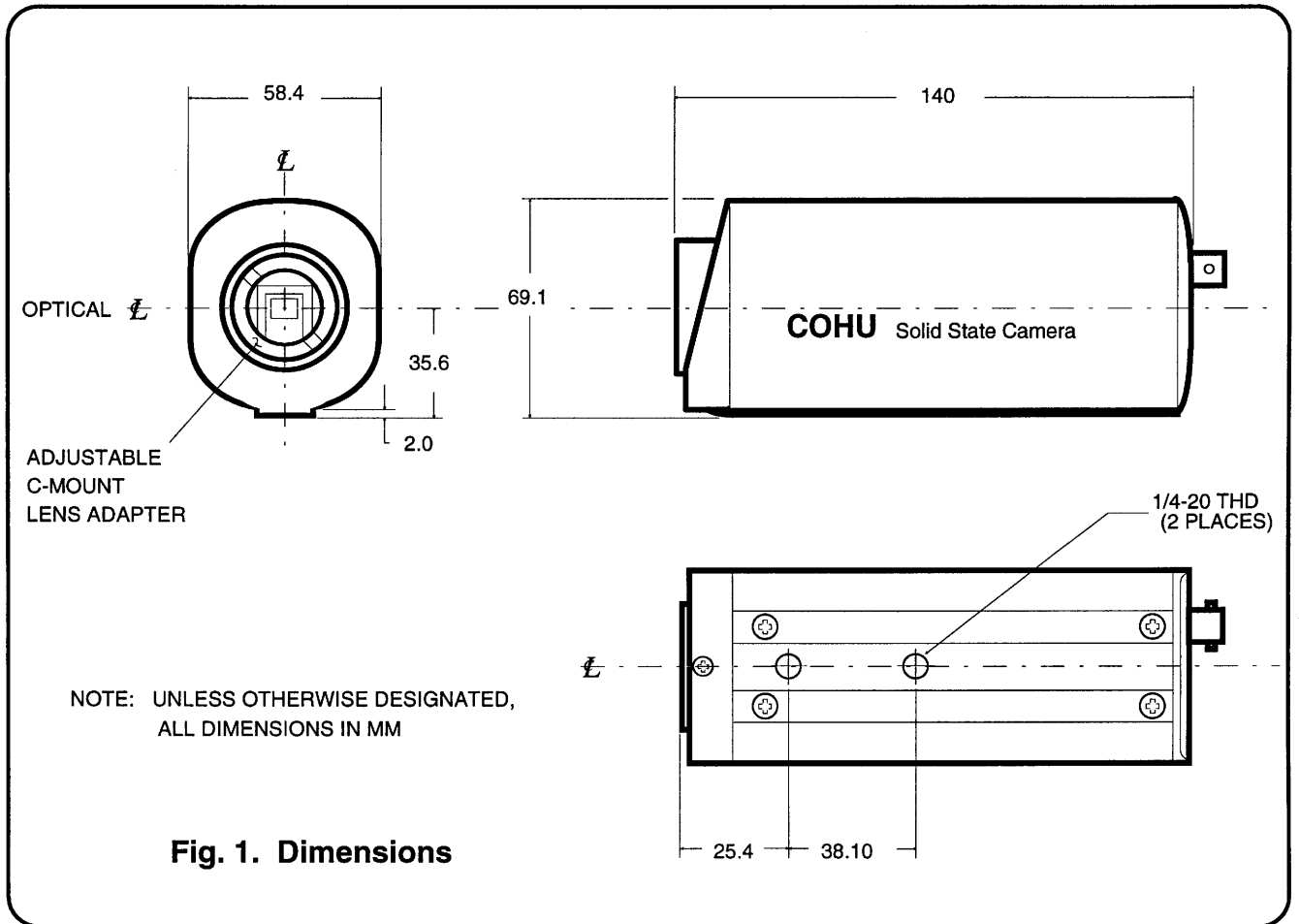


COHU

Installation and Operation Instructions



4710 SERIES MONOCHROME CCD CAMERAS

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COHU
 Cohu, Inc./Electronics Division

Table 1. Specifications

All specifications with 2850 K (incandescent) illumination

ELECTRICAL	
Pickup	Single CCD using frame transfer method
Pickup Area	6.4 by 4.8 mm (corresponding to 1/2-inch tube)
Number of Picture Cells	732(H) by 290(V)
Active Picture Elements	699 (H) by 576 (V)
Cell Size	9.2 μm (H) by 16.8 μm (V)
Resolution	Horizontal: 525 tv lines Vertical: >415 tv lines
Sensitivity	See table 1a and chart 1
Contrast Variation	<5% overall at 25 °C
Scanning System	CCIR, 2:1 interlaced
Video Output	1.0 V p-p, 75 ohm unbalanced
Gamma	0.5 or 1.0, jumper selectable
Agc	6 dB variable gain (peak-average adjustable). Jumper selectable on/off
Auto Lens Drive	Peak/average adjustable
Signal-to-Noise Ratio (at 25 °C)	56 dB (gamma 1, gain 0 dB) unweighted, 8 MHz bandwidth
Automatic Black Level	Maintains setup level at 7.5 ±5 IRE units if picture contains at least 10% black
Power Options	12V dc/ac 50 Hz, ±10% 24V dc/ac 50 Hz, ±5% 230V ac 50 Hz, ±10% (with wall transformer)
Power Consumption	4.2 Watts
ENVIRONMENTAL	
Ambient Temperature Limits	Operating: -10 to 50 °C Storage: -30 to 70 °C
Altitude	Sea level to the equivalent of 3048 m [508 mm of mercury]
Humidity	Up to 95% relative humidity, non-condensing
Shock	30 g's in any axis under non-operating conditions per MIL-E-5400T, Paragraph 3.2.24.6
Vibration	5 to 60 Hz with 2.08 mm total excursion (15 g's at 60 Hz). From 60 to 1000 Hz, 5 g's r m s random vibration without damage.
MECHANICAL	
Dimensions	See figure 1
Weight (less lens)	450 grams
Type of Lens Mount	C-mount
Camera Mount	1/4-20 threaded holes (fig. 1)

See table 2 for model number interpretation

Cohu reserves the right to change specifications without notice.

Complies with VDE, 0871, Class B Requirements

Complies with CE CISPR-22, Class B; EN 55022, Class B; EN 50081-1; EN 50082-1

Table 1a. Sensitivity

SENSITIVITY	With IR filter	Without IR Filter
Usable with AGC	0.2 lux	0.04 lux
Full video, Non-AGC	1.5 lux	0.25 lux
Full video, AGC	0.7 lux	0.12 lux
<i>See figure 2</i>		

Chart 1

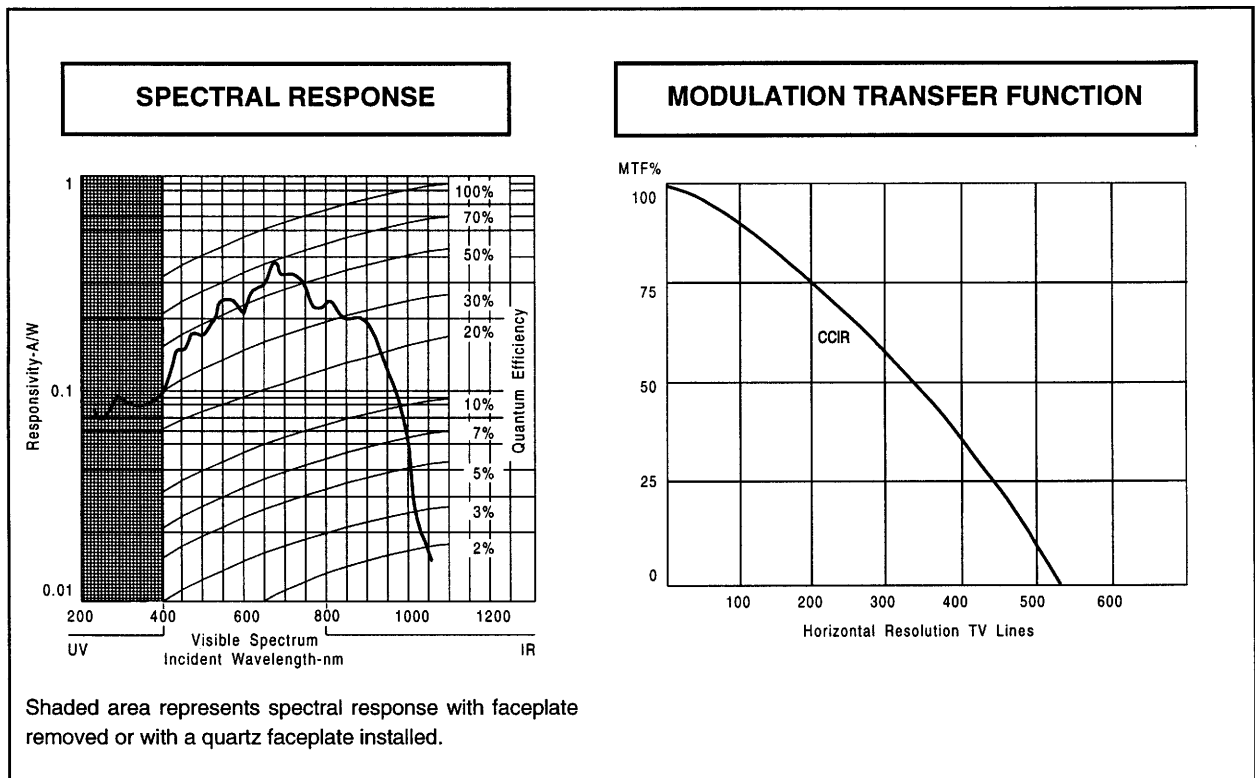


Table 2. Model Number Interpretation

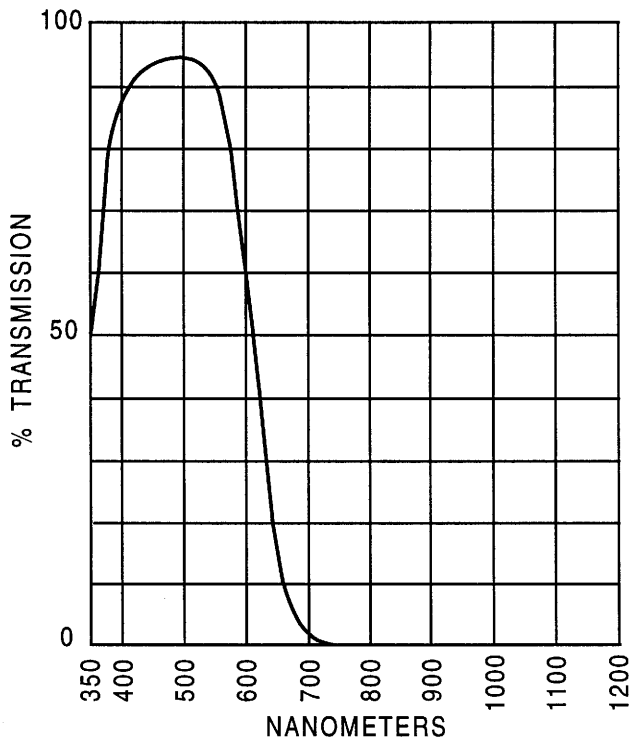
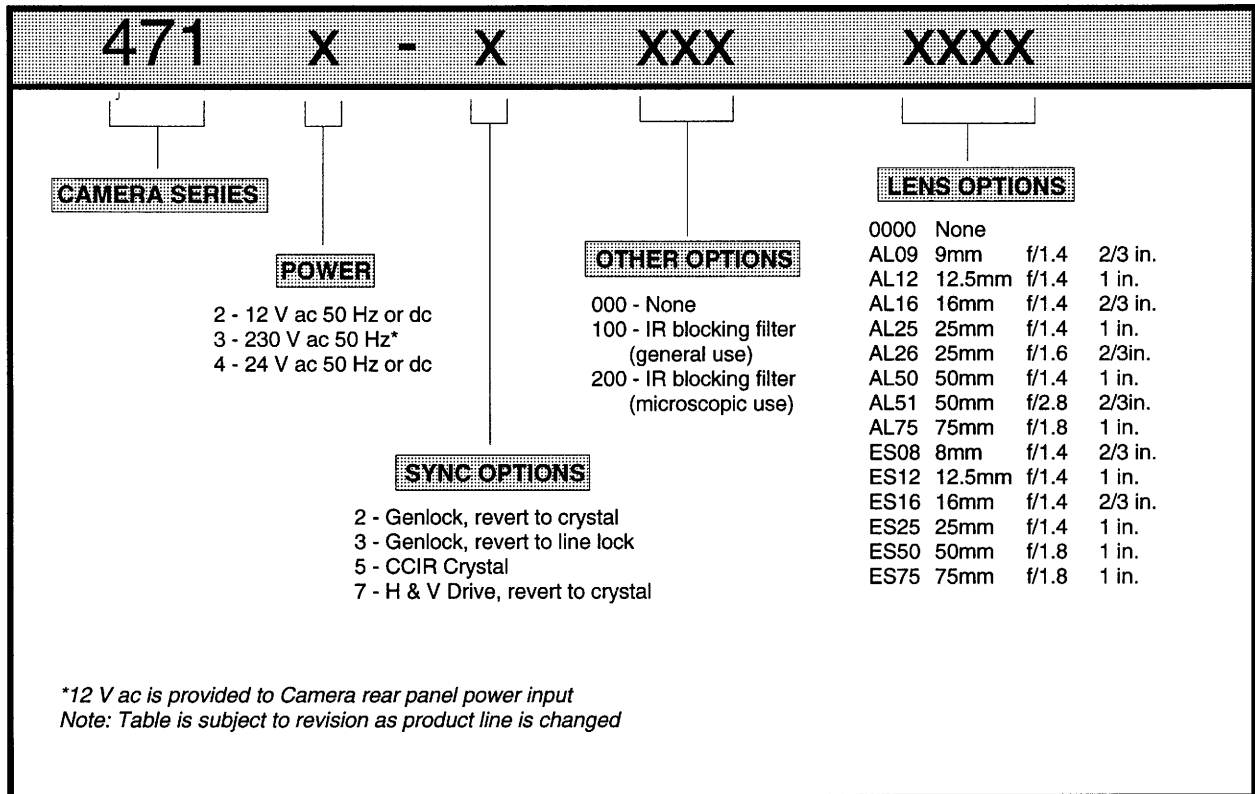


Fig. 2. IR Filter Response

1.1 ELECTRICAL CHARACTERISTICS

The Camera features a 1/2-inch format Charge Coupled Device (CCD) image sensor. The sensor uses the frame transfer method, with an active imaging area measuring 6.4 by 4.8 mm (1/2 inch format). The active imaging area is an array of 699 horizontal by 576 vertical picture elements.

1.2 MECHANICAL CHARACTERISTICS

The Camera is a compact, lightweight unit weighing 440 grams 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 (1/4-inch diameter, 20 threads per inch) 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 230-V 50-Hz ac power when used with the optional external power pack (fig. 4). 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).

1.4 EQUIPMENT SUPPLIED

The following Equipment Supplied 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. 4710 Camera
2. Installation and Operation Manual 6X-862(C)
3. C-mount adapter and 5/64 inch allen wrench
4. Auxiliary connector plug (for J30 on rear panel)
5. Power connector plug (for J38 on rear panel)

The plug for J38 is not supplied if the 230-V ac power pack is shipped with the Camera. The plug for J32 is supplied only if an auto-iris lens is ordered with the Camera. 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 application that does not require direct visual monitoring of the Camera output.

1. 230-V ac, 50-Hz power pack, or 12 V or 24 V ac/dc power supply (depending on the model)
2. Television C-mount lens
3. 75-ohm coaxial cable (RG-59/U)
4. Television monitor

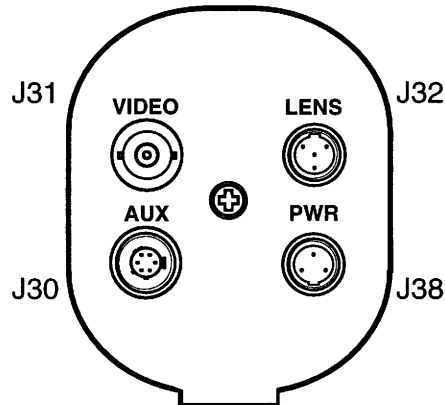


Fig. 3a. Rear Panel

Table 3. Connectors

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

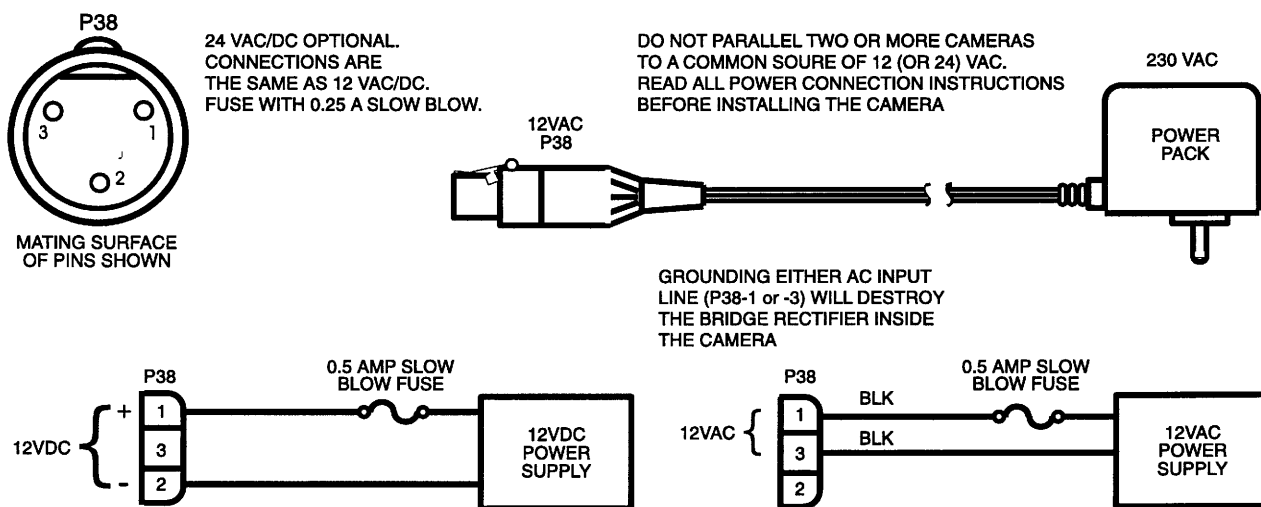


Fig. 4. Power Connections

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 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

1.7.1 Power and Video Connections

1. Power connections. The Camera requires 12- or, optionally, 24-Vac/dc input power. To operate the 12-volt version of the Camera from a 230-Vac 50-Hz power source, use the optional power pack (fig. 4). Or, if desired, use a power supply connected as shown in the figure. Do not ground either ac input line to the Camera rear panel. A ground will destroy the bridge rectifier.

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.

CAUTION

Do not allow voltage excursions outside the recommended operating range of the Camera (10.8 to 13.2 V ac/dc, 22.8 to 25.2 V ac/dc, or 207 to 253 V ac, depending on the version). Be careful of polarity when using dc input power. Polarity reversal may damage the bridge rectifier.

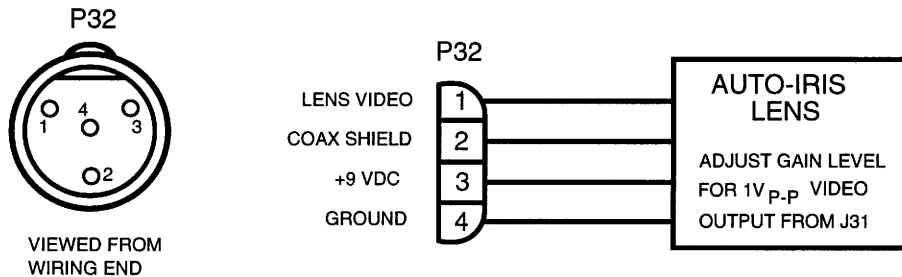


Fig. 5. Auto Iris Lens Connections

2. Video Connections. Connect J31 on the rear panel (fig. 3) 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

Refer to figure 5 for the auto lens connector (P32) wiring diagram.

1. Remove the protective plastic plug from the lens C-mount adapter opening.
2. Clean the lens and the faceplate of the image sensor. Use methyl alcohol or an optical-quality solution and a cotton swab. Never rub an optical surface with a dry swab.

NOTE

The sensor faceplate is 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 overtighten.
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 back 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 composite-sync and -video genlock inputs, horizontal- and vertical-drive inputs and outputs, and a 4.458-MHz clock output. Waveforms are shown in figure 6.

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

1.7.4 Back Focus Adjustment

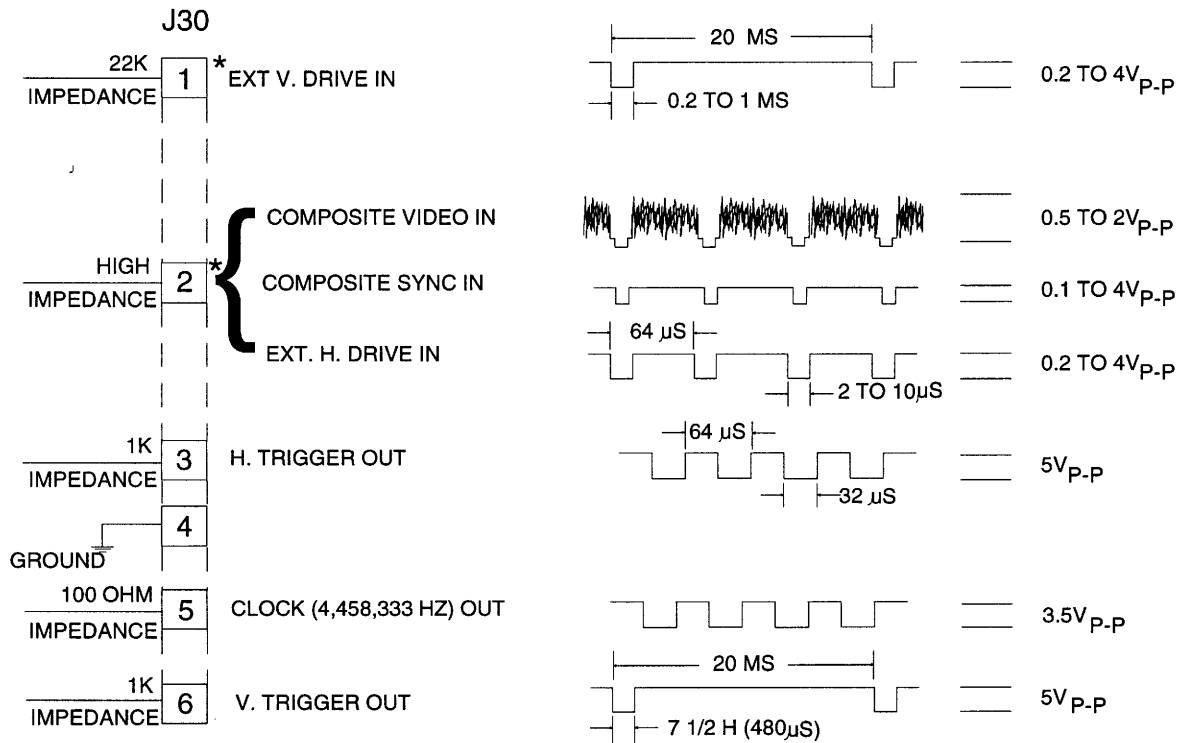
An IR-rejecting filter is desirable if scene illumination varies between light with large amounts of IR (sunlight or incandescent bulbs) and light with little IR (fluorescent). This filter will help prevent focus shift under these lighting conditions.

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 overtighten.

1.7.5 Auto Iris Lens Gain

If an auto iris lens is used and the video viewed on a monitor pulsates under bright lighting conditions, gain on the auto iris lens may require adjustment. To re-adjust gain 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 gain potentiometer on the auto iris lens to obtain an acceptable picture on the monitor.

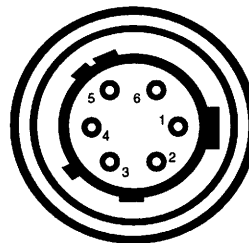


CAMERAS CANNOT BE GENLOCKED USING H. TRIGGER OUT TO AN H. DRIVE INPUT

INPUT WAVEFORMS MUST CONFORM TO CCIR 472-1 SPECIFICATIONS

* MAY REQUIRE 75 OHM TERMINATION IF SYNC SOURCE EXCEEDS ALLOWABLE VOLTAGE

J30



MATING SURFACE OF PINS SHOWN

Fig. 6. Auxiliary Connector and Waveforms

4. Place the agc jumper in the ON position and note that the picture remains normal. Readjust lens gain if necessary.

5. Replace the cover and rear plate.

1.8 STATIC DISCHARGE PROTECTION

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 an approximate 1 megohm 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 when relative humidity is below 30 percent requires extraordinary procedures not listed here
5. Use anti-static bags to store and transport exposed chassis, circuit boards, and components. Use new anti-static 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.

WARNING

The leads for the sheet stock on the work bench and the wrist strap must have a resistor in the megohm range inserted in series. This prevents the person at the bench from being directly grounded. The resistors limit current to a safe value in the event that dangerous voltage is contacted.

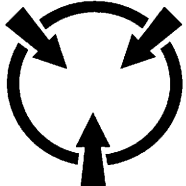
Standard grounding sheets and wrist straps purchased for use at work benches are supplied with leads having the required current limiting resistors for safety. Never substitute with a lead that does not have the resistor.

1.9 INSTALLATION ADJUSTMENTS

Figure 7 shows board locations. Adjustments and jumpers shown with shading in figures 8 through 10 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 12 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 3 lists these adjustments and jumpers.



CAUTION

SENSITIVE ELECTRONIC DEVICES

DO NOT SHIP OR STORE NEAR STRONG
ELECTROSTATIC, ELECTROMAGNETIC,
MAGNETIC OR RADIOACTIVE FIELDS

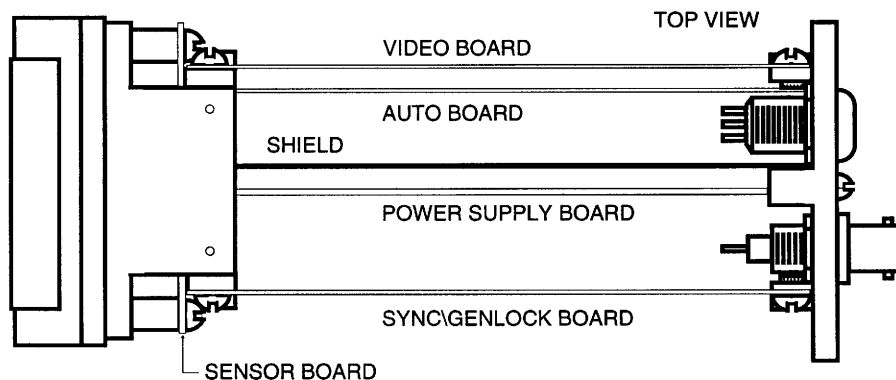
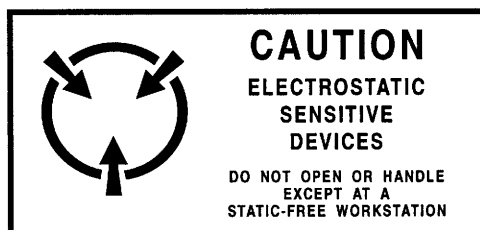


Fig. 7. Circuit Board Locations

Table 4. Adjustments

BOARD LOCATION	ADJ./JUMPER	PURPOSE
SYNC/GENLOCK Board (Fig. 8)	XTAL/LL jumper	For crystal-controlled operation
	1L/2L jumper	For operation with composite-video or -sync, place jumper in the 1L position. For operation with horizontal- and vertical-drive
VIDEO Board (Fig. 9)	AGC OFF/ON jumper	For automatic gain control, place jumper in the ON position
	GAMMA 0.5/1.0 (two jumpers)	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 Note: Both jumpers must be placed in either 0.5 or 1.0 for proper operation
	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)	A maximum of 6 dB gain increase may be obtained by use of this adjustment. The normal setting for this control is full ccw
	BLK BAL 1 and 2 (R41 and R46)	Adjust to remove vertical interference bars. 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 bars. View white field
AUTO Board (Fig. 10)	PK-AVG (R14)	Adjusts agc sensing between peak detect (ccw) and average detect (cw). 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



1.10 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.

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 as the address. Please contact the Customer Service Department for a Return Authorization Number before sending any shipments to the factory.

ADJUST ONLY THOSE COMPONENTS AND REPOSITION ONLY THOSE JUMPERS SHOWN WITH SHADING IN FIG. 8, 9, AND 10. ADJUSTING ANY OTHER COMPONENTS OR CHANGING ANY OTHER JUMPER MAY VOID THE WARRANTY.

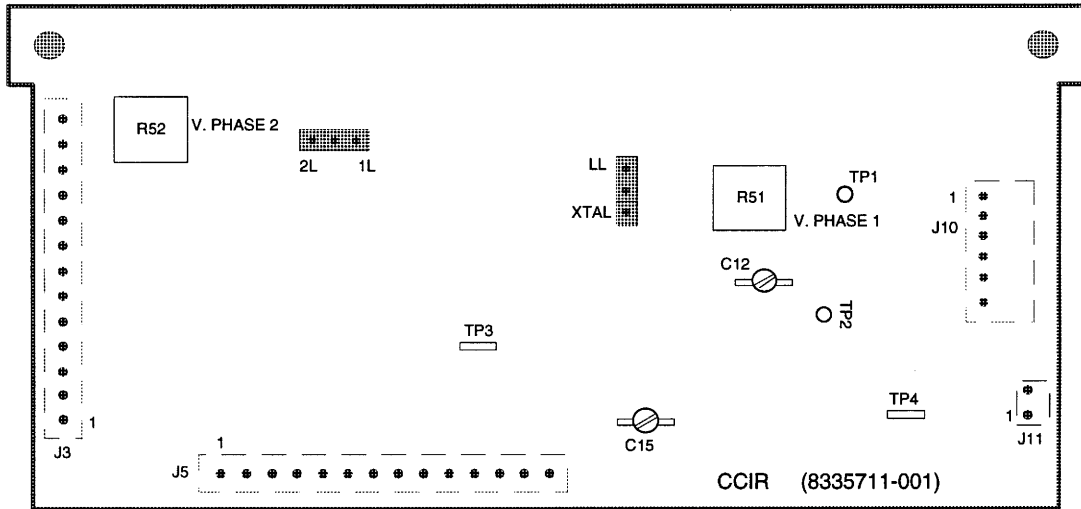


Fig. 8. Adjustment Locations, Sync/Genlock Board

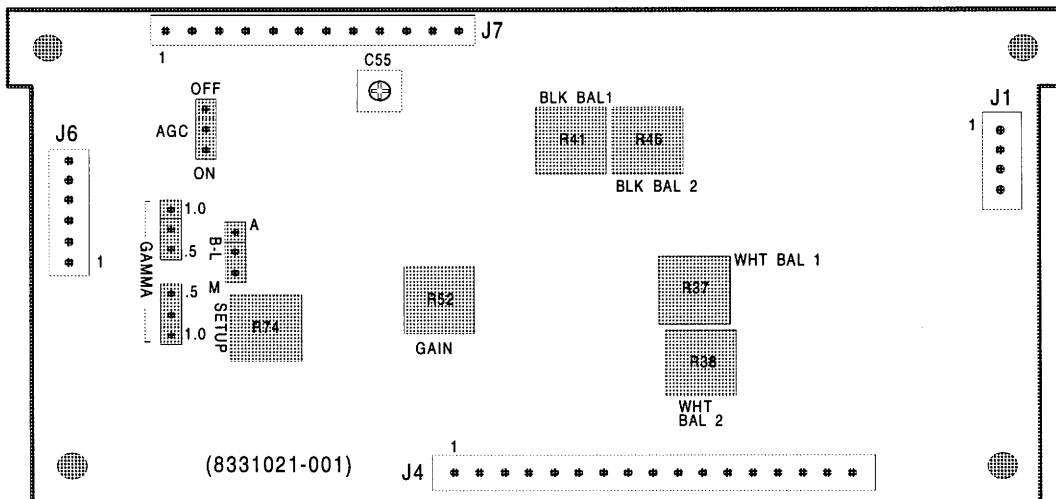


Fig. 9. Adjustment Locations, Video Board

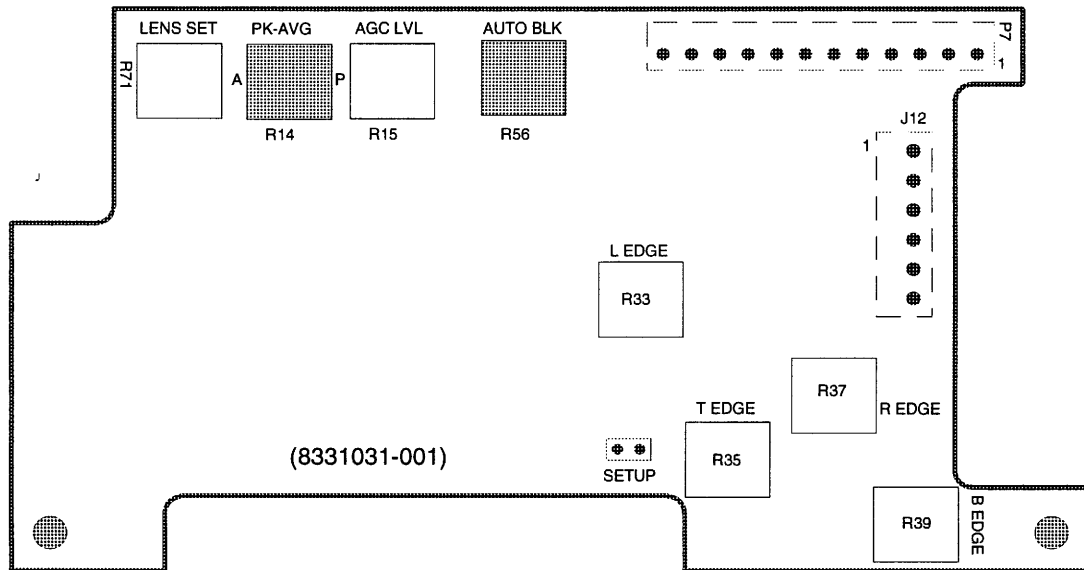


Fig. 10. Adjustment Locations, Automatics Board

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.

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November 11, 1991
Revision 1 October 28, 1997
Revision 2 April 25, 2001