

COHU, INC. Electronics Division

Installation and Operation Instructions

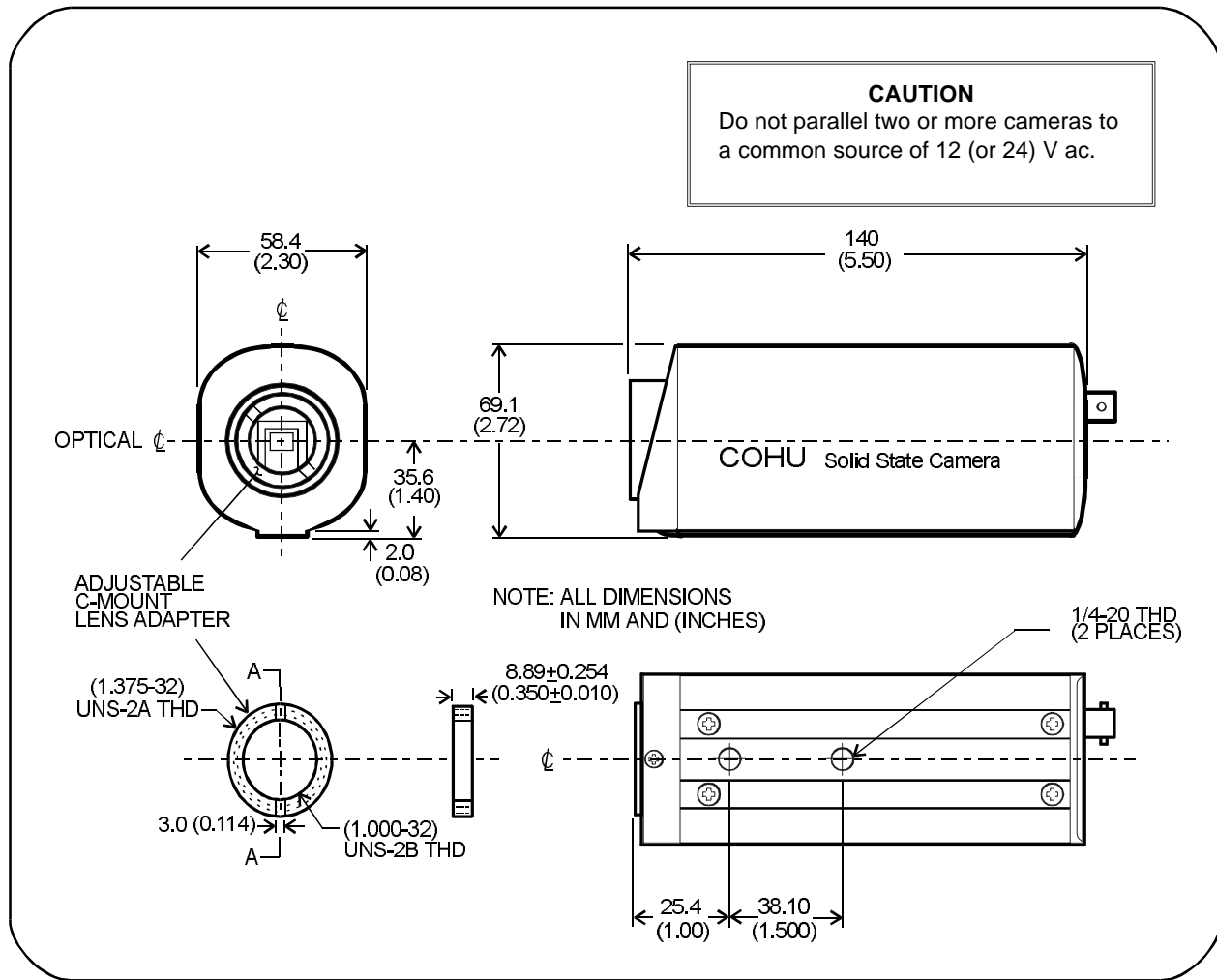


Fig. 1. Dimensions



4810 SERIES MONOCHROME FRAME TRANSFER CCD CAMERAS

5755 KEARNY VILLA ROAD SAN DIEGO, CA 92123-1111
 PHONE: 619-277-6700 FAX: 619-277-0221 E-MAIL: INFO@COHU.COM

COHU
Cohu, Inc./Electronics Division

NOTE

Throughout this manual interpret the following two graphic symbols as indicated:



Indicates presence of uninsulated dangerous voltage constituting a risk of electrical shock

CAUTION

To reduce the risk of electrical shock, do not remove cover. No user serviceable functions inside. Refer servicing to qualified service personnel.

CAUTION

Operate camera only from a UL approved Class 2 power supply.

CAUTION

Do not connect more than one camera to a single source of 12 (or 24) V ac power. If the bridge rectifier of any camera fails, all cameras connected to the same source will have their bridge rectifiers destroyed. Also, connecting two or more cameras to a single source can cause hum bars in the video signal.

IMPORTANT SAFEGUARDS

Read Instructions—All the safety and operating instructions should be read before the equipment is operated.

Retain Instructions—The safety and operating instructions should be retained for future reference.

Heed Warnings—All warnings on the equipment and in the operating instructions should be followed.

Water and Moisture—Do not use this equipment near water—for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, and the like.

Overloading—Do not overload wall outlets and extension cords, as this can result in a fire or electric shock.

Servicing—Do not attempt to service this equipment yourself. Opening or removing the cover may expose you to dangerous voltages or other hazards. Refer all servicing to qualified service personnel.

Damage Requiring Service—Unplug this equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- a. When the power supply cord or plug is damaged

**COMPLIES WITH
FEDERAL COMMUNICATIONS COMMISSION
RULES AND REGULATIONS
PART 15 FOR CLASS A DIGITAL DEVICE**

NOTE: This equipment has been tested and found to comply with the limits for a Class A computing 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.

WARNING

To reduce the risk of fire or electrical shock, do not expose this equipment to rain or moisture

CAUTION

Do not ground either power input line of the camera when operating with 12 (or 24) V ac input power. Both lines must float. A ground on either input will destroy a bridge rectifier inside the camera.

- b. If liquid has been spilled or objects have fallen into the equipment.

- c. If the equipment has been exposed to rain or water.

d. If the equipment does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the equipment to its normal operation.

- e. If the equipment has been dropped or the cabinet has been damaged.

- f. When the equipment exhibits a distinct change in performance, a need for service is indicated.

Replacement Parts—When replacement parts are required, be sure the service technician uses only replacement parts specified by the manufacturer or those parts have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards.

Safety Checks—Upon completion of any service or repairs to this equipment, ask the service technician to perform safety checks to determine that the equipment is in proper operating condition.

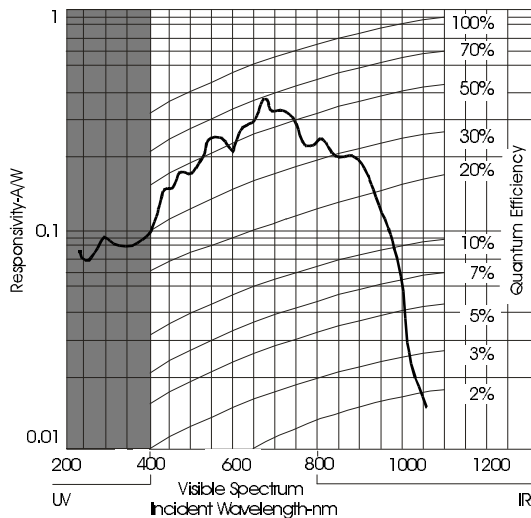
Table 1. Specifications

ELECTRICAL	
Imager	Single CCD using frame transfer method
Image Area	8.8 by 6.6 mm (2/3 inch format)
Active Picture Elements	754 (H) by 488 (V)
Number of Picture Cells	780 (H) by 244 (V)
Cell Size	11.5 μm (H) by 27 μm (V)
Resolution	<ul style="list-style-type: none"> • Horizontal: 565 lines • Vertical: 350 lines
Sensitivity	See table 1a
Contrast Variation, 25 °C	<5% overall
Scanning System	RS-170 2:1 Interlaced
Video Output	1.0 Vp-p, 75 ohms unbalanced
Gamma	0.5 or 1.0, jumper selected
Gray Scale	Renders all shades of gray on EIA tv resolution chart, 1956
Agc	6 dB variable gain (peak-average adjustable); jumper selectable on/off
Auto Lens	Peak/average adjustable
Signal to Noise Ratio, 25 °C	<ul style="list-style-type: none"> • 50 dB (gamma 1, gain 0 dB), unweighted 8 MHz bandwidth • 55 dB (gamma 1, gain 0 dB), weighted
Automatic Black Level	Maintains setup level at 7.5±5 IRE units if picture contains at least 10% black
Synchronization	<ul style="list-style-type: none"> • EIA RS-170 crystal, 14.31818 MHz clock output standard • Genlock, with crystal or line lock backup (jumper selectable) • External H and V drive
Power Options	<ul style="list-style-type: none"> • 12 V dc/ac ±10%, 60 Hz ac • 24 V dc/ac ±10%, 60 Hz ac • 115 Vac 60 Hz, ±10% (with optional wall transformer)
Power Consumption	4.2 Watts
ENVIRONMENTAL	
Ambient Temperature Limits	<ul style="list-style-type: none"> • Operating: -10 to 50 °C (14 to 122 °F) • Storage: -30 to 70 °C (-22 to 158 °F)
Altitude	Sea level to the equivalent of 3048 m (10,000 feet) [20 inches of mercury]
Humidity	Up to 95% relative humidity, noncondensing
Shock	30 g's in any axis under nonoperating conditions per MIL-E-5400T, Paragraph 3.2.24.6
Vibration	5 to 60 Hz with 0.082 inch total excursion (15 g*s at 60 Hz). From 60 to 1000 Hz, 5 g's rms random vibration without damage
MECHANICAL	
Dimensions	See figure 1
Weight, less lens	439 grams (15.5 oz)
Type of lens attachment	C-mount

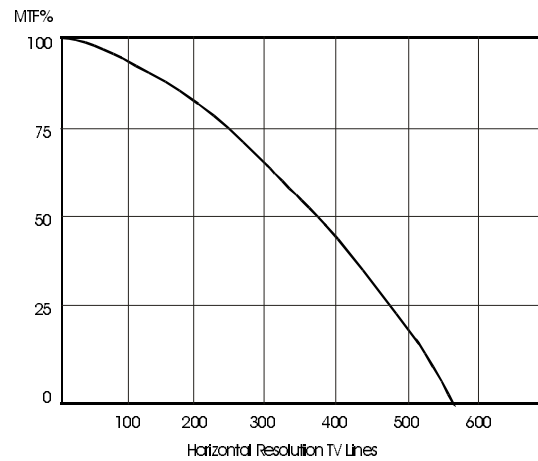
Table 1a. Sensitivity, Faceplate Illumination

SENSITIVITY	With IR Blocking Filter	Without IR Blocking Filter
Full Video, Agc Off	0.2 fc (2 lux),	0.02 fc (0.2 lux)
80% Video, Agc on	0.07 fc (0.7 lux)	0.007 fc (0.07 lux)
30% Video, Agc on	0.02 fc (0.2 lux)	0.002 fc (0.02 lux)

SPECTRAL RESPONSE



MODULATION TRANSFER FUNCTION



1.1 ELECTRICAL CHARACTERISTICS

The Camera features a 2/3 inch format Charge Coupled Device (CCD) image sensor. The sensor uses the frame transfer method with an active imaging area measuring 8.8 mm by 6.6 mm (2/3 inch format). The active imaging area is an array of 754 horizontal by 488 vertical picture elements.

1.2 MECHANICAL CHARACTERISTICS

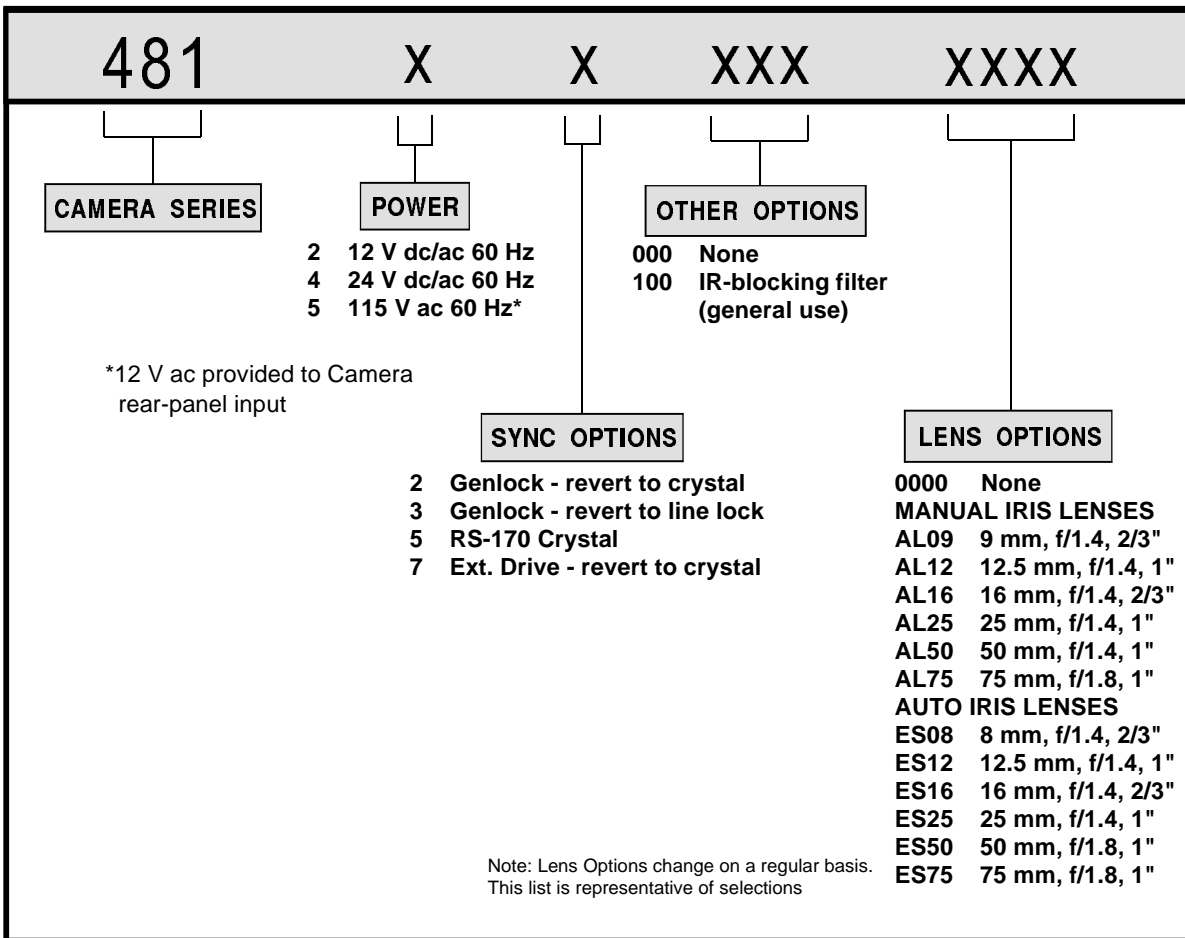
The Camera is a compact, lightweight unit weighing 440 grams (15.5 ounces) without lens. All interfacing connectors are located on the rear panel for easy access. The C-mount adapter

accepts most types of manual and automatic television lenses. Two 1/4-20 tapped holes are provided on the base for mounting (fig. 1).

1.3 POWER REQUIREMENTS

The Camera requires either 12- or 24-V ac/dc input power, depending on the model. The Camera operates from 115-V 60-Hz ac power by using the optional external power pack (fig. 3). If the Camera is to operate from a power supply other than the optional power pack, use a 0.5 amp slow-blow fuse (0.25 amp with the 24-volt version).

Table 2. Model Number Interpretation



1.4 EQUIPMENT SUPPLIED

The following list does not include any optional or special-request items. A lens ordered with the Camera will either be installed on or packed with the Camera.

1. 4810 Camera
2. Installation and Operation Manual, 6X-845(E)
3. C-mount adapter
4. Auxiliary connector plug (for J30 on rear panel)
5. Power connector plug (for J38 on rear panel)

If the 115 V ac power pack is shipped with the Camera, the plug for J38 will be installed on the power pack cable. The plug for J32 is supplied only if an auto iris lens is ordered. This plug will be installed on the lens cable. Plugs are not supplied for rear panel connectors in which a cable is provided. These interconnecting cables may be supplied with other equipment.

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The following items are the minimum required to make use of the Camera. A tv picture monitor will be highly desirable for focusing and other adjustments even if the Camera will be used in an

4810 CAMERA

INSTALLATION AND OPERATION

application that does not require direct visual monitoring of the Camera output. If the lens in item 2 is an auto-iris type lens, the proper connector will be required to mate with J32 on the Camera rear panel. Lenses shipped from the factory have the proper connector.

1. 115 V ac, 60 Hz power pack or 12 V or 24 V ac/dc power supply (depending on the model)
2. Television lens, C-mount
3. Auto lens cable plug (Factory supplied lenses have required plug installed)
4. 75-ohm coaxial cable (RG-59/U)
5. Television monitor, composite, monochrome

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

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 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

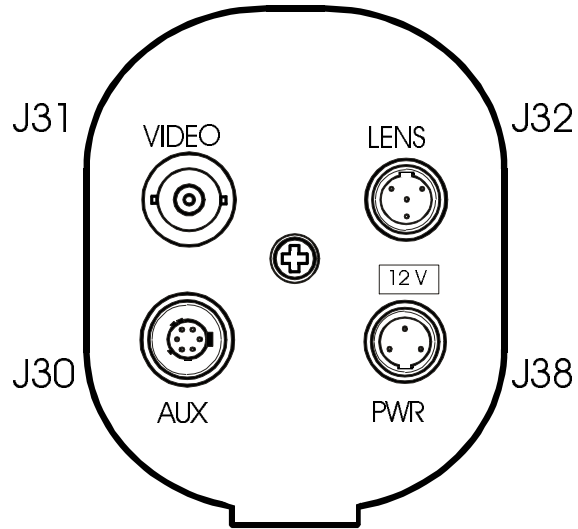


Fig. 2. Rear Panel

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.

1.7 INSTALLATION PROCEDURE

Installation consists of:

1. Connecting power, video, and (if required) sync cables.
2. Installing the lens and checking back focus
3. Setting up internal circuits for the intended application (if required)
4. Mounting the Camera at its location

Table 3. Rear Panel Interface Connectors

NAME	CAMERA REAR PANEL CONNECTOR		MATING CONNECTOR FOR CABLE	
	COHU P/N	MFG P/N	COHU P/N	MFG P/N
VIDEO (J31)	1310242-011	BNC Jack	1310212-001	BNC Plug
AUX. (J30)	1310348-006	Hirose SR30-10R-6S	1310349-006	Hirose SR30-10PE-6P
POWER (J38)	1310356-003	(Switchcraft TB3M	1310356-103	(Switchcraft TA3F
LENS (J32)	1310356-004	Switchcraft TB4M	1310356-104	Switchcraft TA4F

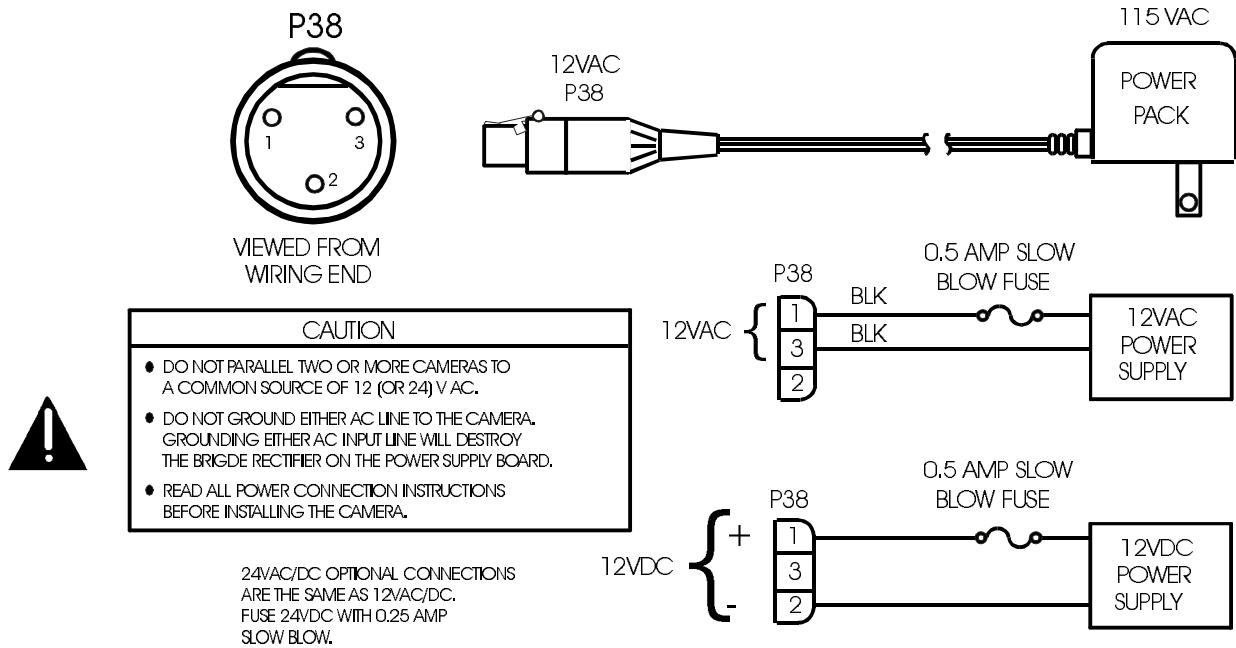


Fig. 3. Power Connections

1.7.1 Power and Video Connections

POWER CONNECTIONS — The Camera requires 12- or, optionally, 24-V ac/dc input power. To operate the 12 volt version of the Camera from a 115-V ac 60-Hz power source, use the optional power pack (fig.3). Or, if desired, use a power supply connected as shown in the figure. Be careful of polarity when making dc power connections. A 0.5 amp (0.25 amp for 24 volt version) slow-blow fuse is recommended when not using the optional power pack.

When using 12 or 24 V ac input power, be sure that neither of the input lines are connected to a chassis or a transformer frame. Such a wiring arrangement will most likely ground one power input and destroy the bridge rectifier on the power supply board.

Also be aware that connecting two or more cameras to a single power source can cause hum bars in the video signal. Each camera should operate from its own step-down transformer, isolation transformer, or from one winding of a multiple secondary winding transformer.

CAUTION

Do not apply voltage outside the recommended operating range to the Camera. (10.8 to 13.2 V ac/dc, 21.6 to 26.4 V ac/dc, or 103.5 to 126.5 V ac, depending on the version). Be careful of polarity when using dc input power. Polarity reversal may damage the bridge rectifier.

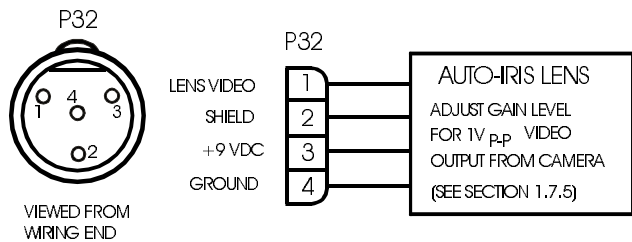
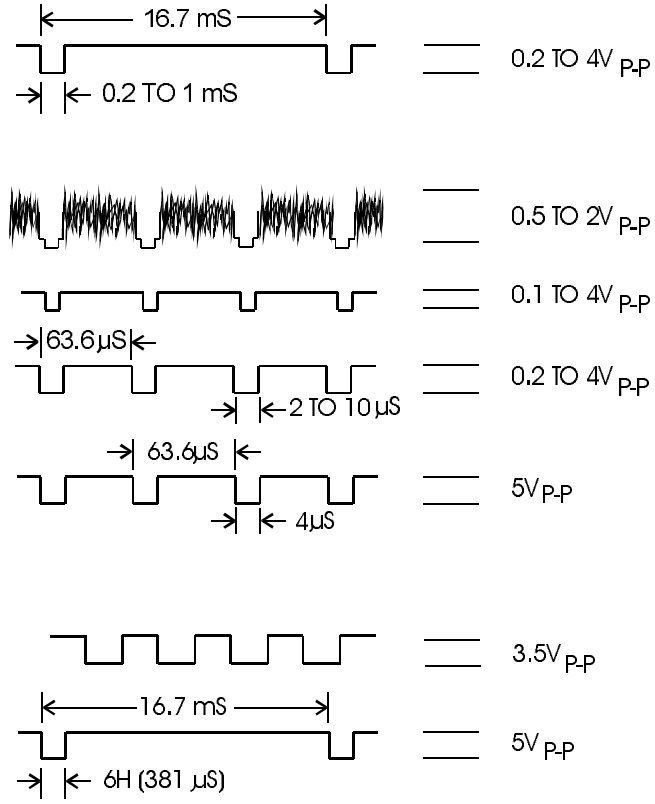
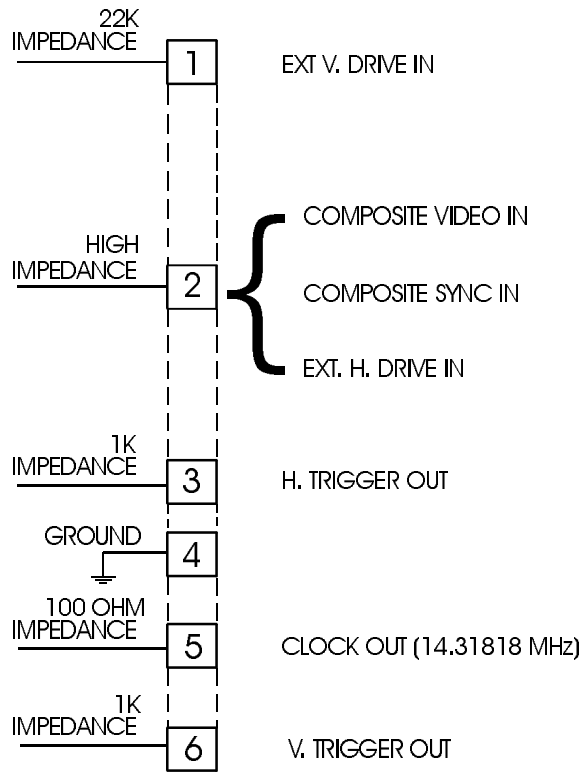
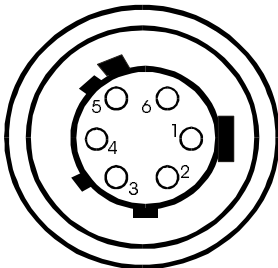


Fig. 4. Auto Iris Lens Connections



J30



MATING SURFACE OF PINS SHOWN

Fig. 5. Auxiliary Connector, and Waveforms

VIDEO CONNECTIONS — Connect J31 on the rear panel (fig. 2) to the tv monitor using 75 ohm (RG-59/U) coaxial cable. Terminate the monitor with a 75 ohm impedance. Multiple monitors may be interconnected in a loop-through arrangement, with only the last monitor in the chain terminated.

1.7.2 Lens Installation

Before installing the lens, it may be desirable to install an IR blocking filter in the Camera. A C-ring adapter with an integral IR-blocking filter

(Part number 8323501-001 for general use or 8323501-002 for microscopic use) may be used if scene illumination will vary between light with large amounts of IR (sunlight or incandescent bulbs) and light with little IR (fluorescent). This filter can help to prevent focus shift under these varying lighting conditions.

If the plug (P32) must be installed on an auto-iris lens cable, refer to figure 4 for the wiring diagram.

Proceed as follows to install the lens:

1. Remove the protective plastic plug or covering from the lens C-mount adapter opening.
2. Clean the lens and the faceplate of the image sensor. If a C-mount adapter with IR filter is to be used, clean it and the sensor faceplate before installation. Use an optical-quality solution and tissue. The sensor faceplate is more easily cleaned with a cotton swab. Never rub an optical surface with a dry tissue or swab.

NOTE

The sensor faceplate is in the focal plane of the Camera. Any contaminants on this surface will show up in the picture. Pressurized air can be helpful in removing these contaminants.

3. Check the setscrew and make sure it is snugged down. Be careful not to over tighten.
4. Screw the lens into the C-mount adapter. Snug down so the two will turn as one unit when the setscrew is loosened for focus adjustments.
5. If an auto lens is used, plug the lens cable (P32) into the lens connector (J32) on the rear panel.

1.7.3 Sync and External Drive Connections

The auxiliary connector provides an input for composite sync and composite video genlock with other cameras, inputs and outputs for horizontal drive and vertical drive, and an output for the

14.31818-MHz clock. Waveforms are shown in figure 5.

If vertical lines appear after changing sync sources, the black balance and white balance potentiometers on the video board may need adjustment. See table 4.

When operating the Camera from horizontal and vertical drive, the vertical sync may lock up ½ line off.

1.7.4 Back Focus Adjustment

Back-focus distance is the spacing between the rear most element of a lens and the imaging surface on the sensor. The lens projects an image onto the sensor. This distance is set empirically by observing for a sharply focus image on a picture monitor. Proceed as follows:

1. Set the lens focusing ring to infinity.
2. Point the camera at a distant scene well into the infinity focusing distance of the lens.
3. Place sufficient neutral density (ND) filters in front of the lens so the lens iris is fully open with normal video output.
4. Note whether the scene is in sharp focus. If it is, no further adjustments are required.
5. If the scene is out of focus, loosen the C-mount setscrew and rotate the lens and C-mount as a unit in and out of the camera until the scene is in focus.
6. Snug down the setscrew. Do not over tighten.

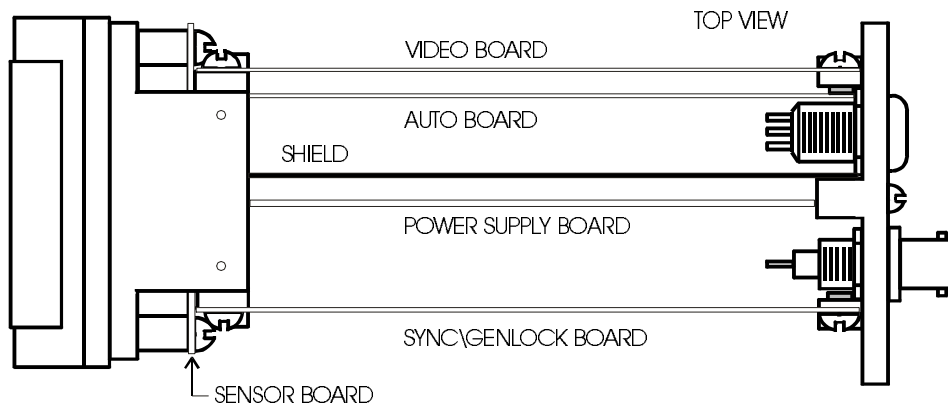


Fig. 6. Circuit Board Locations

Table 4. Adjustments

ADJ./JUMPER	PURPOSE
SYNC/GENLOCK Board (Figure 7)	
XTAL/LL jumper	<p>For crystal-controlled operation, or if dc power is used without genlock or H and V drive this jumper must be in the XTAL position</p> <p>For Line Lock operation this jumper must be in the LL position. When using genlock mode the camera reverts to the operating mode selected by the jumper on removal of the external sync signal</p> <p>Note: Operation in Line Lock sync mode requires ac input power</p>
1L/2L jumper	For operation with composite video or composite sync,, place jumper in the 1L position. For operation with H and V drive, place jumper in the 2L position
VIDEO Board (Figure 8)	
AGC OFF/ON jumper	For automatic gain control, place jumper in the ON position
GAMMA 0.5/1.0 (two jumpers),	<p>Provides a linear video output relative to black and white levels in 1.0. In 0.5, provides a non-linear video output to compensate for picture tube characteristics. Use 0.5 when viewing video on a picture tube. Use 1.0 with other devices</p> <p>Note: Both jumpers must be placed in either 0.5 or 1.0 for proper operation</p>
BLK LVL AUTO/MAN (jumper)	This jumper selects automatic or manual black level (setup). In the AUTO mode the darkest part of the picture adjusts to the setup level automatically. In MAN mode this function is disabled
SETUP (R74)	This control adjusts the video black level (setup) when the BLK LVL AUTO/MAN jumper is in the MAN position
GAIN (R52),	Up to 6 dB gain increase may be obtained by rotating this control cw (noise will increase)
BLK BAL 1 and 2 (R41 and R46)	Adjust to remove vertical interference lines. Cap lens and adjust black balance 1 and 2. Then go to white balance adjustments
WHT BAL 1 and 2 (R37 and R38)	Adjust to remove vertical interference lines. View white field, being careful not to over-drive camera,, and adjust white balance 1 and 2. Repeat black and white balance adjustments until lines are minimized
AUTO Board (Figure 9)	
PK-AVG (R14) ccw-cw	Adjusts agc sensing between peak detect (ccw) and average (cw) detect. In the PK (peak) detect position the agc holds the peaks in the video to a maximum of 100 IRE units. In the AVG (average) detect position the agc averages the video to the 100 unit level
AUTO BLK (R56)	This control sets black level when the BLK LEVEL jumper (video board) is in the AUTO position

ADJUST ONLY THOSE COMPONENTS AND REPOSITION ONLY THOSE JUMPERS SHOWN WITH SHADING IN FIG. 7, 8, AND 9. ADJUSTING ANY OTHER COMPONENTS OR CHANGING ANY OTHER JUMPER MAY VOID THE WARRANTY.

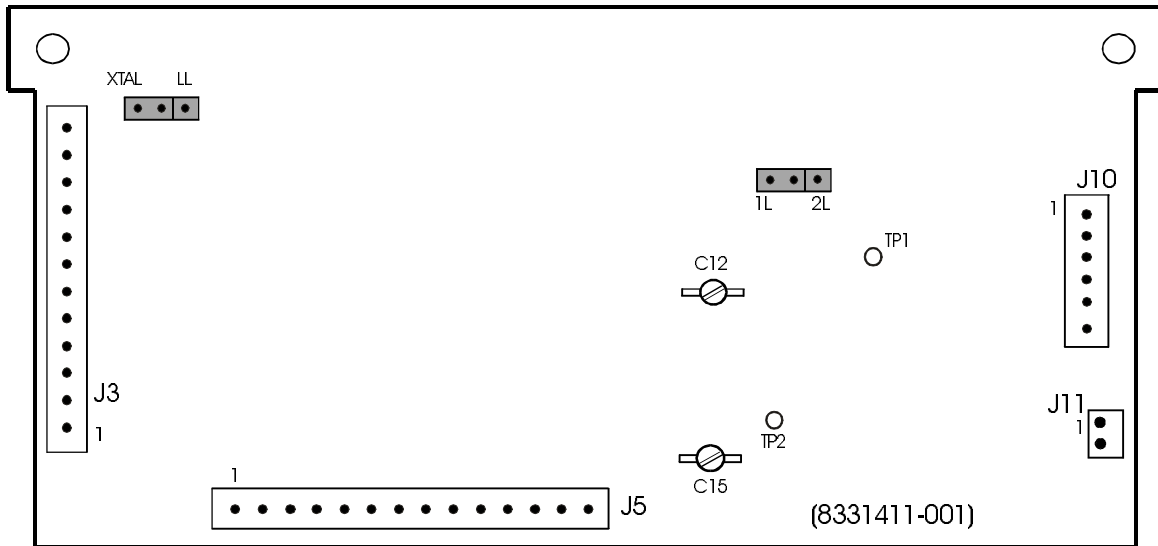


Fig. 7. Adjustment Locations, Sync/Genlock Board

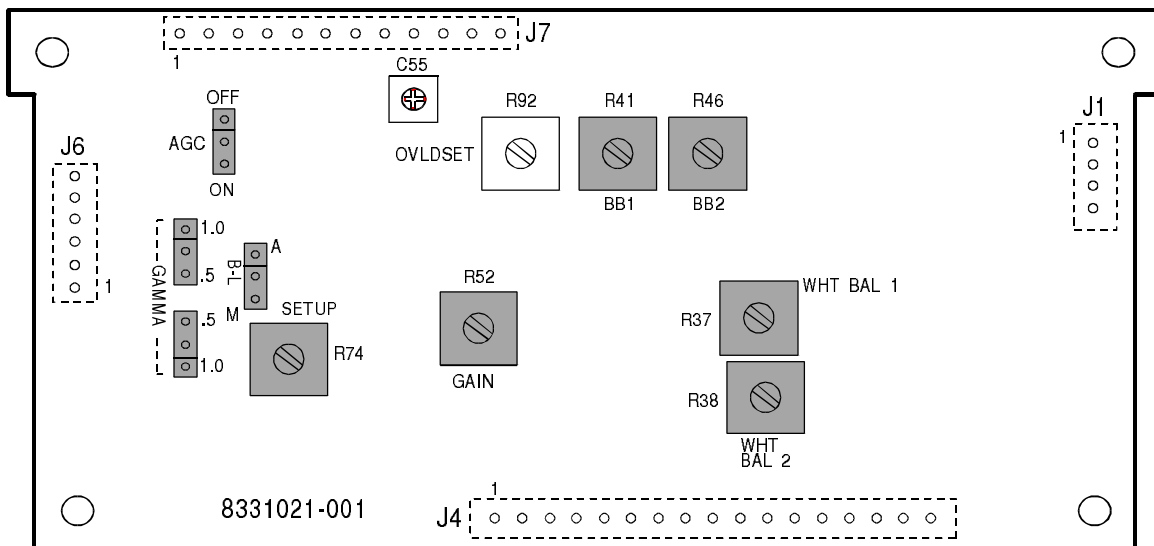


Fig. 8. Adjustment Locations, Video Board

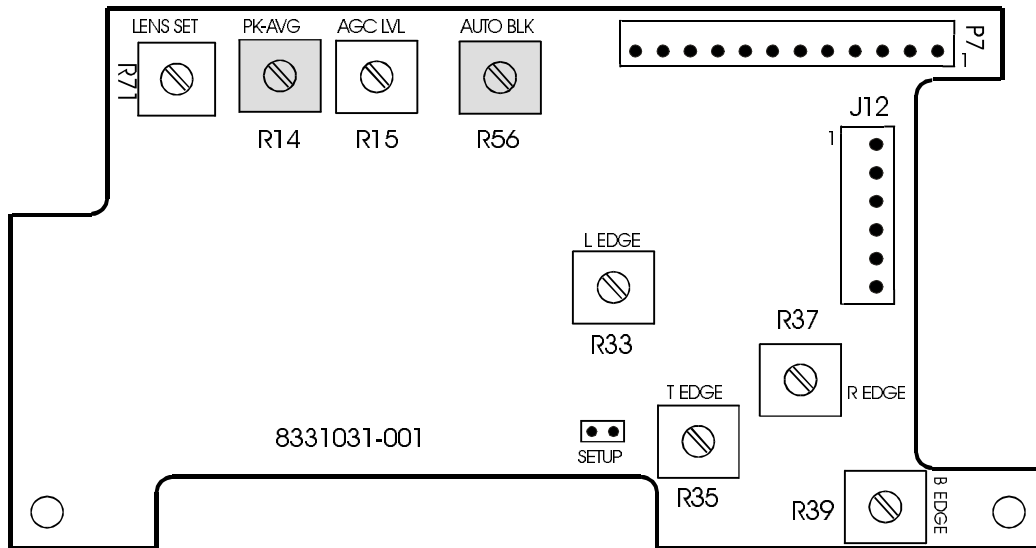


Fig. 9. Adjustment Locations, Automatics Board

1.7.5 Auto Iris Lens Gain

If an auto iris lens is used and the video viewed on a monitor is washed out or very dark, level on the auto iris lens may require adjustment.

To readjust level on the lens, proceed as follows:

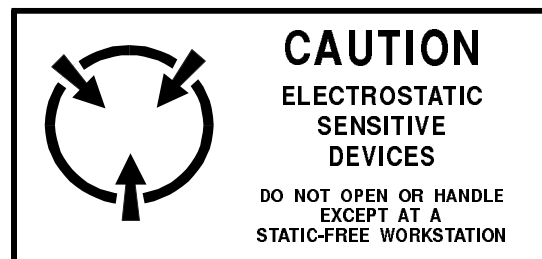
1. Remove the rear plate from the Camera and slide the cover off.
2. Place the agc jumper in the OFF position.
3. Adjust the level potentiometer on the auto iris lens to obtain an acceptable picture on the monitor.
4. Place the agc jumper in the ON position and note whether picture monitor brightness remains normal. If not, readjust lens level by repeating steps 2 through 4 until no further adjustments are required.
5. Replace the cover and rear plate.

1.8 INSTALLATION ADJUSTMENTS

Figure 6 shows board locations. Adjustments and jumpers shown with shading in figures 7 through 9 can be used to change operating

conditions related to various applications of the Camera.

Adjustments and jumpers without shading are setup adjustments that require procedures given in the maintenance manual. Perform maintenance adjustments only when section 5.4 of the maintenance manual is being followed. Be aware that adjusting anything electrical or mechanical without the proper procedure may void the warranty of a new Camera. Refer to the page 14 for the warranty.



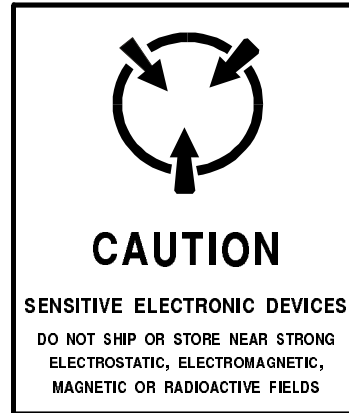
Cameras are shipped with adjustments set for operation under typical conditions, or as requested by the user. Some user adjustments and jumpers are available to change Camera operating conditions. Table 4 lists these adjustments and jumpers.

1.9 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 -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 5755 Kearny Villa Road, San Diego, CA 92123-1111 as the address. Please contact



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

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.

All warranty repairs will be performed at the factory or as otherwise authorized by Cohu in writing. Transportation charges to Cohu shall be prepaid by purchaser.

This warranty does not extend to Cohu equipment subjected to misuse, accident, neglect, or improper application, nor repaired or altered by other than Cohu or those authorized by Cohu in writing. **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 expressed or implied. Cohu shall not be liable for collateral or consequential damages.

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