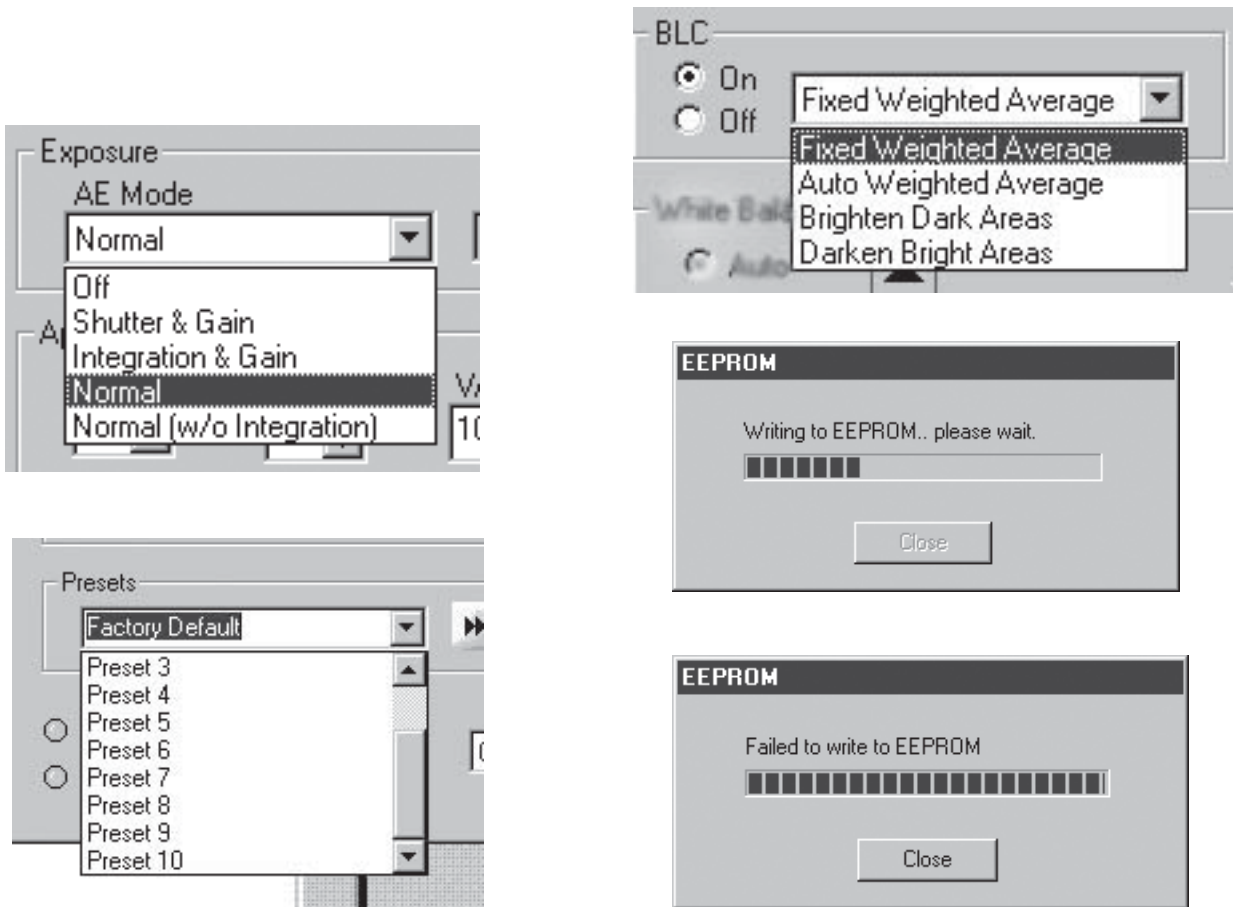


Figure 13. Typical Pop-up Windows

3.2 Lens/Aperture (Lens Dialog) Window (figure 11)

The Lens area of this screen provides settings for a dc iris lens, an auto iris (video driven) lens, or for a manual lens for which no settings are required.

3.2.1 Lens Area

Level offers selections from 109 to 149 for setup of either a dc or auto iris lens. Dc Servo should be selected for use with dc iris lens. Select Ac Servo for auto iris lenses.

3.2.2 Aperture Area

The Aperture area of this screen provides settings for horizontal and vertical aperture. Table 7 lists these four settings together with the available values.

3.3 Set AE Windows (Set Weight) Window (figure 12)

Automatic gain control for a typical Camera is typically performed by monitoring the overall scene video level and then making adjustments to compensate when it becomes too high or too low.

The 3600 Camera, however, divides the scene into five areas that can be re-sized and shaped as desired. Each area is assigned a relative weight (from 1 to 15) for its contribution to the automatic gain control function of the Camera. For example, a high intensity light in one corner of the scene could be assigned a minimum influence upon gain by forming a small window over it and then assigning that window a low value (perhaps "1").

Figure 12 shows the default size and location for these windows. These lines can be pulled to other locations by clicking and pulling on

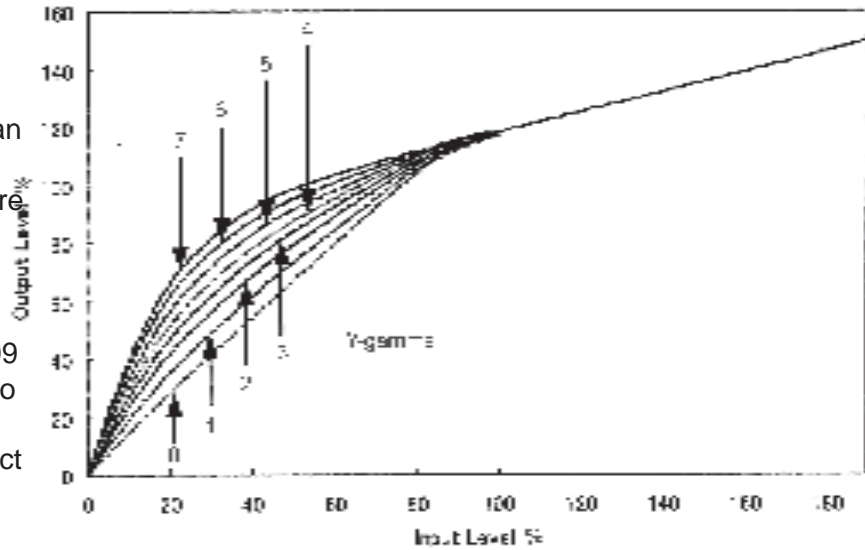


Figure 14. Non-linear Y-gamma Characteristics

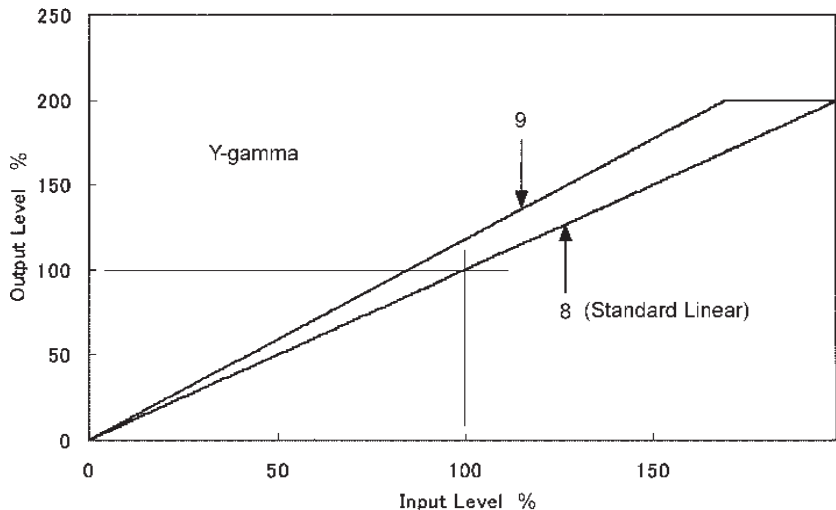


Figure 15. Linear Y-gamma Characteristics

them with a mouse. There is an underlying grid to which they snap.

The Show Windows area of the screen makes it possible to overlay the windowing lines to the video of the scene. The location of these buttons corresponds to the window areas shown above. Clicking on a button turns on a transparent

overlay for that window area. The All and None buttons turns on and off an overlay of all the areas.

Reset to Default re-sizes the window grids to the factory set default size/locations.

Clicking the close button closes the window.

end text

COHU ELECTRONICS WARRANTY

Cohu, Inc., Electronics Division warrants equipment manufactured to be free from defects of material and workmanship. Any part or parts will be repaired or replaced when proven by Cohu examination to have been defective within two years from date of shipment to the original purchaser for standard CCD cameras and one year from date of shipment to the original purchaser for intensified CCD cameras and all other Cohu manufactured products.

Pressurized Housings: Pressurized camera products include a lifetime pressurization warranty. Cohu will re-pressurize at no charge returned environmental cameras not exhibiting evidence of physical damage due to misuse. All warranty repairs will be performed at the factory or as otherwise authorized by Cohu in writing. Purchaser shall prepay transportation charges to Cohu.

Extended IR Cameras: Cameras utilizing extended infrared (extended IR) sensors found to exceed acceptable white blemish specifications within one month of delivery shall be repaired without charge.

This warranty does not extend to Cohu equipment subjected to misuse, accident, neglect, improper application, or repaired or altered by other than Cohu or those authorized by Cohu in writing. Cameras utilizing extended IR sensors are not warranted for use in areas of elevated levels of cosmic radiation. Television image pickup tubes, image intensifiers, lenses, and products manufactured by companies other than Cohu are warranted by the original manufacturer.

This warranty is in lieu of all other warranties, express, implied, or statutory, including warranties of fitness for a particular purpose and merchantability, and set forth buyers sole remedy in connection with such warranties. Cohu, in no event, whether as a result of breach of contract or warranty, tort (including negligence) or otherwise, shall be liable for any penalties regardless of reason; collateral, consequential, incidental, or exemplary damages, including without limitation, any loss of profit or revenues, loss of use of any equipment or goods, or removal or re-installation of equipment without prior written approval.

A Return Authorization (RA) Number must be obtained from Cohu prior to returning any item for warranty repair or replacement.

4/03